SPECIFICATIONS, PROPOSAL AND
CONTRACT DOCUMENTS
FOR

TOWNSHIP OF WILLINGBORO

KENNEDY CENTER
RENOVATION TO SENIOR CENTER

BURLINGTON COUNTY, NEW JERSEY
BID NO. 8-2026

SEPTEMBER 2026

DATE: 9.23.26

William R. Long, P.E.
N.J. Professional Engineer
License No. GE33012

RICHARD A. ALAIMO ASSOCIATES
CONSULTING ENGINEERS
200 HIGH STREET, MOUNT HOLLY, NEW JERSEY 08060
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OUR FILE NO. M-0410-0011-000 (S3051)

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NOTICE TO BIDDERS

Notice is hereby given that sealed bids will be received by the Township of Willingboro, for the Kennedy Center Renovation to Senior Center, Bid No. 8-2026, and will be opened and read in public at the Municipal Complex, 1 Rev. Dr. Martin Luther King, Jr. Drive, Willingboro, New Jersey 08046 on **Friday, October 30, 2026, at 10:00 A.M.**, prevailing time.

The work includes the furnishing of all labor, material and equipment necessary or required to complete all work set forth in these Specifications and shown on the Plans. In general, the work of this project consists of renovations, repairs, and installation of walls, windows, doors, storefronts, stairs, railings, handrails, platform lifts, ADA compliant restrooms, acoustical and meta ceiling systems, structural supports, plumbing, sprinklers, HVAC, gas services, electrical services, and landscaping work at the Kennedy Center located at 429 John F Kennedy Way, Willingboro, New Jersey

Plans, Specifications and forms of bid for the proposed work prepared by Richard A. Alaimo Associates, Municipal Engineer, have been filed in the office of said ENGINEER, at 200 High Street, Mount Holly, New Jersey, and may be inspected by prospective bidders during the regular business hours. Bidders will be furnished with a copy of the Specifications, Plans and Proposal by the ENGINEER at the cost of preparation thereof, **$285.00**, nonrefundable; plus $20.00 postage and handling if mailed. Checks shall be made payable to RICHARD A. ALAIMO ASSOCIATES.

All bids must be submitted on the bid proposal forms approved and provided for by the bid specifications to be considered. Bidders are to provide one (1) hardcopy clearly sealed and marked ORIGINAL, one hardcopy (1) clearly marked COPY and one electronic copy on USB drive. Please have each item on the color checklist tabbed and numbered in your bid packet for a more time efficient packet review.

Bids must be made on the standard Proposal form in the manner designated therein and must be enclosed in a sealed envelope bearing the name and address of the bidder and the name of the project on the outside, addressed to the Township of Willingboro, and must be accompanied by Certified Check, Bid Bond or Cashier's Check drawn to the order of the Township of Willingboro for ten percent (10%) of the total amount bid, provided said security need not be more than $20,000.00. All bid guarantees shall be accompanied by an executed consent from an approved surety company, licensed to conduct business in the State of New Jersey, agreeing to furnish the required Performance and Maintenance Bonds upon the award of contract.

The signed Proposal forms and bid security must be delivered to the place and on or before the hour named above. The accepted bidder must sign the contract within ten (10) days after the Notice of Award or forfeit his bid security. Bid securities will be returned to all but the three apparent lowest responsible bidders. All other bid securities will be returned within three days after awarding and signing of the contract and approval of the Contractor's Performance Bond, Saturdays, Sundays, and Holidays excepted.

NOTICE TO BIDDERS (Continued)

This contract is subject to the provisions of the New Jersey Local Public Contracts Law, N.J.S.A. 40A:11-1, et seq.

Bidders are required to comply with the requirements of N.J.S.A. 52:32-44 (Business Registration Act); and N.J.S.A. 34:11-56.48 et seq. (Public Works Contractor Registration Act); and N.J.S.A. 40A:11-16.2, 16.3, and 16.4 (Public Works Payment Requirements); and N.J.S.A. 10:5-31 et seq., and N.J.A.C. 17:27 et seq. (Affirmative Action Law).

Sealed bids for this project are being solicited through a fair and open process in accordance with N.J.S.A. 19:44A-20.5 et seq.

The right is reserved to reject any or all Bids, pursuant to N.J.S.A. 40A:11-13.2 and any bid that is non-responsive or submitted by a bidder that is not responsible, in whole or in part, or to make awards to such bidder or bidders who, in the judgment of the Township of Willingboro is the lowest responsible bidder and to waive such minor or inconsequential discrepancies and technical omissions as may be permitted by law.

BY ORDER OF THE TOWNSHIP OF WILLINGBORO

Honorable Samantha Whitfield
Mayor

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1. ADVERTISEMENT FOR BIDS. Advertisements for bids will appear in newspapers not less than ten (10) working days before bid opening and notices of revisions or addenda to advertisements or bid documents shall be provided to all plan holders not less than seven (7) working days before the bid opening as outlined in N.J.S.A. 40A:11-23.

2. EXPLANATION TO BIDDERS. Any explanation desired by bidders regarding the meaning or interpretation of the drawings and specifications must be requested in writing and with sufficient time allowed for a reply to reach them before the submission of their bids. Oral explanations or instructions given before the award of the contract will not be binding. Any interpretation made will be in the form of an addendum to the specifications or drawings and will be furnished to all bidders, and its receipt by the bidder shall be acknowledged.

3. CONDITIONS AT SITE OF WORK. Bidders should visit the site to ascertain pertinent local conditions readily determined by inspection and inquiry, such as the location, accessibility and general character of the site, labor conditions, the character and extent of existing work within or adjacent thereto, and any other work being performed thereon.

4. BIDDERS QUALIFICATIONS. The bidder shall submit with his bid a statement of facts in detail as to his previous experience in performing similar or comparable work, and of his business and technical organization and financial resources and plant available and to be used in performing the contemplated work.

5. BID GUARANTY. Each bid shall be accompanied by a cashier's check, certified check, or bid bond duly executed by the bidder as principal and an acceptable surety company, such guarantee to be made payable to the OWNER in the amount of ten percent (10%) of the bid, but not in excess of $20,000.00. All bid guarantees shall be accompanied by an executed consent from an acceptable surety company, agreeing to furnish the required Performance, Payment and Maintenance Bonds upon the award of Contract. An acceptable surety company shall be one conforming to the requirements detailed in the General Conditions. A Bid Bond shall be supplied by the bidder at the bid opening on behalf of himself and any or all subcontractors (N.J.S.A. 40A:11-21, -22).

6. PREPARATION OF BIDS

   A. Bids shall be submitted on the forms furnished, or copies thereof, and must be manually signed. If erasures or other changes appear on the forms, each such erasure or change must be initiated by the person signing the bid.

   B. The form of bid will provide for quotation of a price, or prices, for one or more items which may be lump sum bids, alternate prices, scheduled items resulting in a bid on a unit of construction or a combination thereof, etc. Bidders must quote on all items and they are warned that failure to do so will disqualify the bid.

C. Alternative bids will not be considered unless called for.

D. Listing of subcontractors:

1. There will be set forth in the bid the name or names of all subcontractors to whom the bidder will subcontract the furnishing of (1) plumbing and gas fitting, and all kindred work; and of the (2) steam and hot water heating and ventilating apparatus, steam power plants and kindred work and; (3) electrical work and; (4) structural steel and ornamental iron work; and (5) general construction, each of which subcontractors shall be qualified in accordance with N.J.S.A. 40A:11-16.

2. Whenever a bid sets forth more than one subcontractor for any of the categories (1) through (4) specified hereinabove in this section, the bidder shall submit with the bid a certificate signed by the bidder listing each subcontractor named in the bid for that category. The certificate shall set forth the scope of work for which the subcontractor has submitted a price quote and which the bidder has agreed to award to each subcontractor should the bidder be awarded the contract. The certificate shall be submitted to the contracting unit simultaneously with the list of the subcontractors. The certificate may take the form of a single certificate listing all subcontractors or, alternatively, a separate certificate may be submitted for each subcontractor. If a bidder does not submit a certificate or certificates to the contracting unit, his bid shall be deemed non-responsive and be rejected

E. Penalties for False Statements:

1. A deposit made by any person who makes or causes to be made a false, deceptive or fraudulent statement or answers in response to a questionnaire or in the course of a hearing hereunder may be caused to be forfeited, as liquidated damages by and to the OWNER (N.J.S.A. 40A:11-33).

2. Any person who makes or causes to be made, a false, deceptive or fraudulent statement in the statement or answers in response to the questionnaire, or in the course of any hearing hereunder, shall be guilty of a misdemeanor, and upon conviction shall be punishable by a fine of not less than $100.00 nor more than $1,000.00, and shall be permanently disqualified from bidding on all public work or contracts of the OWNER which submitted the questionnaire; or, in the case of an individual or an officer or employee charged with the duty of responding to the questionnaire for a person, firm, copartnership, association or corporation,

by such fine or by imprisonment, not exceeding 6 months or both. (N.J.S.A. 40A:11-34)

7. SUBMISSION OF BIDS

A. Bids shall be submitted as directed on the bid form and be delivered to the place indicated in the Notice to Bidders on or before the time designated.

B. The following items shall be submitted with the bid and are considered mandatory submittals in accordance with P.L. 1999, c39. Failure to submit any one of these items shall be deemed a fatal defect that shall render the bid proposal unresponsive and that cannot be cured by the governing body.

1. A guarantee to accompany the bid pursuant to Section 21 of P.L. 1971, c.198 (C40A:11-21);

2. A certificate from a surety company pursuant to Section 22 of P.L. 1971, c.198 (C40A:11-22);

3. A Statement of Ownership Disclosure pursuant to N.J.S.A. 52:25-24.2;

4. A listing of subcontractors pursuant to Section 16 of P.L. 1971, c.198 (C40A:11-16); and

5. A document for the bidder to acknowledge the bidder's receipt of any notice or revisions or addenda to the advertisement or bid documents.

C. Business registration required (P.L. 2004, c.57, Amended by P.L. 2009, c. 315):

1. No contract shall be entered into by the OWNER unless the contractor provides a copy of his business registration together with a copy of the business registration for each of the subcontractors required to be listed by N.J.S.A. 40A:11-16 and as required pursuant to Section 1 of P.L. 2001, c.134 (C.52:32-44) in accordance with the following schedule:

a. In response to a request for bids or a request for proposals, before Contract Award (as a practical matter, the Business Registration should be submitted with the bid or proposal); or

b. For all other transactions, before the issuance of a purchase order or other contracting document. In its sole discretion, the OWNER may waive this requirement with a business registration previously provided to the OWNER.

2. A subcontractor shall provide a copy of its business registration to the contractor who shall forward it to the OWNER. No contract with a subcontractor; shall be entered into by the contractor under any contract with the OWNER unless the subcontractor first provides proof of valid business registration. The contractor shall notify all subcontractors by written notice of the subcontractor's obligation to comply with this provision.

3. The contractor shall maintain and submit to the OWNER a list of subcontractors and their addresses that may be updated from time to time during the course of the contract performance. A complete and accurate list shall be submitted before final payment is made for goods provided or services rendered or for construction of a construction project under the contract.

D. Public Works Contractor Registration:

1. In accordance with "The Public Works Contractor Registration Act," P.L. 1999, c.238 (N.J.S.A. 34:11-56.48 et. seq.) amended by P.L. 2003, c.091.

> *"No contractor shall bid on any contract for public work as defined in section 2 of P.L. 1963, c.150 (C34:11-56.26) unless the contractor is registered pursuant to this act.* [P.L. 1999, c.238 (C.34:11-56.48 et. seq.)] *No contractor shall list a subcontractor in a bid proposal for the contract unless the subcontractor is registered pursuant to P.L. 1999, c.238 (C.34:11-56.48 et seq.) at the time the bid is made. No contractor or subcontractor, including a subcontractor not listed in the bid proposal, shall engage in the performance of any public work subject to the contract, unless the contractor or subcontractor is registered pursuant to that act."*

2. Contractors and their subcontractors bidding on public work shall provide proof of the required registration prior to award. (As a practical matter, proof of registration should be submitted with the Bid.)

E. Stockholder Disclosure Certification: In accordance with P.L. 2016, Chapter 43 (C42:25-24.2), *"No corporation, partnership, or limited liability company shall be awarded any contract nor shall any agreement be entered into for the performance of any work or the furnishing of any materials or supplies, the cost of which is to be paid with or out of any public funds, by the State, or any county, municipality or school district, or any subsidiary or agency of the State, or of any county, municipality or school district, or by any authority, board, or commission which exercises governmental functions, unless prior to the receipt of the bid or*

accompanying the bid, of said corporation, said partnership, or said limited liability company there is submitted a statement setting forth the names and addresses of all stockholders in the corporation who own 10 percent or more of its stock, of any class, or of all individual partners in the partnership who own a 10 percent or greater interest therein, or of all members in the limited liability company who own a 10 percent or greater interest therein, as the case may be. If one or more such stockholder or partner or member is itself a corporation or partnership or limited liability company, the stockholders holding 10 percent or more of that corporation's stock, or the individual partners owning 10 percent or greater interest in that partnership, or the members owning 10 percent or greater interest in that limited liability company, as the case may be, shall also be listed. The disclosure shall be continued until names and addresses of every non-corporate stockholder, and individual partner, and member, exceeding the 10 percent ownership criteria established in this act, has been listed."

To comply with this section, a bidder with any direct or indirect parent entity which is publicly traded may submit the name and address of each publicly traded entity and the name and address of each person that holds a 10 percent or greater beneficial interest in the publicly traded entity as of the last annual filing with the federal Securities and Exchange Commission or the foreign equivalent, and, if there is any person that holds a 10 percent or greater beneficial interest, also shall submit links to the websites containing the last annual filings with the federal Securities and Exchange Commission or the foreign equivalent and the relevant page numbers of the filings that contain the information on each person that holds a 10 percent or greater beneficial interest.

The Attorney General has concluded that the provisions of N.J.S.A. 52:25-24.2, in referring to corporations and partnerships, are intended to apply to all forms of corporations and partnerships, including, but not limited to, limited partnerships, limited liability corporations, limited liability partnerships, and Subchapter S corporations.

F. The following additional items are also to be submitted with the bid. Failure to submit this information may result in disqualification of the bid.

1. Bidder Affidavit

2. Contractor Qualification Forms

3. Non-Collusion Affidavit

4. Affirmative Action Certification

5. Bid Document Submission Checklist

G. Annual Disclosure of Political Contributions:

All business entities are advised of their responsibility to file an annual disclosure statement of political contributions with the New Jersey Election Law Enforcement Commission (ELEC) pursuant to N.J.S.A. 19:44A-20.27, if they receive contracts in excess of $50,000.00 from public entities in a calendar year. Business entities are responsible for determining if filing is necessary. Additional information on this requirement is available from ELEC at (888) 313-3532 or at www.elec.state.nj.us. Bidder shall acknowledge this requirement by executing the "Disclosure of Contributions to New Jersey Election Law Enforcement Commission" form contained in the Proposal.

8. RECEIPT AND OPENING OF BIDS

A. Bids will be submitted prior to the time fixed in the Notice to Bidders. Bids received after the time so fixed are late bids. Such late bids will not be considered, but will be held unopened until the time of award and then returned to the bidder, unless other disposition is requested or agreed to by the bidder.

E. No responsibility will attach to any officer for the premature opening of, or the failure to open, a bid not properly addressed and identified.

9. WITHDRAWAL OF BIDS.

A. Bids may be withdrawn on written or telegraphic request received from bidders prior to the time fixed for opening. Negligence on the part of the bidder in preparing the bid confers no right for the withdrawal of the bid after it has been opened.

B. Withdrawal of a Bid After Bid Opening Due to a Mistake in Certain Circumstances (N.J.S.A. 40A:11-23.3):

1. In the case of a bidding process for a public works contract, a bidder may request withdrawal of a bid, due to a mistake on the part of the bidder, within five business days after a bid opening. As used in this section, "mistake" shall have the same meaning as provided in paragraph 42 of section 2 of P.L.1971, c.198 [C.40A:11-2(42)].

2. To request the withdrawal of a public works bid, a bidder shall submit a request for withdrawal in writing by certified or registered mail to the Purchasing Agent or chief administrative officer at the address to which the bid was submitted. The request shall be effective upon mailing. The

request shall include evidence, including any pertinent documents, demonstrating that a mistake was made and was of so great a consequence that:

a. the enforcement of the contract, if actually made, would be unconscionable;

b. the mistake relates to a material feature of the bid;

c. the mistake occurred notwithstanding the fact that the bidder exercised reasonable care in preparation of the bid; and

d. the bidder making the mistake is able to get relief by way of withdrawing the bid without serious prejudice to the contracting unit, except for the loss of the bargain to the contracting unit.

3. A purchasing agent qualified pursuant to subsection b. of section 9 of P.L.1971, c.198 (C.40A:11-9), or legal counsel for the contracting unit, or the chief administrative officer of the contracting unit, shall review the request for bid withdrawal. No later than the next meeting of the governing body of the contracting unit following receipt of the withdrawal request, the individual responsible for reviewing the request shall make a recommendation to the governing body of the contracting unit concerning the disposition of the request. The governing body of the contracting unit shall act upon the request to withdraw the bid no later than at it's next regular meeting.

4. The purchasing agent, legal counsel, or chief administrative officer responsible for reviewing the request pursuant to this section, shall act in good faith in reviewing the request and in making a recommendation to the governing body concerning the disposition of a request to withdraw a bid.

5. A contracting unit whose governing body grants a request to withdraw a bid shall return the bid guarantee to the bidder. Once the decision to approve the withdrawal is made, the contracting unit shall continue the award process with the remaining bids.

6. If a bidder withdraws a bid, the bidder shall be disqualified from future bidding on the same project, including whenever all bids are rejected pursuant to section 21 of P.L.1999, c.440 (C.40A:11-13.2).

10. BIDDERS PRESENT. At the time fixed for the opening of bids, their contents will be made public for the information of bidders and other interested persons, who may be present either in person or by representative.

11. BIDDERS INTERESTED IN MORE THAN ONE BID. If more than one bid be offered by any one party, by or in the name of his or their clerk, partner, or other person, all such bids will be rejected. A party who has quoted price to a bidder is not thereby disqualified from quoting prices to other bidders or from submitting a bid directly for the work.

12. AWARD OF CONTRACT.

A. The contracting unit shall award the contract or reject all bids within such time as may be specified in the invitation to bid, but in no case more than sixty (60) days, except that the bids of any bidders who consent thereto may, at the request of the contracting unit, be held for consideration for such longer period as may be agreed. (N.J.S.A. 40A:11-24)

B. The contract shall be signed by all parties within the time limit set forth in the specifications, which shall not exceed 21 days, Sundays and holidays excepted, after making the award; provided, however that all parties to the contract may agree to extend the limit set forth in the specifications beyond the 21-day limit required in this subsection. The Contractor, upon written request to the contracting unit is entitled to receive, within seven days of the request, an authorization to proceed pursuant to the terms of the contract on the date set forth in the contract for work to commence, or, if no date is set forth in the contract, upon receipt of authorization. If for any reason the contract is not awarded and the bidders have paid for or paid a deposit for the plans and specifications to the contracting unit, the payment or deposit shall immediately be returned to the bidders when the plans and specifications are returned in reasonable condition with ninety (90) days of notice that the contract has not been awarded. (N.J.S.A. 40A:11-24)

C. The OWNER reserves the right to waive any informality in the bids received when such waiver is in the interest of the OWNER.

D. Contracts shall be awarded to the lowest responsible bidder. In the event that a contract is advertised for both separate bids for each branch of work and for bids for all work, goods, and services, said contract shall be awarded in the following manner: If the sum total of the amounts bid by the lowest responsible bidder for each branch is less than the amount bid by the lowest responsible bidder for all the work, goods and services, the contracting unit shall award separate contracts for each of such branches to the lowest responsible bidder therefor, but if the sum total of the amounts bid by the

lowest responsible bidder for each branch is not less than the amount bid by the lowest responsible bidder for all the work, goods and services, the contracting unit shall award a single overall contract to the lowest responsible bidder for all of such work, goods and services. In every case in which a contract is awarded for a single overall contract, all payments required to be made under such contract for work, goods and services supplied by a subcontractor shall, upon the certification of the contractor of the amount due to the subcontractor, be paid directly to the subcontractor. (N.J.S.A. 40A:11-16c)

E. The OWNER further reserves the right to award this Contract based on the lowest price bid for the entire scope of work or to accept alternates if or as listed in the Proposal, and make an award based on the lowest price bid for alternate scope of work. If alternates are utilized, determination of the lowest bidder shall be made by applying one or more selected alternates to the total price bid, for the entire scope of work. Alternates shall be selected in the exact order shown in the Proposal and comparison of bids shall be based on the same alternate items.

F. In accordance with N.J.A.C. 7:22-3.39, no contract will be awarded to a person, firm or corporation currently debarred, suspended or disqualified from NJDEP contracting pursuant to N.J.A.C. 7:1D-2.

G. In accordance with N.J.A.C. 7:22-2.24(b), the Contractor may be debarred, suspended or disqualified from contracting with the State and the Department if the Contractor commits any of the acts listed in N.J.A.C. 7:1D-2.

13. REJECTION OF BIDS. The OWNER reserves the right to reject any an all bids when such rejection is in the interest of the OWNER; to reject the bid of a bidder who has previously failed to perform properly or complete on time contracts of a similar nature; and to reject the bid of a bidder who is not, in the opinion of the ENGINEER, in a position to perform the contract.

14. CONTRACTS AND BONDS. The bidder to whom award is made shall, within ten (10) days of his notice of award, execute the Contract Documents and furnish a Performance Bond in an amount equal to the full amount of the Contract. The Bond must be drawn by an acceptable surety company as described in Paragraph 4, above, and be in the form of a combination Performance and two (2) year Maintenance Bond in the full amount of the contract, and must be executed on the forms provided in these documents. The (2) year maintenance period shall begin on the date of the acceptance of the work by the OWNER.

15. MODIFICATIONS TO SPECIFICATIONS. The right is reserved, as the interest of the OWNER may require, to revise or amend the specifications and/or drawings prior to the date set for opening bids. Such revisions and amendments, if any, will be announced by

an addendum or addenda to this Notice to Bidders. Copies of such addenda as may be issued will be furnished to all prospective bidders. If the revisions and amendments are of a nature which requires material changes in quantities or prices bid, or both, the date set for opening bids may be postponed by such number of days as in the opinion of the ENGINEER will enable bidders to revise their bids. In such case, the addendum will include an announcement of the new date for opening bids.

16. TIME OF COMPLETION. Should all the work under the Contract not be completed within the time specified herein from Notice to Proceed, there shall be deducted and retained out of the payments which may be due the Contractor, the sum as designated in the Proposal for each and every calendar day occupied beyond the time stipulated, excepting Sundays and Legal Holidays, not as a penalty but as liquidated damages for engineering or other expenses.

17. RETURN OF BID GUARANTY. All bid security, except the security of the three apparent lowest responsible bidders, shall be returned, unless otherwise requested by the bidder, within 10 days after the opening of the bids, Sundays and holidays excepted, and the bids of such bidders shall be considered as withdrawn. Within three days, Sundays and holidays excepted, after the awarding and signing of the contract and the approval of the contractor's performance bond, the bid security of the remaining unsuccessful bidders shall be returned to them. [N.J.S.A. 40A:11-24a].

18. WAGE RATES.

A. This contract is subject to the requirements of the New Jersey Prevailing Wage Act, N.J.S.A. 34:11-56.25 et seq. as amended which establishes a prevailing wage level for workmen engaged in public works.

B. The current prevailing wage determination is contained within these contract documents; however, applicable rates are those wages and fringe benefit rates in effect on the date the contract is awarded. Rates may change between the time of issuance of the determination contained herein and the award of the contract. No adjustment in contract amount shall be made on account of any change in the prevailing rates.

C. When a public body engages in competitive bidding for public work subject to the provisions of the New Jersey Prevailing Wage Act (PWA), the person who makes the lowest bid for the contract by 10 percent or more under the amount of the next lowest bid shall prior to award of the contract certify to the public body on the Lowest Bidder Prevailing Wage Certification form that the prevailing wage rates required by the PWA shall be paid in performing the work under the contract. If the bidder does not provide the certification required prior to the award of the contract, the public body shall award the contract to the next lowest responsible and responsive bidder.

D. In accordance with N.J.S.A. 34-11.56.38 this contract will not be awarded to bidders who are on the listing of Contractors and subcontractors debarred from public work pursuant to N.J.S.A. 34:11-56.37.

19. AFFIRMATIVE ACTION. This Contract is subject to the Affirmative Action Regulations per N.J.S.A. 58:11B-26, N.J.S.A. 10:5 et seq. and N.J.A.C. 17:27et seq., as amended. Failure to submit the required documentation when required may result in rejection of the Contractor's Proposal or rescission of the contract award.

20. MBE/WBE AND SMALL BUSINESS UTILIZATION. "REQUIREMENTS FOR USE OF SMALL, MINORITY AND WOMEN'S BUSINESS ENTERPRISE" – Bidders on this work must comply fully with the current requirements of N.J.A.C. 7:22-3.17(a)24 and 7:22-4.17(a) or 7:22-6.17(a)24 and with any further requirements, including the goals established by the OWNER for the utilization of such businesses. No less than 10 percent of the total amount of all contracts or subcontracts related to this project shall be awarded to SEDs. The OWNER'S program and specific requirements for Bidders and Contractors are included in the SED Utilization Plan. (**To be used on Community Development and NJ Infrastructure Trust Projects)**

21. ANTI-DISCRIMINATION. All parties to any contract with the State agree not to discriminate in employment and agree to abide by all anti-discrimination laws including those contained within N.J.S.A. 10:2-1 through N.J.S.A. 10:2-4, N.J.S.A. l0:5-1 et seq. and N.J.S.A. l0:5-31 through 10:5-38, and all rules and regulations issued thereunder are hereby incorporated by reference.

22. CERTIFICATION OF NON-DEBARMENT

A. In accordance with P.L. 2019, c.406 (N.J.S.A. 52:32-44.1), any person or entity that submits a bid or proposal or otherwise proposes to enter into or renew a contract is required to certify, at the time the bid is submitted, or the contract is renewed, that the person or entity is not debarred by the federal government from contracting with a federal agency. The certification required shall be executed on behalf of the applicable person or entity by an authorized officer or representative of the person or entity.

B. If the bidder is unable to certify that it is not debarred by the federal government from contracting with a federal agency, the contracting unit shall not award the business entity any contracts.

C. Failure to submit the required certification is cause for the bid to be rejected.

23. AMERICAN MADE PRODUCTS

A. In accordance with N.J.S.A. 18A:18A-20, only manufactured and farm products of the United States, wherever available, shall be used in the performance of the work required by this contract.

24. PROHIBITION ON CERTAIN TELECOMMUNICATIONS AND VIDEO SURVEILLANCE SERVICE OR EQUIPMENT. The John S. McCain National Defense Authorization Act for Fiscal Year 2019 (P.L. 115- 232), at Section 889, prohibits EPA financial assistance recipients from expending loan funds to procure or obtain; extend or renew a contract to procure or obtain; or enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that use covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. As described in the Act, "covered telecommunications equipment or services" means:

A. Telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).

B. For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).

C. Telecommunications or video surveillance services provided by such entities or using such equipment.

D. Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

E. The Act does not prohibit:

1. Procuring with an entity to provide a service that connects to the facilities of a third-party, such as backhaul, roaming, or interconnection arrangements.

2. Telecommunications equipment that cannot route or redirect user data traffic or permit visibility into any user data or packets that such equipment transmits or otherwise handles.

****END OF INSTRUCTIONS TO BIDDERS****

PROPOSAL

KENNEDY CENTER
RENOVATION TO SENIOR CENTER

BID NO. 8-2026

TO THE TOWNSHIP OF WILLINGBORO:

The undersigned hereby declares that ___ he __ has___ carefully examined the specifications, plans and form of contract for the project named above; that ___ he __ ha___ carefully examined the site of the project; and that ___ he __ will contract to carry out and complete said project as specified and delineated at the price per unit measure or lump sum for each scheduled item of work stated in the Schedule of Prices following.

It is understood that the Total Price for the entire contract stated by the undersigned in the Schedule is based on the estimated quantities and will control in the awarding of the contract. It is further understood that the quantities stated in this Schedule of Prices for the various items are estimated only and may be increased or decreased. Payment will be made only for the actual quantity of authorized work done under each scheduled item.

It is further understood that the following procedure will be used to correct numerical discrepancies found in the Schedule of Prices following:

1. All Unit Prices and the Total Price for the entire contract shall be expressed in both words and figures, and in case of discrepancy, the written price shall govern over the price stated in figures.

2. If based on the above, it is found that the written Total Price for the entire contract is found to have been incorrectly computed, then changes will be made in any or all unit prices so as to attain conformity with said Total Price before the contract is executed.

When alternate bid items are listed in the Proposal, the determination of which bidder's response to a request for bids offers the lowest price shall be made on the basis of the price of: (i) the base bid items plus the price of any selected alternate bid item; or (ii) a choice of alternate bid items within the limit of funds that may be available for a project. If the OWNER provides for more than one alternate bid item, the OWNER shall specify the ranked order in which the alternate bid items are to be selected and included in the award of the contract, provided that this requirement shall only apply to a project with a total estimated cost, including alternate bid items, of greater than $500,000. (N.J.S.A.40A:11-23.1d)

The undersigned proposes to furnish all labor, materials and equipment required to construct and complete the structures and do other work complete in every detail, in accordance with plans, specifications and other contract documents prepared by Richard A. Alaimo Associates, Consulting Engineers, at and for the following Lump Sum Prices and Unit Prices:

PROPOSAL (Continued)

TOWNSHIP OF WILLINGBORO
KENNEDY CENTER
RENOVATION TO SENIOR CENTER
BID NO. 8-2026

Item No.	Description	Unit Price	Total Price
1.	Mobilization. (See Section 00 22 00) LUMP SUM PRICE _____ Dollars and_____ Cents		$_____
2.	Demolition Work. LUMP SUM PRICE _____ Dollars and_____ Cents		$_____
3.	Abatement of hazardous materials including asbestos and lead as indicated in the Appendix A", and in compliance with all regulations of applicable federal, state and local agencies. LUMP SUM PRICE _____ Dollars and_____ Cents		$_____

PROPOSAL (Continued)

Item No.	Description	Unit Price	Total Price
4.	Site and Soil Erosion Control. LUMP SUM PRICE _____ Dollars and_____ Cents		$_____
5.	Yard Piping. LUMP SUM PRICE _____ Dollars and_____ Cents		$_____
6.	Constructing Concrete Patio Area (3,570 SF). LUMP SUM PRICE _____ Dollars and_____ Cents		$_____
7.	Constructing Partition Walls w/Metal Studs and Drywall. LUMP SUM PRICE _____ Dollars and_____ Cents		$_____

PROPOSAL (Continued)

Item No.	Description	Unit Price	Total Price
8.	Constructing of Interior Ramp and Interior Steps w/ Guard Rails and Handrails. LUMP SUM PRICE _____ Dollars and_____ Cents		$_____
9.	Removing stains and paint, cleaning, repairing cracks and pointing damaged and missing masonry joints at the existing exterior brick masonry walls (3,000 SF). LUMP SUM PRICE _____ Dollars and_____ Cents		$_____
10.	Construction Aluminum Exterior Windows, Store Fronts, Interior Glazed Partitions, and modification of existing storefronts, including hardware and all other associated work. LUMP SUM PRICE _____ Dollars and_____ Cents		$_____
11.	Providing and Installing Doors, Frames and Hardware. LUMP SUM PRICE _____ Dollars and_____ Cents		$_____

PROPOSAL (Continued)

Item No.	Description	Unit Price	Total Price
12.	Roofing Repair at Roof Top Mechanical Equipment as indicated on drawings and Specifications and all other associated work. LUMP SUM PRICE _____ Dollars and_____ Cents		$_____
13.	Providing and installing Aluminum Handrails and Guard Rails at Two Exterior Stairs. LUMP SUM PRICE _____ Dollars and_____ Cents		$_____
14.	Providing Interior Steps including construction of concrete steps, foundations, guardrails, handrails and all finishes at Conference Room 145. LUMP SUM PRICE _____ Dollars and_____ Cents		$_____
15.	Providing and installing aluminum Pass Thru Window at Café and all other associated work. LUMP SUM PRICE _____ Dollars and_____ Cents		$_____

PROPOSAL (Continued)

Item No.	Description	Unit Price	Total Price
16.	Cutting existing wood stepped platform to install a new Chairlift, building and finishing the wood podiums with fire rated wood/ plywood and finishing the sides with drywall and all other associated work. LUMP SUM PRICE _____ Dollars and_____ Cents		$_____
17.	Providing and installing Acoustical Ceiling System and Acoustical Linear Metal Ceiling System. LUMP SUM PRICE _____ Dollars and_____ Cents		$_____
18.	Commercial Kitchen Equipment, Commercial Cabinets, and stainless steel work counters and Tables as indicated on drawings. LUMP SUM PRICE _____ Dollars and_____ Cents		$_____
19.	Providing and installing Flooring and Base. LUMP SUM PRICE _____ Dollars and_____ Cents		$_____

Item No.	Description	Unit Price	Total Price
20.	Providing and finishing Paints, Coatings, Pre-Engineered Wall Panels, FRP Wall Panels, Signage, and Finishes at all Interior and Exterior Walls. LUMP SUM PRICE _____ Dollars and_____ Cents		$_____
21.	Restroom – Toilet fixtures, accessories, partitions, Water coolers, and all other associated work. _____ Dollars and_____ Cents		$_____
22.	Landscaping of Courtyard as shown on drawings. LUMP SUM PRICE _____ Dollars and_____ Cents		$_____
23.	Plumbing Work, new work, including demolition of existing concrete, excavation of earthwork to connect to under floor pipes and sanitary sewers, patching and repair to match existing after completion, and all other work as indicated on drawings and specifications. LUMP SUM PRICE _____ Dollars and_____ Cents		$_____

Item No.	Description	Unit Price	Total Price
24.	HVAC including Commercial Kitchen Exhaust System and BMS Work. LUMP SUM PRICE _____ Dollars and_____ Cents		$_____
25.	Electrical Work, including new work, demolition as shown on drawings and specifications and all other associated work. LUMP SUM PRICE _____ Dollars and_____ Cents		$_____
26.	Providing and installing two (2) ADA Compliant Platform Lifts, including structural work, electrical connections, and all other associated work. LUMP SUM PRICE _____ Dollars and_____ Cents		$_____
27.	Providing Remediation and Disposal of Hazardous Materials. ALLOWANCE One Hundred Twenty-Five Thousand Dollars and No Cents		$ 125,000.00

Item No.	Description	Unit Price	Total Price
28.	Contingency Allowance.		
	ALLOWANCE		
	Two Hundred Thousand Dollars		
	and No Cents		$200,000.00
	TOTAL PRICE BID BID NO. 8-2026 ITEM NOS. 1 THROUGH 28		
	_____ Dollars		
	and _____ Cents		$_____

PROPOSAL (Continued)
BID DOCUMENT SUBMISSION CHECKLIST

A. Failure to submit the following documents is a mandatory cause for the bid to be rejected. (N.J.S.A. 40A:11-21) (N.J.S.A. 52:32-55, et seq.)

Required With Submission of Bid (Owner's checkmarks)		Initial Each Item Submitted With Bid (Bidder's Initials)
X	A bid guarantee as required by N.J.S.A. 40A:11-21	
X	A certificate from a surety company, pursuant to N.J.S.A. 40A:11-22	
X	Statement of Ownership Disclosure, pursuant to N.J.S.A. 52:25-24.2	
X	A listing of subcontractors as required by N.J.S.A. 40A:11-16	
X	Bidder's Affidavit submitted with the bid proposal	
X	If applicable, bidder's acknowledgement of receipt of any notice(s) or revision(s) or addenda to an advertisement, specifications or bid document(s)	

B. Failure to submit the following documents before Contract award is cause for the bid to be rejected.

X	A copy of Contractor's and subcontractor's business registration required by N.J.S.A. 52:32-44. This is required prior to award. (As a practical matter, proof of registration should be submitted with the Bid.)	
X	"Public Works Contractor Registration" for the Contractor and each subcontractor (N.J.S.A. 34:11-56.48). This is required prior to award. (As a practical matter, proof of registration should be submitted with the Bid.)	
X	Submission of a Non-Collusion Affidavit (this form must be Notarized)	
X	Affidavit regarding the State Treasurer's List of Debarred, Suspended and Disqualified Bidders (this form must be notarized)	
X	Certification of Non-Debarment for Federal Government Contracts pursuant to N.J.S.A. 52:32-44.1	

C. Submit the following documents.

X	Performance Bond and Maintenance Bond (Required from the awarded Contractor)	
X	Certification of Bidder showing that Bidder owns, leases or controls any necessary equipment.	

D. SIGNATURE: The undersigned hereby acknowledges and has submitted the above listed items.

Name of Bidder/Company: _____
By Authorized Representative:
Signature: _____

Print Name and Title: _____

Date: _____

TOWNSHIP OF WILLINGBORO

ACKNOWLEDGMENT OF RECEIPT OF CHANGES TO BID DOCUMENTS

KENNEDY CENTER
RENOVATION TO SENIOR CENTER

BID NO. 8-2026

Pursuant to N.J.S.A. 40A:11-23.1a, the undersigned bidder hereby acknowledges receipt of the following addenda to the bid documents. By indicating date of receipt, bidder acknowledges the submitted bid takes into account the provisions of the addendum. If there were no revision or addenda write NONE on the top line, sign the acknowledgement below and submit with the bid documents.

Local Unit Reference Number or Title of Addendum/Revision	**How Received (mail, fax, pick-up, etc.)**	**Date Received**

Acknowledgment by Bidder:

Name of Bidder:
Company Name)

By Authorized Representative:
Signature:

Print Name and Title:

Date:

The undersigned hereby agrees to complete all work within the number of calendar days listed below from the date of notice to begin work, which will be forwarded to the Contractor by the ENGINEER. He further agrees that the OWNER may, without recourse or other legal action, retain from the monies that are or may become due the amount stipulated below for each and every calendar day (Sundays and legal holidays excepted) that the completion of the work may be delayed beyond the time stipulated below. Such amount is hereby mutually agreed, not as a penalty, but as liquidated damages accruing to the OWNER due to such delay for extra costs due to engineering or other expenses. The schedule of completion dates and amount for liquidated damages are as follows:

CONTRACT	CALENDAR DAYS TO COMPLETE	LIQUIDATED DAMAGES
Bid No. 8-2026	One Hundred Eighty (180)	$1,500.00

Upon request the bidder will be expected to amplify the statements contained herein as necessary to satisfy the OWNER concerning his ability to successfully perform the work in a satisfactory manner.

The undersigned bidder submitting this proposal or bid certifies and affirms that such bid is genuine and not collusive or sham; that said bidder has not colluded, conspired, connived, or agreed, directly or indirectly, with any bidder or person, to put in a sham bid, or that such other persons shall refrain from bidding, and has not in any manner, directly or indirectly, sought by agreement or collusion, or communication or conference, with any person, to fix the bid price of said bidder or any other bidder or fix any overhead, profit or cost element of said bid price, or that of any other bidder, or to secure any advantage against the OWNER or any person interested in the proposed contract; and further, that such bidder has not, directly or indirectly, submitted this bid, or the contents thereof, or divulged information or data relative thereto to any association or to any member or agent thereof; and, that no member of the OWNER'S Officials or Employees of said OWNER is interested directly or indirectly in the bid or in any portion of the bid, nor in the Contract or in any part of the Contract which may be awarded the undersigned on the basis of such bid.

Signed this _____ day of _____, 20___.

_____

Bidder

By _____

Printed Name and **Signature** of Individual, Partner or Officer Signing the Proposal

(SEAL)

(Seal is required if Bidder is a Corporation)

_____

Title

PROPOSAL (Continued)

BIDDER'S AFFIDAVIT

STATE OF _____)
)
COUNTY OF _____)

_____

being duly sworn, deposes and says that he resides at

_____

and that he is the _____
(Give Title)

of _____

who signed the above Proposal or Bid, that he was duly authorized to sign and that the Bid is the true offer of the Bidder, that the seal attached is the seal of the Bidder and that all declarations and statements contained in the Bid are true to the best of his knowledge and belief.

He further deposes that he has submitted herewith a list of names and addresses of all stockholders and/or partners owning a 10 percent or greater interest therein in compliance with P.L. 1977, Chapter 33, effective March 8, 1977.

_____
Affiant

Subscribed and Sworn to before me this _____ day of_____, 2026.

_____

STATEMENT OF OWNERSHIP DISCLOSURE

N.J.S.A. 52:25-24.2 (P.L. 1977, c.33, as amended by P.L. 2016, c.43)

This statement shall be completed, certified to, and included with all bid and proposal submissions. Failure to submit the required information is cause for automatic rejection of the bid or proposal.

Name of Organization: _____

Organization Address: _____

Part I Check the box that represents the type of business organization:

☐ Sole Proprietorship (skip Parts II and III, execute certification in Part IV)

☐ Non-Profit Corporation (skip Parts II and III, execute certification in Part IV)

☐ For-Profit Corporation (any type) ☐ Limited Liability Company (LLC)

☐ Partnership ☐ Limited Partnership ☐ Limited Liability Partnership (LLP)

☐ Other (be specific): _____

Part II

☐ The list below contains the names and addresses of all stockholders in the corporation who own 10 percent or more of its stock, of any class, or of all individual partners in the partnership who own a 10 percent or greater interest therein, or of all members in the limited liability company who own a 10 percent or greater interest therein, as the case may be. (**COMPLETE THE LIST BELOW IN THIS SECTION**)

OR

☐ No one stockholder in the corporation owns 10 percent or more of its stock, of any class, or no individual partner in the partnership owns a 10 percent or greater interest therein, or no member in the limited liability company owns a 10 percent or greater interest therein, as the case may be. (**SKIP TO PART IV**)

(Please attach additional sheets if more space is needed):

Name of Individual or Business Entity	Address

Part III DISCLOSURE OF 10% OR GREATER OWNERSHIP IN THE STOCKHOLDERS, PARTNERS OR LLC MEMBERS LISTED IN PART II

If a bidder has a direct or indirect parent entity which is publicly traded, and any person holds a 10 percent or greater beneficial interest in the publicly traded parent entity as of the last annual federal Security and Exchange Commission (SEC) or foreign equivalent filing, ownership disclosure can be met by providing links to the website(s) containing the last annual filing(s) with the federal Securities and Exchange Commission (or foreign equivalent) that contain the name and address of each person holding a 10% or greater beneficial interest in the publicly traded parent entity, along with the relevant page numbers of the filing(s) that contain the information on each such person. **Attach additional sheets if more space is needed**.

Website (URL) containing the last annual SEC (or foreign equivalent) filing	Page #'s

Please list the names and addresses of each stockholder, partner or member owning a 10 percent or greater interest in any corresponding corporation, partnership and/or limited liability company (LLC) listed in Part II **other than for any publicly traded parent entities referenced above**. The disclosure shall be continued until names and addresses of every noncorporate stockholder, and individual partner, and member exceeding the 10 percent ownership criteria established pursuant to N.J.S.A. 52:25-24.2 has been listed. **Attach additional sheets if more space is needed.**

Stockholder/Partner/Member and Corresponding Entity Listed in Part II	Address

Part IV Certification

I, being duly sworn upon my oath, hereby represent that the foregoing information and any attachments thereto to the best of my knowledge are true and complete. I acknowledge: that I am authorized to execute this certification on behalf of the bidder/proposer; that the ***Township of Willingboro*** is relying on the information contained herein and that I am under a continuing obligation from the date of this certification through the completion of any contracts with ***Willingboro Township*** to notify the ***Township of Willingboro*** in writing of any changes to the information contained herein; that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I am subject to criminal prosecution under the law and that it will constitute a material breach of my agreement(s) with the, permitting the ***Township of Willingboro*** to declare any contract(s) resulting from this certification void and unenforceable.

Full Name (Print):		Title:	
Signature:		Date:	

BID NO. 8-2026 - CONTRACTOR QUALIFICATIONS

The undersigned offers the following information relative to the facilities, ability and financial resources available for the fulfillment of the contract if such be awarded to him.

FACILITIES: That he or they own and have available for immediate use on the proposed work the following plant and equipment:

_____

_____

_____

_____

_____

FINANCIAL RESOURCES: That information relative to his or their financial resources can and may be obtained from the following: (Give name, business and address.)

_____

_____

_____

_____

_____

Bidder's Name, Address, Telephone Number, Email, and Unique Entity ID:

_____

_____

_____

_____

_____

_____

_____

BID NO. 8-2026 - CONTRACTOR QUALIFICATIONS

STATEMENT OF QUALIFICATIONS

The projects listed below have been constructed by the bidder or persons to be in responsible charge of this project.

REFERENCES

	Date of Completion	Owner	Location	Engineer
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

The bidder attests to the fact that he or the subcontractor has crews trained and expert in the construction of the type specified.

SUBCONTRACTOR LISTING
(**PLEASE TYPE OR PRINT**)

Plumbing and Gas Fitting:

In order to be a Plumbing Contractor in the State of New Jersey a Master Plumber licensed in accordance with N.J.S.A. 45:14C, et seq., must own ten percent (10%) of the firm (N.J.S.A. 45:14C-2(d) and (h)).

Subcontractor Name, Address and Telephone Number:

_____

_____

Name of Master Plumber: _____ License No._____

Electrical Work:

In order to be an Electrical Contractor in the State of New Jersey, a license and business permit must be obtained in accordance with N.J.S.A. 45:5A-9 of the "Electrical Contractors Licensing Act".

Subcontractor Name, Address and Telephone Number:

_____

_____

Business Permit No: _____ License No._____

Heating, Ventilating and Air Conditioning:

Subcontractor Name, Address and Telephone Number:

_____

_____

Structural Steel and Ornamental Iron:

Subcontractor Name, Address and Telephone Number:

_____

_____

General Construction/Other:

Subcontractor Name, Address and Telephone Number:

_____

_____

NON-COLLUSION AFFIDAVIT

STATE OF _____
SS
COUNTY OF _____

I, _____ of the City of _____
(Name)

in the County of _____ and the State of _____
of full age, being duly sworn according to law on my oath depose and say that:

I am _____, a _____
(Name) (Title, Position, Etc.)
in the firm of _____
the bidder making the proposal to _____
(Name of Owner)
for work under _____
(Contract Number - Description)

and that I executed the said Proposal with full Authority to do so; that said Bidder has not, directly or indirectly entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free, competitive bidding in connection with the above named project; and that all statements contained in said Proposal and in this Affidavit are true and correct, and made with full knowledge that the

_____
(Name of Owner)

relies upon the truth of the statements contained in said Proposal and in the statements contained in this Affidavit in awarding the Contract for the said project.

I further warrant that no person or selling agency has been employed or retained to solicit or secure such contract upon an agreement or understanding, except Bona Fide employees of the Contractor, and as may be permitted by law.

_____
(Also type or print name of affiant under signature).

Subscribed and Sworn to before me this _____ day of _____, 2026.

_____
Notary Public of

My Commission Expires _____, 2026.

DISCLOSURE OF CONTRIBUTIONS TO NEW JERSEY ELECTION LAW ENFORCEMENT COMMISSION IN ACCORDANCE WITH N.J.S.A. 19:44A-20.27

STATE OF _____

SS

COUNTY OF _____

I, _____ of the City of _____
(Name)
in the County of_____ and the State of _____ of full age, being duly sworn according to law on my oath depose and say that:

I am _____, a _____
(Name) (Title, Position, etc.)
in the firm of _____ the bidder making the

proposal to _____
(Name of Owner)

for work under _____
(Contract No. – Description)

and that I executed the said Proposal with full Authority to do so; that said Bidder acknowledges our responsibility to file an annual disclosure statement of political contributions with the New Jersey Election Law Enforcement Commission (ELEC) pursuant to N.J.S.A. 19:44-20.27 if in receipt of contracts in excess of $50,000.00 from public entities in a calendar year. I further acknowledge that business entities are solely responsible for determining if filing is necessary and that all statements contained in said Proposal and in this Affidavit are true and correct, and made with full knowledge that the

_____
(Name of Owner)

relies upon the truth of the statements contained in said Proposal and in the statements contained in this Affidavit in awarding the Contract for the said project.

I further warrant that no person or selling agency has been employed or retained to solicit or secure such contract upon an agreement or understanding for commission, percentage brokerage, or contingent fee, except Bona Fide employees of the Contractor, and as may be permitted by law.

_____
(Also type or print name of affiant under signature)

Subscribed and Sworn to before me this _____ day of _____, 20__.

Notary Public of _____
My Commission Expires _____

STATE TREASURER'S LIST OF DEBARRED, SUSPENDED AND DISQUALIFIED BIDDERS

The Contractor shall submit with his bid a sworn statement, as set forth herein signed by an officer or partner of the Contractor, indicating whether or not the Contractor is at the time of the bid, included on the State Treasurer's List of Debarred, Suspended, or Disqualified Bidders. The Contractor will immediately notify the Owner whenever it appears that a Contractor is on the State Treasurer's List. The Contractor may be debarred, suspended, or disqualified from contracting with the State of New Jersey and NJDEP if the Contractor commits any of the acts listed in N.J.A.C. 7:1D-2.2.

STATE OF NEW JERSEY

ss

COUNTY OF

I,_____of the City of _____

in the County of_____and the State of_____of full age,

being duly sworn according to law on my oath depose and say that:

I am_____, an officer of the firm of _____the bidder making the Proposal for the above named work, and that I executed the said Proposal with full authority to do so that said bidder at the time of making of this bid, is not included on the State of New Jersey, State Treasurer's List of Debarred, Suspended and Disqualified Bidder; and that all statements contained in said Proposal and in the affidavit are true and correct, and made with the full knowledge that the Owner as Local Unit relies upon the truth of the statements contained in said Proposal and in the statements contained in this affidavit in awarding the contract for said work.

The undersigned further warrants that should the name of the firm making this bid appear on the State Treasurer's List of Debarred, Suspended and Disqualified Bidders at anytime prior to, and during the life of this Contract, including the Guarantee Period, that the **Township of Willingboro** (Loan Applicant) shall be immediately notified by the signatory of this Eligibility Affidavit.

The undersigned understands that the firm making the bid as a Contractor is subject to debarment, suspension and/or disqualification in contracting with the State of New Jersey and the Department of Environmental Protection if the Contractor, pursuant to N.J.A.C. 7:1D-2.2 commits any of the acts listed therein, and as determined according to applicable law and regulation.

(Insert Name and Address of Contractor)

_____

(Insert Name and Title of Affiant)

Subscribed and sworn

before me this_____day

of_____20_____

_____

Notary Public of_____

My commission expires_____, 20_____

Summary of the Certification Requirements under N.J.S.A. 52:32-44.1

Pursuant to state law any natural person, company, firm, association, corporation, or other entity prohibited, or "debarred," from contracting with the federal government agencies, shall also be prohibited from contracting for public work in the state of New Jersey. This prohibition also extends to any affiliate organization(s) held by or subject to the control of an entity of that prohibited person or entity.

Prior to awarding a contract for public work a local units must obtain written certification from the contracting person or entity through the form below, attesting to their non-debarment from contracting with federal government agencies. Contracting units are reminded that they must fill-in the boilerplate information in the certification sections of Parts II through IV regarding their name and type of contracting unit before using the form.

N.J.S.A. 52:32-44.1 (P.L. 2019, c.406)

This certification shall be completed, certified to, and submitted to the contracting unit prior to contract award, except for emergency contracts where submission is required prior to payment.

PART I: VENDOR INFORMATION	
Individual or Organization Name	
Physical Address of Individual or Organization	
Unique Entity ID (if applicable)	
CAGE/NCAGE Code (if applicable)	
Check the box that represents the type of business organization:	

☐Sole Proprietorship (skip Parts III and IV) ☐Non-Profit Corporation (skip Parts III and IV)

☐For-Profit Corporation (any type) ☐Limited Liability Company (LLC) ☐Partnership

☐Limited Partnership ☐Limited Liability Partnership (LLP)

☐Other (be specific): _____

PART II – CERTIFICATION OF NON-DEBARMENT: Individual or Organization			
I hereby certify that the **individual or organization listed above in Part I** is not debarred by the federal government from contracting with a federal agency. I further acknowledge: that I am authorized to execute this certification on behalf of the above-named organization; that the ***Township of Willingboro*** is relying on the information contained herein and that I am under a continuing obligation from the date of this certification through the date of contract award by the ***Township of Willingboro*** to notify the ***Township of Willingboro*** in writing of any changes to the information contained herein; that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I am subject to criminal prosecution under the law and that it will constitute a material breach of my agreement(s) with the ***Township of Willingboro***, permitting the ***Township of Willingboro*** to declare any contract(s) resulting from this certification void and unenforceable.			
Full Name (Print):		Title:	
Signature:		Date:	

PART III – CERTIFICATION OF NON-DEBARMENT: Individual or Entity Owning Greater than 50 Percent of Organization	
Section A (Check the Box that applies)	
☐	Below is the name and address of the stockholder in the corporation who owns more than 50 percent of its voting stock, or of the partner in the partnership who owns more than 50 percent interest therein, or of the member of the limited liability company owning more than 50 percent interest therein, as the case may be.
Name of Individual or Organization	
Physical Address	
OR	
☐	No one stockholder in the corporation owns more than 50 percent of its voting stock, or no partner in the partnership owns more than 50 percent interest therein, or no member in the limited liability company owns more than 50 percent interest therein, as the case may be.
Section B (Skip if no Business entity is listed in Section A above)	
☐	Below is the name and address of the stockholder in the corporation who owns more than 50 percent of the voting stock of the organization's parent entity, or of the partner in the partnership who owns more than 50 percent interest in the organization's parent entity, or of the member of the limited liability company owning more than 50 percent interest in organization's parent entity, as the case may be.
Stockholder/Partner/Member Owning Greater Than 50 Percent of Parent Entity	
Physical Address	
OR	
☐	No one stockholder in the parent entity corporation owns more than 50 percent of its voting stock, no partner in the parent entity partnership owns more than 50 percent interest therein, or no member in the parent entity limited liability company owns more than 50 percent interest therein, as the case may be.

Section C – Part III Certification			
I hereby certify that no individual or organization that is debarred by the federal government from contracting with a federal agency owns greater than 50 percent of the **Organization listed above in Part I** or, if applicable, owns greater than 50 percent of a parent entity of **<name of organization>**. I further acknowledge: that I am authorized to execute this certification on behalf of the above-named organization; that the ***Township of Willingboro*** is relying on the information contained herein and that I am under a continuing obligation from the date of this certification through the date of contract award ***Township of Willingboro*** to notify the ***Township of Willingboro*** in writing of any changes to the information contained herein; that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I am subject to criminal prosecution under the law and that it will constitute a material breach of my agreement(s) with the ***Township of Willingboro,*** permitting the ***Township of Willingboro*** to declare any contract(s) resulting from this certification void and unenforceable.			
Full Name (Print):		Title:	
Signature:		Date:	

Part IV – CERTIFICATION OF NON-DEBARMENT: Contractor – Controlled Entities		
Section A		
☐	Below is the name and address of the corporation(s) in which the **Organization listed in Part I** owns more than 50 percent of voting stock, or of the partnership(s) in which the **Organization listed in Part I** owns more than 50 percent interest therein, or of the limited liability company or companies in which the **Organization listed above in Part I** owns more than 50 percent interest therein, as the case may be.	
Name of Business Entity		**Business Address**
Add additional sheets if necessary		
OR		
☐	The **Organization listed above in Part I** does not own greater than 50 percent of the voting stock in any corporation and does not own greater than 50 percent interest in any partnership or any limited liability company.	

Section B (skip if no business entities are listed in Section A of Part IV)	
☐	Below are the names and addresses of any entities in which an entity listed in Part III A owns greater than 50 percent of the voting stock (corporation) or owns greater than 50 percent interest (partnership or limited liability company).

Name of Business Entity Controlled by Entity Listed in Section A of Part IV	Business Address
Add additional Sheets if necessary	

OR

☐	No entity listed in Part III A owns greater than 50 percent of the voting stock in any corporation or owns greater than 50 percent interest in any partnership or limited liability company.

Section C – Part IV Certification

I hereby certify that the **Organization listed above in Part I** does not own greater than 50 percent of any entity that that is debarred by the federal government from contracting with a federal agency and, if applicable, does not own greater than 50 percent of any entity that in turns owns greater than 50 percent of any entity debarred by the federal government from contracting with a federal agency. I further acknowledge: that I am authorized to execute this certification on behalf of the above-named organization; that the ***Township of Willingboro*** is relying on the information contained herein and that I am under a continuing obligation from the date of this certification through the date of contract award by ***Township of Willingboro*** to notify the ***Township of Willingboro*** in writing of any changes to the information contained herein; that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I am subject to criminal prosecution under the law and that it will constitute a material breach of my agreement(s) with the ***Township of Willingboro,*** permitting the ***Township of Willingboro*** to declare any contract(s) resulting from this certification void and unenforceable.

Full Name (Print):		Title:	
Signature:		Date:	

AMERICANS WITH DISABILITIES ACT OF 1990
Equal Opportunity for Individuals with Disability

The contractor and the OWNER do hereby agree that the provisions of Title 11 of the Americans With Disabilities Act of 1990 (the "Act") *(42 U.S.C. S121 01* et seq.), which prohibits discrimination on the basis of disability by public entities in all services, programs, and activities provided or made available by public entities, and the rules and regulations promulgated pursuant there unto, are made a part of this contract. In providing any aid, benefit, or service on behalf of the owner pursuant to this contract, the contractor agrees that the performance shall be in strict compliance with the Act. In the event that the contractor, its agents, servants, employees, or subcontractors violate or are alleged to have violated the Act during the performance of this contract, the contractor shall defend the owner in any action or administrative proceeding commenced pursuant to this Act. The contractor shall indemnify, protect, and save harmless the owner, its agents, servants, and employees from and against any and all suits, claims, losses, demands, or damages, of whatever kind or nature arising out of or claimed to arise out of the alleged violation. The contractor shall, at its own expense, appear, defend, and pay any and all charges for legal services and any and all costs and other expenses arising from such action or administrative proceeding or incurred in connection therewith. In any and all complaints brought pursuant to the owner's grievance procedure, the contractor agrees to abide by any decision of the owner which is rendered pursuant to said grievance procedure. If any action or administrative proceeding results in an award of damages against the owner, or if the owner incurs any expense to cure a violation of the ADA which has been brought pursuant to its grievance procedure, the contractor shall satisfy and discharge the same at its own expense.

The owner shall, as soon as practicable after a claim has been made against it, give written notice thereof to the contractor along with full and complete particulars of the claim, If any action or administrative proceeding is brought against the owner or any of its agents, servants, and employees, the *owner shall* expeditiously forward or have forwarded to the contractor every demand, complaint, notice, summons, pleading, or other process received by the owner or its representatives.

It is expressly agreed and understood that any approval by the owner of the services provided by the contractor pursuant to this contract will not relieve the contractor of the obligation to comply with the Act and to defend, indemnify, protect, and save harmless the owner pursuant to this paragraph.

It is further agreed and understood that the owner assumes no obligation to indemnify or save harmless the contractor, its agents, servants, employees and subcontractors for any claim which may arise out of their performance of this Agreement. Furthermore, the contractor expressly understands and agrees that the provisions of this indemnification clause shall in no way limit the contractor's obligations assumed in this Agreement, nor shall they be construed to relieve the contractor from any liability, nor preclude the owner from taking any other actions available to it under any other provisions of the Agreement or otherwise at law.

_____

Signature & Date

_____

Company

54 N.J.R. 1009(a)

LOWEST BIDDER PREVAILING WAGE CERTIFICATION

In the matter of an award of a	)	STATE OF NEW JERSEY
contract for public work for a	)	DEPARTMENT OF LABOR AND
project described as:	)	WORKFORCE DEVELOPMENT
	)	DIVISION OF WAGE &
[Enter project description here]	)	HOUR COMPLIANCE
	)	
	)	Certification of Lowest Bidder

_____, of full age and under oath, duly provides the following sworn statement:

(1). I am the owner and/or highest-ranking official or officer of a company or firm named _____, which holds a currently valid public works contractor registration pursuant to the New Jersey Public Works Contractor Registration Act, N.J.S.A. 34:11-56.48 et seq., certificate number _____.

(2). I submitted a bid for a contract award in the above identified project and the public body has informed me that I am the lowest bidder by 10 percent or more as compared to the next lowest bid submitted.

(3). The amount of my bid does include paying the prevailing wage rate to all workers who perform work on the project at rates of pay, including both base wage and fringe benefits, set forth in applicable Wage Determinations, (1) for the appropriate locality, (2) for the appropriate work classification (e.g., carpenter, electrician, mason, plumber), and (3) for the appropriate job title (e.g., Apprentice, Journeyman, Forman), published by the New Jersey Department of Labor and Workforce Development (NJDOL) pursuant to the New Jersey Prevailing Wage Act (NJPWA), N.J.S.A. 34:11-56.25 et seq., and corresponding NJDOL rules, N.J.A.C. 12:60.

I certify under penalty of perjury that the foregoing statements made by me are true. I am aware that if any of the foregoing statements made by me are false, I am subject to punishment. See N.J.S.A. 2C:28-1 et seq., specifically, N.J.S.A. 2C:28-3, within the New Jersey Code of Criminal Justice.

Dated:_____ Signature:_____

Title: _____

NEW JERSEY REGISTER

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AFFIRMATIVE ACTION CERTIFICATION
(CONSTRUCTION CONTRACTS)

A. This contract is subject to and all bidders are required to comply with the requirements of N.J.S.A. 10:5-31 et seq. and N.J.A.C. 17:27; Affirmative Action Regulations.

B. For any violation of this law in addition to all other penalties allowable by law, the violator shall be subject to a fine of up to $1,000.00 for each violation for each day during which the violation continues, as delineated in N.J.A.C.17:27-10.6, with said fine to be collected in a summary manner pursuant to the "Penalty Enforcement Law of 1999" (N.J.S.A. 2A:58-10 et seq.) (P.L. 1975, C127, Para. 5b) (N.J.A.C. 17:27).

C. ALL CONTRACTORS

1. All contractors shall complete and submit the Initial Project Workforce Report Form AA-201, upon notification of award. Proper completion and submission of this report shall constitute evidence of the contractor's compliance with the regulations.

2. Failure to submit this form may result in the contract being terminated.

3. The contractor also agrees to submit a copy of the Monthly Project Workforce Report Form AA-202, once a month thereafter for the duration of the contract to the Division of Contract Compliance and to the Public Agency Compliance Officer.

The undersigned contractor certifies that he is aware of the commitment to comply with the requirements of N.J.S.A. 10:5-31 et seq. and N.J.A.C. 17:27 and agrees to furnish the required documentation pursuant to the Law.

COMPANY: _____

SIGNATURE: _____

TITLE: _____

NOTE: A contractor's bid must be rejected as non-responsive if a contractor fails to comply with the requirements of N.J.S.A. 10:5-31 et seq. and N.J.A.C. 17:27.

Form **W-9**
(Rev. March 2024)
Department of the Treasury
Internal Revenue Service

Request for Taxpayer Identification Number and Certification

Go to *www.irs.gov/FormW9* for instructions and the latest information.

Give form to the requester. Do not send to the IRS.

Before you begin. For guidance related to the purpose of Form W-9, see *Purpose of Form*, below.

Print or type. See *Specific Instructions* on page 3.

1 Name of entity/individual. An entry is required. (For a sole proprietor or disregarded entity, enter the owner's name on line 1, and enter the business/disregarded entity's name on line 2.)

2 Business name/disregarded entity name, if different from above.

3a Check the appropriate box for federal tax classification of the entity/individual whose name is entered on line 1. Check only **one** of the following seven boxes.

☐ Individual/sole proprietor ☐ C corporation ☐ S corporation ☐ Partnership ☐ Trust/estate

☐ LLC. Enter the tax classification (C = C corporation, S = S corporation, P = Partnership) . . . . . _____

Note: Check the "LLC" box above and, in the entry space, enter the appropriate code (C, S, or P) for the tax classification of the LLC, unless it is a disregarded entity. A disregarded entity should instead check the appropriate box for the tax classification of its owner.

☐ Other (see Instructions) _____

4 Exemptions (codes apply only to certain entities, not individuals; see instructions on page 3):

Exempt payee code (if any) _____

Exemption from Foreign Account Tax Compliance Act (FATCA) reporting code (if any) _____

(Applies to accounts maintained outside the United States.)

3b If on line 3a you checked "Partnership" or "Trust/estate," or checked "LLC" and entered "P" as its tax classification, and you are providing this form to a partnership, trust, or estate in which you have an ownership interest, check this box if you have any foreign partners, owners, or beneficiaries. See instructions . . . . . ☐

5 Address (number, street, and apt. or suite no.). See instructions.

Requester's name and address (optional)

6 City, state, and ZIP code

7 List account number(s) here (optional)

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on line 1 to avoid backup withholding. For individuals, this is generally your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the instructions for Part I, later. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN*, later.

Note: If the account is in more than one name, see the instructions for line 1. See also *What Name and Number To Give the Requester* for guidelines on whose number to enter.

Social security number

			–			–				

or

Employer identification number

		–							

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me); and
2. I am not subject to backup withholding because (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding; and
3. I am a U.S. citizen or other U.S. person (defined below); and
4. The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and, generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions for Part II, later.

Sign Here	**Signature of U.S. person**	**Date**

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Future developments. For the latest information about developments related to Form W-9 and its instructions, such as legislation enacted after they were published, go to *www.irs.gov/FormW9*.

What's New

Line 3a has been modified to clarify how a disregarded entity completes this line. An LLC that is a disregarded entity should check the appropriate box for the tax classification of its owner. Otherwise, it should check the "LLC" box and enter its appropriate tax classification.

New line 3b has been added to this form. A flow-through entity is required to complete this line to indicate that it has direct or indirect foreign partners, owners, or beneficiaries when it provides the Form W-9 to another flow-through entity in which it has an ownership interest. This change is intended to provide a flow-through entity with information regarding the status of its indirect foreign partners, owners, or beneficiaries, so that it can satisfy any applicable reporting requirements. For example, a partnership that has any indirect foreign partners may be required to complete Schedules K-2 and K-3. See the Partnership Instructions for Schedules K-2 and K-3 (Form 1065).

Purpose of Form

An individual or entity (Form W-9 requester) who is required to file an information return with the IRS is giving you this form because they

must obtain your correct taxpayer identification number (TIN), which may be your social security number (SSN), individual taxpayer identification number (ITIN), adoption taxpayer identification number (ATIN), or employer identification number (EIN), to report on an information return the amount paid to you, or other amount reportable on an information return. Examples of information returns include, but are not limited to, the following.

- Form 1099-INT (interest earned or paid).
- Form 1099-DIV (dividends, including those from stocks or mutual funds).
- Form 1099-MISC (various types of income, prizes, awards, or gross proceeds).
- Form 1099-NEC (nonemployee compensation).
- Form 1099-B (stock or mutual fund sales and certain other transactions by brokers).
- Form 1099-S (proceeds from real estate transactions).
- Form 1099-K (merchant card and third-party network transactions).
- Form 1098 (home mortgage interest), 1098-E (student loan interest), and 1098-T (tuition).
- Form 1099-C (canceled debt).
- Form 1099-A (acquisition or abandonment of secured property).

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN.

Caution: If you don't return Form W-9 to the requester with a TIN, you might be subject to backup withholding. See *What is backup withholding*, later.

By signing the filled-out form, you:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued);
2. Certify that you are not subject to backup withholding; or
3. Claim exemption from backup withholding if you are a U.S. exempt payee; and
4. Certify to your non-foreign status for purposes of withholding under chapter 3 or 4 of the Code (if applicable); and
5. Certify that FATCA code(s) entered on this form (if any) indicating that you are exempt from the FATCA reporting is correct. See *What Is FATCA Reporting*, later, for further information.

Note: If you are a U.S. person and a requester gives you a form other than Form W-9 to request your TIN, you must use the requester's form if it is substantially similar to this Form W-9.

Definition of a U.S. person. For federal tax purposes, you are considered a U.S. person if you are:

- An individual who is a U.S. citizen or U.S. resident alien;
- A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States;
- An estate (other than a foreign estate); or
- A domestic trust (as defined in Regulations section 301.7701-7).

Establishing U.S. status for purposes of chapter 3 and chapter 4 withholding. Payments made to foreign persons, including certain distributions, allocations of income, or transfers of sales proceeds, may be subject to withholding under chapter 3 or chapter 4 of the Code (sections 1441–1474). Under those rules, if a Form W-9 or other certification of non-foreign status has not been received, a withholding agent, transferee, or partnership (payor) generally applies presumption rules that may require the payor to withhold applicable tax from the recipient, owner, transferor, or partner (payee). See Pub. 515, Withholding of Tax on Nonresident Aliens and Foreign Entities.

The following persons must provide Form W-9 to the payor for purposes of establishing its non-foreign status.

- In the case of a disregarded entity with a U.S. owner, the U.S. owner of the disregarded entity and not the disregarded entity.
- In the case of a grantor trust with a U.S. grantor or other U.S. owner, generally, the U.S. grantor or other U.S. owner of the grantor trust and not the grantor trust.
- In the case of a U.S. trust (other than a grantor trust), the U.S. trust and not the beneficiaries of the trust.

See Pub. 515 for more information on providing a Form W-9 or a certification of non-foreign status to avoid withholding.

Foreign person. If you are a foreign person or the U.S. branch of a foreign bank that has elected to be treated as a U.S. person (under Regulations section 1.1441-1(b)(2)(iv) or other applicable section for chapter 3 or 4 purposes), do not use Form W-9. Instead, use the appropriate Form W-8 or Form 8233 (see Pub. 515). If you are a qualified foreign pension fund under Regulations section 1.897(l)-1(d), or a partnership that is wholly owned by qualified foreign pension funds, that is treated as a non-foreign person for purposes of section 1445 withholding, do not use Form W-9. Instead, use Form W-8EXP (or other certification of non-foreign status).

Nonresident alien who becomes a resident alien. Generally, only a nonresident alien individual may use the terms of a tax treaty to reduce or eliminate U.S. tax on certain types of income. However, most tax treaties contain a provision known as a saving clause. Exceptions specified in the saving clause may permit an exemption from tax to continue for certain types of income even after the payee has otherwise become a U.S. resident alien for tax purposes.

If you are a U.S. resident alien who is relying on an exception contained in the saving clause of a tax treaty to claim an exemption from U.S. tax on certain types of income, you must attach a statement to Form W-9 that specifies the following five items.

1. The treaty country. Generally, this must be the same treaty under which you claimed exemption from tax as a nonresident alien.
2. The treaty article addressing the income.
3. The article number (or location) in the tax treaty that contains the saving clause and its exceptions.
4. The type and amount of income that qualifies for the exemption from tax.
5. Sufficient facts to justify the exemption from tax under the terms of the treaty article.

Example. Article 20 of the U.S.-China income tax treaty allows an exemption from tax for scholarship income received by a Chinese student temporarily present in the United States. Under U.S. law, this student will become a resident alien for tax purposes if their stay in the United States exceeds 5 calendar years. However, paragraph 2 of the first Protocol to the U.S.-China treaty (dated April 30, 1984) allows the provisions of Article 20 to continue to apply even after the Chinese student becomes a resident alien of the United States. A Chinese student who qualifies for this exception (under paragraph 2 of the first Protocol) and is relying on this exception to claim an exemption from tax on their scholarship or fellowship income would attach to Form W-9 a statement that includes the information described above to support that exemption.

If you are a nonresident alien or a foreign entity, give the requester the appropriate completed Form W-8 or Form 8233.

Backup Withholding

What is backup withholding? Persons making certain payments to you must under certain conditions withhold and pay to the IRS 24% of such payments. This is called "backup withholding." Payments that may be subject to backup withholding include, but are not limited to, interest, tax-exempt interest, dividends, broker and barter exchange transactions, rents, royalties, nonemployee pay, payments made in settlement of payment card and third-party network transactions, and certain payments from fishing boat operators. Real estate transactions are not subject to backup withholding.

You will not be subject to backup withholding on payments you receive if you give the requester your correct TIN, make the proper certifications, and report all your taxable interest and dividends on your tax return.

Payments you receive will be subject to backup withholding if:

1. You do not furnish your TIN to the requester;
2. You do not certify your TIN when required (see the instructions for Part II for details);
3. The IRS tells the requester that you furnished an incorrect TIN;
4. The IRS tells you that you are subject to backup withholding because you did not report all your interest and dividends on your tax return (for reportable interest and dividends only); or
5. You do not certify to the requester that you are not subject to backup withholding, as described in item 4 under *"By signing the filled-out form"* above (for reportable interest and dividend accounts opened after 1983 only).

Certain payees and payments are exempt from backup withholding. See *Exempt payee code*, later, and the separate Instructions for the Requester of Form W-9 for more information.

See also *Establishing U.S. status for purposes of chapter 3 and chapter 4 withholding*, earlier.

What Is FATCA Reporting?

The Foreign Account Tax Compliance Act (FATCA) requires a participating foreign financial institution to report all U.S. account holders that are specified U.S. persons. Certain payees are exempt from FATCA reporting. See *Exemption from FATCA reporting code*, later, and the Instructions for the Requester of Form W-9 for more information.

Updating Your Information

You must provide updated information to any person to whom you claimed to be an exempt payee if you are no longer an exempt payee and anticipate receiving reportable payments in the future from this person. For example, you may need to provide updated information if you are a C corporation that elects to be an S corporation, or if you are no longer tax exempt. In addition, you must furnish a new Form W-9 if the name or TIN changes for the account, for example, if the grantor of a grantor trust dies.

Penalties

Failure to furnish TIN. If you fail to furnish your correct TIN to a requester, you are subject to a penalty of $50 for each such failure unless your failure is due to reasonable cause and not to willful neglect.

Civil penalty for false information with respect to withholding. If you make a false statement with no reasonable basis that results in no backup withholding, you are subject to a $500 penalty.

Criminal penalty for falsifying information. Willfully falsifying certifications or affirmations may subject you to criminal penalties including fines and/or imprisonment.

Misuse of TINs. If the requester discloses or uses TINs in violation of federal law, the requester may be subject to civil and criminal penalties.

Specific Instructions

Line 1

You must enter one of the following on this line; **do not** leave this line blank. The name should match the name on your tax return.

If this Form W-9 is for a joint account (other than an account maintained by a foreign financial institution (FFI)), list first, and then circle, the name of the person or entity whose number you entered in Part I of Form W-9. If you are providing Form W-9 to an FFI to document a joint account, each holder of the account that is a U.S. person must provide a Form W-9.

- **Individual.** Generally, enter the name shown on your tax return. If you have changed your last name without informing the Social Security Administration (SSA) of the name change, enter your first name, the last name as shown on your social security card, and your new last name.

Note for ITIN applicant: Enter your individual name as it was entered on your Form W-7 application, line 1a. This should also be the same as the name you entered on the Form 1040 you filed with your application.

- **Sole proprietor.** Enter your individual name as shown on your Form 1040 on line 1. Enter your business, trade, or "doing business as" (DBA) name on line 2.

- **Partnership, C corporation, S corporation, or LLC, other than a disregarded entity.** Enter the entity's name as shown on the entity's tax return on line 1 and any business, trade, or DBA name on line 2.

- **Other entities.** Enter your name as shown on required U.S. federal tax documents on line 1. This name should match the name shown on the charter or other legal document creating the entity. Enter any business, trade, or DBA name on line 2.

- **Disregarded entity.** In general, a business entity that has a single owner, including an LLC, and is not a corporation, is disregarded as an entity separate from its owner (a disregarded entity). See Regulations section 301.7701-2(c)(2). A disregarded entity should check the appropriate box for the tax classification of its owner. Enter the owner's name on line 1. The name of the owner entered on line 1 should never be a disregarded entity. The name on line 1 should be the name shown on the income tax return on which the income should be reported. For example, if a foreign LLC that is treated as a disregarded entity for U.S. federal tax purposes has a single owner that is a U.S. person, the U.S. owner's name is required to be provided on line 1. If the direct owner of the entity is also a disregarded entity, enter the first owner that is not disregarded for federal tax purposes. Enter the disregarded entity's name on line 2. If the owner of the disregarded entity is a foreign person, the owner must complete an appropriate Form W-8 instead of a Form W-9. This is the case even if the foreign person has a U.S. TIN.

Line 2

If you have a business name, trade name, DBA name, or disregarded entity name, enter it on line 2.

Line 3a

Check the appropriate box on line 3a for the U.S. federal tax classification of the person whose name is entered on line 1. Check only one box on line 3a.

IF the entity/individual on line 1 is a(n) . . .	THEN check the box for . . .
• Corporation	Corporation.
• Individual or • Sole proprietorship	Individual/sole proprietor.
• LLC classified as a partnership for U.S. federal tax purposes or • LLC that has filed Form 8832 or 2553 electing to be taxed as a corporation	Limited liability company and enter the appropriate tax classification: P = Partnership, C = C corporation, or S = S corporation.
• Partnership	Partnership.
• Trust/estate	Trust/estate.

Line 3b

Check this box if you are a partnership (including an LLC classified as a partnership for U.S. federal tax purposes), trust, or estate that has any foreign partners, owners, or beneficiaries, and you are providing this form to a partnership, trust, or estate, in which you have an ownership interest. You must check the box on line 3b if you receive a Form W-8 (or documentary evidence) from any partner, owner, or beneficiary establishing foreign status or if you receive a Form W-9 from any partner, owner, or beneficiary that has checked the box on line 3b.

Note: A partnership that provides a Form W-9 and checks box 3b may be required to complete Schedules K-2 and K-3 (Form 1065). For more information, see the Partnership Instructions for Schedules K-2 and K-3 (Form 1065).

If you are required to complete line 3b but fail to do so, you may not receive the information necessary to file a correct information return with the IRS or furnish a correct payee statement to your partners or beneficiaries. See, for example, sections 6698, 6722, and 6724 for penalties that may apply.

Line 4 Exemptions

If you are exempt from backup withholding and/or FATCA reporting, enter in the appropriate space on line 4 any code(s) that may apply to you.

Exempt payee code.

- Generally, individuals (including sole proprietors) are not exempt from backup withholding.

- Except as provided below, corporations are exempt from backup withholding for certain payments, including interest and dividends.

- Corporations are not exempt from backup withholding for payments made in settlement of payment card or third-party network transactions.

- Corporations are not exempt from backup withholding with respect to attorneys' fees or gross proceeds paid to attorneys, and corporations that provide medical or health care services are not exempt with respect to payments reportable on Form 1099-MISC.

The following codes identify payees that are exempt from backup withholding. Enter the appropriate code in the space on line 4.

1—An organization exempt from tax under section 501(a), any IRA, or a custodial account under section 403(b)(7) if the account satisfies the requirements of section 401(f)(2).

2—The United States or any of its agencies or instrumentalities.

3—A state, the District of Columbia, a U.S. commonwealth or territory, or any of their political subdivisions or instrumentalities.

4—A foreign government or any of its political subdivisions, agencies, or instrumentalities.

5—A corporation.

6—A dealer in securities or commodities required to register in the United States, the District of Columbia, or a U.S. commonwealth or territory.

7—A futures commission merchant registered with the Commodity Futures Trading Commission.

8—A real estate investment trust.

9—An entity registered at all times during the tax year under the Investment Company Act of 1940.

10—A common trust fund operated by a bank under section 584(a).

11—A financial institution as defined under section 581.

12—A middleman known in the investment community as a nominee or custodian.

13—A trust exempt from tax under section 664 or described in section 4947.

The following chart shows types of payments that may be exempt from backup withholding. The chart applies to the exempt payees listed above, 1 through 13.

IF the payment is for . . .	THEN the payment is exempt for . . .
• Interest and dividend payments	All exempt payees except for 7.
• Broker transactions	Exempt payees 1 through 4 and 6 through 11 and all C corporations. S corporations must not enter an exempt payee code because they are exempt only for sales of noncovered securities acquired prior to 2012.
• Barter exchange transactions and patronage dividends	Exempt payees 1 through 4.
• Payments over $600 required to be reported and direct sales over $5,000[1]	Generally, exempt payees 1 through 5.[2]
• Payments made in settlement of payment card or third-party network transactions	Exempt payees 1 through 4.

[1] See Form 1099-MISC, Miscellaneous Information, and its instructions.

[2] However, the following payments made to a corporation and reportable on Form 1099-MISC are not exempt from backup withholding: medical and health care payments, attorneys' fees, gross proceeds paid to an attorney reportable under section 6045(f), and payments for services paid by a federal executive agency.

Exemption from FATCA reporting code. The following codes identify payees that are exempt from reporting under FATCA. These codes apply to persons submitting this form for accounts maintained outside of the United States by certain foreign financial institutions. Therefore, if you are only submitting this form for an account you hold in the United States, you may leave this field blank. Consult with the person requesting this form if you are uncertain if the financial institution is subject to these requirements. A requester may indicate that a code is not required by providing you with a Form W-9 with "Not Applicable" (or any similar indication) entered on the line for a FATCA exemption code.

A—An organization exempt from tax under section 501(a) or any individual retirement plan as defined in section 7701(a)(37).

B—The United States or any of its agencies or instrumentalities.

C—A state, the District of Columbia, a U.S. commonwealth or territory, or any of their political subdivisions or instrumentalities.

D—A corporation the stock of which is regularly traded on one or more established securities markets, as described in Regulations section 1.1472-1(c)(1)(i).

E—A corporation that is a member of the same expanded affiliated group as a corporation described in Regulations section 1.1472-1(c)(1)(i).

F—A dealer in securities, commodities, or derivative financial instruments (including notional principal contracts, futures, forwards, and options) that is registered as such under the laws of the United States or any state.

G—A real estate investment trust.

H—A regulated investment company as defined in section 851 or an entity registered at all times during the tax year under the Investment Company Act of 1940.

I—A common trust fund as defined in section 584(a).

J—A bank as defined in section 581.

K—A broker.

L—A trust exempt from tax under section 664 or described in section 4947(a)(1).

M—A tax-exempt trust under a section 403(b) plan or section 457(g) plan.

Note: You may wish to consult with the financial institution requesting this form to determine whether the FATCA code and/or exempt payee code should be completed.

Line 5

Enter your address (number, street, and apartment or suite number). This is where the requester of this Form W-9 will mail your information returns. If this address differs from the one the requester already has on file, enter "NEW" at the top. If a new address is provided, there is still a chance the old address will be used until the payor changes your address in their records.

Line 6

Enter your city, state, and ZIP code.

Part I. Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. If you are a resident alien and you do not have, and are not eligible to get, an SSN, your TIN is your IRS ITIN. Enter it in the entry space for the Social security number. If you do not have an ITIN, see *How to get a TIN* below.

If you are a sole proprietor and you have an EIN, you may enter either your SSN or EIN.

If you are a single-member LLC that is disregarded as an entity separate from its owner, enter the owner's SSN (or EIN, if the owner has one). If the LLC is classified as a corporation or partnership, enter the entity's EIN.

Note: See *What Name and Number To Give the Requester*, later, for further clarification of name and TIN combinations.

How to get a TIN. If you do not have a TIN, apply for one immediately. To apply for an SSN, get Form SS-5, Application for a Social Security Card, from your local SSA office or get this form online at *www.SSA.gov*. You may also get this form by calling 800-772-1213. Use Form W-7, Application for IRS Individual Taxpayer Identification Number, to apply for an ITIN, or Form SS-4, Application for Employer Identification Number, to apply for an EIN. You can apply for an EIN online by accessing the IRS website at *www.irs.gov/EIN*. Go to *www.irs.gov/Forms* to view, download, or print Form W-7 and/or Form SS-4. Or, you can go to *www.irs.gov/OrderForms* to place an order and have Form W-7 and/or Form SS-4 mailed to you within 15 business days.

If you are asked to complete Form W-9 but do not have a TIN, apply for a TIN and enter "Applied For" in the space for the TIN, sign and date the form, and give it to the requester. For interest and dividend payments, and certain payments made with respect to readily tradable instruments, you will generally have 60 days to get a TIN and give it to the requester before you are subject to backup withholding on payments. The 60-day rule does not apply to other types of payments. You will be subject to backup withholding on all such payments until you provide your TIN to the requester.

Note: Entering "Applied For" means that you have already applied for a TIN or that you intend to apply for one soon. See also *Establishing U.S. status for purposes of chapter 3 and chapter 4 withholding*, earlier, for when you may instead be subject to withholding under chapter 3 or 4 of the Code.

Caution: A disregarded U.S. entity that has a foreign owner must use the appropriate Form W-8.

Part II. Certification

To establish to the withholding agent that you are a U.S. person, or resident alien, sign Form W-9. You may be requested to sign by the withholding agent even if item 1, 4, or 5 below indicates otherwise.

For a joint account, only the person whose TIN is shown in Part I should sign (when required). In the case of a disregarded entity, the person identified on line 1 must sign. Exempt payees, see *Exempt payee code*, earlier.

Signature requirements. Complete the certification as indicated in items 1 through 5 below.

1. Interest, dividend, and barter exchange accounts opened before 1984 and broker accounts considered active during 1983. You must give your correct TIN, but you do not have to sign the certification.

2. Interest, dividend, broker, and barter exchange accounts opened after 1983 and broker accounts considered inactive during 1983. You must sign the certification or backup withholding will apply. If you are subject to backup withholding and you are merely providing your correct TIN to the requester, you must cross out item 2 in the certification before signing the form.

3. Real estate transactions. You must sign the certification. You may cross out item 2 of the certification.

4. Other payments. You must give your correct TIN, but you do not have to sign the certification unless you have been notified that you have previously given an incorrect TIN. "Other payments" include payments made in the course of the requester's trade or business for rents, royalties, goods (other than bills for merchandise), medical and health care services (including payments to corporations), payments to a nonemployee for services, payments made in settlement of payment card and third-party network transactions, payments to certain fishing boat crew members and fishermen, and gross proceeds paid to attorneys (including payments to corporations).

5. Mortgage interest paid by you, acquisition or abandonment of secured property, cancellation of debt, qualified tuition program payments (under section 529), ABLE accounts (under section 529A), IRA, Coverdell ESA, Archer MSA or HSA contributions or distributions, and pension distributions. You must give your correct TIN, but you do not have to sign the certification.

What Name and Number To Give the Requester

For this type of account:	Give name and SSN of:
1. Individual	The individual
2. Two or more individuals (joint account) other than an account maintained by an FFI	The actual owner of the account or, if combined funds, the first individual on the account[1]
3. Two or more U.S. persons (joint account maintained by an FFI)	Each holder of the account
4. Custodial account of a minor (Uniform Gift to Minors Act)	The minor[2]
5. a. The usual revocable savings trust (grantor is also trustee)	The grantor-trustee[1]
b. So-called trust account that is not a legal or valid trust under state law	The actual owner[1]
6. Sole proprietorship or disregarded entity owned by an individual	The owner[3]
7. Grantor trust filing under Optional Filing Method 1 (see Regulations section 1.671-4(b)(2)(i)(A))**	The grantor*
8. Disregarded entity not owned by an individual	The owner
9. A valid trust, estate, or pension trust	Legal entity[4]
10. Corporation or LLC electing corporate status on Form 8832 or Form 2553	The corporation
11. Association, club, religious, charitable, educational, or other tax-exempt organization	The organization
12. Partnership or multi-member LLC	The partnership
13. A broker or registered nominee	The broker or nominee
14. Account with the Department of Agriculture in the name of a public entity (such as a state or local government, school district, or prison) that receives agricultural program payments	The public entity
15. Grantor trust filing Form 1041 or under the Optional Filing Method 2, requiring Form 1099 (see Regulations section 1.671-4(b)(2)(i)(B))**	The trust

[1] List first and circle the name of the person whose number you furnish. If only one person on a joint account has an SSN, that person's number must be furnished.

[2] Circle the minor's name and furnish the minor's SSN.

[3] You must show your individual name on line 1, and enter your business or DBA name, if any, on line 2. You may use either your SSN or EIN (if you have one), but the IRS encourages you to use your SSN.

[4] List first and circle the name of the trust, estate, or pension trust. (Do not furnish the TIN of the personal representative or trustee unless the legal entity itself is not designated in the account title.)

* **Note:** The grantor must also provide a Form W-9 to the trustee of the trust.

** For more information on optional filing methods for grantor trusts, see the Instructions for Form 1041.

Note: If no name is circled when more than one name is listed, the number will be considered to be that of the first name listed.

Secure Your Tax Records From Identity Theft

Identity theft occurs when someone uses your personal information, such as your name, SSN, or other identifying information, without your permission to commit fraud or other crimes. An identity thief may use your SSN to get a job or may file a tax return using your SSN to receive a refund.

To reduce your risk:

- Protect your SSN,
- Ensure your employer is protecting your SSN, and
- Be careful when choosing a tax return preparer.

If your tax records are affected by identity theft and you receive a notice from the IRS, respond right away to the name and phone number printed on the IRS notice or letter.

If your tax records are not currently affected by identity theft but you think you are at risk due to a lost or stolen purse or wallet, questionable credit card activity, or a questionable credit report, contact the IRS Identity Theft Hotline at 800-908-4490 or submit Form 14039.

For more information, see Pub. 5027, Identity Theft Information for Taxpayers.

Victims of identity theft who are experiencing economic harm or a systemic problem, or are seeking help in resolving tax problems that have not been resolved through normal channels, may be eligible for Taxpayer Advocate Service (TAS) assistance. You can reach TAS by calling the TAS toll-free case intake line at 877-777-4778 or TTY/TDD 800-829-4059.

Protect yourself from suspicious emails or phishing schemes. Phishing is the creation and use of email and websites designed to mimic legitimate business emails and websites. The most common act is sending an email to a user falsely claiming to be an established legitimate enterprise in an attempt to scam the user into surrendering private information that will be used for identity theft.

The IRS does not initiate contacts with taxpayers via emails. Also, the IRS does not request personal detailed information through email or ask taxpayers for the PIN numbers, passwords, or similar secret access information for their credit card, bank, or other financial accounts.

If you receive an unsolicited email claiming to be from the IRS, forward this message to *phishing@irs.gov*. You may also report misuse of the IRS name, logo, or other IRS property to the Treasury Inspector General for Tax Administration (TIGTA) at 800-366-4484. You can forward suspicious emails to the Federal Trade Commission at *spam@uce.gov* or report them at *www.ftc.gov/complaint*. You can contact the FTC at *www.ftc.gov/idtheft* or 877-IDTHEFT (877-438-4338). If you have been the victim of identity theft, see *www.IdentityTheft.gov* and Pub. 5027.

Go to *www.irs.gov/IdentityTheft* to learn more about identity theft and how to reduce your risk.

Privacy Act Notice

Section 6109 of the Internal Revenue Code requires you to provide your correct TIN to persons (including federal agencies) who are required to file information returns with the IRS to report interest, dividends, or certain other income paid to you; mortgage interest you paid; the acquisition or abandonment of secured property; the cancellation of debt; or contributions you made to an IRA, Archer MSA, or HSA. The person collecting this form uses the information on the form to file information returns with the IRS, reporting the above information. Routine uses of this information include giving it to the Department of Justice for civil and criminal litigation and to cities, states, the District of Columbia, and U.S. commonwealths and territories for use in administering their laws. The information may also be disclosed to other countries under a treaty, to federal and state agencies to enforce civil and criminal laws, or to federal law enforcement and intelligence agencies to combat terrorism. You must provide your TIN whether or not you are required to file a tax return. Under section 3406, payors must generally withhold a percentage of taxable interest, dividends, and certain other payments to a payee who does not give a TIN to the payor. Certain penalties may also apply for providing false or fraudulent information.

RECEIPT FOR RETURN OF BID SECURITY

If bid security is returned at the time of Receipt of bids, the bidder or his representative must sign receipt below:

TO THE TOWNSHIP OF WILLINGBORO

PROJECT: KENNEDY CENTER RENOVATION TO SENIOR CENTER

BID NO.: 8-2026

I hereby acknowledge return of bid security submitted this date for the project noted above.

_____ _____

Date Bidder

By _____

Bid Security Returned: ( ) Certified Check No. _____

( ) Bid Bond _____

( ) Cashier's Check No. _____

In the Amount of $ _____

All other bid securities will, at the appropriate time, be returned by CERTIFIED MAIL.

C O N T R A C T

CONTRACT

TOWNSHIP OF WILLINGBORO
KENNEDY CENTER
RENOVATION TO SENIOR CENTER
BID NO. 8-2026

THIS AGREEMENT, made and executed at _____,

_____, New Jersey, this _____ day

of _____, 2026, by and between the _____

_____, hereinafter called the OWNER and _____

_____

_____

_____

a Corporation of _____

hereinafter called the "Contractor."

WITNESSETH: That the said Contractor has agreed and by these presents does agree with the OWNER for the prices stipulated in the proposal herein contained or hereunto annexed and under the penalty expressed in bonds bearing even date with these presents, and herein contained or hereunto annexed, to furnish at his own cost and expense all the necessary materials, labor, superintendence, tools and appliances and shall execute, construct and finish and test in an expeditious and workmanlike manner, the

KENNEDY CENTER RENOVATION TO SENIOR CENTER

BID NO. 8-2026

In the Amount Of $

and appurtenances commencing the work within ten (10) days from the date of notice from the office of the ENGINEER to commence work and executing the same within the time and in the

manner specified and in conformity with the requirements set forth in the specifications herein contained or hereunto attached and in accordance with the contract drawings of said work on file in the office of the OWNER and all to the acceptance of the said OWNER. The Contractor shall proceed with the said work in a prompt and diligent manner and shall do the several parts thereof at such times in such order as the ENGINEER may direct.

The undersigned hereby agrees that the work will be Complete and ready for final payment within the number of calendar indicated below from the date of Notice to Proceed.

CONTRACT	CALENDAR DAYS TO COMPLETE	LIQUIDATED DAMAGES
Bid No. 8-2026	One Hundred Eighty (180)	$1,500.00

CONTRACTOR and OWNER recognize that time is of the essence of this Agreement and that OWNER will suffer financial loss if the Work is not completed within the times specified above, plus any extensions thereof allowed in accordance with the General Conditions. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding, the actual loss suffered by OWNER if the Work is not completed on time. Accordingly, instead of requiring any such proof, OWNER and CONTRACTOR agree that as liquidated damages for delay (but not as a penalty), CONTRACTOR shall pay OWNER in the manner stipulated the amount stated above for each and every calendar day (Sunday and legal holidays excepted) that expires after the time specified for Completion until the Work is complete.

The OWNER shall not be liable to the Contractor for any neglect, default, delay or interference of or by any other contractor, nor shall any such neglect, default, delay or interference of any other contractor, or alteration which may be required in said work, release the Contractor from the obligation to finish the said work within the time aforesaid or from the damages to be paid in default thereof.

Names and addresses of each person or company interested in the Contract:

_____

_____

_____

_____

It is hereby mutually agreed that the OWNER is to pay and the Contractor is to receive the prices stipulated in the Proposal herein contained or hereto annexed, as full compensation for furnishing all materials and labor in building, constructing and testing, and in all respects completing the herein specified and for fully complying with the terms and conditions of this Contract.

The status of the Contractor in the work to be performed by him under the Contract is that of an independent contractor. As such, the work, in every respect, from the execution of the Contract and during progress of the work thereunder, and until final acceptance, shall be under the charge and in care of the Contractor and at his risk. He shall be solely responsible for site safety and the implementation, discharge and monitoring of all safety standards or practices and shall properly safeguard against any or all injury to the public, the public and private property, materials and things, and, as such, the Contractor alone shall be responsible for any and all damage, loss or injury to persons or property that may arise, or be incurred in, or during the conduct or progress of said work without regard to whether the Contractor, his subcontractors, agents or employees, have been negligent. The Contractor shall keep the OWNER and ENGINEER free and discharged of any and all responsibility and liability therefore of any sort or kind whatsoever. The Contractor shall assume all responsibility for risks and casualties of every description and for any or all damage, loss or injury to persons or property arising out of the nature of the work from the action of the elements, or from any unforeseen or unusual difficulty or circumstance. The Contractor shall assume and be liable for all blame and loss of whatsoever nature by reason of neglect or violation of any State, County or local laws, statutes, ordinances or any and all rules and regulations promulgated thereunder. The Contractor shall indemnify and save harmless the OWNER and ENGINEER and all of the respective officers, agents and employees from all liability or suits or actions at law or in equity of any kind whatsoever arising from the failure of the Contractor to comply with terms and conditions of the Contract, the plans and specifications or State statutes or local ordinances or any rules and regulations promulgated, in accordance with the provisions of such statutes or ordinances by the State of New Jersey or any municipality thereof or by any department or agency of any or all thereof, and the Contractor shall, if required by the OWNER or ENGINEER, produce evidence of settlement of any such action before final payment under the Contract shall be made by the OWNER.

The Contractor shall, unless otherwise specified, maintain and pay for such insurance, issued in the name of the OWNER and ENGINEER as will protect the OWNER and ENGINEER from contingent liability under this Contract and the OWNER's and ENGINEER's right to enforce against the Contractor any provision of this article shall be contingent upon the full compliance by the OWNER and ENGINEER with the terms of such insurance policy or policies, a copy of which shall deposited with the OWNER and ENGINEER.

Subject to the applicable provisions of the law, this Contract shall be in full force and effect as a contract from and after the date when a fully executed and approved counterpart hereof is delivered to the Contractor.

In witness whereof: The parties hereto have executed this Agreement the day and year first mentioned above.

OWNER:

Attest: _____ By: _____

Samantha Savino, RMC
Clerk

Honorable Samantha Whitfield
Mayor

(SEAL)

CONTRACTOR:

_____ _____

Date

Contracting Firm

Attest: _____ By: _____

Principal of Contracting Firm

(SEAL)

ACKNOWLEDGMENT OF MAYOR

STATE OF _____)

COUNTY OF _____)

On this _____ day of _____, 2026, before me personally came and appeared the Honorable Samantha Whitfield, to me known, who, being by me duly sworn, did depose and say that she is Mayor of the Township of Willingboro described in and who executed the foregoing instrument; that she knows the seal of said Township of Willingboro; that one of the seals affixed to said instrument is such seal; that it was so affixed by order of the said Township of Willingboro, and that he signed her name thereto by like order.

_____
Notary Public

(SEAL)

ACKNOWLEDGMENT OF CLERK

STATE OF _____)

COUNTY OF _____)

On this _____ day of _____, 2026, before me personally came and appeared Samantha Savino, to me known to be the Clerk of the Township of Willingboro described in and who executed the foregoing instrument, and she acknowledged to me that she executed the same as and for the act and deed of said Township of Willingboro.

_____
Notary Public

(SEAL)

ACKNOWLEDGMENT OF CONTRACTOR, IF A CORPORATION

STATE OF _____)

COUNTY OF _____)

On this _____ day of _____, 2026, before me personally came and appeared _____, to me known, who, being by me duly sworn, did depose and say that he/she is _____ of _____, the corporation described in and who executed the foregoing instrument; that he/she knows the seal of said corporation; that one of the seals affixed to said instrument is such seal; that it was so affixed by order of said corporation; and that he/she signed h___ name thereto by like order.

_____
Notary Public

(SEAL)

ACKNOWLEDGMENT OF CONTRACTOR, IF A FIRM OR PARTNERSHIP

STATE OF _____)

COUNTY OF _____)

On this _____ day of _____, 2026, before me personally came and appeared _____, to me known to be one of the members of the firm of _____, described in and who executed the foregoing instrument, and he/she acknowledged to me that he/she executed the same as and for the act and deed of said firm.

_____
Notary Public

(SEAL)

ACKNOWLEDGMENT OF CONTRACTOR, IF AN INDIVIDUAL

STATE OF _____)

COUNTY OF _____)

On this _____ day of _____, 2026, before me personally came and appeared _____, to me known to be the person described in and who executed the foregoing instrument and acknowledged that he/she executed the same.

_____
Notary Public

(SEAL)

PERFORMANCE AND TWO-YEAR MAINTENANCE BOND
BID NO. 8-2026

BOND NO. _____

Know all men by these presents, that we, the undersigned _____ as principal and _____ as sureties, are hereby held and firmly bound unto _____ in the penal sum of _____ dollars, for the payment of which well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

Signed this _____ day of _____, 2026.

The condition of the above obligation is such that whereas, the above named principal did on the _____ day of _____, 2026, enter into a contract with _____, which said contract is made a part of this the bond the same as though set forth herein;

Now, if the said _____ shall well and faithfully do and perform the things agreed by _____ to be done and performed according to the terms of said contract, and shall pay all lawful claims of beneficiaries as defined in N.J.S.A. 2A:44-143 for labor performed or materials, provisions, provender or other supplies or teams, fuels, oils, implements or machinery furnished, used or consumed in the carrying forward, performing or completing of said contract, we agreeing and assenting that this undertaking shall be for the benefit of any beneficiary as defined in N.J.S.A. 2A:44-143 having a just claim, as well as for the obligee herein; and shall continue said obligation for two years from the date of completion and acceptance of the work to be performed under the said contract to guarantee against defects in the work which, in the judgment of the obligee or its successors or assigns having jurisdiction in the premises, are caused by defective or inferior materials and/or workmanship; then this obligation shall be void; otherwise the same shall remain in full force and effect; it being expressly understood and agreed that the liability of the surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated.

The said surety hereby stipulates and agrees that no modifications, omissions or additions in or to the terms of the said contract or in or to the plans or specifications therefore shall in anywise affect the obligation of said surety on its bond.

The Principal and the Surety agree that in case of default in and/or any action arising out of this Bond, the Obligee or any person, association, partnership and/or corporation who shall be entitled to institute and maintain an action upon this Bond, as above provided, may use, for the purposes of the establishment of the claim, a copy of this Bond, duly certified by the Obligee to be true and correct; and the Principal and the Surety agree that any action instituted upon any part of this Bond shall not be a bar to any subsequent action upon the same part or any other part of this Bond.

Each reference in this Bond to the Obligee shall also include the officers, employees and representatives of said Obligee.

It is the intention of the parties hereto to be legally bound by this instrument.

IN WITNESS WHEREOF THE said Principal and Surety have duly executed this Bond in triplicate under seal and day and year first above written.

SIGNED, SEALED AND DATED THIS _____ day of _____, 2026.

_____
Principal

Attest: By: _____(L.S.)

_____
Title of Officer

_____
Secretary (SEAL)

_____
Surety

_____
Address

_____

Attest: By: _____(L.S.)

_____
Title of Office

_____
Secretary (SEAL)

ACKNOWLEDGMENT OF PRINCIPAL, IF A CORPORATION

STATE OF _____)

COUNTY OF _____)

On this _____ day of _____, 2026, before me personally came and appeared _____, to me known, who, being by me duly sworn did depose and say that he resides at _____, that he is the _____ of _____, a Corporation described in and which executed the foregoing instrument; that he knows the seal of said Corporation; that one of the impressions affixed to said instrument is an impression of such seal; that it was so affixed by order of the directors of said Corporation, and that he signed his name thereto by like order.

_____
Notary Public

(SEAL)

ACKNOWLEDGMENT OF PRINCIPAL, IF A FIRM OR PARTNERSHIP

STATE OF _____)

COUNTY OF _____)

On this _____ day of _____, 2026, before me personally came and appeared _____, to me known to be one of the members of the firm of _____, described in and who executed the foregoing instrument and he acknowledge to me that he executed the same as and for the act and deed of said firm.

_____
Notary Public

(SEAL)

ACKNOWLEDGMENT OF PRINCIPAL, IF AN INDIVIDUAL

STATE OF _____)

COUNTY OF _____)

On this _____ day of _____, 2026, before me personally came and appeared _____, to me known to be the person described in and who executed the foregoing instrument and acknowledged that he executed same.

_____
Notary Public

(SEAL)

ACKNOWLEDGMENT OF SURETY COMPANY

STATE OF _____)

COUNTY OF _____)

On this _____ day of _____, 2026, before me personally came a _____, to me personally known to me to be the _____ of _____, the Corporation described in and which executed the within instrument, who being by me duly sworn, did depose and say that he resides at _____, that he is the _____ of the said Corporation; that he knows the seal of said Corporation; that the seal affixed to the said instrument is such corporate seal; that it was so affixed by order of the Board of Directors of said Corporation and that he signed his name thereto by like order.

_____
Notary Public

(SEAL)

FORM OF CONTRACTOR'S CERTIFICATE
(as required by N.J.S.A. 34:11-56.33)

STATE OF _____)

COUNTY OF _____)

Before me, the undersigned, a Notary Public in and for said County and State, personally appeared _____ who being duly sworn according to law deposes and says that ___he ___has___ complied with the requirements of the New Jersey Department of Labor and Workforce Development Rules and Regulations pertaining to Prevailing Wage Rates and that all labor, material, outstanding claims and indebtedness of whatsoever nature arising out of the performance of the contract of

_____

_____

_____

with the _____ have been paid. __he__further state(s) that all workmen have received all wages and benefits, and that __he__ha__full knowledge of contents of this statement and the same is true to his/their knowledge.

_____
Contractor

Sworn to me and subscribed before me this

_____ day of _____, 2026.

_____
Notary Public

(SEAL)

GENERAL CONDITIONS

GENERAL CONDITIONS

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1. DEFINITIONS

A. Wherever the term "OWNER" is used herein, it shall refer to the Township of Willingboro, Municipal Complex, 1 Rev. Dr. Martin Luther King, Jr. Drive, Willingboro, New Jersey 08046, the party of the first part to this Agreement.

B. Whenever the term "Contractor" is used herein, it shall refer to and designate the party of the second part to this Agreement, or his or their legal representative, successors or assigns.

C. Whenever the term "ENGINEER" is used herein, it shall refer to and designate the ENGINEER duly authorized by the OWNER to observe the construction of the improvements contemplated herein, or the duly appointed assistant or representative of said ENGINEER. ENGINEER as referenced in the STANDARD SPECIFICATIONS, shall be interpreted to mean the ENGINEER duly authorized by the OWNER to observe the construction of the improvements contemplated herein, or the duly appointed assistant or representative of said ENGINEER.

D. Wherever the terms "Mayor" and "Clerk" are used herein, they shall refer to and designate the Mayor and Clerk of the Township of Willingboro.

E. Wherever the term "As Designated" is used herein, it shall be held to refer to information or directions indicated on the Contract Drawings or in the specifications covering the construction of the improvements contemplated herein.

F. Wherever the term "Approved" is used herein, it shall be held, unless otherwise specified, to mean as approved by the ENGINEER. Similar use will be made of the terms "Directed," "Required," "Permitted" and words or like import.

G. The Contract Documents consist of Notice to Bidders, Instructions to Bidders, Statement of Work, General Conditions, Supplementary Conditions, Specifications, Proposal, Contract, Wage Rate Determination and Plans, including all modifications incorporated in the documents before their execution.

H. The term "Subcontractor" as employed herein, includes only those having a direct contract with the Contractor, and it includes one who furnishes material worked to a special design according to the Plans and Specifications of this work, but does not include one who merely furnishes material not so worked.

I. "Written Notice" shall be deemed to have been duly served if delivered in person to the authorized agent of the Contractor, such as superintendent or foreman in charge of work or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered mail to the last business address known to him who given the notice.

J. "Section" shall refer to the either the specification section of these specifications in which case it will be followed by the term "of these specifications" or a specified section of the Standard Specifications in which case it will be followed by the term "of the STANDARD SPECIFICATIONS".

K. "Commissioner" as referenced in STANDARD SPECIFICATIONS shall be interpreted to mean ENGINEER.

L. "Department" as referenced in STANDARD SPECIFICATONS shall be interpreted to mean the ENGINEER duly authorized by the OWNER to observe the construction of the improvements contemplated herein, or the duly appointed assistant or representative of said ENGINEER.

M. "Provide" means to furnish and install complete.

N. "Standard Specification", the New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction, dated 2019, English, and all amendments thereto.

O. "State", as referenced in STANDARD SPECIFICATIONS shall be interpreted to mean OWNER.

2. EXTENT OF CONTRACT

A. The Advertisement, Instructions to Bidders, Proposal, Bonds, Specifications and Contract Drawings are, and shall be taken to be a part of this contract. All work and materials mentioned in the specifications and not shown on the drawings, and all work and materials shown on the Drawings and not mentioned in the specifications, and all work and materials necessary for the completion of the work according to the true intent and meaning of the Contract Drawings and specifications, shall be furnished, performed and done as if the same were both mentioned in the specifications and shown on the drawings. In case of disagreement between the plans and specifications, the ENGINEER will decide which shall prevail and the Contractor shall proceed in accordance with the ENGINEER's decision at no change in contract price.

B. Should anything be omitted from the Contract Drawings or specifications which is necessary to a clear understanding of the work, or should any error appear either in any of the various instruments furnished or in the work done by other contractors affecting the work included under this contract, the Contractor shall promptly notify the ENGINEER of such omission or errors and in the event of the Contractor's failure to do so, he shall make good any damage to or defect in his work caused thereby. He will not be allowed to take advantage of any error or omission on the Contract Drawings, as full instructions will be furnished by the ENGINEER. Should such error or omission be discovered, the Contractor shall carry out such instructions as if originally specified.

C. Each and every provision of law and clause required by law to be inserted in this contract shall be deemed to be inserted herein, and this contract shall be read and enforced as though it were included herein, and if through mere mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party hereto, the contract shall forthwith be physically amended to make such insertion.

D. Each clause of these specifications is to be followed wherever it may apply throughout the work irrespective of the section or subdivision of the specifications in which the clause may appear.

3. OBLIGATION OF CONTRACTOR

A. The Contractor shall, at his own cost and expense, and in strict conformity with the hereinafter contained or hereto annexed specifications and the contract drawings, furnish all the materials and labor and all tools, tackle, implements, machinery and appliances of very kind necessary or proper for the purpose, and in good substantial and workmanlike manner and within the time hereinafter specified, perform and complete the work required under this contract. He shall complete the entire work to the satisfaction and approval of the ENGINEER, and shall accept in consideration thereof, and as full compensation therefore, the sums set opposite the respective classes of work and materials named in the contract and proposal herein contained or hereto annexed, the said sums being the amounts at which the contract therefore was awarded to the Contractor at the public letting thereof.

B. CONTRACTOR shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with OWNER. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as CONTRACTOR and OWNER may otherwise agree in writing.

4. ABSENCE OF CONTRACTOR

A. In the absence of the Contractor there shall at all times be a duly authorized representative on the work, who shall receive and execute all orders given by the ENGINEER, and such orders so given to and received by said representative, shall be deemed to have been given to and received by the Contractor. Whenever the Contractor or his representative is not present at any place on the work where it may be necessary to give orders or directions, they will be given by the ENGINEER and his assistants, and shall be received and promptly obeyed by the superintendent or the foremen who may have immediate charge of the men employed on the particular work in relation to which the order may be given.

5. NOTICE TO CONTRACTOR

A. The residence or place of business given in the bid or proposal upon which this contract is founded is hereby designated as the place where all notices, letters and other communications shall be served, mailed to or delivered. Any notice, letter or other communication addressed to the Contractor and delivered at the above named place or deposited in a postpaid wrapper in any post office box regularly maintained by the United States Post Office. Department shall be deemed sufficient service thereof upon the Contractor, and the date of mailing shall be the date of service. The place named may be changed at any time by an instrument in writing, executed and acknowledged by the Contractor and delivered to the ENGINEER.

B. Nothing herein contained shall be deemed to preclude or render inoperative the service of any notice, letter or other communication upon the Contractor personally.

6. OBSERVATION

A. The work is subject to observation by the ENGINEER or his appointed representative to provide the OWNER a greater degree of confidence that the work is in conformance with the Contract Documents. The Engineer's Representative is not authorized to change any provision of the Contract Documents without written authorization of the ENGINEER, nor shall the presence or absence of the Engineer's Representative relieve the Contractor from any requirements of the Contract. Should the CONTRACTOR desire to work in excess of 40 hours per week, he shall pay for all costs associated with maintaining the ENGINEER's Representative on-site for observation of the work at the same rates paid to the ENGINEER by the OWNER for similar work..

B. The ENGINEER or his authorized representative will observe the materials furnished and the work done under this contract, and he is also hereby authorized and empowered to reject and refuse all work and materials and the method of application of any part thereof, under or in fulfillment of this contract, that does not comply in kind, quality, quantity, time or place with the specifications and the Contract Drawings. The observations, approval or acceptance of any part of the work herein contracted for, or the materials used therein, or any payment on account thereof, shall not prevent the rejection of said work or materials at any time thereafter during the existence of this contract and prior to the payment of the final estimate, should said work or materials be found to be defective or not in accordance with the requirements of this contract.

C. As soon as practicable after the completion of the entire work, or any divisible part thereof as may be designated in these Contract Documents an examination thereof will be made by the ENGINEER at the site of the work. It such work is found to comply with the requirements of the contract, it will be accepted, and final payment therefore will be made in accordance with the clause of the contract entitled, "Estimates and Payment."

7. ENGINEER'S STATUS

A. The ENGINEER is the agent of the OWNER to the extent provided in the Contract Documents and in special instances he shall, upon request, show the Contractor written authority.

B. As the ENGINEER is, in the first instance, the interpreter of the conditions of the contract and the judge of its performance, he shall side neither with the OWNER nor with the Contractor, but shall use his powers under the contract to enforce its faithful performance by both.

C. In case of termination of the employment of the ENGINEER, the OWNER shall appoint a capable and reputable Engineer against whom the Contractor makes no reasonable objection, whose status under the contract shall be that to the former Engineer.

8. ENGINEER'S DECISION

A. The ENGINEER shall, in all cases, determine the amount, quality, acceptability and fitness of the several kinds of work, materials and equipment which are to be paid for under this contract. He shall also determine all questions in relation to said work and the performance thereof, and decide every question which may arise relative to the fulfillment of this contract on the part of the Contractor,

except as provided herein. The determinations of the ENGINEER as to work, materials and equipment shall be subject to the final approval of the OWNER.

B. All decisions of the ENGINEER shall be final except in cases where time and/or financial considerations are involved which, of no agreement in regard thereto is reached, shall be subject to appeal by the OWNER.

C. In carrying out the provisions of this Contract or in exercising any power of authority granted them by their position there shall be no liability upon the appointed officials, the Engineer or their authorized representatives or assistants, either personally or as officials of the Owner, it being understood that in such matters they act as agents and representatives of the Owner.

9. ACCESS TO WORK

A. The Contractor shall at all times give access to the work to the OWNER, to the ENGINEER and the assistants and inspectors under him, and to representatives of governmental agencies with jurisdictional interest. The Contractor shall furnish all the necessary facilities for determining both on the work and at the places of manufacture, that all work to be done and all materials to be furnished under this contract is being performed and are being made strictly in accordance with the terms of the contract and with the Contract Drawings and specifications. The Contractor shall notify the ENGINEER in writing at least seven (7) days previous to the commencement of the manufacture of any materials, of the time and place where the manufacture is to take place, in order that a representative of the OWNER may be present to inspect the manufacture, should it be so desired.

10. COMPETENT PERSONS TO BE EMPLOYED

A. The Contractor shall employ only competent and skill full persons to do the work, and whenever the ENGINEEER shall notify the Contractor in writing that any person on the work is, in his opinion, incompetent, disorderly, or otherwise unsatisfactory, the Contractor, on receiving such notice, shall forthwith remove from the site such person and shall not allow back on-site without the written consent of the ENGINEER.

11. LAW AND ORDINANCES

A. The Contractor shall keep himself fully informed of, and shall carefully observe and comply with all State, County and local laws, ordinances and regulations which in any manner affect the conduct of the work, and all such orders or decrees as exist at present and those which may be enacted later, of bodies having any

jurisdiction or authority over the work, and shall indemnify and save harmless the OWNER and all its officers, agents and servants against any claim or liability arising from or based upon the violation of any such law, ordinance, regulation, order or decree, whether by himself of his employees.

12. PERMITS

A. Those Permits required to be obtained, by the OWNER have been or will be obtained. Those Permits required to be obtained by the Contractor (i.e., Building Permits, Road Opening Permits, Blasting Permits, etc.) shall be obtained and paid for the by Contractor. Any charge or fee for Permits issued by the OWNER shall be borne by the OWNER. The OWNER will be reimbursed by the Contractor for the cost of inspection of the work under this contract required by public authority other than the OWNER, such as other public agencies. The Contractor shall comply with all requirements of N.J.S.A. 12:190-7.7 and N.J.A.C. 12:190-7.7 regarding blasting in the vicinity of underground and above ground utility lines.

13. LABOR-EMPLOYMENT-WAGE HOURS

A. The Contractor shall comply with all requirements of the labor laws of the State applicable to contracts on behalf of a municipality for construction, alternation or repair of any building or public work.

14. WORKMENS COMPENSATION

A. The Contractor shall take out and maintain Workmen's Compensation Insurance to fully protect the OWNER as required by existing law, or as such may be amended during the life to this contract. In case the Contractor shall subcontract any portion of the work, he shall require that all employees of the subcontractor are properly covered by such Workmen's Compensation Insurance. In case any class of employees engaged in hazardous work under this contract is not protected under Workmen's Compensation statute, the Contractor shall provide, and shall cause each subcontractor to provide, adequate and suitable insurance for the protection of his employees not otherwise protected.

15. PUBLIC LIABILITY, PROPERTY AND AUTOMOBILE INSURANCE

A. The Contractor shall, at his own cost and expense, secure and maintain in force until Contract Completion and at all times thereafter when the Contractor may be correcting, removing or replacing defective work or completing plantings, insurance for damages imposed by law and assumed under the Contract of the

kinds and in the amounts hereinafter provided with insurance companies authorized to do business in the State of New Jersey.

B. After Notice to Proceed, the Contractor shall furnish to the OWNER a certificate or certificates of insurance, in triplicate, together with declaration pages, in a form satisfactory to the OWNER, showing that the Contractor has complied with this Section. Insurance binders are not acceptable as proof of insurance coverage. Such certificates shall specifically refer to this Project by project name and contract number. Original copies of the Owner's and Contractor's Protective Liability Insurance (OCPL) policy and the Builders Risk Policy shall be provided to the OWNER before starting work.

C. All of the policies of insurance required to be purchased and maintained and the certificates, declaration pages, or other evidence thereof shall contain a provision or endorsement that the coverage afforded is not to be cancelled, materially changed, or renewal refused until at least thirty (30) calendar days prior to written notice has been given to the OWNER by certified mail.

D. Contractor Insurance Requirements: The Contractor shall procure and maintain liability insurance as specified below, to protect the Contractor, the OWNER, ENGINEER and their respective officers, employees and agents against claims of or relating to personal injury (including death) to persons or damage to property which may arise from or in connection with the performance of the work (whether performed on-site or off-site) by the Contractor, its employees, officers, agents, subcontractors or other individuals or entities for whom the Contractor may be contractually or legally responsible from the date of execution of the Contract until Contract Completion.

1. Commercial General Liability: Commercial General Liability is to be written as broad as the standard coverage form currently in use in the State of New Jersey and shall not be circumscribed by any endorsements limiting the breath of coverage. The policy shall include coverage for contractual liability, products, completed operations, and any explosion, collapse and underground (XCU) operations. Limits of liability shall not be less than $2,000,000 combined single limit with excess or umbrella liability coverage with the same terms and conditions as the underlying coverage in an amount such that the primary coverage and excess/umbrella coverage equals $2,000,000. The policy shall name the OWNER, the ENGINEER, their respective officers, employees and agents as additional insured's.

2. Automobile Liability Insurance: The Contractor shall carry Automobile Liability Insurance covering owned, non-owned, and hired vehicles. The limits of liability shall not be less than $1,000,000 combined single limit, each accident for bodily injury and property damage.

3. Workers Compensation and Employer's Liability: Workers Compensation Insurance in accordance with the laws of the State of New Jersey and any other state or federal jurisdiction as is required to protect the employees of the Contractor or any subcontractor who will be engaged in the performance of the work. This policy shall include Employer's Liability protection with a limit of liability of not less than $1,000,000.

4. Owner's and Contractor's Protective Liability Insurance (OCPL): In addition to the insurance required above, the Contractor shall obtain and maintain a separate Owner's and Contractor's Protective Liability insurance policy for the same limits of liability as specified for the Commercial General Liability insurance. The policy shall be maintained in force for the term of the Contract or for one (1) year, whichever is longer, and shall name the OWNER, the ENGINEER and their respective officers, employees and agents as insured's.

5. Builder's Risk Insurance: The Contractor shall provide Special Form Builder's Risk insurance on a completed value basis and in the full amount of the Contract insuring the interest of the OWNER, covering all real and personal property for all risks of physical loss or damage to the project, including coverage while in transit and during storage away from the site, external water damage and debris removal. In the event that the value of the work increases during the course of construction, the value of the insurance shall be immediately increased accordingly.

   The Contractor shall maintain such coverage from the date of execution of the Contract until Contract Completion.

   Coverage shall include all materials, supplies, assemblies, furnishings and equipment that are intended for specific installation in the project while such materials, supplies, assemblies, furnishings and equipment are located at the site, in transit and while temporarily located away from the site for the purpose of repair, adjustment or storage.

   Coverage shall include structures, excavations and foundations, including pilings, demolition, re-excavation and debris removal and operations testing.

The Builder's Risk insurance policy shall be endorsed waiving the insurance company's rights of subrogation and provide that the insurance company will not cancel such insurance without giving thirty (30) day prior written notice to the OWNER.

Deductibles or self-insured retentions with respect to the builder's risk insurance shall be no greater than $25,000 per claim for flood and earthquake, and not greater than $10,000 per claim for all other property losses. The Contractor shall bear the cost of all deductibles and self-insured retentions. Notwithstanding any deductible or self-retention, the Contractor shall remain solely liable for the full amount of any item covered by the builder's risk insurance.

The OWNER and the Contractor waive all rights against each other for damages caused by fire or other perils to the extent they are covered by the builder's risk insurance or any other property insurance applicable to the work.

E. Endorsement and Waivers: The Commercial General Liability Policy, Automobile Liability Policy, and Excess/Umbrella Policies provided by the Contractor shall contain or be endorsed to contain the following provisions:

1. The OWNER, the ENGINEER, and their respective officers, employees and agents shall be covered as additional insured's as respects any and all liability arising out of the work of this Contract.

2. For any claims related to the Project, the Contractor's insurance coverage shall be primary insurance with respect to the OWNER, the ENGINEER, and their respective officers, employees and agents, and shall specify that coverage, continues notwithstanding the fact that the Contractor has departed from the site. Any insurance or self-insurance maintained by the OWNER, the ENGINEER, and their respective officers, employees and agents shall be in excess of the Contractor's insurance and shall not contribute with it.

3. Any failure on the part of the Contractor to comply with reporting provisions or other conditions of the policies, any breach of warranty, any action or inaction of the Contractor or others, any foreclosures related to the Project or any change in ownership of all or any portion of the Project shall not affect coverage provided to the OWNER, the ENGINEER, and their respective officers, employees and agents.

4. The Contractor's insurance shall apply separately to each insured against whom a claim is made or suit is brought, except with respect to the limits of the insurer's liability.

5. In the event the Commercial General Liability Insurance has an aggregate limit of liability, it shall be endorsed with the Designated Construction Project(s) General Aggregate Limit endorsement (CG 25 03 or equivalent).

6. The Builder's Risk policy shall contain a waiver of subrogation against the OWNER, the ENGINEER and their respective officers, employees and agents.

F. Disclaimer: The Contractor and each subcontractor have the responsibility to make sure that their respective e insurance programs fit their particular needs, and it is their responsibility to arrange for and secure any insurance coverage that they deem advisable, whether or not specified herein.

G. No Recourse: There shall be no recourse against the OWNER or the ENGINEER for payment of premiums or other amounts with respect to the insurance required by the Contractor hereunder.

H. Right to Remedy: If the Contractor fails to provide insurance as required herein, the OWNER shall have the right, but not the obligation, to purchase such insurance. In such event, the Contract Price shall be reduced by the amount paid for such insurance.

16. SOCIAL SECURITY ACT

A. The Contractor shall be and remain an independent Contractor with respect to all services performed hereunder and agrees to and does hereby accept full liability for the payment of any and all contributions or taxes for social security, unemployment insurance, federal withholding tax or old age retirement benefits, pensions or annuities, nor or hereafter imposed under any state or federal law which are measured by the wages, salaries, or other remuneration paid to persons employed by the Contractor on work performed under the terms of this contract, and further agrees to obey all lawful rules and regulations and to meet all lawful requirements which are now or hereafter may be issued or promulgated under said respective laws by any duly authorized state or federal officials; and said Contractor also agrees to indemnify and save harmless the OWNER from any such contributions or taxes or liability thereof.

17. ASSIGNMENT OF CONTRACT

A. The Contractor or his thoroughly qualified and designated representative shall give his personal attention constantly to the faithful prosecution of the work. He shall not assign, transfer, convey or otherwise dispose of this contract, or his right, title, or interest in, or to the same or any part thereof, without the previous approval of the OWNER.

B. The Contractor shall not assign, by power of attorney or otherwise, any of the monies to become due and payable under this contract, unless by and with the written consent of the OWNER, and such consent or approval, if given, will not relieve the Contractor from any of the obligations of said contract, assignment of this contract or any part thereof or of any funds to be received thereunder by the Contractor shall contain a clause to the effect that it is agreed that the funds to be paid the assignee under the assignment are subject to a prior lien for services rendered or materials supplied for the performance of the work called for in said contract in favor of all persons, firms or corporations rendering such services or supplying such materials.

18. ROYALTIES AND PATENTS

A. The Contractor shall indemnify and save harmless the OWNER and its officers and agents from all damages, judgments, claims and expenses arising from the infringement of any letter, patent, or patent right because of any royalty, fee or license for the use, arrangement of operation of any tools, machinery, appliances, devices, materials, process or processes which may be used by the Contractor or furnished by him in fulfillment of the requirements of this contract. In the event of any claim or action at law on account of such patents or fees, it is agreed that the OWNER may retain out of the monies which are or which may become due the Contractor under his contract, a sum of money sufficient to protect itself against loss, and to retain the same until said claims are paid or satisfactorily adjusted.

19. CLAIMS FOR LABOR, MATERIALS AND DAMAGES

A. The Contractor shall, from time to time, as required by the OWNER, furnish the OWNER with satisfactory evidence that all persons who have done work or furnished materials under this contract, or have suffered some damage on account of the Contractor's operations, have been fully paid or secured; and in case such evidence be not furnished as aforesaid, such amount as the OWNER may consider necessary to meet the lawful claims of the persons aforesaid will be retained from the monies otherwise due said Contractor, until the liabilities aforesaid have been

full satisfied. It is understood and agreed, however, that the OWNER hereby assumes no obligation toward such claimants, nor in any way undertakes to pay such claims out of any funds due or that may become due the Contractor, or out of its own funds.

20. ACCIDENTS AND CLAIMS TO BE GUARDED AGAINST

A. All work shall be in compliance with OSHA General Industry Standards (29 CFR 1910), OSHA Construction Industry Standards (29 CFR 1926), the rules and regulations of State of New Jersey Department of Labor and Workforce Development, the "Construction Safety Act," (N.J.S.A. 34:5-166, et seq.), the High Voltage Proximity Act N.J.S.A. 34:6-47.1) and other applicable rules and regulations.

B. The Contractor, when necessary, shall erect and maintain on the work such strong and suitable barriers and at night time such red lights as will efficiently and effectually prevent any accident to life, limb or property on consequence of said work, or in the use or occupancy of street, alley, highway or public or private grounds.

C. The status of the Contractor in the work to be performed by him under the contract is that of an independent Contractor and the safety of his employees, the safety of third parties on or near the construction site and the means, methods, techniques and sequences of construction are the sole responsibility of the Contractor. As such, the work, in every respect, from the execution of the contract and during progress of the work thereunder, and until final acceptance, shall be under the charge and in care of the Contractor and at his risk. He shall be solely responsible for site safety and the implementation, discharge and monitoring of all safety standards or practices and shall properly safeguard against any or all injury to the public, to public and private property, materials and things and, as such, the Contractor alone shall be responsible for any and all damage, loss or injury to persons or property that may arise, or be incurred in, or during the conduct or progress of said work without regard to whether the Contractor, his subcontractors, agents or employees, have been negligent. The Contractor shall appoint a Construction Site Safety Officer who shall implement the Contractor's Safety Program. The Contractor shall keep the OWNER and ENGINEER free from, and discharged of any and all responsibility and liability therefore of any sort or kind whatsoever. The Contractor shall assume all responsibility for risks and casualties of every description and for any or all damage, loss or injury to persons or property arising out of the nature of the work from the action of the elements, or from any unforeseen or unusual difficulty or circumstance. The Contractor shall assume and be liable for all blame and loss of

whatsoever nature by reason of neglect or violation of any Federal, State, County or local laws, statutes, ordinances or any an all rules and regulations promulgated thereunder. The Contractor shall indemnify, defend and save harmless the OWNER and ENGINEER and all of their respective officers, agents and employees from all liability or suits or actions at loss or in equity of any kind whatsoever arising from the failure of the Contractor to comply with the terms and conditions of the contract, plans and specifications or any Federal or State statutes or local ordinances or any rules and regulations promulgated, in accordance with the provisions of such statutes or ordinances by the United States, the State of New Jersey, or any municipality thereof, or by any department or agency of any or all thereof, and the Contractor shall, if required by the OWNER or ENGINEER, produce evidence of settlement of any such action before final payment under the contract shall be made by the OWNER.

D. The Contractor shall, unless otherwise specified, maintain and pay for such primary insurance, issued in the name of the OWNER and ENGINEER, as will protect the OWNER and ENGINEER from contingent liability under this contract, and the OWNER's and ENGINEER's right to enforce against the Contractor any provision of this article shall be contingent upon the full compliance by the OWNER and ENGINEER with the terms of such insurance policy or policies, a copy of which shall be deposited with the OWNER and ENGINEER.

21. STATEMENT OF QUANTITIES

A. The quantities of the work to be done and the materials to be furnished under this contract as given in the Instructions to Bidders or attached hereto or as indicated on the Contract Drawings, are to be used solely as a uniform basis for comparing proposals and/or for determining the amount of the Contractor's performance bond. The OWNER shall not be held responsible if any of the said quantities are found incorrect or omitted and the Contractor shall not make any claim for damages or for loss of profits or for an extension of time because of a difference between the quantities of the various classes or work as estimated and the work actually performed. If any error, omission, or misstatement is discovered in the said estimated quantities, the same shall not invalidate the contract or release the Contractor from execution and completion of the whole or any part of the work to the satisfaction of the ENGINEER and in accordance with the specifications and plans and for the prices agreed upon and fixed therefore or excuse him from any of the obligations or liabilities set forth in the Contract Documents, or entitle him to any damages or compensation otherwise than is specified in said Contract Documents.

B. The quantities of the various work on which payments will be made to the Contractor are to be determined by measurements of the work actually performed by the Contractor and accepted by the ENGINEER as being satisfactorily completed in accordance with the requirements of the Contract Documents.

C. Before submitting this proposal, the Contractor shall determine for himself the quantities of work required and the conditions under which the work will be performed, by such means as he may prefer, and shall assume all risks as to variations in the quantities of the different classes of work.

D. He shall not at any time after the submission of this proposal, dispute or complain of the schedule of quantities or assert that there are any misunderstanding as to the amount or character of the work to be done, and shall not make any claim for damages, or for loss of profits, or for an extension of time because of a difference between the quantities of the various classes of work stated, and the quantities of work actually performed.

22. MATERIALS AND WORK

A. All materials furnished under this contract shall be as specified or required, or in the absence of particular specification shall be the best of their respective kinds, or new stock, unused and not deteriorated and all the work contemplated and described shall be done in a good, substantial and workmanlike manner.

B. Only manufactured and farm products of the United States, wherever available, shall be incorporated into the work of this contract in accordance with N.J.S.A. 40A:11-18.

C. Wherever in these *Specifications* or on the plans, the terms ASTM, AWWA, or other such reference *Specifications* are used, it shall be considered to mean the latest pertinent *Specifications* and any subsequent amendments thereto.

D. Substitutes and "Or-Equals"

1. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted,

other items of material or equipment of other Suppliers may be submitted to ENGINEER for review under the circumstances described below.

a. *"Or-Equal" Items*: If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by ENGINEER as an "or-equal" item, in which case review and approval of the proposed item may, in ENGINEER's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:

(1) in the exercise of reasonable judgment ENGINEER determines that:

(a) it is at least equal in quality, durability, appearance, strength, and design characteristics;

(b) it will reliably perform at least equally well the function imposed by the design concept of the completed Project as a functioning whole, and;

(c) it has a proven record of performance and availability of responsive service; and

(2) CONTRACTOR certifies that:

(a) if approved and incorporated into the work there will be no increase in cost to the OWNER; and

(b) it will conform substantially, to the detailed requirements of the item named in the Contract Documents.

b. *Substitute Items*:

(1) If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR does not qualify

as an "or-equal" item under paragraph 22.D.1.a, it will be considered a proposed substitute item.

(2) CONTRACTOR shall submit sufficient information as provided below to allow ENGINEER to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefore. Requests for review or proposed substitute items of material or equipment will not be, accepted by ENGINEER from anyone other than CONTRACTOR.

(3) The procedure for review by ENGINEER will be as set forth in paragraph 22.D.1.b.(4), as supplemented in the General Requirements and as ENGINEER may decide is appropriate under the circumstances.

(4) CONTRACTOR shall make written application to ENGINEER for review of a proposed substitute item of material or equipment that CONTRACTOR seeks to furnish or use. The application:

(a) Shall certify that the proposed substitute item will:

(i) perform adequately the functions and achieve the results called for by the general design,
(ii) be similar in substance to that specified,
(iii) and be suited to the same use as that specified.

(b) The application will state:

(i) the extent, if any, to which the use of the proposed substitute item will prejudice CONTRACTOR's achievement of Substantial Completion on time;
(ii) whether or not use of the proposed substitute item in the Work will required a change in any of the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) to adapt the design to the proposed substitute item;

(iii) and whether or not incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.

(c) Will identify:

(i) all variations of the proposed substitute item from that specified, and;
(ii) available engineering, sales, maintenance, repair, and replacement services.

(d) And shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.

2. *Substitute Construction Methods or Procedures*: If a specific means, method, technique, sequence, or procedure of construction is shown or indicated in and expressly required by the Contract Documents, CONTRACTOR may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by ENGINEER. CONTRACTOR shall submit sufficient information to allow ENGINEER, in ENGINEER's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The procedure for review, by ENGINEER will be similar to that provided in subparagraph 22.D.1.b.

3. *ENGINEER's Evaluation*: ENGINEER will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to paragraphs 22.D.1 and 22.D.2. ENGINEER may require CONTRACTOR to furnish additional data about the proposed substitute item. ENGINEER will be the sole judge of acceptability. No "or-equal" or substitute will be ordered, installed or utilized until ENGINEER's review is complete, which will be evidenced by either a Change Order for a substitute or an approved Shop Drawing for an "or-equal." ENGINEER will advise CONTRACTOR in writing of any negative determination.

4. *Special Guarantee*: OWNER may require CONTRACTOR to furnish at CONTRACTOR's expense a special performance guarantee or other surety with respect to any substitute.

5. *ENGINEER's Cost Reimbursement*: ENGINEER will record time required by ENGINEER and ENGINEER's Consultants in evaluating substitute proposed or submitted by CONTRACTOR pursuant to paragraphs 22.D.1 and 22.D.2 and in making changes in the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) occasioned thereby. Whether or not ENGINEER approves a substitute item so proposed or submitted by CONTRACTOR, CONTRACTOR shall reimburse OWNER for the charges of ENGINEER and ENGINEER's Consultants for evaluating each such proposed substitute.

6. *CONTRACTOR's Expense*: CONTRACTOR shall provide all data in support of any proposed substitute or "or-equal" at CONTRACTOR's expense.

E. Modification Request to Contract Documents:

1. CONTRACTOR may, at his sole cost and expense, submit to the ENGINEER for his consideration a Modification Request to the *Contract Documents* for a change in equipment, materials or methods of work than would result in net savings in excess of $15,000 to the OWNER. A Modification Request will only be considered that will not compromise the useful life, operation costs, safety, code compliance, project schedule, or design integrity of the system.

2. Requests by the CONTRACTOR shall only be considered if accompanied by a detailed report, calculations, and drawings signed and sealed by a licensed Professional Engineer in the State of New Jersey defining the impacts related to the Modification Report and the net cost savings to the OWNER over the useful life of the Modification.

3. CONTRACTOR shall submit all Modification Requests to the ENGINEER within sixty (60) calendar days after Notice to Proceed. Each request will be, accompanied with a Certified Check for $5,000.00 in the name of the OWNER to cover the cost of the initial review of the Modification Request by the ENGINEER. The ENGINEER shall respond to the Request within thirty (30) calendar days of submission either denying the Request, deeming the Request incomplete, or conditionally approving the Request. In cases where Requests are conditionally approved, the ENGINEER shall define the conditions of approval including the applicable redesign costs and any other impacts which must be borne at the CONTRACTOR'S sole cost and expense. In cases where

a Request is deemed incomplete, the CONTRACTOR shall resubmit the required information within ten (10) calendar days or the Request will be deemed denied. No denied Requests will be reconsidered.

4. Submission of Modification Requests shall be in general conformance with *Section 01 25 13, Substitutions* for informational content. Equipment, materials, or methods of work rejected as an *"or equivalent"* or *"substitute"* item may be resubmitted under this section in keeping with conditions defined herein.

23. DEFECTIVE WORK OR MATERIALS

A. If at any time before the final acceptance of the work, any materials or workmanship shall be discovered, which do not comply with the specifications and Contract Drawings they shall be immediately removed by the Contractor, when notified to do so by a written notice from the ENGINEER, and shall be replaced at the Contractor's expense. Any work condemned by the ENGINEER as unsuitable or improperly done shall be removed and repaired, or otherwise remedied, as the ENGINEER may direct.

B. All material condemned by the ENGINEER shall be removed from the site of the work within two (2) days if and after notice to that effect is given.

C. Should defective work be suspected and the ENGINEER so requires, the Contractor shall uncover, take down or make openings in the finished work for the purpose of examining at such points as said ENGINEER designates. Should the work thus exposed or examined provide satisfactory, the uncovering, taking down or making openings in and the replacing of the covering or the making good of the parts removed shall be paid for in accordance with the contract prices for the items involved; but should the work exposed or examined prove unsatisfactory, the uncovering, taking down and replacing and making good shall be at the expense of the Contractor.

D. If the Contractor shall neglect or refuse to remove or replace the same within seven (7) days from the date of the written notice from the ENGINEER to do so, said notice being served either personally or by leaving it at his place of business or with his agent in charge of the work, then the OWNER may remove or cause the same to be removed and satisfactorily replaced by contract or otherwise, as he may deem expedient, and charge the expense thereof to the Contractor. The expense so charged will be deducted and paid by the OWNER out of such monies as are or may become due under this Agreement; or if such monies are not sufficient to meet the said expense, the additional monies shall be furnished by the

Contractor; and if he refuses or neglects to provide the necessary monies, they shall be provided by his surety.

24. PERMISSIBLE CHANGES AND VARIATIONS IN THE WORK

A. Should it be deemed necessary in the execution of the work, by reason of any condition or circumstance arising or discovered after the making of the contract, to make any minor variation desirable or necessary for the stability, safety, economy or betterment of the work, which variations increase or decrease the quantities of the work specified or change the location thereof to an extent not unreasonably affecting the conditions of the work, and further interpreted by the ENGINEER as involving no classes of work other than those called for by this contract, the Contractor shall, upon written order from the ENGINEER to that effect, make such minor variations. If such minor variations diminish the quantity of the work to be done, no claim for damages or for anticipated profits on the work that may be dispensed with shall thereby accrue to the Contractor, and the value of the work dispensed with, will not be included in any payments made to the Contractor. If such minor variations increase the amount of the work, the value of such increase shall be determined and fixed by the ENGINEER in accordance with the quantity of such work actually done, and/or at the unit prices stipulated in the contract.

B. Such alterations or changes as are mentioned in this section shall not vitiate or annul the obligations of the contract or the agreement of the work.

C. The law defines “bid proposal quantity” as the quantity indicated in the bid proposal less the quantities designated in the project plans as “if and where directed.” Contracting unit may increase or decrease the quantity of work to be performed by the contractor.

D. If the quantity of a pay item:

1. Is cumulatively increased or decreased by 20% or less from the bid proposal quantity, the quantity change is considered a minor change in quantity.

    a. The contracting unit must make payment for the quantity of the pay item performed at the bid price for the pay item.

2. Is cumulatively increased or decreased by more than 20% from the bid proposal quantity, the quantity change is considered a major change in quantity.

a. For major increase:

(1) The contracting unit or the contractor may request to renegotiate the price for the quantity in excess of 120% of the bid proposal.

(2) If mutual agreement cannot be reached the contracting unit must pay the actual cost plus an additional 10% for overhead and additional 10% for profit unless otherwise specified in the original bid.

b. For major decrease:

(1) The contracting unit or the contractor may request to renegotiate the price for the quantity of work performed.

(2) If mutual agreement cannot be reached the contracting unit must pay the actual cost plus an additional 10% for overhead and additional 10% for profit unless otherwise specified in the original bid. Provided that the contracting unit does not make a payment in an amount that exceeds 80% of the value of the bid price multiplied by the bid proposal quantity.

25. EXTRA WORK

A. Any extra work not originally contemplated under this contract and not covered by unit or lump sum prices in the proposal shall be performed by the Contractor if ordered in writing by the ENGINEER prior to undertaking such work. Such extra work shall be subject to payment under the contract with a change order fixing the prices and method of payment and of doing the work or shall be compensated on the basis of actual cost of necessary labor and materials and an allowance as set forth below for overhead and profit as may be stipulated by the OWNER in the written authorization for the work. All such change orders must be authorized by, the OWNER prior to the initiation of the work.

B. A change order in letterform addressed to the Contractor by the ENGINEER and containing approved endorsements of the OWNER and Contractor will be prepared in all cases of extra work involving changes in or additions to the project. At the discretion of the OWNER, extra work may be ordered on a labor, materials, overhead and profit basis as set forth above.

C. The cost or credit to the OWNER resulting from a change in the work shall be determined in one or more of the following ways:

1. By mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

2. By unit prices stated in the Contract Documents or subsequently agreed upon;

3. By cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

4. By the method provided below.

D. If none of the methods set forth above is agreed upon, the Contractor, provided he receives a written order signed by the OWNER, shall promptly proceed with the work involved. The cost of such work shall then be determined by the ENGINEER on the basis of the actual expenditures and savings of those performing the work attributable to the change, including, in the case of an increase in the Contract Sum, an allowance for overhead and profit as set forth below:

1. For the Contractor, for any work performed by the Contractor's own forces, 15% of the cost.

2. For the Contractor, for work performed by the Contractor's subcontractor, 5% of the amount due the Subcontractor.

3. For each Subcontractor or Subcontractor involved, for any work performed by that Subcontractor's own forces, 15% of the cost.

E. In such case, and also under the methods set forth above, the Contractor shall keep and present, in such form as the ENGINEER may prescribe, an itemized accounting together with appropriate supporting data for inclusion in a Change Order. Unless otherwise provided in the Contract Documents, cost shall be limited to the following: cost of materials, cost of delivery; cost of labor, including social security, Federal and State disability and unemployment compensation insurance, fringe benefits as required by prevailing rate or union agreements, the incremental cost of additional bond premiums, workers compensation, general liability and property damage insurance pertaining to the work involved, rental value of equipment and machinery.

F. The compensable cost for construction equipment shall be based upon the most current annual costs established in "Rental Rates for Construction Equipment" (Blue Book), Machinery Information Division of K-III Directory Corp., San Jose, CA. The hourly charge for each piece of equipment will be the applicable monthly cost divided by 176 whether owned by the Contractor or rented from an outside source. Payment for equipment on the job-site will only be for that which is being used in the course of the work. Equipment that is on the job-site but idle or unused will not be included in the cost of the work.

G. Pending final determination of cost to the OWNER, payments on account shall be made on the ENGINEER'S Certificate for Payment. The amount of credit to be allowed by the Contractor to the OWNER for any deletion or change, which results in a net decrease in the Contract Sum will be the amount of the actual net cost as confirmed by the ENGINEER. When both additions and credits covering related work or substitutions are involved in any one change, the allowance for overhead and profit shall be figured on the basis of the net increase, if any, with respect to that change.

H. In order to facilitate checking of quotations for additional work or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials and subcontracts. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are subcontracts, they shall be itemized also. In no case will a change be approved without such itemization.

I. The Contractor shall give the ENGINEER access to all accounts, bills, payrolls and vouchers relating to such extra work and he agrees that he shall have no claim for compensation for such extra work in the case of items not covered by unit prices unless a statement in writing of the actual cost of the same, fully itemized as to labor, materials and other allowable costs is presented to the ENGINEER before the fifteenth day of the month following that during which each specific order was complied with by him.

J. Should concealed conditions encountered in the performance of the work below the surface of the ground or should concealed or unknown conditions in an existing structure be at variance with the conditions indicated by the Contract Documents, or should unknown physical conditions below the surface of the ground or should concealed or unknown conditions in an existing structure of an unusual nature, differing materially-from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this Contract, be encountered, the Contract Sum shall be equitably adjusted by Change

Order upon claim made within five (5) days after the first observance of the conditions by the Contractor.

K. If the Contractor wishes to make a claim for an increase in the Contract Sum, he shall give the ENGINEER written notice thereof within five (5) days after the occurrence of the event, giving rise to such claim. This notice shall be given by the Contactor before proceeding to execute the work, except in an emergency endangering life or property in which case the Contractor shall proceed in accordance with Paragraph 20. No such claim shall be valid unless so made. If the OWNER and the Contractor cannot agree on the amount of the adjustment in the Contract Sum it shall be, determined by the ENGINEER. Any change in the Contract Sum resulting from such claim shall be, authorized by Change Order.

L. If the Contractor claims that additional cost is involved because of, but not limited to; (1) any written interpretation, (2) any order by the OWNER to stop the work where the Contractor was not a fault, (3) any written order for a minor change in the work, or (4) failure of payment by the OWNER, the Contractor shall make such claim as provided above.

26. OTHER CONTRACTS

A. It is understood and agreed that the Contractor shall execute his work in such a manner and in such order as will not interfere with work in progress and will permit the OWNER to perform other work or to enter into other contracts for work and materials to be constructed or placed in, on, or about the work herein described, with the least interference possible and with complete cooperation whenever it is desirable to prosecute said work, either simultaneously with the work under this contract or otherwise. It is agreed that the Contractor shall not be entitled to any damages or extra compensation from the OWNER on account of any work performed by the OWNER or other contractors that in any way affects the work under this contract, provided that such work of the OWNER and other contractors shall, in the opinion of the ENGINEER, be performed in a proper and expeditious or a necessary manner. The ENGINEER shall decide all questions between the Contractors hereunder, the other contractors, and the order of carrying on the work shall always be subject to his direction or approval.

B. If, in the judgment of the ENGINEER, the joint occupation of the site of the work by the OWNER, or by two or more contractors working on different contracts at the same time actually impedes progress on the work herein described, then upon the recommendation of the ENGINEER, the OWNER may extend the time for the completion of the work by a length of time which accords with and compensates for the delay so caused.

C. In the case the Contractor by his own acts, or the acts of any person or person in his employ, shall unnecessarily delay, in the opinion of the ENGINEER, the work of the OWNER or other contractors by not properly cooperating with them, or by not allowing them sufficient opportunity or facility to perform work as may be specified, the Contractor shall, in that case, pay all costs and expenses incurred by such parties due to any such delays, and he hereby authorizes the OWNER to deduct the amount of such cost and expenses from any monies due or to become due the Contractor under this contract. The ENGINEER, subject to the approval of the OWNER, shall decide the extent of such delay or delays, and the amount of such cost and expenses, and his decision shall be binding upon both parties to this contract. Nothing contained in this paragraph shall, however, relieve said Contactor from liability or damage resulting to the OWNER on account of such delay or delays.

D. If any part of the Contractor's work depends for proper execution or results upon the work of any other Contractor, the Contractor shall inspect and promptly report to the ENGINEER any defects in such work and render it unsuitable for such proper execution and results. His failure to so inspect and report shall constitute an acceptance of the other contractor's work as fit and proper for the reception of his work, except as to defects, which may develop in the other contractor's work after the execution of his work.

E. To insure the proper execution of this subsequent work, the Contractor shall measure work already in place and shall at once report to the ENGINEER any discrepancy between the executed work and the drawings.

27. SUSPENSION OF WORK

A. The OWNER shall have right to suspend the whole or any part of the work to be done hereunder, when, in the opinion of the OWNER, the Contractor is not doing the work in accordance with the provisions of the contract and specifications.

B. The contracting unit must provide advance written notice to the contractor of any suspension of work lasting more than ten (10) calendar days of the performance of all or any portion of the work of the contract.

C. If the performance of all or any portion of the work of the contract is suspended by the contracting unit for more than 10 calendar days due to no fault of the contractor or as a consequence of an occurrence beyond the contracting unit's control, the contractor shall be entitled to compensation for any resultant delay to the project completion or additional contractor expenses, and to an extension of time, provided that, to the extent feasible, the contractor, within 10 calendar days

following the conclusion of the suspension, notifies the contracting unit, in writing, of the nature and extent of the suspension of work.

1. The notice must include available supporting information, which information may thereafter be supplemental by the contractor as needed and as may be reasonably requested by the contracting unit.

2. Whenever a work suspension exceeds 60 days, upon seven days' written notice, either party shall have the option to terminate the contract for cause and to be fairly and equitably compensated therefor.

D. Upon receipt of the contractor's suspension of work notice, the contracting unit must promptly evaluate the contractor's notice and promptly advise, in writing, the contractor of its determination on how to proceed.

1. If the contracting unit determines that the contractor is entitled to additional compensation or time, the contracting unit must make a fair and equitable upward adjustment to the contract price and contract completion date.

2. If the contracting unit determines that the contractor is not entitled to additional compensation or time, the contractor shall proceed with the performance of the contract work and is entitled to pursue a suspension of work claim against the contracting unit for additional compensation or time attributable to the suspension.

3. Failure of the contractor to provide timely notice of a suspension of work will result in a waiver of a claim if the contracting unit can prove by clear and convincing evidence that the lack of notice or delayed notice by the contractor actually prejudiced the contracting unit's ability to adequately investigate and defend against the claim.

28. REMEDIES

A. In compliance with N.J.S.A. 40A:11-50, any and all disputes arising under this Contract shall be submitted to non-binding mediation. This non-binding mediation procedure is the process of resolution and the alternative dispute resolution procedure agreed to by the parties to this Contract pursuant to N.J.S.A. 40A:11-50, and disputes arising under this Contract shall be submitted to such non-binding mediation prior to being submitted to a Court for adjudication. Any such mediation shall be, governed by the Construction Arbitration Rules of Procedure of the American Arbitration Association insofar as they are not

inconsistent with this Contract. Any mediator shall be expressly bound to apply New Jersey substantive law in the mediation process and shall be guided by the New Jersey Rules of Evidence.

B. Nothing herein shall prevent or be deemed to prevent the contracting unit from seeking injunctive or declaratory relief in a Court of competent jurisdiction at any time. In addition, the Alternative Dispute Resolution Practices required hereunder shall not apply to disputes concerning the bid solicitation or award process, or to the formation of contracts or subcontracts to be entered into pursuant to N.J.S.A. 40A:11-1 et. seq.

C. The request for mediation in the event of a dispute shall be submitted to the other interested parties. The request shall include a statement of the specific claims that the complaining party has against the other party relating to these disputes. Within the reasonable time thereafter, the party being served with the notice of mediation shall provide to the complaining party a statement of its specific claims and/or defenses that it has against the complaining party relating to the dispute. The mediation proceedings shall commence within thirty (30) days of the submission of a request, and shall continue for a period not greater than fifteen (15) days of such longer period as the parties may agree. In the event of an emergency situation, the mediation process shall be accelerated.

D. The ENGINEER shall have the authority, with the approval of both parties to select the mediator. The mediator shall proceed to attempt to mediate and resolve the dispute pursuant to industry standards.

E. The contracting unit ("OWNER") and contracting party ("CONTRACTOR") shall divide equally and be equally responsible for all costs of such mediator and the mediation proceeding. Each party shall pay its own costs and fees and other costs incurred by the party in connection with its preparation for and participation in such mediation proceedings.

F. Any suit brought by either party with respect to this Contract shall be filed only in the Superior Court of New Jersey, in the County in which the OWNER is located, regardless of any rule or law involving diversity of citizenship, amount in controversy, residence of a part or venue.

29. ABANDONMENT OF WORK

A. Should the Contractor abandon or in any manner fail to complete the said work, the OWNER is hereby authorized and empowered to pay any laborers for work done who may have been employed by said Contractor upon the work herein, and

to pay any claims against the Contractor for material furnished, out of any funds that would otherwise be due or become due said Contractor under this contract, and in every such case the said OWNER is hereby authorized and empowered to ascertain through the ENGINEER, the amount or amounts so due or owing to such labor or laborers, or for material, from said Contractor, in such manner and upon such proof as the said ENGINEER may deem sufficient; and the amount or amounts so found by the ENGINEER to be due and payable be final and conclusive against the Contractor, and may therefore be paid by the OWNER to said labor or laborer, or to liquidate claims for materials furnished; and any estimate may be withheld from said Contractor until all such claims for labor or material on his contract have been satisfied.

30. FORFEITURE OF CONTRACT

A. The OWNER at any time during the continuance of the contract for the work herein provided for, and prior to the date of acceptance of the work as hereinafter provided, shall have the right and power to declare the whole or any part of the same forfeited for the violation of any of the conditions, terms, requirements or limitations herein contained, or if the performance of the contract is unnecessarily or unreasonably delayed, or if the Contractor is not progressing with the work as fast as is necessary to insure its completion within the time specified by this contract, or if the Contractor is showing bad faith in carrying out the contract, or if the work be not fully completed within the time fixed in this contract, for its completion, or within the time to which completion may be extended as hereinafter provided, or further, if the Contractor shall fail to refuse to remedy or repair defective work or materials when so ordered as herein provided. If the OWNER shall declare the said contract forfeited, in whole or in any particular, such declaration of forfeiture shall in no way relieve or affect the liability of the Contractor and his sureties for breach of any of the covenants and conditions for said contract.

B. The OWNER will give written notice of the Contractor stating the effective date of the forfeiture. This notice will be delivered to the Contractor at least five (5) days before said effective date.

C. On such event, all finished or unfinished documents, data, studies, surveys, drawings, maps, models, photographs and reports prepared by the Contractor under this Contract shall, at the option of the OWNER, become the OWNER'S property and the Contractor shall be entitled to receive just and equitable compensation for any work satisfactorily completed hereunder.

D. Not withstanding the above, the Contractor shall not be relieved of liability to the OWNER for damages sustained by the OWNER by virtue of any breach of the Contract by the Contractor, and the OWNER may withhold any payments due the Contractor until such time as the exact amount of damages due the OWNER from the Contractor is determined.

31. COMPLETION OF CONTRACT BY OWNER

A. If the work to be done hereunder shall be abandoned by the Contractor, or, if this contract shall be assigned or the work sublet by him, otherwise than as herein specified, or if at any time and for reasons hereinbefore specified, the OWNER declares the contract forfeited, the OWNER may notify the Contractor to discontinue all work or any part thereof, hereunder, or may notify the said Contractor to remedy or correct the condition or breaches enumerated by a written notice served upon the Contractor. In the event that the work is ordered discontinued as herein provided, or in case the said conditions or breaches are not remedied and corrected to the satisfaction of the OWNER within seven (7) days from the service of the said written notice, the OWNER will thereupon have the power to contract for the completion of the work, or such parts thereof, in the manner prescribed by law, or to employ such and so many persons as he may deem advisable, by contract or otherwise to work at and complete the work herein described or such parts thereof, and to use such machinery, materials, tools and appliances as may be found upon the site of the work, and to produce other materials, machinery, tools and appliances for the completion of the same, and to charge the expense so incurred to the Contractor. The expense so charged will be deducted and paid by the OWNER out of such monies as may be due or may at any time thereafter become due to the Contractor under and by virtue of this contract or any part thereof. In case such expense exceeds the amount due and payable or which would become due and payable under this contract, if completed by the Contractor, the amount of such excess shall be repaid to the OWNER, and in case such expense shall be less than the sum which would have been payable under this contract, if the same had been completed by the Contractor, then the Contractor shall be entitled to receive the difference. When any particular part of the work is being carried on by the OWNER, by contract or otherwise, under the provisions of this clause of the contract, the Contractor shall continue the remainder of the work in conformity with the terms of this contract, and in such manner as will in nowise hinder or interfere with the persons or workmen employed, as above provided, by the OWNER, by contract or otherwise, to do any part of the work or to complete the same under provisions of this article of the contract.

32. COMPLETION OF WORK DEFINED

A. The completion of the herein specified work is defined as that stage when the installation and the appurtenant equipment included under this contract have been completed and tested, and are together, ready for continuous permanent use and occupancy for the purpose intended. After this date, there may still remain some cleaning up or other minor work, which does not prevent the permanent use of the contracted work.

33. TIME FOR COMPLETION

A. Work on this contract shall be commenced within ten (10) days from the date a notice from the OWNER/ENGINEER is received to commence work.

B. The work shall be carried on with such force and in such manner and order and at such points that by the date stipulated in the proposal and contract, or as may be modified or extended as hereinafter provided, the whole work and its parts shall be performed in accordance with the terms of this contract.

C. It is mutually agreed and understood by and between the parties hereto that time is an essential part of this contract, and that, if the Contractor shall fail to complete the work or any part thereof within the time above fixed, the OWNER may retain as liquidated damages as a result of such delay, from monies that are or which may become due the said Contractor, such sum per day as specified in the contract for each and every day (Sundays and legal holidays excepted) the completion of the work be delayed beyond the time specified herein for such completion.

D. It is understood and agreed that by the signing of the foregoing contract the Contractor waives any legal defense he might have because of the omission of a bonus clause in the event of completion before the date agreed upon, the term "Liquidated Damages" governing absolutely.

E. It is agreed by and between the parties hereto that inasmuch as expenses and inconvenience and other damages will be sustained by the OWNER in the event that said Contractor fails to perform the work herein specified within the time herein set forth, such as inconvenience of the public, consulting and field engineering expenses, interest charges, wages, salaries of inspectors, delay caused to other work by failure to perform this contract, and other elements, some of which are indefinite and in some cases insusceptible of easy proof, the sum per day specified in the contract for each day's delay (Sundays and legal holidays excepted) shall be considered as liquidated damages and not as a penalty and shall become due said OWNER as full payment for all such expenses and damages

sustained to fit by the failure of said Contractor to complete the work as herein specified.

34. DELAYS AND EXTENSION OF TIME FOR COMPLETION

A. The OWNER shall have the right to defer the beginning or to suspend the whole or any part of the work herein contracted to be done whenever it may be necessary or expedient for the OWNER so to do; and if the Contractor be delayed in the completion of the work by any act of the OWNER, or of any employee of his or any other contractor employed by the OWNER or by changed order in the work, or by strikes, lockouts, fire, unusual delay of common carriers, unavoidable casualties, epidemics, abnormal weather conditions, acts of God or acts or neglect of utility companies, or any other such cause beyond the Contractor's control, then for all such delays and suspensions the Contractor shall be allowed one day additional to the time herein stated for each and every day of such delay so caused in the completion of the work, the same to be ascertained by the ENGINEER and recommended to the OWNER for issuance of a change order.

B. No such extension shall be made for any one or more of such delays unless within ten (10) days after the beginning of such delay a written request for additional time shall be filed with the ENGINEER. In case of a continuing cause of delay, only one request is necessary.

C. No claim for damages or any claim other than that for extension of time as herein provided shall be made or asserted against the OWNER by reason of any of the delays hereinbefore mentioned.

D. Those acts by the OWNER which are negligent, taken in bad faith, represent active interference, tortuous conduct or are otherwise un-contemplated by the parties to this contract are not subject to the above provisions.

35. PRICES

A. The OWNER will pay and the Contractor shall receive the prices stipulated in the proposal herein contained or hereto annexed, as full compensation for furnishing all the materials and performing all the labor which may be required in the prosecution and completion of the work in the contract as described and specified, and as shown on the Contract Drawings.

B. In accordance with NJSA 54:32B-1 et. seq., the OWNER is a public agency exempt from sales and use taxes. The Contractor must issue Contractors Exempt Purchase Certificate (ST-13) to his suppliers.

C. Use Tax: In accordance with P.L. 2009, c. 315, and for the term of this contract, a contractor or a contractor with a subcontractor that enters into a contract with the OWNER, and each of the affiliates of the contractor or subcontractor (as defined by N.J.S.A. 52:32-44(g)(3)), shall collect and remit to the Director of the Division of Taxation in the Department of the Treasury the use tax due pursuant to the "Sales and Use Tax Act," P.L. 1966, c.30 (N.J.S.A. 53:32B-1 et seq.) on all their sales of tangible personal property delivered into this State.

36. APPROVAL AND ACCEPTANCE OF WORK

A. Following the completion of this contract, as such completion is defined herein, and as soon thereafter as practicable, the OWNER will inspect the entire work on all parts and details or cause the same to be inspected, and if said work and all contract performances are found to be satisfactory and in accordance with the provisions and terms of the contract and specifications, the OWNER will certify the work as completed and will accept it, but conditional upon the subsequent remedying of defects which may become manifest within a period of two (2) years following completion and as herein required. The certification of completion and the said acceptance of the work will be prerequisite to final payment hereunder.

B. Twenty-four (24) months after the date of the certificate of acceptance as hereinbefore set forth, and as soon thereafter as practicable, the OWNER shall make a review and reinspection of the work and performances of this contract, or cause the same to be made. If the said performances and work shall be found satisfactory and the work not to have deteriorated through defects of workmanship or materials, then the OWNER shall certify the release of the two year Maintenance Bond herein elsewhere specified, if applicable, and such certification shall be prerequisite to the release of the sureties on the contract bonds. If, however, the review and reinspection as herein or any prior inspection discloses defects due to the non-fulfillment of this contract, or non-compliance with its requirements, the OWNER shall so notify the Contractor in writing, and thereupon the Contractor shall, at his own expense, repair or replace and shall make good all defects of workmanship, material and guarantee, and shall rectify any non-compliance, and such repairs and fulfillment shall be a prerequisite to the release of the two year Maintenance Bond, if applicable. If however, the Contractor shall, after due notice, refuse or neglect to make good the defects as notified and to the satisfaction of the OWNER, then the OWNER may and is empowered to proceed in the manner described in the event of abandonment or forfeiture of the work by the Contractor and completion by the OWNER and the payment of claims for material and labor and other expenses as provided in such procedures shall be a prerequisite to the release of the surety on the bond.

C. In the event that an element of the work evidences noncompliance with the Contract Documents due to deficient materials, methods of construction, failure to comply with established/specified practices and procedures, Contractor negligence, Contractor error or other reason attributable to the CONTRACTOR necessitating retesting; reinspection; supplemental engineering reports, calculations, design, coordination or field survey work; and/or extended inspection hours/days then the cost for such reinspection, retesting and related additional engineering services shall be documented, presented to the CONTRACTOR and deducted from payments otherwise due the CONTRACTOR by the OWNER.

1. This provision shall not apply to normal or routine construction activities and punch list items such as:

- Touch-up painting
- Re-seeding
- Adjustment of castings
- Maintenance/repair of trench restorations
- Bulb replacement
- Tightening of nuts and bolts
- Adjustment of lighting fixtures
- Routine site maintenance and clean-up
- Maintenance of erosion controls
- Re-compaction of soil/fill after proof-rolling
- Re-chlorination and retesting of a waterline retesting of a force main after one test failure and CONTRACTOR initiated remedial work
- Re-hanging of gates/doors
- Re-caulking
- Minor regrading of landscaped areas and replacement of dead or dying plants during the contract period.

2. The OWNER recognizes that the afore listed normal or routine remedial work activities are to be expected in most construction contract and engineering service charges related to those and similar normally encountered or routine remedial work activities will be paid by the OWNER and not deducted from payments otherwise due the CONTRACTOR.

3. The ENGINEER will notify the CONTRACTOR by letter or memorandum as soon as practical following a determination that

noncompliant materials, equipment, products or work has resulted in, is necessitating, or will necessitate supplemental engineering service charges and/or supplemental testing costs which are to be deducted from payments otherwise due the CONTRACTOR.

4. The hourly rates and charges by the ENGINEER for billings to be deducted from the Contractor's payments shall be the same rates and charges the ENGINEER bills the OWNER under the Engineering Services Agreement in effect between the OWNER and the ENGINEER when the costs are incurred. The testing service costs to be deducted from the Contractor's payments shall be the actual invoiced amount from the testing agency/laboratory for the necessary additional testing.

37. ESTIMATES AND PAYMENT – PARTIAL, FINAL AND CASH GUARANTEE

A. The ENGINEER will, each month, make an approximate partial estimate, based on the Contractors partial payment request; such as he shall believe to be just and fair, of the amount and value of the work done and the materials incorporated into the work during the previous calendar month, whenever said monthly work exceeds One Thousand Dollars ($1,000.00) in value. More frequent estimates may, at the option of the OWNER, be made at any time during the progress of the work, and payment may at any time be withheld if the work is not proceeding in accordance with the contract. In those instances where a Schedule of Values is requested and the Contractor wishes to include bond and insurance premiums in his Schedule of Values as a separate payment item he shall furnish satisfactory evidence of the rate or rates paid for such bonds and insurance.

B. The CONTRACTOR will submit to the ENGINEER on or before the first business day of the month, which day shall be the "Billing Date," a payment request signed by the CONTRACTOR covering the WORK performed during the previous month to include certified payroll records as required by N.J.A.C. 12:60-5.1(c) and supported by such other data as the ENGINEER may reasonably require. If the payment request is not received on or before the "Billing Date," it will not be considered until the next billing date.

The ENGINEER will, within twenty (20) calendar days after the "Billing Date" either approve the payment request or notify the CONTRACTOR in writing the reasons for refusing to approve the request or any part thereof. The ENGINEER will prepare a payment estimate for the approved amount and present the payment estimate to the OWNER. The OWNER will, after presentation of an approved payment estimate, authorize payment at the public meeting following the 20th calendar day after the "Billing Date" and pay the CONTRACTOR a progress

payment on the basis of the approved payment estimate less the retainage during the payment cycle following the public meeting. Allowances will be made for all materials placed along or upon the site or stored at secured locations that are suitable for use in the execution of the contract, if the person providing the materials furnishes releases of liens for the materials at the time each estimate of work is submitted for payment. The total of all the partial payments shall not exceed ninety percent (90%) of the cost of the materials. The cost of such materials shall be verified by vouchers from the suppliers (N.J.S.A. 40A:11-16.4). If payment is required on the basis of materials and equipment not incorporated in the WORK the payment request shall also be accompanied by such supporting data, satisfactory to the OWNER, as will establish the OWNER'S title to the material and equipment and protect the OWNER'S interest therein, including applicable insurance. The CONTRACTOR shall furnish written proof from the supplier of ninety (90%) percent payment for the material and/or equipment no later than thirty (30) days after receipt of payment, for same from OWNER. The OWNER shall have the right to deduct from the next payment estimate an amount equal to the payment for said material and/or equipment if reasonable and adequate proof is not submitted.

C. Upon such estimate being made and certified by the ENGINEER and approved by the OWNER, the OWNER will pay to the Contractor ninety percent (90%) of the amount stated in such estimate or certificate to be the value of the work therein certified to have been done, except that when the total contract price exceeds One Hundred Thousand Dollars ($100,000.00), then the OWNER will pay to the Contractor ninety-eight percent (98%) of the amount stated on said estimate or certificate. In lieu of the two percent (2%) cash retainage on contracts exceeding $100,000.00, the Contractor may agree to deposit registered book bonds, entry municipal bonds, state bonds or other appropriate bonds of the State of New Jersey, or negotiable bearer bonds or notes of any political subdivision of the State, the value of which is equal to two percent (2%) of said estimate or certificate, provided they are delivered directly to and approved by the OWNER. The value of a bond or note shall mean par value or current market value, whichever is lower. The OWNER may at all times reserve and retain out of any or all of said partial payments, all such sums as it is or may be authorized to reserve or retain.

D. The making of any such estimates or payment thereon shall not be taken or construed as an approved or acceptance by the OWNER of any work so estimated.

E. Following the completion of the work and the acceptance thereof as previously defined, the CONTRACTOR shall file with the OWNER his Contractor's Certificate as required by N.J.S.A. 34:11-56.33 duly executed along with his

request for final payment or release of retainage. The date the ENGINEER receives the request shall be the "Billing Date." The ENGINEER will, within twenty (20) calendar days after the "Billing Date" either approve the final payment request or notify the CONTRACTOR in writing the reasons for refusing to approve the request or any part thereof. The ENGINEER will prepare a final payment estimate for the approved amount and present the final payment estimate to the OWNER. The OWNER will, after presentation of an approved final payment estimate, authorize payment at the public meeting following the 20th calendar day after the "Billing Date" and return to the CONTRACTOR any bonds or notes deposited together with any interest accruing on such bonds or notes, and will pay the CONTRACTOR the full value of the work done under this Contract less any amounts previously paid during the payment cycle following the public meeting (N.J.S.A. 2A:30A-1).

F. Any interest accruing on cash payments withheld shall be credited to the OWNER. (N.J.S.A. 40A:11-16.1)

G. Prior to SUBSTANTIAL COMPLETION, the OWNER with the approval of the ENGINEER and with the concurrence of the CONTRACTOR, may use any completed or substantially completed portions of the Work. Such use shall not constitute and acceptance of such portions of the WORK.

H. The OWNER shall have the right to enter the premises for the purpose of doing work not covered by the CONTRACT DOCUMENTS. This provision shall not be construed as relieving the Contractor of the sole responsibility for the care and protection of the Work or the restoration of, any damaged Work except such as may be caused by agents or employees of the OWNER.

I. The Contractor will indemnify and save the OWNER and the OWNER'S agents harmless from all claims growing out of the lawful demand of Subcontractors, laborers, workmen, mechanics, materialmen, and furnishers of machinery and parts thereof, equipment, tools, and all supplies, incurred in the furtherance of the performance of the Work. The Contractor shall, at the OWNER'S request, furnish satisfactory evidence that all obligations of the nature designated above have been paid, discharged, or waived. The evidence shall be submitted with each monthly request for payment. If the Contractor fails to do so the OWNER may, after having notified the Contractor, either pay unpaid bills or withhold from the Contractor's unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged, whereupon payment to the Contractor shall be resumed in accordance with the terms of the Contract Document, but in no event shall the provisions of this sentence be construed to impose any

obligations upon the OWNER to either the Contractor, the Contractor's Surety, or any third party. In paying any unpaid bills of the Contractor, any payment so made by the OWNER shall be considered as a payment made under the Contract Documents by the OWNER to the CONTRACTOR and the OWNER shall not be liable to the CONTRACTOR for any such payments made in good faith.

J. Acceptance of final payment as release:

1. The acceptance by the Contractor of final payment shall be and shall operate as a release to the OWNER of all claims and all liability to the Contractor other than claims in stated amounts as may be specifically excepted by the Contractor for all things done or furnished in connection with this Work and for every act and neglect of the Owner and others relating to or arising out of this work. Any payment, however, final or otherwise, shall not release the Contractor or its sureties from any obligations under the Contract Documents or the Performance and Payment Bonds.

K. All disputes regarding whether a party has failed to make payments required pursuant to this section may be submitted to a process of alternative dispute resolution as described in Article 28, REMEDIES. Alternative dispute resolution permitted by this section shall not apply to disputes concerning the bid solicitation or award process, or to the formation of contracts or subcontracts. In any civil action brought to collect payments pursuant to this section, the action shall be conducted inside of this State and the prevailing party shall be awarded reasonable costs and attorney fees. (N.J.S.A. 2A:30A) (P.L. 2006, c.96)

38. LIENS

A. Neither the final payment nor any part of the retained percentage shall become due until the Contractor, if required, shall deliver to the OWNER a complete release of all liens arising out of this contract, or receipts in full in lieu thereof and, if required in either case, an affidavit that so far as he has knowledge or information the release and receipts include all the labor and material for which a lien could be filed; but the Contractor may, if any subcontractor refuses to furnish a release or receipt in full, furnish a bond satisfactory to the OWNER to indemnify him against any lien. If any lien remains unsatisfied after all payments are made, the Contractor shall refund to the OWNER all monies that the latter may be compelled to pay in discharging such a lien, including all costs and a reasonable attorney's fee.

39. CONTRACTORS CLAIM FOR DAMAGES

A. If the Contractor shall claim compensation for any damage sustained by reason of the acts of the OWNER, or its agents, he shall, within seven (7) days after the sustaining of such damage, make a written statement to the ENGINEER of the nature of the damage sustained. On or before the fifteenth day of the month subsequent to that in which any such damage shall have been sustained, the Contractor shall file with the ENGINEER an itemized statement of the details and the amount of such damage, and unless such statement is made as thus required, his claim for compensation shall be forfeited and invalidated, and he shall not be entitled to payment on account of any such damage.

40. NO WAIVER OF CONTRACT

A. Neither an extension of time for any reason beyond the date fixed herein for the completion of the contract, nor the delivery and acceptance of any articles or materials, nor any payment for, nor acceptance of the whole or any part of the work by the ENGINEER, nor any possession taken by the OWNER, or its employees or agents, shall be deemed to be a waiver by the OWNER of the right to abrogate this contract for abandonment or delay or non-performance in the manner herein provided, nor shall it operate to void or annul any of the terms of this contract.

41. NO ESTOPPEL

A. Neither the OWNER nor any department or officer thereof, shall be precluded or estopped by any return or certificate made or given to the OWNER, the ENGINEER, or other officer, agent or appointee to the OWNER under any provision of this agreement, from any time before the completion and acceptance of the work, and payment therefore, or before the payment of the guarantee retainer, pursuant to any such return or certificate showing the true and correct amount and character of the work done and materials furnished by the Contractor or any other person under this agreement, or that any such return or certificate is untrue and incorrect or improperly made in any particular, or that the work and materials, or any part thereof, do not in fact conform to the specifications and contract drawings, and the OWNER shall not be precluded or estopped, notwithstanding any such return or certificate any payment in accordance therewith, from demanding and recovering from the Contractor such damages as it may sustain by reason of his failure to comply with the specifications and contract drawings.

42. SUBLETTING

A. The Contractor must perform, construct or install not less than 50% of each contract with his own forces and equipment. Only special items approved by the ENGINEER may be sublet.

B. The Contractor shall not sublet any part of the work included in this contract without the previous approval of the ENGINEER. In making application for subletting any portion of the work, the Contractor shall state in writing, the portion of the work which each subcontractor is to do or the material which he is to furnish, his place of business, and such other information as may be required in order to ascertain whether such subcontractor is responsible, reliable and able to perform the work or to furnish the materials as called for in the specifications. Subletting, if permitted, shall not relieve the Contractor of any of his obligations under this contract. The Contractor shall be as fully responsible to the OWNER for the acts and omissions of his subcontractors, and of persons either directly or indirectly employed by them as he is for the acts and omissions of persons directly employed by him. The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the work, to bind subcontractors to the Contractor by the terms of the General Conditions and other Contract Documents insofar as applicable to the work of subcontractors, and to give the Contractor the same power as regards terminating any subcontract that the OWNER may exercise over the Contractor under any provisions of the Contract Documents.

C. Nothing contained in this contract shall create any contractual relations between any subcontractor and the OWNER.

D. Within five (5) days after the Contractor receives payment for work performed under this contract, he shall pay each subcontractor for the amount allowed the Contractor for and on account of work performed by the subcontractor to the extent of the subcontractor's interest herein. On each instance when the CONTRACTOR received payment from the OWNER and the CONTRACTOR thereafter makes a payment to a subcontractor, the CONTRACTOR shall furnish proof of all such payments to subcontractors prior to the OWNER releasing the next payment to the CONTRACTOR.

43. RELATIONS OF CONTRACTOR AND SUBCONTRACTOR

A. The Contractor agrees to bind every subcontractor and every subcontractor agrees to be bound by the terms of the Agreement, the General Conditions, the Drawings and Specifications as far as applicable to his work, including the following provisions of this article, unless specifically noted to the contrary in a subcontract

approved in writing as adequate by the OWNER or ENGINEER. This does not apply to minor subcontracts.

B. The subcontractor agrees:

1. To be bound to the Contractor by the terms of the Agreement, General Conditions, Drawings and Specifications, and to assume toward him the obligations and responsibilities that he, by those documents, assumes toward the OWNER.

2. To submit to the Contractor applications for payment in such reasonable time as to enable the Contractor to apply for payment.

3. To make all claims for extras, for extensions of time and for damages for delays or otherwise, to the Contractor in the manner provided in the General Conditions for like claims by the Contractor upon the OWNER, except that the time for making claims for extra cost is one week.

C. The Contractor agrees:

1. To be bound to the subcontractor by all the obligations that the OWNER assumes to the Contractor under the Agreement, General Conditions, Drawings and Specifications, and by all the provisions thereof affording remedies and redress to the Contractor from the OWNER.

2. To pay the subcontractor, upon the payment of certificates, if issued under the schedule of values described herein, the amount allowed to the Contractor on account of the subcontractor's work to the extent of the subcontractor's interest therein.

3. To pay the subcontractor, upon the payment of certificates, if issued otherwise than in "b" so that at all times his total payments shall be as large in proportion to the value of the work done by him as the total amount certified to the Contractor is to the value of the work done by him.

4. To pay the subcontractor to such extent as may be provided by the Contract Documents or the subcontract, if either of these provides for earlier or larger payments than the above.

5. To pay the subcontractor on demand for his work or materials as far as executed and fixed in place, less the retained percentage, at the time the

certificate should be issued, even though the ENGINEER fails to issue it for any cause not the fault of the subcontractor.

6. To pay the subcontractor a just share of any fire insurance money received by him, the Contractor.

7. To make no demand for liquidated damages or penalty for delay in any sum in excess of such amount as may be specifically named in the subcontract.

8. That no claim for services rendered or materials furnished by the Contractor or to the subcontractor shall be valid unless written notice thereof is given by the Contractor to the subcontractor during the first ten (10) days of the calendar month following that in which the claim originated.

9. To give the subcontractor an opportunity to be present and to submit evidence in any arbitration or court action involving his rights.

10. If arbitration is used, name as arbitrator under arbitration proceedings as provided in the General Conditions, the person nominated by the subcontractor, if the sole cause of dispute is the work, materials, rights or responsibilities of the subcontractor; or if of the subcontractor and other subcontractors jointly, to name as such arbitrator the person upon whom they agree.

11. In the manner of arbitration or court action, their rights and obligations and all procedures shall be analogous to those set forth in this contract.

D. Nothing in this paragraph shall create any obligation on the part of the OWNER to pay or see to the payment of any sums to any subcontractor.

44. WAGE RATES

A. This contract is subject to the New Jersey State Department of Labor and Industry prevailing wage rates. Prevailing minimum wage rates are appended to this contract. BIDS WILL NOT BE ACCEPTED FROM BIDDERS WHO ARE ON THE "DEBARRED LIST OF THE NEW JERSEY DEPARTMENT OF LABOR AND INDUSTRY."

B. Attached hereto and incorporated herein is (are) the Department of Labor and Workforce Development prevailing wage determination(s) for the locality and

craft(s) that will be employed in the performance of work under this contract. It is hereby stipulated that each individual who performs work under this contract shall be paid not less than the prevailing wage rate to which that worker is entitled under the New Jersey Prevailing Wage Act, as reflected in the appropriate Department of Labor and Workforce Development prevailing wage determination.

C. In the event it is found that any worker employed by the contractor or any subcontractor covered by this contract has been paid a rate of wages less than the prevailing wage rate required to be paid by this contract, the public body, the lessee to whom the public body is leasing a property or premises or the lessor from whom the public body is leasing or will be leasing a property or premises may terminate the contractor's or subcontractor's right to proceed with the work, or such part of the work as to which there has been a failure to pay required wages, and to prosecute the work to completion or otherwise. The contractor and his sureties shall be liable to the public body, any lessee to whom the public body is leasing a property or premises, or to any lessor from whom the public body is leasing or will be leasing a property or premises for any excess costs occasioned by the termination of the contractor's or subcontractor's right to proceed with the work, or such part of the work as to which there has been a failure to pay required wages.

D. Applicable rates are those in effect at that date on which a contract is awarded, and must be kept current as indicated.

E. The wage rates are conclusive for a period of two (2) years from date of issuance unless superseded within said two (2) year period by a later determination.

F. Employers not paying the itemized employees benefits to a payee designated in a collective bargaining agreement shall pay them directly to the employee on each payday.

45. SCOPE OF WORK

A. The work to be performed under this contract consists of furnishing all materials, equipment, supplies, labor and transportation, including fuel, power, water and performing all work as required in the Statement of Work in the contract, in strict accordance with the specifications, schedules and drawings, all of which are made a part hereof, and including such detail drawings as may be furnished by the ENGINEER from time to time during the prosecution of the work in explanation of said drawings.

46. CHARACTER OF WORK AND MECHANICS

A. The work shall be executed in the best and most workmanlike manner by qualified, careful and efficient mechanics in strict accordance with the drawings and specifications.

B. Change in Character of Work.

1. The law defines "material change" as a character change which increases or decreases the contractor's cost of performing the work, increases or decreases the amount of time by which the contractor completes the work in relation to the contractually required completion date or both.

   a. If the contractor believes that a change directive by the contracting unit results in a material change to the contract work, the contractor must notify the contracting unit in writing. The contractor must continue to perform all work on the project that is not the subject of the notice.

   b. Upon receipt of the contractor's change in character notice the contracting unit shall promptly evaluate the contractor's notice and promptly advise the contractor of its determination on how to proceed in writing.

   c. If the contracting unit determines that a change to the contractor's work caused or directed by the contracting unit materially changes the character of any aspect of the contract work, the contracting unit must make a fair and equitable upward adjustment to the contract price and contract completion date. The basis for any such price adjustment shall be the difference between the cost of performance of the work as planned at the time of contracting and the actual cost of such work as a result of its change in character, or as otherwise mutually agreed upon the contractor and the contracting unit prior to the contractor performing the subject work.

   d. If the contracting unit determines that the contractor is not entitled to additional compensation or time, the contractor must continue the performance of all contract work and is entitled to pursue a claim against the contracting unit for additional compensation or time attributable to the alleged material change.

47. SITE INVESTIGATION

A. The Contractor acknowledges that he has satisfied himself as to the nature and location of the work, the general and local conditions, including but not restricted to those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, electric power, roads and uncertainties of weather, river stages, tides or similar physical conditions at the site, the conformation and conditions of the ground, the character of equipment and facilities needed preliminary to and during the prosecution of the work.

B. The Contractor further acknowledges that he has satisfied himself as to the character, quality and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work done by the ENGINEER, as well as from information presented by the drawings and specifications made a part of this contract.

C. Any failure by the Contractor to acquaint himself with the available information will not relieve him from responsibility for estimating properly the difficulty or cost of successfully performing the work. The OWNER assumes no responsibility for any conclusions or interpretations made by the Contractor on the basis of the information made available by the ENGINEER. The OWNER also assumes no responsibility for any understanding or representations made by its officers or agents during or prior to the execution of this contract, unless (1) such understanding or representations are expressly stated in the contract, and (2) the contract expressly provides that the responsibility therefore is assumed by the OWNER'S Representatives.

48. OPERATIONS AND STORAGE AREAS

A. All operations of the Contractor (including storage of materials) shall be confined to areas authorized or approved by the ENGINEER. No unauthorized or unwarranted entry upon or passage through, or storage or disposal of materials shall be made upon private premises. The Contractor shall be liable for any and all damage caused by him to such private premises. The Contractor shall hold and save the OWNER, its officers and agents, free and harmless from liability of any nature of kind arising from any use, trespass or damage occasioned by his operations on premises of third persons.

B. Temporary buildings (storage sheds, shops, offices, etc.) may be erected by the Contractor only with the approval of the ENGINEER, and shall be built with

labor and materials furnished by the Contractor without expense to the OWNER. Such temporary buildings and/or utilities shall remain the property of the Contractor and will be removed by him at his expense upon the completion of the work. With the written consent of the ENGINEER, such buildings and/or utilities may be abandoned and need not be removed.

C. The Contractor shall, under regulations prescribe by the ENGINEER, use only established roadways or construct and use such temporary roadways as may be authorized by the ENGINEER. Where materials are transported in the prosecution of the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any federal, state or local law or regulation. When it is necessary to cross curbings or sidewalks protection against damage shall be, provided by the Contractor and any damaged roads, curbing or sidewalks shall be repaired by, or at the expense of, the Contractor.

49. PROGRESS CHARTS AND REQUIREMENTS FOR OVERTIME

A. The Contractor shall, within five (5) days after date of notice to proceed, prepare and submit to the ENGINEER for approval a practicable schedule showing the date on which he will start the several salient features (including procurement of materials, plant and equipment) and the contemplated dates for completing same.

B. If, in the opinion of the ENGINEER, the Contractor falls behind the progress schedule, the Contractor shall take steps as may be necessary to improve his progress, and the ENGINEER may require him to increase the number of shifts and/or overtime operations, days of work, and/or the amount of construction plant, and to submit for approval such supplementary schedule or schedules in chart form as may be deemed necessary to demonstrate the manner in which the agreed rate of progress will be regained, all without additional cost the OWNER.

C. Failure of the Contractor to comply with the requirements of the ENGINEER under the provision shall be grounds for determination by the ENGINEER that the Contractor is not prosecuting the work with such diligence as will insure completion within the time specified. Upon such determination, the ENGINEER may terminate the Contractor's right to proceed with the work, or any separable part thereof, in accordance with the delays – damage clause of the contract.

50. SUBCONTRACTORS

A. There will be set forth in the bid the name, or names, and addresses of all subcontractors to whom the bidder will subcontract the furnishing of plumbing

and gas fitting, and all kindred work, and of the steam and hot water heating and ventilating apparatus, steam power plants and kindred work, and electrical work, structural steel and ornamental iron work, each of which subcontractors shall be qualified in accordance with N.J.S.A. 40A:11-16. The OWNER shall require evidence of performance security to be submitted simultaneously with the list of the subcontractors.

B. If for sufficient reason, at any time during the progress of the work, the ENGINEER determines that any subcontractor is incompetent or undesirable, he will notify the Contractor accordingly and immediately steps will be taken for cancellation of such subcontract. Subletting by subcontractors shall be subject to the same regulations. Nothing contained in this Contract shall create any contractual relation between the subcontractor and the OWNER.

51. QUALITY OF ARTICLES, MATERIALS AND EQUIPMENT

A. Articles, materials and equipment to be incorporated into the work under the contract shall be new and unused unless otherwise specified; and where required to conform to standard specifications of the ENGINEER or other authorities incorporated by reference, will conform to the respective editions, including amendments specified; or where the editions are not specified, will conform to the editions, including amendments in effect on the date of the Invitation for Bids.

B. In accordance with N.J.S.A. 40A:11-18, only manufactured and farm products of the United States, wherever available, shall be used in this Contract.

C. Any samples and descriptive data required shall:

1. Be submitted within the time specified in these specifications, or, if no time be specified, within a reasonable time before use to permit inspection and testing.

2. Be shipped, prepaid and delivered, as specified in these specifications, or as directed by the ENGINEER.

3. Be properly marked to show the name of the material, trade name of manufacturer, place of origin, name and location of the project where the material represented by the sample is to be used, and the name of the contractor submitting the sample.

D. Samples not subject to destructive tests may be retained until the completion of the work, but thereafter will be returned to the Contractor, if he so requests, in

writing, at his own expense. Failure of any sample to pass the specified requirements will be sufficient cause for refusal to consider further any sample from the same manufacturer whose material failed to pass the tests.

52. PROTECTION OF MATERIAL AND WORK

A. The Contractor shall at all times protect and preserve all materials, supplies and equipment of every description (including property which may be OWNER furnished or owned) and all work performed. All reasonable requests of the ENGINEER to enclose or specially protect such property shall be complied with. If, as determined by the ENGINEER, material, equipment, supplies and work performed are not adequately protected by the Contractor such property may be protected by the OWNER and the cost thereof may be charged to the Contractor or deducted from any Payment due to him.

53. PROTECTION OF VEGETATION

A. The Contractor will preserve and protect all existing vegetation such as trees, shrubs and grass on or adjacent to the site which do not reasonably interfere with the construction as may be determined by the ENGINEER. The Contractor will be responsible for all unauthorized cutting or damaging of trees and shrubs, including damage due to careless operation of equipment, stockpiling of materials, or tracking of grass areas by equipment.

B. Care will be taken by the Contractor in felling trees authorized for removal to avoid any unnecessary damage to vegetation that is to remain place. Any limbs or branches of trees broken during such operations shall be trimmed with a clean cut and painted with an approved tree pruning compound if required by the ENGINEER. The Contractor will be liable for, or may be required to replace or restore at his own expense, all vegetation destroyed or damaged.

C. Protect existing structures and other property at site or adjacent thereto, including walks, pavements and roadways.

D. Promptly remedy all damage or loss, at no expense to the Owner.

54. POSSESSION PRIOR TO COMPLETION

A. The OWNER shall have the right to take possession of or use any completed or partially completed part of the work. Such possession or use shall not be deemed an acceptance of any work not completed in accordance with the contract. If such prior possession or use by the OWNER delays the progress of the work or causes

additional expenses to the Contractor, and equitable adjustment in the contract price and/or the time of completion will be made and the contract shall be modified in writing accordingly.

55. SUSPENSION OF WORK

A. The ENGINEER may order the Contractor to suspend all or any part of the work for such period of time as may be determined by him to be necessary or desirable for convenience of the OWNER. Unless such suspension unreasonably delays the progress of the work and causes additional expense to the Contractor, no increase in contract price will be allowed. In the case of suspension of all or any part of the work for an unreasonable length of time, causing additional expense not due to the fault or negligence of the Contractor, the ENGINEER shall make an adjustment in the contract price in the amount of the additional proper expense and modify the contract accordingly. An extension of time for the completion of the work in the event of any such suspension will be allowed the Contractor, providing, however, that the suspension was not due to the fault or negligence of the Contractor.

56. CLEANING UP

A. The Contractor shall at all times keep the construction area, including storage areas used by him, free from accumulations of waste materials or rubbish and prior to completion of the work remove the rubbish from the premises. Upon completion of the construction, the Contractor shall leave the work and premises in a clean, neat and workmanlike condition satisfactory to the ENGINEER.

57. BONDS

A. Performance, Payment and Maintenance Bonds. The Contractor further agrees to furnish a performance, payment and maintenance bond with an obligation for the payment by the Contractor, and by all subcontractors, for all labor performed or materials, provisions, provender, or other supplies, teams, fuels, oils, implements or machinery used or consumed in, upon, for or about the construction, erection, alteration or repair of such buildings, works or improvements. The maintenance bond shall remain in effect for a period of two (2) years after completion and acceptance of all work as a guarantee against latent defects. Such bonds shall be issued by a surety which meets the following criteria:

1. The surety shall be licensed to conduct business in the State of New Jersey and have the minimum surplus and capital stock or net cash assets

required by N.J.S.A. 17:17-6 or N.J.S.A. 17:17-7, whichever is appropriate, at the time the invitation to bid is issued, and

2. With respect to all bonds in the amount of $850,000 or more:

   a. If the amount of the bond is at least $850,000 but not more than $3.5 million, the surety shall hold a current Certificate of Authority, issued by the United States Secretary of the Treasury pursuant to 31U.S.C. 9305 that is valid in the State of New Jersey as listed annually in the United States Treasury Circular 570, except that if the surety has been operational for a period in excess of five (5) years, the surety shall be deemed to meet the requirements of this subparagraph if it is rated in one of the three highest categories by an independent, nationally recognized United States rating company that determines the financial stability of insurance companies, which rating company or companies shall be as determined by the Commissioner of Insurance, and

   b. If the amount of the bond is more than $3.5 million, then the surety shall hold a current Certificate of Authority, issued by the United States Secretary of the Treasury pursuant to 31 U.S.C.9305, that is valid in the State of New Jersey as listed annually in the United States Treasury 570 and, if the surety has been operational for a period in excess of five (5) years, shall be rated in one of the three highest categories by an independent, nationally recognized United States rating company that determines the financial stability of insurance companies, which rating company or companies shall be as determined by the Commissioner of Insurance.

3. A surety subject to the provisions of subparagraph 2.b above which does not hold a Certificate of Authority issued by the United States Secretary of the Treasury shall be exempt from the requirement to hold such a certificate if the surety meets an equivalent set of standards developed by the Commissioner of Insurance and certifies to the OWNER that it meets said standards.

B. A surety's obligation shall not extend to any claim for damages based upon alleged negligence that resulted in personal injury, wrongful death, or damage to real or personal property, and no bond shall in any way be construed as a liability insurance policy. Nothing herein shall relieve the surety's obligation to guarantee the Contractor's performance of all conditions of the contract, including the maintenance of liability insurance if and as required by the contract. Only the

obligee named on the bond, and any subcontractor performing labor or any subcontractor or materialman providing materials for the construction, erection, alteration or repair of the public building, work or improvement for which the bond is required pursuant to this section, shall have any claim against the surety under the bond.

C. The OWNER shall not accept more than one payment, performance and maintenance bond to cover a single construction contract. The OWNER may accept a single bond executed by more than one surety to cover a single construction contract only if the combined underwriting limitations of all the named sureties, as set forth in the most current annual revision of the United States Treasury Circular 570, or as determined by the Commissioner of Insurance pursuant to N.J.S.A. 17:18-9, meets or exceeds the amount of the contract to be performed.

D. The OWNER shall not accept a performance, payment or maintenance bonds unless there is attached thereto a Surety Disclosure Statement and Certification to which each surety executing the bond shall have subscribed. This statement and certification shall be submitted with the Bonds and be complete in all respects and duly acknowledged according to law, and shall have substantially the form required by N.J.S.A. 2A:44-143.

E. The bonds required herein shall be executed by the Contractor with such sureties as shall be approved by the OWNER in an amount equal to at least 100 percent of the contract price, and shall be conditioned for the payment by the Contractor, and by all subcontractors, or his or their subcontractors, of all indebtedness which may accrue to any person, firm or corporation, in an amount not exceeding the sum specified in the bond, on account of any labor performed or materials, provisions, provender or other supplies, or teams, fuels, oils, implements or machinery used or consumed in, upon, for or about the construction, erection, alteration or repair of the public building or public work or improvement. The bond shall be deposited with and be held by the OWNER for the use of any party interested therein.

F. Any bonds required hereunder will be dated as of the same date as the contract and will be furnished by the Contractor to the OWNER at the time the contract is executed, and must be accompanied by a Power of Attorney Certificate and Financial Statement.

58. ON-SITE CONDITIONS

A. Comply with following requirements during the progress of construction.

1. New Jersey Department of Transportation Standard Specifications, 2019.

   a. Safety - Subsection 108.05.02.

   b. Sanitary, Health and Safety Provisions - Subsection 108.05.

   c. Final Clean Up - Section 161.

2. Code of Federal Regulations:

   a. 29 CFR 1926; Safety and Health Regulations for Construction.

59. UTILITIES

A. Adhere to Subsection 105.07 of Standard Specifications regarding location of and construction around public utilities, including those publicly and privately owned.

B. Permit owners of utilities, or their agents, access to site work at all times, in order to relocate or protect their facilities. Cooperate and coordinate with utility owners in performing this work.

C. Notify utility owners not less than three (3) business days or more than ten (10) business days in advance of any work that will endanger or affect their facilities. A business day is any day, NOT INCLUDING WEEKENDS AND/OR HOLIDAYS. Comply with the New Jersey Underground Facility Protection Act. See http://www.nj1-call.org/whats_new.php.

D. Separate payment will not be made for protection and preservation of utilities and cooperation and coordination with their owners. Include all such costs in unit price bid for the various items of contract as listed in Proposal.

E. Any public utility facilities being constructed under this contract shall be subject to inspection by the utility owner during construction, and the utility owner shall be given the opportunity to inspect material to be used in reference to the specifications and plan details applying to such materials.

F. Comply with requirements of Blasting – Excavating - Restrictions, State of New Jersey - Laws of 1964 and amended 1974 according to Section I, P.L. 1964 c.53 (C.2A:170-69.4), which generally requires notification of gas company before any work commences within 200 feet of their services.

G. Contact the following a minimum of ten (10) days prior to construction:

1. Utility Line Service: (800) 272-1000

H. Existence and location of utilities, pipes and structures shall be investigated and verified in field by Contractor before starting work.

I. Contractor shall be held responsible for any damages to and for protection of all existing utilities and structures.

60. STORING OF MATERIALS

A. All materials required in the work may be stored on site subject to approval by the ENGINEER. All such materials, tools, and machinery stored upon public thoroughfares shall be provided with approved warning lights or other devices to protect pedestrian and vehicular traffic.

61. WATER SUPPLY

A. Provide all water for construction purposes, including expense of having water conveyed about the work, in prices stipulated for various items of the work under this contract. The source, quality and quantity of water furnished shall at all times be satisfactory to ENGINEER.

B. Existing water supply lines may be connected for construction water in accordance with utility company or utility authority requirements.

62. PRECONSTRUCTION CONFERENCE

A. A Preconstruction Conference will be held at the office of the ENGINEER after award of the Contract. The ENGINEER shall notify the Contractor of the date and time. The Contractor and his superintendent shall attend along with his subcontractors as appropriate.

63. COMMUNICATIONS

A. Forward all communications to OWNER through ENGINEER.

64. INDEMNIFICATION

A. To the fullest extent permitted by law, the Contractor shall indemnify, defend and hold harmless the OWNER and the ENGINEER and their agents and employees from and against all claims, damages, losses and expenses, including but not limited to attorney's fees, arising out of or resulting from the performance of the

work, provided that any such claim, damage, loss or expense (1) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the work itself) including the loss of use resulting therefrom, and (2) is caused in whole or in part by any negligent act or omission of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right of obligation of indemnity which would otherwise exist as to any party or person described in this Paragraph.

B. In any and all claims against the OWNER or the ENGINEER or any of their agents or employees by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this Paragraph shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts.

C. The obligations of the Contractor under this Paragraph shall not extend to the liability of the ENGINEER, his agents or employees, arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, change orders, designs or specifications, or (2) the giving of or the failure to give directions or instructions by the ENGINEER, his agents or employees provided such giving or failure to give is the sole cause of the injury or damage.

65. EXECUTION, CORRELATION AND INTENT OF DOCUMENTS

A. The Contract Documents as defined in the General Conditions are complementary, and what is called for by one, is called for by all.

66. DEDUCTIONS FOR EXTRA ENGINEERING SERVICES

A. The OWNER has employed the ENGINEER and other consultants to observe and test the work of this contract. In the event that the Contractor's unauthorized actions (including failure to act; failure to appear for scheduled appointments; deviations from the contract specifications for materials, equipment or methods of construction; failure to meet the minimum specified test performance criteria for the materials and/or work product) necessitate or otherwise cause reinspection, retesting or redesign of the work, then the cost of all such reinspection, retesting

or redesign shall be paid for by the Contractor in the form of deduction applied to the payment otherwise due the Contractor.

B. The Contractor shall also be responsible for the charges paid by the OWNER to the ENGINEER for the services of the ENGINEER (i.e., Project Manger, Resident Engineer, Field Services Representatives, etc.) for work after the completion date. Such charges shall be paid for by the Contractor in the form of a deduction applied to the payment otherwise due the Contractor.

C. Deductions from the contract payments to the Contractor shall be listed on the current estimate and be accompanied by an itemized description of the extra engineering/testing services which shall be based upon the same rates paid to the ENGINEER by the OWNER for similar work.

67. COPIES OF DOCUMENTS

A. OWNER shall furnish to CONTRACTOR up to five (5) copies of the Contract Documents. Additional copies will be furnished upon request at the cost of preparation thereof.

B. Upon request by the CONTRACTOR, electronic drawing files will be provided to the CONTRACTOR for his convenience. The CONTRACTOR is under no obligation to utilize the electronic drawing files. By acceptance and utilization of same, the CONTRACTOR is assuming responsibility for ensuring that the electronic drawing files match the Contract Drawings including all issued addenda and revisions. The CONTRACTOR shall immediately notify the ENGINEER of any discrepancies between the electronic drawing files and the Contract Drawings. In the event of future revisions to the Contract Drawings, the CONTRACTOR accepts responsibility for obtaining updated electronic drawing files as required. The CONTRACTOR agrees to accept full responsibility for any and all erroneous interpretations of the electronic drawing files due to variations in Computer Aided Design and Drafting (CADD) software packages and/or CADD user skill and ability. These drawings are the property of the ENGINEER and may not be reproduced for any other purpose than for the project for which they were produced.

68. DIFFERING SITE CONDITIONS

A. The law defines “differing site conditions” as the physical conditions at the contract work site that are subsurface or otherwise concealed and which differ materially from those indicated in the contract documents or are of such an unusual nature that the conditions differ materially from those ordinarily

encountered and generally recognized as inherent in the work of the character provided for in the contract.

1. If the contractor encounters differing site conditions during the progress of the contract work, the contractor must promptly provide written notification to the contracting unit of the specific differing site conditions encountered before the site is further disturbed and before any additional work is performed in the impacted area.

2. Upon receipt of differing site conditions written notice or upon the contracting unit otherwise learning of differing site conditions, the contracting unit must promptly undertake an investigation to determine whether differing site conditions are present.

3. If the contracting unit determines whether differing site conditions may result in additional cost or delays, the contracting unit shall provide prompt written notification to the contractor containing directions on how to proceed.

4. The contracting unit must make a fair and equitable adjustment to the contract price and contract completion date for increased costs and delays resulting from the agreed upon differing site conditions encountered by the contractor.

5. If both parties agree to the contracting unit's investigation and directions decrease the contractor's costs or time, the contracting unit is entitled to fair and equitable downward adjustment to the contract and price.

6. If the contracting unit determines that there are no differing site conditions present that would result in additional cost or delays, the contracting unit must notify the contractor, in writing, and the contractor must resume performance of the contract, and be entitled to pursue a differing site conditions claim against the contracting unit for additional compensation or time attributable to the alleged differing site conditions.

B. Contract execution by the contractor constitutes a representation that the contractor has visited the site and has become generally familiar with the local conditions under which the work is to be performed.

****END OF GENERAL CONDITIONS****

EXHIBIT B

MANDATORY EQUAL EMPLOYMENT OPPORTUNITY LANGUAGE
N.J.S.A. 10:5-31 et seq. (P.L. 1975, C. 127)
N.J.A.C. 17:27

CONSTRUCTION CONTRACTS

During the performance of this contract, the contractor agrees as follows:

The contractor or subcontractor, where applicable, will not discriminate against any employee or applicant for employment because of age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Except with respect to affectional or sexual orientation and gender identity or expression, the contractor will ensure that equal employment opportunity is afforded to such applicants in recruitment and employment, and that employees are treated during employment, without regard to their age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Such equal employment opportunity shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Public Agency Compliance Officer setting forth provisions of this nondiscrimination clause.

The contractor or subcontractor, where applicable will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex.

The contractor or subcontractor will send to each labor union, with which it has a collective bargaining agreement, a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of the contractor's commitments under this act and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

The contractor or subcontractor, where applicable, agrees to comply with any regulations promulgated by the Treasurer, pursuant to N.J.S.A. 10:5-31 et seq., as amended and supplemented from time to time and the Americans with Disabilities Act. When hiring or scheduling workers in each construction trade, the contractor or subcontractor agrees to make good faith efforts to employ minority and women workers in each construction trade consistent with the targeted employment goal prescribed by N.J.A.C. 17:27-7.2; provided,

however, that the Dept. of LWD, Construction EEO Monitoring Program may, in its discretion, exempt a contractor or subcontractor from compliance with the good faith procedures prescribed by the following provisions, A, B and C, as long as the Dept. of LWD, Construction EEO Monitoring Program is satisfied that the contractor or subcontractor is employing workers provided by a union which provides evidence, in accordance with standards prescribed by the Dept. of LWD, Construction EEO Monitoring Program, that its percentage of active "card carrying" members who are minority and women workers is equal to or greater than the targeted employment goal established in accordance with N.J.A.C. 17:27-7.2. The contractor or subcontractor agrees that a good faith effort shall include compliance with the following procedures:

(A) If the contractor or subcontractor has a referral agreement or arrangement with a union for a construction trade, the contractor or subcontractor shall, within three business days of the contract award, seek assurances from the union that it will cooperate with the contractor or subcontractor as it fulfills its affirmative action obligations under this contract and in accordance with the rules promulgated by the Treasurer pursuant to N.J.S.A. 10:5-31 et. seq., as supplemented and amended from time to time and the Americans with Disabilities Act. If the contractor or subcontractor is unable to obtain said assurances from the construction trade union at least five business days prior to the commencement of construction work, the contractor or subcontractor agrees to afford equal employment opportunities minority and women workers directly, consistent with this chapter. If the contractor's or subcontractor's prior experience with a construction trade union, regardless of whether the union has provided said assurances, indicates a significant possibility that the trade union will not refer sufficient minority and women workers consistent with affording equal employment opportunities as specified in this chapter, the contractor or subcontractor agrees to be prepared to provide such opportunities to minority and women workers directly, consistent with this chapter, by complying with the hiring or scheduling procedures prescribed under (B) below; and the contractor or subcontractor further agrees to take said action immediately if it determines that the union is not referring minority and women workers consistent with the equal employment opportunity goals set forth in this chapter.

(B) If good faith efforts to meet targeted employment goals have not or cannot be met for each construction trade by adhering to the procedures of (A) above, or if the contractor does not have a referral agreement or arrangement with a union for a construction trade, the contractor or subcontractor agrees to take the following actions:

(l) To notify the public agency compliance officer, the Division, and minority and women referral organizations listed by the Dept. of LWD, Construction EEO Monitoring Program pursuant to N.J.A.C. 17:27-5.3, of its workforce needs, and request referral of minority and women workers;

(2) To notify any minority and women workers who have been listed with it as awaiting available vacancies;

(3) Prior to commencement of work, to request that the local construction trade union refer minority and women workers to fill job openings, provided the contractor or subcontractor has a referral agreement or arrangement with a union for the construction trade;

MANDATORY EQUAL EMPLOYMENT OPPORTUNITY LANGUAGE (Continued)

(4) To leave standing requests for additional referral to minority and women workers with the local construction trade union, provided the contractor or subcontractor has a referral agreement or arrangement with a union for the construction trade, the State Training and Employment Service and other approved referral sources in the area;

(5) If it is necessary to lay off some of the workers in a given trade on the construction site, layoffs shall be conducted in compliance with the equal employment opportunity and non-discrimination standards set forth in this regulation, as well as with applicable Federal and State court decisions;

(6) To adhere to the following procedure when minority and women workers apply or are referred to the contractor or subcontractor:

(i) The contactor or subcontractor shall interview the referred minority or women worker.

(ii) If said individuals have never previously received any document or certification signifying a level of qualification lower than that required in order to perform the work of the construction trade, the contractor or subcontractor shall in good faith determine the qualifications of such individuals. The contractor or subcontractor shall hire or schedule those individuals who satisfy appropriate qualification standards in conformity with the equal employment opportunity and non-discrimination principles set forth in this chapter. However, a contractor or subcontractor shall determine that the individual at least possesses the requisite skills, and experience recognized by a union, apprentice program or a referral agency, provided the referral agency is acceptable to the Dept. of LWD, Construction EEO Monitoring Program. If necessary, the contractor or subcontractor shall hire or schedule minority and women workers who qualify as trainees pursuant to these rules. All of the requirements, however, are limited by the provisions of (C) below.

(iii) The name of any interested women or minority individual shall be maintained on a waiting list, and shall be considered for employment as described in (i) above, whenever vacancies occur. At the request of the Dept. of LWD, Construction EEO Monitoring Program, the contractor or subcontractor shall provide evidence of its good faith efforts to employ women and minorities from the list to fill vacancies.

(iv) If, for any reason, said contractor or subcontractor determines that a minority individual or a woman is not qualified or if the individual qualifies as an advanced trainee or apprentice, the contractor or subcontractor shall inform the individual in writing of the reasons for the determination, maintain a copy of the determination in its files, and send a copy to the public agency compliance officer and to the Dept. of LWD, Construction EEO Monitoring Program.

(7) To keep a complete and accurate record of all requests made for the referral of workers in any trade covered by the contract, on forms made available by the Dept. of LWD, Construction EEO Monitoring Program and submitted promptly to the Dept. of LWD, Construction EEO Monitoring Program upon request.

MANDATORY EQUAL EMPLOYMENT OPPORTUNITY LANGUAGE (Continued)

(C) The contractor or subcontractor agrees that nothing contained in (B) above shall preclude the contractor or subcontractor from complying with the union hiring hall or apprenticeship policies in any applicable collective bargaining agreement or union hiring hall arrangement, and, where required by custom or agreement, it shall send journeymen and trainees to the union for referral, or to the apprenticeship program for admission, pursuant to such agreement or arrangement. However, where the practices of a union or apprenticeship program will result in the exclusion of minorities and women or the failure to refer minorities and women consistent with the targeted county employment goal, the contractor or subcontractor shall consider for employment persons referred pursuant to (B) above without regard to such agreement or arrangement; provided further, however, that the contractor or subcontractor shall not be required to employ women and minority advanced trainees and trainees in numbers which result in the employment of advanced trainees and trainees as a percentage of the total workforce for the construction trade, which percentage significantly exceeds the apprentice to journey worker ratio specified in the applicable collective bargaining agreement, or in the absence of a collective bargaining agreement, exceeds the ratio established by practice in the area for said construction trade. Also, the contractor or subcontractor agrees that, in implementing the procedures of (B) above, it shall, where applicable, employ minority and women workers residing within the geographical jurisdiction of the union.

After notification of award, but prior to signing a construction contract, the contractor shall submit to the public agency compliance officer and the Dept. of LWD, Construction EEO Monitoring Program an initial project workforce report (Form AA 201) electronically provided to the public agency by the Dept. of LWD, Construction EEO Monitoring Program, through its website, for distribution to and completion by the contractor, in accordance with N.J.A.C. 17:27-7.The contractor also agrees to submit a copy of the Monthly Project Workforce Report once a month thereafter for the duration of this contract to the Dept. of LWD, Construction EEO Monitoring Program and to the public agency compliance officer.

The contractor agrees to cooperate with the public agency in the payment of budgeted funds, as is necessary, for on-the-job and/or off-the-job programs for outreach and training of minorities and women.

(D) The contractor and its subcontractors shall furnish such reports or other documents to the Dept. of LWD, Construction EEO Monitoring Program as may be requested by the Dept. of LWD, Construction EEO Monitoring Program from time to time in order to carry out the purposes of these regulations, and public agencies shall furnish such information as may be requested by the Dept. of LWD, Construction EEO Monitoring Program for conducting a compliance investigation pursuant to NJAC 17:27-1.1 et seq.

NEW JERSEY DEPARTMENT
OF
LABOR AND WORKFORCE DEVELOPMENT

WAGE DETERMINATION

PREVAILING WAGE RATES / LISTED CONTRACTORS AND SUBCONTRACTORS

IT IS THE CONTRACTOR'S RESPONSIBILITY TO COMPLY WITH THE MOST RECENT WAGE DETERMINATION FROM THE STATE OF NEW JERSEY DEPARTMENT OF LABOR. REFERENCE IS MADE to https://www.nj.gov/labor/wageandhour/prevailing-rates/public-works/currentprevailingwage.shtml; THE WAGE DETERMINATION AND LIST OF DEBARRED CONTRACTORS AND SUBCONTRACTORS. THIS IS FOR REFERENCE ONLY. PRIOR TO THE START OF CONSTRUCTION THE CONTRACTOR MUST OBTAIN THE MOST RECENT, APPLICABLE LIST

****END OF SECTION 00 73 46 – WAGE RATES****

SECTION 01 11 00
(01010)
STATEMENT OF WORK

TOWNSHIP OF WILLINGBORO
KENNEDY CENTER
RENOVATION TO SENIOR CENTER
BID NO. 8-2026

1.01 IN GENERAL, the work of this project consists of renovations and construction of walls, windows, doors, storefronts, repair of stairs and installing railing and handrails, ADA compliant Restrooms, installing Platform Lifts, acoustical and meta ceiling system, including all civil, architectural, structural, plumbing, sprinklers, HVAC, gas services, electrical services, and landscaping work at the Kennedy Center located at 429 John F Kennedy Way, Willingboro, New Jersey complete as specified within these Contract Documents and shown on the Drawings entitled, "Kennedy Center Renovation to Senior Center, Bid No. 8-2026" prepared by Richard A. Alaimo Associates, and consisting of ninety (90) drawings as listed at the end of this Statement of Work. The Drawings are appended to these Specifications.

1.02 DESCRIPTION OF WORK

A. The work for this project includes, but is not limited to, the following items:

1. Submit for and acquire all relevant permits
2. Construction layout and field engineering
3. Pre and post construction photographs
4. Soil erosion and sediment control practices
5. Clearing site
6. Selective demolition
7. Remediation of hazardous materials
8. Site work including excavation, filling, grading, Concrete patio and paving, new storm drainage, and landscaping.

9. Construction and renovation of the partial areas of the existing Kennedy Center Senior Center consisting of installing new walls, storefront windows, doors, ceilings, handrails and guardrails, platform lifts, repair of steps, limited roofing repair at the newly installed mechanical equipment, including concrete foundations, footings and walls, steel reinforcement, structural steel, walls, doors, windows, louvers, ceiling, flooring, interior and exterior wall finishes, Signage, FRP wall panels, pre-engineered wall panels and exterior patio and landscaping features.

10. All structural work including concrete walls, foundations, floor slab, steel supports.

11. Provide and install all kitchen equipment, work tables, and cabinets, as indicated on the Drawings.

12. Heating, ventilation, air conditioning, exhaust and building management system work, including commercial kitchen hood.

13. Plumbing work including demolition of concrete floor slab, excavation, refill and refinishing of concrete floor for connecting new pipes to existing sanitary sewer pipes.

14. Fire protection work / installation of sprinkler system

15. Electrical work including installation of all new LED lighting,

16. Startup, demonstration, and O&M training for all equipment

17. Site restorations and cleanup

18. Contract closeout documentation.

19. All other items shown on drawings, specifications, and appendices.

1.03 COORDINATION

A. Contractor shall coordinate his operations with those of other Contractors. Cooperation will be required in the arrangement for the storage of materials and in the detailed execution of the work. The Contractors, including their subcontractors, shall keep informed of the progress and the detail work of other Contractors and Subcontractors, and shall notify the *ENGINEER* immediately of lack of progress or defective workmanship on the part of others. Failure of a Contractor to keep informed of the work progressing on the site and failure to give notice of lack of progress or defective workmanship by others shall be

construed as acceptance by him of the status of the work as being satisfactory for proper coordination with his own work.

B. All prime Contractors shall coordinate their work with adjacent work and with other trades so as to facilitate general progress of the work and assure correctness.

C. Each Contractor shall lay out and install his work at such time or times and in such manner as to facilitate general progress of the project.

D. Coordinate all work as further described in the General Conditions of the *Contract Documents*.

1.04 DRAWINGS

A. The following Drawings prepared by Richard A. Alaimo Associates are appended hereto and are a part of these Contract Documents:

1.	G1	Title Sheet
2.	G2	Drawing List, Symbols and Legend
3.	G3	Accessibility Details
4.	D1	Demolition Notes
5.	D2	Demolition Plan – Senior Center (Partial)
6.	D3	Demolition Plan – Senior Center (Partial)
7.	D4	Demolition Ceiling Plan – Senior Center (Partial)
8.	D5	Demolition Ceiling Plan – Senior Center (Partial)
9.	C1	Site Plan
10.	C2	Landscaping Plan
11.	C3	Soil Erosion and Sediment Control Plan
12.	C4	Soil Erosion and Sediment Control Details and Notes
13.	C5	Construction Details
14.	S1	Overall Floor Plan
15.	S2	Room 145 Modifications
16.	S3	Room 168 Modifications
17.	S4	Room #153 Modifications 1 of 2
18.	S5	Room #153 Modifications 2 of 2
19.	S6	Room #152A Modifications
20.	S7	Room #121 Modifications
21.	S8	Room #144 Modifications
22.	S9	Masonry & Concrete Typical Details and General Notes
23.	S10	Structural Typical Details and Notes

24.	S11	Structural Typical Details and Notes
25.	A0	Code Plan and Notes
26.	A1	Overall Floor Plan
27.	A2	Floor Plan – Senior Center (Partial)
28.	A3	Floor Plan – Senior Center (Partial)
29.	A4	Roof Plan – Senior Center (Partial)
30.	A5	Roof Plan – Senior Center (Partial)
31.	A6	Reflected Ceiling Plan – Senior Center (Partial)
32.	A7	Reflected Ceiling Plan – Senior Center (Partial)
33.	A8	Floor Plans & Details – Woman's Restroom
34.	A9	Floor Plans – Café and Kitchen
35.	A10	Exterior Stair Ramp Details
36.	A11	Stairs and Ramp Details
37.	A12	Platform Lift Details
38.	A13	Roof Details
39.	A14	Roof Details
40.	A15	General Details
41.	A16	Storefront Details
42.	A17	Storefront Details
43.	A18	Storefront and Window Details
44.	A19	Door, Window and Storefront Schedule
45.	A20	Room Finish Schedule and Details
46.	F1	Furniture Plan – Senior Center (Partial) (Not in Contract)
47.	F2	Furniture Plan – Senior Center (Partial) (Not in Contract)
48.	PD1	Plumbing Demolition Plan – Senior Center (Partial)
49.	PD2	Plumbing Demolition Plan – Senior Center (Partial)
50.	FP1	Fire Protection Floor Plan
51.	P1	First Floor Plan – Plumbing New Work
52.	P2	First Floor Plan – Plumbing New Work
53.	P3	First Floor Plan – Plumbing New Work
54.	P4	Partial Gas Riser Diagram – Plumbing New Work
55.	P5	Plumbing Gas Details, Schedules, and Diagrams
56.	HD1	Partial First Floor Office and Lounge Area – HVAC – Demolition
57.	HD2	Partial First Floor Senior Center – HVAC – Demolition
58.	H1	Partial First Floor Office and Lounge Area – HVAC – New Work
59.	H2	Partial First Floor Senior Center – HVAC – New Work
60.	H3	Partial Roof Plan Office and Lounge Area – HVAC – New Work
61.	H4	Partial Roof Plan Senior Center – HVAC – New Work

62. H5 HVAC – Details – I
63. H6 HVAC – Details – II
64. H7 HVAC – Details – III
65. H8 HVAC – Control Diagrams, Points List, and Schedules
66. H9 HVAC – Sequence of Operations – I
67. H10 HVAC – Sequence of Operations – II
68. H11 General Notes, Symbols, and Abbreviation Schedules
69. H12 HVAC – Schedules – I
70. H13 HVAC – Schedules – II

71. ED1 Electrical Demolition Floor Plan
72. ED2 Electrical Demolition Senior Center Floor Plan

73. E0 Electrical Key Plan and Notes
74. E1 Electrical Floor Plans
75. E2 Electrical Lighting Plan
76. E3 Electrical HVAC Plans – 1 of 2
77. E4 Electrical HVAC Plans – 2 of 2
78. E5 Electrical Block Diagrams
79. E6 Electrical Schedules – 1 of 3
80. E7 Electrical Schedules – 2 of 3
81. E8 Electrical Schedules – 3 of 3
82. E9 Electrical Floor Plan – Senior Center 1 of 3
83. E10 Electrical Floor Plan – Senior Center 2 of 3
84. E11 Electrical Floor Plan – Senior Center 3 of 3
85. E12 Electrical Lighting Plan – Senior Center
86. E13 Electrical HVAC Plan – Senior Center
87. E14 Electrical Block Diagrams – Senior Center
88. E15 Electrical Schedules – Senor Center 1 of 2
89. E16 Electrical Schedules – Senior Center 2 of 2

B. Reference Drawings:

1. The Reference Drawings listed below are provided for the Contractors information. These drawings are not part of the Contract Documents and Contractor may not rely upon or make any claim against *OWNER*, *ENGINEER*, or any of ENGINEER's Consultants with respect to:

    a. The accuracy or completeness of these drawings for Contractor's purposes including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be completed by Contractor and safety precautions and programs incident thereto; or

b. Other data, interpretations, opinions, and information shown or indicated on the drawings; or

c. Any Contractor interpretation of, or conclusion drawn from any data, interpretations, opinions or information.

2. The following Drawings prepared by Kimmel Bogrette Architecture and Remington Vernick Engineers, dated 5/22/2013, are included for reference only.

a. FP2.1 Fire Protection Ground Floor Plan
b. FP2.2 Fire Protection Ground Floor Plan
c. FP3.1 Mechanical Demolition Ground Floor Plan
d. P3.2 Utility Piping Ground Floor Plan

1.05 The above Statement of Work outlines the general items and distribution of work, and should not be construed as being all-inclusive.

****END OF STATEMENT OF WORK****

SECTION 01 12 16
(01014)
CONSTRUCTION SEQUENCE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Several elements of this project must be constructed or under construction before work on other elements can be commenced or completed due to practical and environmental considerations or requirements of the *OWNER*. Without regard to the *CONTRACTOR'S* means, methods or techniques, the sequence specified herein shall be adhered to.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Statement of Work

B. General Conditions

C. Specifications

1.03 SUBMITTALS

A. The Contractor's Construction Schedule shall reflect the timely completion of the work in accordance with the sequence specified herein. Submit as specified in *Section 01 32 16, Construction Schedules*.

PART 2 - PRODUCTS

No materials are required.

PART 3 - EXECUTION

3.01 GENERAL

A. The work of this project is required to be completed in stages as listed herein, the Statement of Work and the *PROPOSAL*.

B. Each stage must be completed at or before the time specified in the *PROPOSAL* in order that the *OWNER* may avoid undue hardship.

C. The following sequence is intended to indicate the general order of construction. The work should proceed as stated, although some items may be simultaneous.

3.02 LIQUIDATED DAMAGES

A. Liquidated damages will be assessed as shown in the *PROPOSAL* and indicated in the General Provisions for late completion.

3.03 CONSTRUCTION SEQUENCE

A. The *CONTRACTOR* shall schedule the work as required to meet the staged construction schedule established in these *Contract Documents*. See the Contract Proposal, Form of Contract and Statement of Work for a description of the work included in each stage, the contract period for each stage and liquidated damages related to failure to complete the work of a given stage within the time allotted.

B. In general, the *CONTRACTOR* shall proceed with the work of this contract according to the following schedule:

1. Submit preconstruction photographs of the Kennedy Center building and surrounding areas that are proposed for use by the *CONTRACTOR*. During the course of construction if the condition of the roads/drives change before the *CONTRACTOR* actually occupies the existing roads/drives the *CONTRACTOR* shall submit new photographs depicting the conditions prior to use by the *CONTRACTOR*.

2. Submit preconstruction photographs of the treeline and ditches/stream at the limit of construction.

3. Field survey and stake the limit of the wetland transition area shown on the *Contract Drawings*. (Owner will supply the coordinates for each point along the wetland transition limit.) Flag the wetland transition limit line to preclude encroachment upon the transition zone during construction.

4. Construct temporary site access roads and stone tread cleaners with related erosion and sediment control improvements.

5. Construct staging area and setup trailers with utility service, stone yard areas and related erosion and sediment control improvements.

6. Construct site erosion and sediment control improvements; sedimentation/detention basin; silt fencing; tire tread cleaners; interior haul roads; diversion ditches; diversion berms and prepare topsoil stockpile areas with tire tread cleaners and perimeter silt fencing.

11. Upon completion of 1 through 6 above proceed with the remaining work of this Contract implementing site specific erosion and sediment control measures for each element of the work.

12. Prepare and submit operations and maintenance manuals for all equipment and systems 180 calendar days prior to the end of the contract period.

13. Complete testing and *CONTRACTOR* start-up and adjustment of all equipment and systems according to the staged construction schedule.

C. The above outlines the work required in the various stages and is not all inclusive. The required work is more fully described within these *Specifications*, the *PROPOSAL* and shown on the Plans.

****END OF SECTION****

SECTION 01 21 00
(01021)
CASH ALLOWANCES

PART 1 - GENERAL

1.01 SUMMARY

A. To provide adequate budget and bonding to cover items not precisely determined or foreseen by the *OWNER* prior to bidding, allow within the proposed Contract Sum the amounts described in this Section.

B. Related work:

1. Other provisions concerning Cash Allowances may be stated in other Sections of these *Specifications*.

1.02 DESCRIPTION

A. *CONTRACTOR* shall include in the Contract Price all allowances named and shall cause the Work so covered to be done for such sums within the limit of the allowances as may be acceptable to the *ENGINEER*.

B. *CONTRACTOR* agrees that the allowances include the cost to *CONTRACTOR* less any applicable trade discounts) of materials, equipment and labor required by the allowances to be delivered to the site, less applicable taxes; and *CONTRACTOR'S* costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for the allowances. No demand for additional payment on account of any thereof will be valid.

C. Prior to work being performed, an appropriate Change Order will be issued as recommended by *ENGINEER* to reflect actual amounts due *CONTRACTOR* on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted. Funds remaining in any Allowance at closeout of Contract will be credited to the *OWNER* by Change Order.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Submit cost proposals for purchase of products included in the allowances.

C. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for each allowance.

1.04 COORDINATION

A. *ENGINEER* will consult with Contractor for consideration and selection of products and materials and consult with *OWNER* for final selection. *ENGINEER* will notify Contractor of final selection and prepare a Change Order.

B. Contractor shall assist the *ARCHITECT/ENGINEER* in selection of products and materials, obtain proposals from suppliers and offer recommendations.

C. Upon notification of selection by *ENGINEER/OWNER*, Contractor shall execute purchase agreement with designated supplier/installer and process shop drawings, product data, and samples.

D. Contractor shall inspect products and materials upon delivery for completeness, damage, and defects and resolve any claims for damage.

1.05 SPECIFIC CASH ALLOWANCES

A. Contingency Allowances: There is included in the Contract price a Contingency Allowance in an amount sufficient to account for any unforeseen costs in the project that are not included in the original work. The Contingency Allowance shall be used to cover the cost(s) of work performed under an authorized Change Order. The Change Order shall be prepared in accordance with the General Conditions and shall include all costs associated with the Change.

B. Office Furniture: There is included in the Contract price an Allowance in an amount sufficient to cover the cost for furniture. The allowance shall be used to cover the costs of tables, file cabinets, chairs, shelves and desks under an authorized Change Order. The Change Order shall be prepared in accordance with the General Conditions and shall include all costs associated with the Change.

K. Remediation And Disposal Of Hazardous Material: There is included in the Contract price an Allowance in an amount sufficient to cover the costs for remediation and disposal of hazardous materials if they are found to be present as a result of testing performed by the Contractor. The allowance shall be used to cover the costs of work performed under an authorized Change Order. The Change Order shall be prepared in accordance with the General Conditions and shall include all costs associated with the Change.

****END OF SECTION****

SECTION 01 22 00
(01025)
MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Requirements for determining measurement and payment of work specified on Unit basis or Lump Sum basis.

2. Requirements for a Schedule of Values.

3. Mobilization.

B. Related work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 00 41 00: Proposal*

1.02 DESCRIPTION

A. Unit price items:

1. Measurement of units of work for which payment will be made by unit prices are defined herein.

2. Payment for the units of work will be determined by multiplying the unit prices stated within the bid, times the quantity of the unit of work as determined by the measurement provisions stated herein. Payment for the units of work shall fully compensate the *CONTRACTOR* for furnishing all materials, labor, equipment, services, tools and all else incidental and necessary to complete the work.

B. Lump sum items:

1. Measurement of quantities of work will be estimated based on the accepted schedule of values as specified herein.

2. Payment for the quantities of work indicated in the accepted schedule of values will be at the prices stated in the accepted schedule of values, not to exceed the lump sum stated within the bid. Payment for the work to be performed under the lump sum shall fully compensate the *CONTRACTOR* for furnishing all material, labor, equipment, services, tools and all else incidental and necessary to complete the work.

C. No specific measurement and payment will be made herein for work having no separate payment, but the costs thereof shall be included in the prices bid for the various other items of related work listed herein and in the *PROPOSAL*.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Schedule of values:

1. Submit a Schedule of Values for the work at the Pre-Construction Conference. Schedule shall reflect the specified construction stages if any, and the component parts of each stage.

2. Upon request, support the values with data, which will substantiate their correctness.

3. The Schedule of Values, unless objected to by the *ENGINEER*, shall be used only as the basis for the Contractor's Applications for Payments.

C. Form and content of Schedule of Values:

1. Type Schedule on 8½ x 11 in. white paper *CONTRACTOR'S* standard forms and automated printout will be considered for approval by *ENGINEER* upon *CONTRACTORS* request. Identify schedule with:

a. Title of project and location.

b. *ENGINEER* and project number.

c. Name and address of *CONTRACTOR*.

d. Contract designation.

e. Item designation as listed in the *PROPOSAL*.

f. Date of submission.

D. Schedule shall list the installed value of each of the items listed in the Proposal for all of the work in sufficient detail to serve as a basis for computing values for progress payments during construction.

E. In the case of Lump Sum items, each item shall be divided into its component parts and be shown on a subschedule.

F. Follow the 48 Division Construction Specification Institute (CSI) format for listing component items of each payment item listed in the *PROPOSAL*.

G. The sum of all values listed in the schedule shall equal the total Contract Price.

PART 2 - PAYMENT

2.01 GENERAL

A. The *CONTRACTOR* shall receive and accept the compensation provided for in the Contract as full payment for furnishing all labor, materials, tools, equipment and incidentals necessary to the completed work, and for performing all work contemplated and embraced under the Contract in a complete and acceptable manner; also, except where specifically provided elsewhere in the *Contract Documents*, for all risk, loss, damage, or expense of whatever character arising out of the nature of the work or the prosecution thereof, or for the action of the elements, or for any unforeseen difficulties which may be encountered during the prosecution of the work until acceptance by the *OWNER*: also, except where specifically provided elsewhere in the *Contract Documents*, for all expenses incurred in consequence of the suspension or discontinuance of the work as provided in the Contract.

B. If the payment clause relates to any unit price in the *PROPOSAL* and requires that the said unit price cover and be considered compensation for certain work or material essential to the item, this same work or material will not also be measured or paid for under any other Pay Item which may appear elsewhere in the *Contract Documents*.

C. The *CONTRACTOR* shall receive payments in accordance with the completion of work as identified by the *Construction Schedules, Section 01 32 16*.

2.02 MOBILIZATION

A. Mobilization shall consist of the cost of initiating the Contract and include such portions of the following as are required at the beginning of the Project: setting up the *CONTRACTOR'S* general plant, offices, shops, storage areas, sanitary and other temporary utilities, including but not limited to water, sewer, gas and electric including connections and appropriate metering from local utility and other facilities as required by the *Specifications*, by local or State law or by regulation; providing access to the Project site; obtaining necessary permits, grants and licenses, and payment of fees; protecting existing utilities; lighting work areas; providing shop drawings; sampling and testing of materials; but not including providing the required insurance and bonds. Payment for mobilization will be made at the lump sum price bid for this item in the *PROPOSAL*, which price shall include the cost of initiating the Contract.

B. The provisions for payment for the item mobilization supersede any provisions elsewhere in the *Specifications* for including the cost of these initial services and facilities in the prices bid for the various items scheduled in the *PROPOSAL*. The lump sum price bid for mobilization shall be payable to the *CONTRACTOR* whenever he shall have completed 10 percent of the work of the Contract. For the purposes of this item, 10 percent of the work shall be considered completed when the total of payments earned, exclusive of the amount bid for this item, shown on the monthly certificates of the approximate quantities of work done, shall exceed 10 percent of the total price bid for the Contract.

C. The lump sum price bid for mobilization is limited to the following maximum amounts:

Contract Amount From More Than	To and Including	Maximum Amount for Item of Mobilization
0	$ 100,000	$ 3,000
100,000	500,000	15,000
500,000	1,000,000	30,000
1,000,000	2,000,000	60,000
2,000,000	3,000,000	90,000
3,000,000	4,000,000	120,000
4,000,000	5,000,000	125,000
5,000,000	6,000,000	150,000
6,000,000	7,000,000	175,000
7,000,000	10,000,000	200,000
10,000,000	2.5% of amount bid	

D. Payment for mobilization as hereinbefore specified will be made for the lump sum price bid therefore, regardless of the fact that the *CONTRACTOR* may have, for

any reason, shut down his work on the project or moved equipment away from the project and back again.

E. In the event the amount bid for the item "Mobilization" exceeds the limits specified above, the portion exceeding the limits specified above will be paid after all the work has been completed and accepted.

2.03 LIQUIDATED DAMAGES

A. The *OWNER* will suffer significant financial loss if the project, or each stage thereof, is not substantially complete on the date(s) set forth in the *Contract Documents*. The *CONTRACTOR* and his surety shall be liable for and shall pay to the *OWNER* the sum stipulated, as fixed and agreed, as liquidated damages for each calendar day of delay until the project, or each stage thereof, is substantially complete.

B. Liquidated damages in the amounts specified in the *PROPOSAL* will be assessed as required by the General Provisions and the Contract and collected through Current Estimate/Voucher deduct items implemented at completion of the various stages of construction specified.

****END OF SECTION****

SECTION 01 25 13
(01640)
SUBSTITUTIONS

1.01 GENERAL

A. Work included:

1. Procedures for requesting use of products, materials or methods in place of those specified.

B. Related requirements:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 01 33 23: Shop Drawings, Product Data and Samples*

1.02 SUBSTITUTIONS

A. After Notice to Proceed, *ENGINEER* will consider formal request from *CONTRACTOR* for products, materials or methods in place of those specified.

B. Submit six (6) copies of Request for Substitution together with Submittal Transmittal Form contained in *Section 01 33 23*. Include in request as applicable:

1. Complete data substantiating compliance of proposed substitution with *Contract Documents*.

2. For products:
   a. Product identification, including manufacturer's name and address.

   b. Manufacturer literature:

      (1) Product description.

      (2) Performance and test data.

      (3) Reference standards.

   c. Samples.

d. Name and address of similar projects on which product was used, and date of installation.

3. For construction methods:

a. Detailed description of proposed method.

b. Drawings illustrating methods.

4. Itemized comparison of proposed substitution with product or method specified.

5. Names of facilities at which the substitute material or product has been successfully used in a similar situation.

6. Relation to separate contracts.

C. In making requests for substitution, *CONTRACTOR* represents:

1. He has personally investigated proposed product or method, and determined that it is equal or superior in all respects to that specified.

2. He will provide the same guarantee for substitution as for product or method specified.

3. He will coordinate installation of accepted substitution into work making such changes as may be required for work to be completed in all respects.

4. In the event the *CONTRACTOR* chooses to furnish and install a system or item of equipment of different arrangement from that shown or specified, and receives approval to do so, he shall furnish and install any additional wiring, conduit or other materials required by the system at no additional cost to the *OWNER*.

5. He waives all claims for additional costs related to substitutions which consequently become apparent.

6. Cost data is complete and includes all related costs under this contract.

7. Redesign due to *CONTRACTOR'S* substitution shall be accomplished by a registered professional engineer in the State of New Jersey and will be subject to review and approval by the *ENGINEER* before implementation. Whether or not the *ENGINEER* accepts a proposed substitute, *CONTRACTOR* shall be responsible for all costs incurred for any redesign required as a result of any requested substitution. *ENGINEER* shall record time required for review of *CONTRACTOR'S* submitted redesign and

OWNER will deduct from *CONTRACTOR'S* payments all costs of the *OWNER's ENGINEER* in performing said review. *ENGINEER* shall bill the *OWNER* at the billing rates current at the time of review.

D. Substitutions will not be considered if:

1. They are indicated or implied on shop drawings of product data submittals without formal request submitted in accordance with Paragraph 1.02.

2. Acceptance will require substantial revision of *Contract Documents*.

3. *OWNER* or *ENGINEER* determines that the substitutions will cause operational issues.

E. If accepted, the *ENGINEER* will approve the substitution in writing.

****END OF SECTION****

REQUEST FOR SUBSTITUTION

_____ _____ _____
Date of Request Contract # Project Title

SPECIFIED ITEM:
Specification Section #:_____ Paragraph #_____Drawing #_____Detail/Section #_____

Description:_____

_____

The undersigned requests consideration of the following:

PROPOSED SUBSTITUTION:_____

_____

REASON for REQUEST FOR SUBSTITUTION:

Cost savings to accrue to OWNER in amount of: $_____.

Specified product no longer manufactured

Specified product not available for _____weeks

Specified item does not comply with Building Code

Manufacturer declares product not suitable for intended use and will not warrant its installation

Other (EXPLAIN)_____

In making requests for substitution, *CONTRACTOR* certifies that:

1. He has personally investigated proposed product or method and determined that it is equal or superior in all respects to that specified.
2. He will provide the same guarantee for substitution as for product or method specified.
3. Redesign due to substitution shall be subject to the provisions of the contract documents.
4. He will coordinate installation of accepted substitution into work making such changes as may be required for work to be completed in all respects.
5. He shall furnish and install any additional wiring, conduit or other materials required by the system at no additional cost to the *OWNER*.
6. He waives all claims for additional costs related to substitutions that consequently become apparent.
7. Cost data is complete and includes all related costs under this contract.

Submitted by:

_____
Signature

_____
CONTRACTOR

For Use By A/E:

No Exceptions Taken

Note Markings, No Further Submissions Required

Note Markings, Further Submission Required

Rejected

By:_____ Date:_____

SECTION 01 31 13
(01040)
PROJECT COORDINATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Administrative and supervisory requirements necessary for coordination of the Project.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 01 31 19: Project Meetings*

3. *Section 01 32 16: Construction Schedules*

4. *Section 01 33 23: Shop Drawings, Product Data and Samples*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *PROJECT COORDINATION* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Submit Coordination drawings.

1.03 GENERAL COMMUNICATION

A. The *ENGINEER* shall act as the Owner's Representative for this project.

B. In case of an EMERGENCY, dial 9-1-1

1.04 CORRESPONDENCE

A. Address all correspondence to *ENGINEER*.

B. All correspondence to and from Contractor will be routed through the Owner's Representative.

C. Format: Number correspondence sequentially beginning with Serial Number #1. Include project title and Contract number.

1.05 REQUEST FOR INFORMATION (RFI)

A. When field conditions or Contract Document contents require clarification by the *ENGINEER*, a written RFI is to be submitted.

B. Each RFI shall identify the nature and location of each clarification or verification; provide as a minimum the following information:

1. Project name and number
2. Date
3. Date response required by
4. RFI number
5. Subject
6. Initiator of the question
7. Indication of costs, if known or anticipated
8. Indication of schedule impact
9. Location on site
10. Contract drawing reference
11. Contract specification section and paragraph reference
12. Descriptive text
13. Recommended solution(s); and
14. Space for reply on same page as questions.

C. Route RFI's in same manner as correspondence

D. The Contractor shall be responsible for development and weekly maintenance of an RFI log.

1.06 COORDINATION

A. Contractor shall coordinate its construction activities with those of its subcontractors and other entities involved to assure efficient and orderly installation of each part of the Work. The Contractor shall coordinate requirements included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation.

1. Where installation of one part of the work is dependent on installation of other components, either before or after its own installation, Contractor shall schedule construction activities in the sequence required to obtain the best results.

2. Where sleeves, cutouts, chases, and similar provisions are required for the Work of a particular trade, the Contractor shall coordinate the furnishing and placing of sleeves and other such required components **.**

3. Where availability of space is limited, Contractor shall coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.

4. Contractor shall make adequate provisions to accommodate items scheduled for later installation.

B. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include items such as required notices, reports, and attendance at meetings.

C. Construction Schedules:

1. Provide schedule in accordance with *Section 01 32 16*.

2. Monitor schedules as work progresses.

a. Identify potential variances between scheduled and probable completion dates for each phase.

b. Recommend to Contractors adjustment in schedule to meet required completion dates.

c. Adjust schedules of contractors or subcontractors as required.

d. Document changes in schedule and submit to other involved contractors.

3. Monitor compliance with schedule.

   a. Verify that labor and equipment are adequate for the work and the schedule.

   b. Verify that product procurement schedules are adequate and transmitted to the *OWNER*.

   c. Verify that product deliveries are adequate to maintain schedule.

   d. Report noncompliance to *OWNER*. Present program to reestablish compliance with schedules.

B. Process Shop Drawings, Product Data and Samples:

1. Comply with requirements of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

2. Prior to submittal to *ENGINEER* review for compliance with contract documents.

   a. Field dimensions and clearance dimensions.

   b. Relation to available space.

   c. Relation to other contracts and to other trades.

   d. Effect of any changes on the work of any other contracts or other trades.

C. Provide coordination drawings as required to resolve conflicts and to assure coordination of the work of, or affected by, mechanical and electrical trades, or by special equipment requirements.

1. Layout Drawings:

   a. Layout drawings shall be provided for all mechanical rooms, pipe gallery's, process rooms, reflected ceilings, kitchens, chemical feed rooms and other spaces where conflicts may occur.

   b. Contractor shall prepare composite layout drawings of all equipment, process piping, duct work, fire sprinkler piping, and plumbing piping at a scale of not less than ¼" per foot. The building may be divided into area segments for development of the layout drawings. The building systems will be constructed in the

sequence of area layout drawing submissions. An overall drawing showing all the various layout area segments and showing the dates when each segment will be completed by the Contractor or his Subcontractor shall be prepared and submitted to the *ENGINEER* before any work is started that is the subject of the layout drawings.

c. These drawings shall show equipment, valves, fittings, couplings, registers, grilles, diffusers and similar features, as well as locations of all valve dampers, operators, instrumentation, electrical connections and other items for service, operation and maintenance. The drawings shall also show structural beams, girders, columns, ceiling heights, walls, floor-to-floor Architectural and Structural features as shown on the Contract Drawings. Particular attention shall be given to the locations, size clearance dimensions of equipment items, shafts and similar features. Elevations and Sections shall be developed as needed to define the space needed for the various systems to fit around, near and between each other; to determine the construction installation sequence for each system and to show any conflicts.

d. Any conflicts identified shall be immediately brought to the attention of the *ENGINEER*.

e. CAD Requirements:

(1) Contractor shall prepare coordinated drawings using a CAD system that is compatible with or can be translated to AutoCAD, 2015 or later, which is the ENGINEER's standard. Background drawings (CAD) will be made available by, the *ENGINEER* subject to the Contractor executing whatever Release/Waiver the *ENGINEER* may require. The Contractor will be responsible for including all disciplines on a final set of coordinated drawings (CAD) representing As-Built conditions for turnover to the *ENGINEER*.

(2) The Contractor shall comply with the *ENGINEER's* Standards and all layering requirements contained therein. Contractor shall obtain copies of and comply with the CADD Standards.

f. Coordination Meetings:

(1) Contractor shall schedule coordination meetings at the jobsite attended by a representative from each of the subcontractors involved in the coordination process. At these meetings, the subcontractors shall indicate where conflicts exist and resolve the problems through mutual agreement. Should an impasse occur, the *ENGINEER* shall decide the resolution. When all conflicts are resolved, the subcontractors shall indicate their agreement by signing the coordination drawings. Each subcontractor shall be issued copies of the finished drawings from which they can make final refinements on their shop drawings before submission to the *ENGINEER* for approval.

(2) By signing off the composite drawings, each of the subcontractors shall be indicating their awareness of and agreement with the indicated routings and layouts and their interrelationship with the adjoining or contiguous work of all other subcontractors.

(3) Thereafter, no unauthorized deviations shall be permitted, and if made without knowledge or agreement of the *ENGINEER*, this unauthorized work shall be subject to removal and correction at no additional cost to the Owner.

2. Composite Drawings:

a. In preparing the composite drawings, minor changes in duct, pipe or conduit routings that do not affect the intended function may be made as required to avoid space conflicts, when mutually agreed, but items may not be resized nor exposed items relocated without the *ENGINEER's* written acceptance. No changes shall be made in wall or chase locations, ceiling heights, door swings or locations, window or other openings, or other features affecting the function or esthetic effect of the building. If conflicts or interferences cannot be satisfactorily resolved the *ENGINEER* shall be notified and his decision obtained.

b. After the final composite drawings have been agreed upon and signed by the Contractor and all subcontractors, the Contractor shall provide and distribute four (4) prints to each subcontractor, the *ENGINEER* and to the *OWNER* for reference and record purposes. All subcontractors desiring additional prints of such drawings, beyond the basic distribution indicated above, shall arrange for and pay the cost of same.

c. The record copies of final composite drawings shall be retained by, the *ENGINEER* and each subcontractor as working reference. All shop drawings, prior to their submittal to the *ENGINEER*, shall be compared with the composite drawings and developed accordingly by the subcontractor responsible. Any revision to the composite drawings that becomes necessary during the progress of the work shall be noted by all subcontractors and shall be neatly and accurately recorded on the record copies. Each subcontractor shall be responsible for up-to-date maintenance of his record copies of the composite drawings and keep one (1) copy available at the site. The composite drawings and any subsequent changes thereto shall be utilized by, the Contractor and each subcontractor, in the development of his "as-built" drawings.

d. The drawings need not be submitted as a whole but shall be sequenced as required by the Contractor in ample time to avoid construction delay. The coordination drawings may lack complete data in certain instances pending receipt of shop drawings, but sufficient space shall be allotted for the items affected. When final information is received, such data shall be promptly inserted on the composite.

e. No additional payment will be made for relocating any duct, pipe, conduit, or other material that has been installed without proper coordination between all subcontractors or trades involved. Any improperly coordinated work or work installed that is not in accordance with the approved composite coordination drawings shall be corrected at no additional cost to the *OWNER*.

f. All changes in the scope of work due to revisions formally issued and approved shall be shown on the composite drawings.

g. All work on the coordination composite drawings shall be performed by competent draftsmen and shall be clear and fully legible. The *ENGINEER* shall be the sole judge of the acceptability of the drawings.

D. Safety:

1. Enforce compliance with all current OSHA, State and local regulations.

E. Inspection and testing:

1. Comply with requirements of *Section 01 45 29, Testing Laboratory Services*.

2. Inspect Work to assure performance in accord with requirements of Contract Documents.

3. Administer special testing and inspections of suspect Work. Submit results and summary to *OWNER*.

4. Reject Work that does not comply with requirements of Contract Documents.

5. Coordinate Testing Laboratory Services:

   a. The Contractor shall at all times make his work safely accessible for inspection and testing as specified in the Contract Documents.

6. Report noncompliance with Contract Documents to the *ENGINEER* and *OWNER*. Submit data and summarize.

F. Monitor the use of temporary utilities:

1. Verify that adequate services are provided and maintained in a safe manner.

2. Provide alternate service with backup capabilities when critical work is involved.

G. Arrange for delivery of products furnished by *OWNER* and others:

1. Inspect for condition at delivery.

2. Submit in advance, complete schedule requirements for items furnished by others. Update on monthly basis showing material received to date and requirements for balance.

PART 2 - PRODUCTS - Not Used

PART 3 – EXECUTION – Not Used

****END OF SECTION****

SECTION 01 31 19
(01200)
PROJECT MEETINGS

1.01 DESCRIPTION

A. *CONTRACTOR* shall attend pre-construction meeting, periodic progress meetings, and special meetings called throughout the progress of the work.

B. Representatives of *CONTRACTORS*, subcontractors and suppliers attending the meetings shall be qualified and authorized to act on behalf of the entity each represents.

C. *ENGINEER* may attend meetings to ascertain that work is expedited consistent with *Contract Documents* and the construction schedules.

1.02 PRECONSTRUCTION MEETING

A. Will be scheduled by the *ENGINEER* within fifteen (15) days after date of Notice to Proceed.

B. Location: A central site, convenient for all parties.

C. Attendance:

1. Owner's Representative

2. Representative of local Police Department

3. *ENGINEER* and his professional consultants

4. Resident Project Representative

5. Contractor's Superintendent

6. Major Subcontractors

7. Major Suppliers

8. Others as appropriate.

D. Suggested agenda:

1. Distribution and discussion of:

    a. List of major subcontractors and suppliers.

    b. Projected construction schedules.

2. Critical work sequencing.

3. Major equipment deliveries and priorities.

4. Project coordination: Designation of responsible personnel.

5. Procedures and processing of:

    a. Field decisions

    b. Proposal requests

    c. Submittals

    d. Change orders

    e. Applications for payment, including vouchers and current cost estimates.

6. Adequacy of distribution of *Contract Documents*.

7. Procedures for maintaining Record Documents.

8. Use of premises:

    a. Office, work and storage areas

    b. *OWNER'S* requirements.

9. Construction facilities, controls and construction aids.

10. Maintenance and Protection of Traffic.

11. Temporary utilities.

12. Safety and first-aid procedures.

13. Security procedures.

14. Housekeeping procedures.

1.03 PROGRESS MEETINGS

A. Will be scheduled on a regular periodic basis, as required, by the *ENGINEER*.

B. Additional meetings will be held as required by progress of the work.

C. Location of the meetings: The project field office of the *CONTRACTOR*.

D. Attendance:

1. *ENGINEER*, and his professional consultants as needed.

2. Representative of local Police Department

3. Contractor's Superintendent.

4. Subcontractors as appropriate to the agenda.

5. Suppliers as appropriate to the agenda.

6. Others.

E. Suggested agenda:

1. Review, approval of minutes of previous meetings.

2. Review of work progress since previous meeting.

3. Field observations, problems, conflicts, and recommendations.

4. Problems that impede Construction Schedule.

5. Review of off-site fabrication, delivery schedules.

6. Corrective measures and procedures to regain projected schedule.

7. Revisions to Construction Schedule.

8. Plan progress, schedule, during succeeding work period.

9. Coordination of schedules.

10. Review submittal schedules, expedite as required.

11. Maintenance of quality standards.

12. Review proposed changes for:

    a. Effect on Construction Schedule and on completion date.

    b. Effect on other contracts of the Project.

13. Maintenance and Protection of Traffic.

14. Other business.

****END OF SECTION****

SECTION 01 32 16
(01310)
CONSTRUCTION SCHEDULES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Promptly after award of the contract, the *CONTRACTOR* shall prepare and submit to the *ENGINEER* estimated construction progress schedules for the work, with subschedules of related activities, which are essential to its progress.

2. Submit revised progress schedules monthly.

B. Related work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 01 11 00: Statement of Work*

3. *Section 01 33 23: Shop Drawings, Product Data and Samples*

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

1.03 FORM OF SCHEDULES

A. Prepare schedules in the form of a horizontal bar chart.

1. Provide separate horizontal bar for each trade or operation.

2. Horizontal time scale: Identify the first workday of each week.

3. Scale and spacing: To allow space for notation and future revisions.

4. Minimum sheet size: 18-inch by 24-inch.

B. Format of listings: The chronological order of the start of each item of work.

C. Identification of listings: By major specification section numbers.

1.04 CONTENT OF SCHEDULES

A. Construction progress schedule:

1. Show the complete sequence of construction by activity.

2. Show the dates for the beginning, and completion of each element of construction.

3. Show projected percentage of completion for each item, as of the first day of each month.

B. Provide subschedules to define critical portions of prime schedules.

1.05 PROGRESS REVISIONS

A. Indicate progress of each activity to date of submission.

B. Show changes occurring since previous submission of schedule:

1. Major changes in scope.

2. Activities modified since previous submission.

3. Revised projections of progress and completion.

4. Other identifiable changes.

C. Provide a narrative report as needed to define:

1. Problem areas, anticipated delays, and the impact on the schedule.
2. Corrective action recommended, and its effect.

3. The effect of changes on schedules of other prime contractors.

1.06 SUBMISSIONS

A. Submit initial schedules within five (5) days after Notice to Proceed.

1. *ENGINEER* will review schedules and return review copy within ten (10) days after receipt.

2. If required, resubmit within seven (7) days after return of review copy.

B. Submit revised progress schedules with each application for payment.

C. Submit one (1) reproducible transparency and one (1) opaque reproduction.

1.07 DISTRIBUTION

A. Distribute copies of the reviewed schedules to:

1. Job site file.

2. Subcontractors.

3. Other concerned parties.

B. Instruct recipients to report promptly to the *CONTRACTOR*, in writing, any problems anticipated by the projection shown in the schedules.

PART 4 - PAYMENT

4.01 CONSTRUCTION SCHEDULES

A. Unless otherwise noted in the *PROPOSAL* Section, no separate payment shall be made for this item.

B. Include all costs for the *CONSTRUCTION SCHEDULES* in the prices bid for the various related items of work as designated in the *PROPOSAL*.

****END OF SECTION****

SECTION 01 32 33
(01380)
CONSTRUCTION PHOTOGRAPHS

PART 1 - GENERAL

1.01 SUMMARY

A. Work included:

1. Provide Preconstruction Photographs prior to beginning of construction activities including site and access clearing.

2. Provide post Construction Photographs.

B. Related Work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 01 32 16: Construction Schedules*

3. *Section 01 33 23: Shop Drawings, Product Data and Samples*

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Samples:

1. Submit three (3) representative samples of photographs to be provided in high resolution electronic format.

C. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same label information as corresponding set of photographs.

D. Obtain transfer copyright usage from photographer to *OWNER* for unlimited reproduction of photographic documentation.

E. Submit name and address of photographer.

1.03 QUALITY ASSURANCE

A. Secure the services of a professional photographer who is skilled and experienced in construction photography and whose work samples are acceptable to the *ENGINEER*.

B. Do not replace the photographer without the *ENGINEER'S* written approval.

C. Acceptable Photographers:

1. Stokes Creative Group
   Vincentown, NJ 08088
   609-859-8400
   http://stokescg.com

2. Protec Documentation Services
   Rancocas, NJ 08073
   609-267-2666
   http://www.protecservices.com

3. Rainbow Photographic Documentation Co.
   Coopersburg, PA 18036
   215-538-0707
   800-538-0909
   www.rainbowphotographic.photos

4. Or equivalent

PART 2 - PRODUCTS

2.01 PHOTOGRAPHS

A. All photographs shall be color digital photographs stored on a flash drive, CD-ROM, DVD or approved other media. Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 1600 by 1200 pixels and 400 dpi.

B. Identification:

1. Images shall be provided in separate digital folders named with yyyy mm dd prefix and title of work area.

2. Provide the following information on the storage media folder on individual photograph as appropriate.

   a. Name of Project.

   b. Orientation of view (Approximate station and direction or provide photo location map).

   c. Name and address of photographer.

   d. Name of *ENGINEER*.

   e. Name of Contractor.

   f. Date and time of exposure.

PART 3 - EXECUTION

3.01 PREPARATION

A. Prior to the work of this section verify that the work of other trades is complete to the point where this work may properly commence.

3.02 PHOTOGRAPHY

A. Photography required:

1. Consult with *ENGINEER* prior to photography for instructions concerning views required.

2. Provide Preconstruction Photos of environmentally critical areas including construction areas within tidal regions. [N.J.A.C. 7:22-10.11(q)]

3. Provide Preconstruction Photos of site.

4. Provide post construction photographs of all work and site and environmentally critical areas at final acceptance of project and prior to final payment.

B. Views:

1. Continuous coverage of existing conditions.

2. Photographs shall particularly address driveways; mailboxes; trees, shrubs, landscaping; existing pavement conditions; existing structures to include curbs, sidewalks, inlets, manholes, utility poles, signs and environmentally critical areas.

3. Photographs shall be labeled by station so that subsequent photographs can be taken from the same control points. [N.J.A.C. 7:22-10.11(q)]

C. Technique:

1. Factual presentation.

2. Correct exposure and focus:

a. High resolution and sharpness.

b. Maximum depth of field.

c. Minimum distortion.

3.03 DELIVERY

A. Deliver photographs to *ENGINEER* within fourteen (14) calendar days after they are taken.

B. Digital images shall be provided on a flash drive CD-ROM or external hard drive labeled to show date, project, contract number and location.

PART 4 - PAYMENT

4.01 CONSTRUCTION PHOTOGRAPHS

A. Include all costs for construction photographs in the overall contract price.

B. Parties requiring additional prints will pay photographer directly.

****END OF SECTION****

SECTION 01 33 23
(01340)
SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 - GENERAL

1.01 SUMMARY

A. Work included:

1. Prepare and submit to the *ENGINEER* a Schedule of Submittals showing all submittals required by the Specification sections or the Drawings.

2. Prepare and submit to *ENGINEER* shop drawings, product data and samples required by the Specification sections.

3. Prepare and submit to the *ENGINEER* engineering drawings and calculations for items indicated on the Plans or as otherwise required by the contract specifications.

B. Related Requirements:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 01 25 13: Substitutions*

C. Payment:

1. Unless otherwise noted in the *PROPOSAL* Section, no separate payment shall be made for this item.

2. Include all costs for the *SHOP DRAWINGS, PRODUCT DATA AND SAMPLES* in the prices bid for the various related items of work as designated in the *PROPOSAL*.

3. Shop drawings, product data and samples, engineering drawings and calculations are an integral part of the construction process and are required as part of the construction contract. *CONTRACTOR'S* failure to provide shop drawings, product data and samples, engineering drawings and calculations in a complete and timely manner may affect his payment

and/or completion schedule. No extension of time will be granted due to untimely or incomplete submittals.

1.02 DEFINITIONS

A. Shop drawings are original drawings, diagrams, schedules and other data specifically prepared for the work by the *CONTRACTOR* or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the work.

B. Product data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information prepared by the manufacturer and furnished by the *CONTRACTOR* to illustrate materials or equipment for some portion of the work. All such data shall be the manufacturer's current materials.

C. Samples are physical examples that illustrate materials, equipment or workmanship and establish standards by which the work will be judged.

1.03 SCHEDULING

A. Schedule submission for shop drawings, product data and samples, engineering drawings and calculations at least twenty-one (21) days before dates reviewed submittals will be needed.

B. Shop drawings, engineering drawings and calculations for equipment foundations will not be reviewed by the *ENGINEER* until shop drawings for equipment have been submitted and approved.

1.04 PRESENTATION

A. Present drawings, calculations and product data in a clear and thorough manner.

B. Drawings, calculations and product data shall be clear, concise, readable and legible.

C. Second, third, fourth, etc., generation photocopies are frequently illegible and may not be accepted as a required submission.

D. Drawings, calculations and product data sent via facsimile (fax) machine are frequently illegible and may not be accepted as a required submission.

E. *ENGINEER* will notify *CONTRACTOR* in the event submittals are illegible. No time extensions shall be allowed as a result of resubmittals due to illegibility.

1.05 SUBMITTALS

A. Schedule of Submittals:

1. Prepare and submit for approval a schedule showing each and every submittal required by the Contract Documents and their initial submittal dates required for coordination of the work.

2. Organize the schedule by the applicable specification Section number.

3. Submit the schedule within fourteen (14 days) after Notice to Proceed.

4. The schedule shall reflect the overall job schedule sequence so as to cause no delay in the Work of other Contractors, if any.

5. Revise and resubmit the schedule for approval when requested.

6. Prepare and transmit each submittal sufficiently in advance of scheduled performance to allow for adequate review and processing time, including time for re-submittal if necessary.

7. If processing time for a particular submittal will be critical to progress of the work, so advise on the submittal.

8. No extension of time will be authorized because of the contractor's failure to transmit submittals sufficiently in advance of the work.

B. Shop drawings:

1. Original drawings, prepared by *CONTRACTOR*, subcontractor, supplier or distributor, that illustrate some portion of the work; showing fabrication, layout, setting or erection details.

2. Present drawings in a clear and thorough manner: Details shall be identified by reference to sheet and detail, schedule or room numbers shown on *Contract Drawings*.

3. Minimum sheet size: 11 inches by 17 inches.

C. Product data:

1. Preparation:

a. Clearly mark each copy to identify pertinent products or models.

b. Show performance characteristics and capacities.

c. Show dimensions and clearances required.

d. Show wiring or piping diagrams and controls.

2. Manufacturer's standard schematic drawings and diagrams:

a. Modify drawings and diagrams to delete information not applicable to the work.

b. Supplement standard information to provide information specifically applicable to the work.

3. Manufacturer's catalog sheets, brochures, diagrams, illustrations and other standard descriptive data:

a. Clearly mark each copy to identify pertinent materials, products or models.

b. Show dimensions and clearances required.

c. Show compliance with referenced standards.

D. Color selections:

1. All colors for all finished surfaces and materials will be selected by *ARCHITECT* and approved by the *OWNER*. The exterior color selections will be made at one time and the interior color selections will be made at one time to provide a complete and coordinated color schedule that, upon acceptance of the *OWNER*, will be provided to the *CONTRACTOR*.

2. The Contractor shall submit all exterior color selections/samples within thirty (30) days and all interior color selections/samples within forty-five (45) days after "Notice to Proceed."

3. It is imperative that all color information be submitted to, the *ENGINEER* by the *CONTRACTOR* before color selections can be made. If any color

selection information is not available when colors are needed to meet the project schedule, the *ENGINEER* will select colors from one of the named manufacturers in the specifications, and the *CONTRACTOR* will be required to exactly match that color. A claim for delay will not be accepted if the color schedule is late due to the failure of the *CONTRACTOR* to provide the *ENGINEER* with all required color information, nor will an adjustment in price be entertained if the selected color is not available from the manufacturer the *CONTRACTOR* intended to use, but neglected to submit.

E. Samples:

1. Office samples will be of sufficient size and quantity to clearly illustrate:

   a. Functional characteristics of product or material with integrally related parts and attachment devices.

   b. Full range of color, texture, and pattern.

   c. After review samples will be retained by *ENGINEER*. Upon completion of the work, *CONTRACTOR* may submit written request for return of samples.

2. Field samples and mock-ups:

   a. Erect at project site or at location acceptable to *ENGINEER*.

   b. Size or Area: As specified in the respective specification section.

   c. Fabricate each sample and mock-up complete and finished.

   d. Remove mock-ups at conclusion of work or when acceptable to *ENGINEER*.

F. Engineering drawings:

1. Engineering drawings shall provide sufficient data regarding member sizes, arrangement, connection and joint details and material properties that fully substantiates the assembly or item involved can safely withstand the specified design loads and/or meet the performance criteria.

2. Engineering drawings shall be done in conformance with the appropriate material code as referenced in the currently adopted International Building

Code – New Jersey Edition or, when applicable, the specified industry standard.

3. All engineering drawings shall be done to scale, shall state the design loads and/or performance criteria and shall be signed and sealed by a Professional Engineer licensed in the State of New Jersey.

G. Engineering calculations:

1. Engineering calculations shall, in an orderly and thorough manner, provide sufficient analytical data that fully substantiates that the assembly or items addressed can safely withstand the specified design loads and/or meet the performance criteria.

2. Unless otherwise specified or indicated on the plans, all engineering design shall be done in accordance with the currently adopted Codes and Subcodes adopted and referenced in the Uniform Construction Code of the State of New Jersey; N.J.A.C. 5:23-1 et seq.

3. All engineering calculations shall state the design loads and/or performance criteria and shall be signed and sealed by a Professional Engineer licensed in the State of New Jersey.

1.06 CONTRACTOR'S RESPONSIBILITIES

A. Review shop drawings, product data, samples, engineering drawings and calculations prior to submission.

B. Determine and verify:

1. Field measurements.

2. Field construction criteria.

3. Catalog numbers and similar data.

4. Conformance with specifications.

C. Coordinate each submittal with requirements of the work and of the *Contract Documents*.

D. **All copies of all** shop drawings, product data and samples, engineering drawings and calculations shall be accompanied by a transmittal containing Contractor

Certification that he has determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and that he has checked and coordinated each item with other related submittals and all other contract requirements. **A copy of the required Submittal Form is included at the end of this specification section**.

E. *CONTRACTOR'S* responsibility for errors and omissions in submittals is not relieved by *ENGINEER'S* review of submittals.

F. *CONTRACTOR'S* responsibility for deviations in submittals from requirements of *Contract Documents* is not relieved by *ENGINEER'S* review of submittals, unless *ENGINEER* gives written acceptance of specific deviations.

G. Notify *ENGINEER*, in writing at time of submission, of deviations in submittals from requirements of *Contract Documents*.

H. Begin no fabrication or work that requires submittals until return of submittals with *ENGINEER'S* stamp and initials or signature indicating review and that no further submissions are required. Any manufacturing done, shipment made, workmanship performed, or work installed before the required shop drawings, product data, samples, engineering drawings, or engineering calculations are returned indicating that no further submissions are required will be at the sole expense and responsibility of the *CONTRACTOR* and subject to rejection.

1.07 ENGINEERS RESPONSIBILITIES

A. Engineering duties:

1. Review submittals with reasonable promptness.

2. Review for:

   a. Design concept of project.

   b. Information given in *Contract Documents*.

3. Review of separate item does not constitute review of an assembly in which item functions.

4. Affix stamp and initials or signature certifying to review of submittal.

5. Return submittals to *CONTRACTOR* for distribution or resubmission.

B. The *ENGINEER* shall review all shop drawings, product data, samples, engineering drawings and calculations. The submittal shall be marked as follows:

1. No exceptions taken; no further submission required.

2. Note markings; no further submission required.

3. Note markings; further submission required.

4. Rejected.

C. The *ENGINEER* will review the original submittal and one resubmittal at no additional cost to the *CONTRACTOR*.

D. In the event there are more than two (2) submittals for the given product, the *ENGINEER* shall record the time required for the subsequent reviews. The *ENGINEER* shall deduct the cost of said review(s) from the current estimate, defining amounts due the *CONTRACTOR*. The costs shall be based upon the same rates paid to the *ENGINEER* by the *OWNER* for similar work.

E. In the event that any submittal is rejected and a new submittal is prepared that must be resubmitted for review by the *CONTRACTOR*, the resubmittal shall be counted as the third submittal for the purposes of determining review costs(s).

1.08 SUBMISSION REQUIREMENTS

A. Make submittals so as to cause no delay in the work or in the work of any other *CONTRACTOR*.

B. Number of submittals required:

1. Shop drawings, engineering drawings and calculations: Submit high resolution electronic copies.

2. Product data: Submit high resolution electronic copies.

3. Samples: Submit number stated in each specification section.

C. Accompany submittals with Submittal Transmittal Form contained herein, in duplicate containing:

1. Date of submission and dates of any previous submissions.

2. Project title and contract number.

3. *CONTRACTOR'S* name.

4. The number of each shop drawing, product data and sample submitted.

5. Notification of deviations from *Contract Documents*.

6. Other pertinent data.

D. Submittals shall include:

1. Date and revision date.

2. Project title and number.

3. The names of:

a. *ENGINEER*

b. *CONTRACTOR*

c. Subcontractor

d. Supplier

e. Manufacturer

f. Separate details when pertinent.

4. Identification of product or materials.

5. Field dimensions, clearly identified as such.

6. Specification Section number.

7. Relation to adjacent or critical features of the work or materials.

8. Applicable standards, such as ASTM or Federal Specification numbers.

9. Identification of deviations from *Contract Documents*.

10. Identification of revisions on resubmittals.

11. An 8-inch by 3-inch blank space for *CONTRACTOR* and *ENGINEER* stamps.

12. *CONTRACTOR'S* stamp, initialed or signed, certifying to review of submittal, verification of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the work and of *Contract Documents*.

13. Engineering drawings and calculations must be signed and sealed by a Professional Engineer licensed in the State of New Jersey.

1.09 RESUBMISSION REQUIREMENTS

A. Make any corrections or changes in the submittals required by the *ENGINEER* and resubmit until no further submissions are required.

B. Shop drawings, engineering drawings, calculations and product data:

1. Revise initial drawings, calculations or data, and resubmit as specified for the initial submittal.

2. Clearly indicate any and all changes made to the submittal.

C. Samples: Submit new samples as required for initial submittals.

1.10 DISTRIBUTION

A. Distribute reproductions of shop drawings, engineering drawings, calculations and copies of Product data that carry the *ENGINEER* stamp to:

1. Subcontractors.

2. Supplier.

3. Contractor’s file.

B. Distribute samples that carry the *ENGINEER* stamp as directed by *ENGINEER*.

****END OF SECTION****

SUBMITTAL TRANSMITTAL FORM

_____ _____ _____

CONTRACTOR NAME Contract # Project Title

_____ _____ _____

Date of this Submission Date of Prior Submission Submittal Number

Specification Section #: _____ Paragraph #:_____ Drawing #:_____ Detail/Section #:_____

TYPE OF SUBMITTAL:

___ Shop Drawings ___ Product Data ___ Sample ___ Test Report ___ Color Charts ___ O&M Manuals

___ Engineering Drawings___ Engineering Calculations ___ Other

IS THIS A:

___ Complete Submission ___ Partial Submission ___ Resubmission ___ Substitution

(Substitutions must be identified and accompanied by a Request for Substitution in accordance with Section 01 25 13)

LIST EACH ITEM SUBMITTED

_____

_____

_____

List and describe any deviations from the Contract Documents (attach additional sheets as required)

_____

_____

_____

CONTRACTOR CERTIFICATION

By this submittal, the Contractor named above hereby represents that he has determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and has checked and coordinated each item with other applicable shop drawings and all contract requirements, except for the specific deviations noted.

_____ _____

Signature of Contractor's Authorized Representative Date

SECTION 01 45 29
(01410)
TESTING LABORATORY SERVICES

1.01 GENERAL

A. *CONTRACTOR* shall employ and pay for the services of an Independent Testing Laboratory to perform specified testing. Include such costs in overall contract price.

1. Employment of the laboratory shall in no way relieve *CONTRACTOR'S* obligations to perform the work of the contract.

B. Related requirements specified elsewhere:

1. Inspections and testing required by law, ordinances, rules, regulations, orders or approval of public authorities: General Conditions.

2. Certification of products. The respective sections of these *Specifications*.

3. Test, adjust and balance equipment. The respective sections of these *Specifications*.

4. Laboratory testing, sampling required, and standards for testing: See each Specification Section listed below:

a. *Section 03 30 00: Concrete*

b. *Section 31 23 00: Excavating, Filling and Grading*

1.02 QUALIFICATION OF LABORATORY

A. Meet "Recommended Requirements for Independent Laboratory Qualification", published by American Council of Independent Laboratories.

B. Meet basic requirements of ASTM E-329, "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction."

C. Authorized to operate in the state in which the project is located, and acceptable to *OWNER*.

D. Testing equipment: Calibrated at reasonable intervals by devices of accuracy traceable to either:

1. National Bureau of Standards.

2. Accepted values of natural physical constants.

E. If requested by *ENGINEER*, submit copy of report of inspection of facilities made by Materials Reference Laboratory of National Bureau of Standards during the most recent tour of inspection.

1.03 LABORATORY DUTIES

A. Cooperate with *ENGINEER* and *CONTRACTOR*. Provide qualified personnel after due notice.

B. Perform specified inspections, sampling and testing of materials.

1. Comply with specified standards for testing.

2. Ascertain compliance of materials with requirements of *Contract Documents*.

C. Promptly notify *ENGINEER* and *CONTRACTOR* of observed irregularities or deficiencies of work or products.

D. Promptly submit six (6) copies of written report of each test and/or inspection to *ENGINEER*. Each report shall include:

1. Date issued.

2. Project title and number.

3. Testing laboratory name, address and telephone number.

4. Name and signature of laboratory inspector.

5. Date and time of sampling or inspection.

6. Record of temperature and weather condition.

7. Date of test.

8. Identification of product and specification section.

9. Location of sample or test in the project.

10. Type of inspection or test.

11. Results of tests and compliance with *Contract Documents*.

12. Interpretation of test results, when requested by *ENGINEER*.

E. Perform additional tests as required by *ENGINEER* or the *OWNER*.

1.04 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

A. Laboratory is not authorized to:

1. Release, revoke, alter or enlarge on requirements of *Contract Documents*.

2. Approve or accept any portion of the work.

3. Perform any duties of the *CONTRACTOR*.

1.05 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with laboratory personnel, provide access to work.

B. Secure and deliver to the laboratory adequate quantities of representative samples of materials proposed to be used and which require testing.

C. Provide to the laboratory the design mix proposed to be used for concrete, and other material mixes, which require control by the testing laboratory.

D. Furnish incidental labor and facilities:

1. To provide access to work to be tested.

2. To obtain and handle samples at the project site or at the source of the product to be tested.

3. To facilitate inspections and tests.

4. For storage and curing of test samples.

E. Notify laboratory sufficiently in advance of operations to allow for assignment of personnel and scheduling of tests.

F. Make arrangements with laboratory and pay for additional samples and tests required for *CONTRACTOR'S* convenience.

G. Employ and pay for the services of a separate, equally qualified independent testing laboratory to perform additional sampling and testing required when initial tests indicate work does not comply with *Contract Documents*.

****END OF SECTION****

SECTION 01 52 13
(01590)
FIELD OFFICES AND SHEDS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Furnish, install and maintain temporary field offices and storage sheds during the entire construction period.

2. Provide *ENGINEER's* temporary field office, complete with all appurtenances within fourteen (14) days of Notice to Proceed.

3. At completion of work, remove field offices, sheds and contents.

4. Design anchorage and foundations for temporary offices and sheds.

5. Obtain all building permits required for field offices and sheds.

B. Related work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 01 11 00: Statement of Work*

1.02 REQUIREMENTS OF REGULATORY AGENCIES

A. Comply with requirements of Federal, State and Local codes and regulations.

1. Field offices shall conform to the requirements of N.J.A.C. 5:23-4A and be labeled in accordance with N.J.A.C. 5:23-4A.8.

B. Design requirements:

1. General: The temporary facilities, unless otherwise indicated, shall be designed, constructed and erected in accordance with the New Jersey Uniform Construction Code, the 2021 International Building Code, and the 2021 National Standard Plumbing Code and the design criteria

specifications. Where member sizes have been indicated, they shall be the minimum acceptable.

2. Design loads: Anchorage for temporary facilities shall be designed to withstand 30 lb./S.F. lateral windload and 15 lb./S.F. uplift with a 1.5 safety factor against uplift and overturning.

3. Engineering certification: Provide written structural calculations and drawings prepared and certified by a Professional Engineer registered in the State of New Jersey showing that the proposed anchorage meets the above design requirements.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. *Specifications* and other data required to demonstrate compliance with the specified requirements.

3. Manufacturer's current recommended installation procedures.

C. Shop drawings showing precise dimensions and floor plans of the work of this section, and all other data needed to ensure proper installation.

D. Engineering data for the proposed anchorage system.

1.04 REQUIREMENTS FOR FACILITIES

A. Construction:

1. Structurally sound, weathertight, with floors raised above ground.

2. Temperature transmission resistance: Compatible with occupancy and storage requirements.

3. At *CONTRACTOR'S* option, portable or mobile buildings may be used.

B. Office for *ENGINEER* and *OWNER'S* Representative:

1. A separate space for the sole use of designated occupants, with secure entrance doors and one key per occupant.

2. Area: 400 square ft. minimum, with minimum dimension 10ft.

3. Windows:

   a. Minimum: Six (6), with a minimum total area of 10% of floor area.

   b. Operable sash and insect screens.

   c. Locate to provide views of construction areas.

4. Furnishings:

   a. Two (2) standard size desks with three drawers:

   b. Two (2) drafting tables: 39 in. x 72 in. x 36 in. high, with one equipment drawer (each).

      Locate table oriented in relation to the site at a window with a view of the site.

   c. One (1) coat rack for six (6) coats.

   d. One (1) plan rack to hold a minimum of six racks of project drawings.

   e. Two (2) standard five-drawer legal-size metal filing cabinets with locks and keys.

   f. One (1) swivel arm chair per desk.

   g. Two (2) straight chairs per desk.

   h. One (1) drafting table and stool.

   i. One (1) waste basket per desk and table.

   j. One (1) tack board, 36 in. wide x 30 in. high.

5. Services:

   a. Lighting: 50 foot-candles at desk top height.

   b. Exterior lighting at entrance door.

   c. Automatic heating and air conditioning equipment to maintain comfort conditions.

   d. Minimum of twelve (12) 110 volt duplex electric convenience outlets, at least two (2) on each wall.

   e. Electric distribution panel: Two (2) circuits minimum, 110 volt, 60 hertz service.

   f. Toilet facilities.

C. *CONTRACTOR'S* office and facilities:

   1. Size: As required for general use and to provide space for project meetings.

   2. Lighting and temperature control: As specified for *ENGINEER's* office.

   3. Telephone: One (1) direct line instrument (minimum).

   4. Furnishings in meeting area:

      a. Conference table and chairs for at least eight (8) persons.

      b. Racks and files for project record documents in, or adjacent to, the meeting area.

   5. Other furnishings: *CONTRACTOR'S* option.

   6. One 10 in. (250 mm.) outdoor-type thermometer.

D. Storage sheds:

   1. To requirements of the various trades.

   2. Dimensions: Adequate for storage and handling of products.

3. Ventilation: Comply with specified and code requirements for the products stored.

4. Heating: Adequate to maintain temperatures specified in the respective sections for the products stored.

1.05 USE OF EXISTING FACILITIES

A. Existing facilities at the site shall not be used for field offices or for storage.

1.06 USE OF PERMANENT FACILITIES

A. Permanent facilities shall not be used for field offices or for storage.

PART 2 - PRODUCTS

2.01 MATERIALS, EQUIPMENT, FURNISHINGS

A. May be new or used, but must be serviceable, clean, adequate for the required purpose, and must not violate applicable codes or regulations.

PART 3 - EXECUTION

3.01 PREPARATION

A. Prior to installation of offices and sheds, consult with *ENGINEER* on location, access and related facilities.

B. Fill and grade sites for temporary structures to provide surface drainage.

3.02 INSTALLATION

A. Construct temporary field offices and storage sheds on proper foundations, provide connections for utility services.

1. Secure portable or mobile buildings when used.

2. Provide steps and landings at entrance doors.

B. Mount thermometer at convenient outside location, not in direct sunlight.

3.03 MAINTENANCE AND CLEANING

A. Provide periodic maintenance and cleaning for temporary structures, furnishings, equipment and services.

B. Vacuum and sweep, dust, empty all wastebaskets and clean facilities in *ENGINEER'S* field office weekly. Coordinate with *ENGINEER* for scheduling.

3.04 REMOVAL

A. Remove temporary field offices, contents and services at a time when no longer needed.

B. Remove storage sheds when they are no longer needed.

C. Remove foundations and debris; grade the site to required elevations and clean the area.

D. Provide permanent cover or landscaping as specified.

PART 4 - PAYMENT

4.01 TEMPORARY FIELD OFFICES AND SHEDS

A. No separate payment shall be made for this item. Include all costs for this item in the prices bid for the various related items of work as designated in the *PROPOSAL*.

B. *ENGINEER* shall pay for long distance calls placed by his representatives on phones for their use based upon phone company billing. *CONTRACTOR* shall pay all other charges for installation, maintenance, removal and calls within local dialing area.

C. *ENGINEER* shall pay all costs for local and long distance use of the Facsimile machine and shall supply plain paper. *CONTRACTOR* shall supply special paper and pay all costs for installation, maintenance, removal and other charges.

D. *CONTRACTOR* shall pay all costs associated with providing desktop copier with maintenance contract. *ENGINEER* shall supply plain paper.

****END OF SECTION****

SECTION 01 54 00
(01520)
CONSTRUCTION AIDS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Furnish, install and maintain required construction aids, remove on completion of work.

B. Related work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 01 11 00: Statement of Work*

1.02 REQUIREMENTS OF REGULATORY AGENCIES

A. Comply with Federal, State and local codes and regulations.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions, as approved by the *ENGINEER*, will provide the basis for acceptance or rejection of the work performed under this section.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Materials may be new or used, suitable for the intended purpose, but must not violate requirements of applicable codes and standards.

2.02 CONSTRUCTION AIDS

A. Provide construction aids and equipment required by personnel and to facilitate the execution of the work; scaffolds, staging, ladders, stairs, ramps, runways, platforms, railings, hoists, cranes, chutes and other such facilities and equipment.

1. Refer to respective sections for particular requirements for each trade.

B. Designated stairs in existing building may be used by, construction personnel:

1. As directed by the *OWNER*.

C. Maintain all facilities and equipment in a first-class condition.

2.03 TEMPORARY ENCLOSURES

A. Provide temporary weathertight enclosure of exterior walls for successive areas of the building as work progresses, as necessary to provide acceptable working conditions, provide weather protection for interior materials, allow for effective temporary heating, and to prevent entry of unauthorized persons.

1. Provide temporary exterior doors with self-closing hardware and padlocks.

2. Other enclosures shall be removable as necessary for work and for handling of materials.

B. Provide temporary enclosures to separate work areas from the areas of existing building occupied by *OWNER*; to prevent penetration of dust or moisture into occupied areas, to prevent damage to existing equipment, and to protect *OWNER'S* employees and operations from construction work.

1. Temporary partition and ceiling enclosures: Framing and sheet materials, which comply with structural and fire rating requirements of applicable codes and standards.

a. Close joints between sheet materials, and seal edges and intersections with existing surfaces, to prevent penetration of dust or moisture.

b. In locations where fire protection is required, paint both sides of partitions and ceilings with fire-retardant paint to provide maximum flame spread of 25 when tested under ASTM E84, or as required by local fire regulations.

PART 3 - EXECUTION

3.01 PREPARATION

A. Consult with *ENGINEER*, review site conditions and factors which affect construction procedures and construction aids, including adjacent properties and public facilities which may be affected by execution of the work.

3.02 GENERAL

A. Comply with applicable requirements specified in sections of Divisions 2 through 16.

B. Relocate construction aids as required by progress of construction, by storage or work requirements, and to accommodate legitimate requirements of *OWNER* and other *CONTRACTORS* employed at the site.

3.03 REMOVAL

A. Completely remove temporary materials, equipment and services:

1. When construction needs can be met by use of permanent construction.

2. At completion of the project.

B. Clean, repair damage caused by installation or by use of temporary facilities.

1. Remove foundations and underground installations for construction aids.

2. Grade the areas of the site affected by temporary installations to required elevations and slopes, and clean the area.

C. Restore existing facilities used for temporary purposes to be specified, or to original, condition.

****END OF SECTION****

SECTION 01 56 00
(01530)
BARRIERS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Provide barriers to prevent unauthorized entry to construction areas to allow for Owner's use of site, and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by authorities having jurisdiction for public rights-of-way and for public access to existing building.

C. Provide protection for plants designated to remain. Replace damaged plants.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

E. Remove when no longer needed, or at completion of work.

F. Related work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 01 11 00: Statement of Work*

3. *Section 01 54 00: Construction Aids*

1.02 REQUIREMENTS OF REGULATORY AGENCIES

A. Comply with Federal, State and local codes and regulations.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General: Materials may be new or used, suitable for the intended purpose, but must not violate requirements of applicable codes and standards.

2.02 BARRIERS

A. Materials to *CONTRACTOR'S* option, minimum fence height 6 feet.

PART 3 - EXECUTION

3.01 GENERAL

A. Install facilities of a neat and reasonable uniform appearance, structurally adequate for the required purposes.

B. Maintain barriers during entire construction period.

C. Relocate barriers as required by progress of construction.

3.02 BARRIERS

A. Prior to the start of work at the project site, install enclosure fence with suitably locked entrance gates.

1. Locate fence to enclose substantially the entire project site, or that portion the *CONTRACTOR* establishes as required to encompass the entire project construction operation.

2. Locate vehicular entrance gates in suitable relation to construction facilities; and to avoid interference with traffic on public thoroughfares.

3. Locate pedestrian entrance gates as required to provide controlled personnel entry, in suitable relation to construction parking facilities.

B. Construct open-mesh fence in accordance with industry standards.

3.03 TREE AND PLANT PROTECTION

A. Preserve and protect existing trees and plants at the site, which are designated to remain, and those adjacent to the site.

B. Consult with *ARCHITECT/ENGINEER*, and remove agreed-on roots and branches, which interfere with construction.

1. Employ qualified tree surgeon to remove, and to treat cuts.

C. Provide temporary barriers to a height of 6 feet, around each, or around each group of trees and plants.

D. Protect root zones of trees and plants:

1. Do not allow vehicular traffic or parking.

2. Do not store materials or products.

3. Prevent dumping of refuse or chemically injurious materials or liquids.

4. Prevent puddling or continuous running water.

E. Carefully supervise excavating, grading and filling, and subsequent construction operations, to prevent damage.

F. Replace, or suitably repair, trees and plants designated to remain which are damaged or destroyed due to construction operations.

3.04 REMOVAL

A. Completely remove barricades, including foundations, when construction has progressed to the point that they are no longer needed, and when approved by *ARCHITECT/ENGINEER*.

B. Clean and repair damage caused by installation, fill and grade the areas of the site to required elevations and slopes, and clean the area.

PART 4 - PAYMENT

4.01 BARRIERS

A. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

B. Include all costs for *BARRIERS* in the prices bid for the various related items of work as designated in the Proposal.

****END OF SECTION****

SECTION 01 56 19
(01564)
NOISE CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Requirements for controlling noise levels resulting from construction activities.

B. Related work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 01 57 13: Temporary Soil Erosion and Sediment Control Measures*

3. *Section 01 74 00: Cleaning and Restorations*

1.02 SYSTEM DESCRIPTION

A. The *CONTRACTOR* shall control the noise generated by his construction operations.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 PROJECT CONDITIONS

A. Noise caused by construction activities shall not exceed the levels permitted by applicable federal, state or local regulations.

B. All construction equipment powered by an internal combustion engine shall be equipped with a properly maintained muffler.

C. Air compressors shall be operated in accordance with the manufacturer's instructions for proper noise abatement.

D. Air-powered equipment shall be fitted with pneumatic exhaust silencers.

E. Stationary equipment powered by an internal combustion engine shall not be operated within 150 feet of noise sensitive sites without temporary noise barriers placed between the equipment and the noise sensitive sites. Noise sensitive sites shall include residential buildings, motels, hotels, schools, churches, hospitals, nursing homes, libraries and public recreation areas. Temporary noise barrier shall be constructed of plywood or tongue and groove boards with a noise absorbent treatment on the interior surface (facing the equipment).

F. Unless otherwise permitted, powered construction equipment shall not be operated before 7:00 A.M. or after 6:00 P.M. within 150 feet of a noise sensitive site. [NJAC 7:22-10.11(n)]

G. No driving, pulling, or other operations entailing the use of vibratory hammers or compactors shall be permitted other than between the hours of 8:00 A.M. and 5:00 P.M. [NJAC 7:22-10.11(n)]

H. The number of machines in operation at a given time shall be limited to the minimum practicable. [NJAC 7:22-10.11(n)]

PART 4 - PAYMENT

4.01 NOISE CONTROL

A. Unless otherwise noted in the *PROPOSAL* Section, no separate payment shall be made for this item.

B. Include all costs for the *NOISE CONTROL* in the prices bid for the various related items of work as designated in the *PROPOSAL*.

****END OF SECTION****

SECTION 01 56 20

DUST PROTECTION AND CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION

A. Purpose:

1. Protect the Owner's employees, equipment and property/improvements against dust generated by the Contractor's operations.

2. Protect the Contractor's employees against dust generated by the Contractor.

B. Related work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 02 41 19: Selective Demolition*

PART 2 - PRODUCTS

2.01 DEFINITIONS

A. Dust Collection System: A dust control system using ventilation principles to capture the dust filled air stream as it is generated and carry it away from the source through ductwork to a collector or other acceptable discharge point.

B. Wet Dust Suppression: Wet dust suppression techniques use water sprays to wet the material so that it generates less dust.

C. Airborne Dust Capture: Airborne dust capture involves a water spray technique where by airborne dust particles are sprayed with atomized water capturing the dust particles in water droplets.

D. Housekeeping Dust Control: Housekeeping dust control includes dusting/cleaning/vacuuming of surfaces exposed to dust and installation of sheet plastic barriers to prevent the spread of dust beyond the immediate work area.

PART 3 – EXECUTION

3.01 EQUIPMENT / MATERIALS

A. The Contractor shall submit to the *ENGINEER* a description of the system(s) to be employed and the equipment/materials to be used for dust control. The systems to be employed by the Contractor shall include a Dust Collection System, Wet Dust Suppression, Airborne Dust Capture and Housekeeping Dust Control.

B. Respirators shall be used in the work area in addition to the Dust Control Systems and Practices.

3.02 COMPLIANCE

A. Comply with United States Department of Labor, OSHA, Silica/Crystalline Dust Control Handbook, Chapter 3.

B. Comply with OSHA Standard for Respiratory Crystalline Silica Maximum Exposure Limits (29 CFR 455, 1910.1000).

C. If the *OWNER* determines that the Contractor means and methods for Dust Control are inadequate, the Contractor shall cease all work generating dust until additional dust control systems/methods are implemented.

D. Conduct final clean-up of work area surfaces and areas adjacent to the work area.

PART 4 - PAYMENT

4.01 DUST CONTROL

A. Unless otherwise noted in the *PROPOSAL* Section, no separate payment shall be made for this item.

B. Include all costs for the *DUST CONTROL* in the prices bid for the various related items of work as designated in the *PROPOSAL*.

****END OF SECTION****

SECTION 01 57 13
(01563)
TEMPORARY SOIL EROSION AND SEDIMENT CONTROLS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Provide temporary control measures for the life of the contract as shown on Plans, to control erosion and sedimentation through use of berms, dikes, dams, sediment basins, fiber mats, netting, gravel, mulches, grasses, and other erosion control devices or methods.

2. Control soil erosion to the maximum extent practicable commensurate with reasonable and economical construction practices.

3. The temporary control provisions contained herein shall be coordinated with the permanent erosion control features (grass, pavement and other restorations) specified elsewhere to the extent practical to assure economical, effective and continuous erosion control throughout the construction and post-construction period.

4. The erosion control measures shall be continued until the construction is complete and final restorations installed.

5. Wherever construction exposes work, which is subject to erosion control measures or other work to be completed within such areas shall follow as soon after exposure as practicable.

6. All erosion and sedimentation control measures shall be constructed and maintained in accordance with the "Standards for Soil Erosion and Sediment Control in New Jersey", prepared by the New Jersey State Soil Conservation Committee, 7th Edition, January 2014, Revised July 2017. [NJAC 7:22-10.11(c) 2]

B. Related work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 31 10 00: Clearing Site*

3. *Section 31 23 00: Excavating, Filling and Grading*

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

C. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by, the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 MATERIALS

A. All materials and methods of construction shall be in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey, 7th Edition, January 2014, Revised July 2017.

B. Mulches may be hay, straw, fiber mates, netting, wood cellulose, corn or tobacco stalks, bark, corncobs, wood chips, or other suitable material and shall be reasonably clean and free of noxious weeds and deleterious materials.

C. Grass shall be a quick growing species (such as rye grass, Italian rye grass, or cereal grasses) suitable to the area providing a temporary cover.

D. Fertilizer and soil conditioners shall be a standard commercial grade.

E. Others materials.

1. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 PRECONSTRUCTION CONFERENCE

A. At the preconstruction conference or prior to the start of the applicable construction, the *CONTRACTOR* shall submit for acceptance his schedules for accomplishment of temporary and permanent erosion control work, as are applicable for excavation work, and any other elements of the project which may contribute to ground erosion or siltation. No work shall be started until the erosion control measures are in place.

3.03 INSTALLATION

A. Limit the surface area of erodible earth material exposed by excavation and grading operations, and provide immediate permanent or temporary pollution control measures to prevent contamination of adjacent streams, water courses, or bodies of water. Such work may involve the construction of temporary berms, dikes, dams, sediment basins, slope drains, and use of temporary mulches, mats, seeding or other control devices or methods as necessary to control erosion. Cut slopes shall be temporarily seeded and mulched as the excavation proceeds to the extent considered desirable and practicable.

B. All erosion and sedimentation control measures shall be in place prior to any grading operations or construction of proposed facilities and shall be maintained until construction is complete and the construction area is stabilized. After restoration is complete, temporary control measures shall be removed and disposed of properly. [NJAC 7:22-10.11(c) 1].

C. Disturbed areas that will be exposed in excess of 10 days shall be temporarily seeded and/or mulched until proper weather conditions exist for establishment of a permanent vegetative cover except in areas where final restoration is expected to be completed within seven (7) days after the completion of construction, in which case no temporary protective measures will be required. If final restoration is expected to begin more than seven (7) days and completed more than thirty (30) days after the start of construction, seeding shall be required for temporary protection, except where seasonal conditions are not suitable for growing vegetation. In this case, mulch may be applied until conditions are suitable for establishing vegetative cover or until final restoration is implemented. [NJAC 7:22-10.11(c) 3]

D. Temporary control measures will be used to correct conditions that develop during construction that are needed prior to installation or permanent control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

E. Where erosion is likely to be a problem, excavation and grading operations shall be so scheduled and performed that permanent erosion control features can follow immediately; otherwise temporary erosion control measures may be required between successive construction stages.

F. Limit the area of excavation and grading operations in progress commensurate with progress in keeping the finish permanent pollution control measures current in accordance with the accepted schedule. Should seasonal limitations make such

coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified.

G. In the event of conflict between these requirements and pollution control laws, rules, or regulations of other federal or state or location agencies, the more restrictive laws, rules, or regulations shall apply.

H. The *CONTRACTOR* will be responsible for maintaining all soil erosion and sediment control measures in an acceptable manner. All temporary measures shall be removed by, the *CONTRACTOR* at completion of project after permanent measures are in place and have been accepted.

PART 4 - PAYMENT

4.01 TEMPORARY SOIL EROSION AND SEDIMENT CONTROL MEASURES

A. No separate measurement will be made for the work of this section.

B. Payment will be made for the lump sum price bid in the Proposal for the item *SITE AND SOIL EROSION CONTROLS* which price shall include all materials, equipment, labor, and tools necessary and shall include those items, which are considered to be an integral part of this work that may be specified elsewhere in these *Specifications*.

C. In case of repeated failures on the part of the *CONTRACTOR* to control erosion, pollution, and/or siltation, the *OWNER* reserves the right to employ outside assistance or to use his own forces to provide the necessary corrective measures. Such incurred costs will be charged to the *CONTRACTOR*.

****END OF SECTION****

SECTION 01 61 00
(01600)
MATERIALS AND EQUIPMENT

1.01 GENERAL

A. Material and equipment incorporated into the work:

1. Conform to applicable *Specifications* and standards.

2. Comply with size, make, type and quality specified, or as specifically approved in writing by the *ENGINEER*.

3. Manufactured and fabricated products:

a. Design, fabricate and assemble in accord with the best engineering and shop practices.

b. Manufacture like parts of duplicate units to standard sizes and gauges to be interchangeable.

c. Two or more items of the same kind shall be identical, by the same manufacturer.

d. Products shall be suitable for service conditions.

e. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.

4. Do not use material or equipment for any purpose other than that for which it is designed or is specified.

B. Related requirements in other parts of the Contract Documents: See the General Provisions.

1.02 REUSE OF EXISTING MATERIAL

A. Except as specifically indicated or specified, materials and equipment removed from the existing structure shall not be used in the completed work.

B. For material and equipment specifically indicated or specified to be reused in the work:

1. Use special care in removal, handling, storage and reinstallation to assure proper function in the completed work.

2. Arrange for transportation, storage and handling of products which require off-site storage, restoration or renovation. Pay all costs for such work.

1.03 MANUFACTURER'S INSTRUCTIONS

A. When *Contract Documents* require that installation of work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation, including two (2) copies to *ENGINEER*.

Maintain one (1) set of complete instructions at the job site during installation and until completion.

B. Handle, install, connect, clean, condition and adjust products in strict accord with such instructions and in conformity with specified requirements.

1. Should job conditions or specified requirements conflict with manufacturer's instructions consult with *ENGINEER* for further instructions.

2. Do not proceed with work without clear instructions.

C. Perform work in accord with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by *Contract Documents*.

1.04 TRANSPORTATION AND HANDLING

A. Arrange deliveries of products in accord with construction schedules, coordinate to avoid conflict with work and conditions at the site.

1. Deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.

2. Immediately on delivery, inspect shipments to assure compliance with requirements on *Contract Documents* and approved submittals, and that products are properly protected and undamaged.

B. Provide equipment and personnel to handle products by methods to prevent soiling or damage to products or packaging.

1.05 STORAGE AND PROTECTION

A. Store products in accord with manufacturer's instructions, with seals and labels intact and legible.

1. Store products subject to damage by the elements in weathertight enclosures.

2. Maintain temperature and humidity within the ranges required by manufacturer's instructions.

B. Exterior storage:

1. Store fabricated products above the ground, on blocking or skids, prevent soiling or staining. Cover products which are subject to deterioration with impervious sheet coverings, provide adequate ventilation to avoid condensation.

2. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.

C. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, and free from damage or deterioration.

D. Protection after installation: Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. Remove when no longer needed.

1.06 SUBSTITUTIONS AND PRODUCT OPTIONS

A. Products list: Within thirty (30) days after contract date, submit to *ENGINEER* a complete list of major products proposed to be used, with the name of the manufacturer and the installing subcontractor.

B. Contractor's options:

1. For products specified only by reference standard, select any product meeting that standard.

2. For products specified by naming several products or manufacturers, select any one (1) of the products or manufacturers named, which complies with the *Specifications*.

3. For products specified by naming one (1) or more products or manufacturers and "or equal," *CONTRACTOR* must submit a request as for substitutions for any product or manufacturer not specifically named.

C. Substitutions: Submit requests for substitutions as specified in Section 01 25 13.

****END OF SECTION****

SECTION 01 66 00
(01620)
STORAGE AND PROTECTION

PART 1 - GENERAL

1.01 SUMMARY

A. Protect products scheduled for use in the Work by means including, but not necessarily limited to, those described in this Section.

B. Related work:

1. Additional procedures also may be prescribed in other Sections of these *Specifications*.

1.02 QUALITY ASSURANCE

A. Include within the *CONTRACTOR'S* quality assurance program such procedures as are required to assure full protection of work and materials.

1.03 MANUFACTURERS' RECOMMENDATIONS

A. Except as otherwise approved by the *ENGINEER*, determine and comply with manufacturer's recommendations on product handling, storage, and protection.

1.04 PACKAGING

A. Deliver products to the job site in their manufacturer's original container, with labels intact and legible.

1. Maintain packaged materials with seals unbroken and labels intact until time of use.

2. Promptly remove damaged materials and unsuitable items from the job site, and promptly replace with material meeting the specified requirements, at no additional cost to the *OWNER*.

3. Leave all plugs and caps in place on equipment and machinery.

B. The *ENGINEER* may reject as non-complying such material and products that do not bear identification satisfactory to the *ENGINEER* as to manufacturer, grade, quality, and other pertinent information.

1.05 PROTECTION

A. Protect finished surfaces, including jambs and soffits of openings used as passageways, through which equipment and materials are handled.

B. Provide protection for finished floor surfaces in traffic areas prior to allowing equipment or materials to be removed over such surfaces.

C. Maintain finished surfaces clean, unmarred, and suitably protected until accepted by the *OWNER*.

D. During construction, properly cap all pipes and equipment nozzles so as to prevent the entrance of sand, dirt, etc.

1.06 REPAIRS AND REPLACEMENTS

A. In event of damage, promptly make replacements and repairs to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

B. Additional time required to secure replacement and to make repairs will not be considered by the *ENGINEER* to justify an extension in the Contract Time of Completion.

****END OF SECTION****

SECTION 01 74 00
(01710)
CLEANING AND RESTORATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Maintain premises and public properties free from accumulations of waste, debris and rubbish caused by work operations.

2. At completion of work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials; clean all sight exposed surfaces; leave project clean and ready for occupancy.

3. At completion of work, restore or replace, any public or private property disturbed or damaged by *CONTRACTOR'S* work operations to a condition at least equal to that existing prior to beginning work, or as otherwise specified. Materials, equipment and methods, shall be approved by the *ENGINEER*.

4. In landscaped areas, environmental features shall be replaced or restored to pre-disturbance conditions or better. This includes sodding, replacement of trees, shrubs, fences, drives and other landscape features in-kind. [N.J.A.C. 7:22-10.11(e) 5]

5. Final restoration shall be undertaken as soon as an area is no longer needed for construction, stockpiling or access. Excavated material unsuitable for backfill as set forth in N.J.A.C. 7:14-2.13 and considered to be solid waste pursuant to N.J.A.C. 7:26-1.6 shall be removed from the construction site and disposed of at a sanitary landfill approved and licensed by N.J.D.E.P. Excess excavated material which is not considered to solid waste pursuant to N.J.A.C. 7:26-1.6 shall be graded or removed in accordance with N.J.A.C. 7:22-10.11(l)3 and *Section 31 23 00, Excavating, Filling and Grading*. When access roads are no longer needed, road fill shall be removed and the access area shall be restored to pre-disturbance conditions. Care shall be taken to avoid damage to adjacent vegetation and to prevent the formation of depressions that would serve as mosquito pools. [N.J.A.C. 7:22-10.11(e) 1]

B. Related work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. General requirements for cleaning and restorations: See the General Conditions.

3. In addition to standards described in the Section, comply with requirements for cleaning and restorations as described in pertinent other Sections of these *Specifications*.

C. References:

1. New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction, 2019, and all amendments thereto (Standard Specifications).

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by, the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 MATERIALS

A. Use only those cleaning materials which will not create hazards to health or property and which will not damage surfaces.

B. Use only cleaning materials recommended by manufacturer of surface to be cleaned.

C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

D. For restorations, use only materials approved by *ENGINEER*.

PART 3 - EXECUTION

3.01 REQUIREMENTS OF REGULATORY AGENCIES

A. Dispose of all non-recyclable solid waste materials in permanently established licensed OSWA (Office of Solid Waste Administration, New Jersey Department of Environmental Protection) landfills, or in temporary landfill sites approved by OSWA.

B. Dispose of all recyclable materials such as concrete, asphalt, wood waste, yard waste and similar materials at a recycling facility properly licensed to accept such waste materials.

C. Waste materials include, but are not limited to, concrete, blacktop, trees, stumps, lumber and timbers, unacceptable backfill material including heavy clay soils, organic materials, silts and rock.

3.02 SAFETY REQUIREMENTS

A. Hazards control:

1. Store volatile wastes in covered metal containers, and remove from premises daily.

2. Prevent accumulation of wastes, which create a hazardous condition.

3. Provide adequate ventilation during use of volatile or noxious substances.

B. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws:

1. Do not burn or bury rubbish and waste materials on project site.

2. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains.

3. Do not dispose of wastes into streams or waterways.

3.03 CLEANING DURING CONSTRUCTION

A. Execute periodic cleaning to keep the work, the site, and adjacent properties free from accumulations of waste materials, rubbish and windblown debris resulting from construction operations.

B. Provide on-site containers for the collection of waste materials, debris and rubbish.

C. Remove waste materials, debris and rubbish from site periodically and legally dispose at location provided by *CONTRACTOR*.

3.04 DUST CONTROL

A. Clean interior spaces prior to the start of finish painting and continue cleaning on an as-needed basis until painting is finished.

B. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly coated surfaces.

C. Wet down dry materials and rubbish to lay dust and prevent blowing dust.

D. Handle waste or surplus materials in a controlled manner with as few handlings as possible; do not drop or throw material from heights.

E. The *CONTRACTOR* shall employ construction methods and means that will keep flying dust to the minimum. He shall provide for the laying of water on the Project, and on roads, streets and other areas immediately adjacent to the Project limits, wherever traffic, or buildings that are occupied or in use, are affected by such dust caused by his hauling or other operations. The *CONTRACTOR* shall control dust using water. The cost of carrying out the foregoing provisions shall be included in the prices bid for the various items in the Contract.

F. The *CONTRACTOR* shall provide for prompt removal from existing roadways of all dirt and other materials that have been spilled, washed, tracked or otherwise deposited thereon by his hauling and other operations whenever the accumulation is sufficient to cause the formation of mud, interfere with drainage, damage pavements or create a traffic hazard.

G. In order to control dust, as often as required during each working day, and particularly prior to the conclusion of each working day, areas under immediate construction (including access roads and other areas affected thereby) shall be swept and wet down with water sufficiently to lay dust. In addition, these areas shall be wet down during non-working hours (including weekends) as often as required to keep the dust under control. The use of calcium chloride or petroleum

products or other chemicals for dust control is prohibited. [N.J.A.C. 7:22-10.11 (m)]

3.05 FINAL CLEANING

A. Employ skilled workmen for final cleaning.

B. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior and exterior surfaces.

C. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.

D. Remove all temporary buildings and structures built by *CONTRACTOR*, all temporary works; tools, machinery or other construction equipment furnished by him.

E. Clean insides of manholes, valve boxes, inlets or other structures constructed, reconstructed or reset during *CONTRACTOR'S* operations to remove debris, excess mortar or foreign materials.

F. Prior to final acceptance, *CONTRACTOR* shall conduct an inspection of all work areas to verify that the entire work is clean.

3.06 RESTORATIONS

A. General:

1. All existing structures, unpaved areas and paved areas disturbed or damaged during the work under this Contract shall be restored or replaced to a condition at least equal to that existing prior to beginning work, or as otherwise specified.

2. The methods of conducting this work shall, as a minimum, conform to the Standard Specifications.

B. Grass restorations: Seeding shall conform to Section 806.

C. Pavement restorations: Conform to Section 401.

D. Restorations of Concrete Curbs & Islands: Conform to Section 607.

E. Restoration of Sidewalks, Driveways, Curb Ramps and Aprons: Conform to Section 606.

F. All other restorations: Restore in accordance with applicable Articles of the Standard Specifications, or as approved by the *ENGINEER* or authorities having jurisdiction.

PART 4 - PAYMENT

4.01 CLEANING AND RESTORATIONS

A. All costs for *CLEANING AND RESTORATIONS* shall be included in prices bid for various items scheduled in the *PROPOSAL*.

****END OF SECTION****

SECTION 01 77 19
(01760)
CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 DESCRIPTION

A. Comply with requirements stated in the *General Conditions* of the Contract and in the specifications for administrative procedures in closing out the work.

B. Related requirements in other parts of the Project Manual:

1. Fiscal provisions, legal submittals and additional administrative requirements: Conditions of the Contract.

C. Related requirements specified in other sections:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 01 11 00: Statement of Work*

3. *Section 01 21 00: Cash Allowances*

4. *Section 01 74 00: Cleaning and Restorations*

5. *Section 01 78 23: Operating and Maintenance Data*

6. *Section 01 78 36: Guarantees*

7. *Section 01 78 39: Project Record Documents*

8. *Section 01 78 45: Spare Parts and Maintenance Materials*

9. Closeout submittals required of trades: The respective sections of specifications.

1.02 COMPLETION

A. When Contractor considers the work is complete and ready for acceptance by the *OWNER*, he shall submit to the *ENGINEER*:

1. A written notice that the work or designated portion thereof is complete and ready for acceptance.

2. Certification that equipment systems have been tested, in the presence of the *OWNER'S* representative and are operational.

3. Operating and Maintenance Data, Instructions to *OWNER'S* Personnel: to requirements of Section 01 78 23.

4. Guarantees: to requirement of Section 01 78 36.

5. Project Record Documents: to requirements of Section 01 78 39.

6. Keys and Keying Schedules: to requirements of *Section 08 71 00 – Finish Hardware*.

7. Contractors Certificate (N.J.S.A. 34:11-56.33): to requirements of Section 00 72 00, paragraph 37E and Section 00 65 01, Contractors' Certificate

8. A list of items to be completed or corrected.

B. Within a reasonable time after receipt of such notice, *ENGINEER* will make or cause an inspection to be made to determine the status of completion.

C. Should *ENGINEER* determine that the work is not complete:

1. *ENGINEER* will promptly notify the Contractor in writing, giving the reasons therefore.

2. Contractor shall remedy the deficiencies in the work, and send a second written notice of completion to the *ENGINEER*.

3. *ENGINEER* will reinspect the work.

D. When *ENGINEER* concurs that the work is complete, he will:

1. Prepare a Certificate of Completion, accompanied by Contractor's list of items to be completed or corrected, as verified and amended by the *ENGINEER*.

2. Submit the Certificate to *OWNER* and Contractor for their written acceptance of the responsibilities assigned to them in the Certificate.

1.03 FINAL INSPECTION

A. When Contractor considers the work is complete, he shall submit written certification that:

1. Contract documents have been reviewed.

2. Work has been inspected for compliance with *Contract Documents*.

3. Work has been completed in accordance with *Contract Documents*.

4. Work is completed and ready for final inspection.

B. *ENGINEER* will make an inspection to verify the status of completion with reasonable promptness after receipt of such certification.

C. Should *ENGINEER* consider that the work is incomplete or defective:

1. *ENGINEER* will promptly notify the Contractor in writing, listing the incomplete or defective work.

2. Contractor shall take immediate steps to remedy the stated deficiencies, and send a second written certification to Construction Manager that the work is complete.

3. *ENGINEER* will reinspect the work.

D. When the *ENGINEER* finds that the work is acceptable under the *Contract Documents*, he shall request the Contractor to make closeout submittals.

1.04 REINSPECTION FEES

A. Should *ENGINEER* perform reinspections due to failure of the work to comply with the claims of status of completion made by the Contractor:

1. *OWNER* will compensate *ENGINEER* for such additional services.

2. *OWNER* will deduct the amount of such compensation from the final payment to the Contractor.

1.05 CONTRACTOR'S CLOSEOUT SUBMITTALS TO *ENGINEER*

A. Evidence of compliance with requirements of governing authorities:

1. Comply with the requirements of N.J.A.C. 5:23-2.23 for the Certificate of Occupancy.

2. Certificates of Inspection.

    a. Special Inspections required by International Building Code

B. Evidence of payment and release of liens: to requirements of General and Supplementary Conditions.

C. Certificate of Insurance for products and completed operations.

1.06 FINAL ADJUSTMENT OF ACCOUNTS

A. Submit a final statement of accounting to *ENGINEER*.

B. Statement shall reflect all adjustments to the Contract Sum:

1. The original Contract Sum.

2. Additions and deductions resulting from:

    a. Previous change orders.

    b. Allowances.

    c. Unit prices.

    d. Deductions for uncorrected work.

    e. Penalties and bonuses.

    f. Deductions for liquidated damages.

    g. Deductions for reinspection payments.

    h. Other adjustments.

3. Total Contract Sum, as adjusted.

4. Previous payments.

5. Sum remaining due.

C. *ENGINEER* will prepare a final change order, reflecting approved adjustments to the Contract Sum that were not previously made by change orders.

1.07 FINAL APPLICATION FOR PAYMENT

A. No separate measurement will be made for this work. Contractor shall submit the final application for payment in accordance with procedures and requirements stated in the *General Conditions* of the contract after he has submitted the required Closeout Submittals.

****END OF SECTION****

SECTION 01 78 23
(01730)
OPERATING AND MAINTENANCE DATA

1.01 GENERAL

A. Compile product data and related information appropriate for *OWNER'S* maintenance and operation of products furnished under the contract.

B. Prepare operating and maintenance data as specified in this section and as referenced in other pertinent sections of *Specifications*.

C. Instruct *OWNER'S* personnel in the maintenance of products and in the operation of equipment and systems.

1.02 FORM OF SUBMITTALS

A. Prepare data in the form of an instructional manual for use by *OWNER'S* personnel.

B. Format:

1. Size: 8½ inches by 11 inches.

2. Paper: Twenty (20) pound minimum, white, for typed pages.

3. Text: Manufacturer's printed data, or neatly typewritten.

4. Drawings:

a. Provide reinforced punch binder tab, bind in with text.

b. Fold larger drawings to the size of the text pages.

5. Provide fly-leaf for each separate product, or each piece of operating equipment:

a. Provide typed description of product, and major component parts of equipment.

b. Provide indexed tabs.

6. Cover: Identify each volume with typed or printed title: “OPERATING AND MAINTENANCE INSTRUCTIONS.” List:

a. Title of project.

b. Identity of separate structure as applicable.

c. Identity of general subject matter covered in the manual.

C. Binders:

1. Commercial quality 3-ring binders with durable and cleanable plastic covers.

2. Maximum ring size: 1 inch.

3. When multiple binders are used, correlate the data into related consistent groupings.

1.03 CONTENT OF MANUAL

A. Neatly typewritten table of contents for each volume, arranged in a systematic order.

1. *CONTRACTOR*, name of responsible principal, address and telephone number.

2. A list of each product required to be included, indexed to the content of the volume.

3. List, with each product, the name, address and telephone number of:

a. Subcontractor or installer.

b. Maintenance contractor, as appropriate.

c. Identify the area of responsibility of each.

d. Local source of supply for parts and replacement.

4. Identify each product-by-product name and other identifying symbols as set forth in *Contract Documents*.

B. Product data:

1. Include only those sheets, which are pertinent to the specific product.

2. Annotate each sheet to:

a. Clearly identify the specific product or part installed.

b. Clearly identify the data applicable to the installation.

c. Delete references to inapplicable information.

C. Drawings:

1. Supplement product data with drawings as necessary to clearly illustrate:

a. Relations of component parts of equipment and systems.

b. Control and flow diagrams.

2. Coordinate drawings with information in project record documents to assure correct illustration of completed installation.

3. Do not use project record documents as maintenance drawings.

D. Written text, as required to supplement product data for the particular installation:

1. Organize in a consistent format under separate heading for different procedures.

2. Provide a logical sequence of instructions for each procedure.

E. Copy of each warranty, bond and service contract issued.

Provide information sheet for Owner's personnel, give:

1. Proper procedures in the event of failure.

2. Instances, which might affect the validity of warranties or bonds.

1.04 MANUAL FOR MATERIALS AND FINISHES

A. Submit two (2) copies of complete manual in final form.

B. Content, for architectural products, applied materials and finishes:

1. Manufacturer's data, giving full information on products:

    a. Catalog number, size, and composition.

    b. Color and texture designations.

    c. Information required for reordering special manufactured products.

2. Instructions for care and maintenance:

    a. Manufacturer's recommendation for types of cleaning agents and methods.

    b. Cautions against cleaning agents and methods, which are detrimental to the product.

    c. Recommended schedule for cleaning and maintenance.

C. Content, for moisture-protection and weather-exposed products:

1. Manufacturer's data, giving full information on products:

    a. Applicable standards.

    b. Chemical composition.

    c. Details of installation.

2. Instructions for inspection, maintenance and repair.

D. Additional requirements for maintenance data: The respective sections of *Specifications*.

E. Provide complete information for products specified.

1.05 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Submit three (3) copies of complete manual in final form.

B. Content, for each unit of equipment and system, as appropriate:

1. Description of unit and component parts.

a. Function, normal operating characteristics, and limiting conditions.

b. Performance curves, engineering data and tests.

c. Complete nomenclature and commercial number of all replaceable parts.

2. Operating procedures:

a. Start-up, break-in, routine, and normal operating instructions.

b. Regulation, control, stopping, shutdown and emergency instructions.

c. Summer and winter operating instructions.

d. Special operating instructions.

3. Maintenance procedures:

a. Routine operations.

b. Guide to "trouble-shooting."

c. Disassembly, repair and reassembly.

d. Alignment, adjusting and checking.

4. Servicing and lubrication schedule: List of lubricants required.

5. Manufacturer's printed operating and maintenance instructions.

6. Description of sequence of operation by control manufacturer.

7. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.

a. Predicted life of parts subject to wear.

b. Items recommended to be stocked as spare parts.

8. As-installed control diagrams by controls manufacturer.

9. Each Contractor's coordination drawings.

10. Charts of valve tag numbers, with the location and function of each valve.

11. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

12. Other data as required under pertinent sections of *Specifications*.

C. Content, for each electric and electronic system, as appropriate:

1. Description of system and components parts.

a. Function, normal operating characteristics, and limiting conditions.

b. Performance curves, engineering data and tests.

c. Complete nomenclature and commercial number of replaceable parts.

2. Circuit directories of panelboards:

a. Electrical service.

b. Controls.

c. Communications.

3. As-installed color coded wiring diagrams.

4. Operating procedures:

a. Routine and normal operating instructions.

b. Sequences required.

c. Special operating instructions.

5. Maintenance procedures:

a. Routine operations.

b. Guide to "trouble-shooting."

c. Disassembly, repair and reassembly.

d. Adjustment and checking.

6. Manufacturer's printed operating and maintenance instructions.

7. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

8. Other data as required under pertinent sections of *Specifications*.

D. Prepare and include additional data when the need for such data becomes apparent during instruction of *OWNER'S* personnel.

E. Additional requirements for operating and maintenance data: The respective sections of *Specifications*.

F. Provide complete information for products specified.

1.06 SUBMITTAL SCHEDULE

A. Submit two (2) copies of preliminary draft of proposed formats and outlines of contents prior to start of work.

ARCHITECT/ENGINEER will review draft and return one (1) copy with comments.

B. Submit one (1) copy of completed data in final form thirty (30) days prior to completion and acceptance as defined in the General Conditions.

Copy will be returned with comments.

C. Submit six (6) copies of approved data in final form ten (10) days before completion and acceptance as defined in the *General Conditions*.

1.08 INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to final completion and acceptance as previously defined, fully instruct *OWNER'S* designated operating and maintenance personnel in the operation, adjustment and maintenance of all products, equipment and systems.

B. Operating and maintenance manual shall constitute the basis of instruction.

Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance.

****END OF SECTION****

SECTION 01 78 36
(01740)
GUARANTEES

1.01 GENERAL

A. Compile specified warranties and bonds.

B. Co-execute submittals.

C. Review submittals to verify compliance with *Contract Documents*.

D. Submit to *ENGINEER* for review and transmittal to *OWNER*.

E. Related requirements in other parts of the *Contract Documents*:

1. Bid or proposal bonds: See the *Instructions to Bidders*.

2. Performance bond and maintenance bond: See the *General Conditions*.

1.02 SUBMITTAL REQUIREMENTS

A. Assemble warranties and bonds executed by each of the respective manufacturers, suppliers and subcontractors.

B. Number of original signed copies required: Two (2) each.

C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.

1. Product or work item.

2. Firm, with name of principal, address and telephone number.

3. Scope.

4. Date of beginning of warranty or bond.

5. Duration of warranty or bond.

6. Provide information for *OWNER'S* personnel:

a. Proper procedure in case of failure.

b. Instances which might affect the validity of warranty or bond.

7. *CONTRACTOR*, name of responsible principal, address and telephone number.

1.03 FORM OF SUBMITTALS

A. Prepare in duplicate packets.

B. Format:

1. Size: 8½" by 11", punch sheets for 3-ring binder.

Fold larger sheets to fit into binders.

2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS." List:

a. Title of project.

b. Name of contractor.

C. Binders: Commercial quality, 3-ring, D-type, with durable and cleanable plastic covers.

1.04 SUBMITTAL REQUIREMENTS

A. Submit documents within ten (10) days after inspection and written acceptance by the *ENGINEER*

B. Submit warranties by the manufacturers of all equipment furnished; or furnished and installed by the *CONTRACTOR*.

1. Manufacturer shall issue warranties in the name of the *CONTRACTOR* and *OWNER*.

2. Warranties shall be valid for a period of two (2) years from the date of acceptance by the *OWNER* of the structures and equipment, unless a longer period is specified.

3. Warranties shall cover all costs for repairing or replacing defective materials and equipment.

C. Submit warranties, service and maintenance contracts as specified in the respective sections of *Specifications*.

D. In the event the equipment manufacturer's warranty does not comply with the conditions outlined above or are otherwise unavailable as required above, the *CONTRACTOR* may:

1. Provide a dedicated security deposit in lieu of the specified warranties.

2. Provide either a separate Maintenance Bond or certification of extended warranty coverage under the *CONTRACTOR'S* overall bonding to guarantee *OWNER* for warranty and deficiencies.

1.05 WARRANTY REPAIRS

A. *CONTRACTOR* shall repair and/or replace as required all equipment which may be defective due to manufacturing errors or faulty installation, at his expense, during the maintenance period.

B. The *CONTRACTOR* shall be responsible for all costs of the repair work including removal, shipping, reinstallation and start-up during the two (2) year maintenance period. The *OWNER* shall not incur any additional costs as a result of warranted equipment failure.

****END OF SECTION****

SECTION 01 78 39
(01720)
PROJECT RECORD DOCUMENTS

1.01 GENERAL

A. Maintain for the *OWNER* one (1) record copy of:

1. Drawings.

2. Specifications.

3. Addenda.

4. Change Orders and other modifications to the contract.

5. Change Orders or written instructions.

6. Approved shop drawings, product data and samples.

7. Field test records.

8. As-built record drawings.

1.02 MAINTENANCE OF DOCUMENTS AND SAMPLES

A. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.

B. Make documents and samples available at all times for inspection by the *ENGINEER*.

1.03 MARKING DEVICES

A. Provide felt-tip marking pens for recording information in the color code accepted by the *ENGINEER*.

1.04 RECORDING

A. Label each document, "PROJECT RECORD" in neat large printed letters.

B. Mark *CONTRACTOR* prints of working drawings to show the final horizontal and vertical locations of any revisions to the work. Record information concurrently with construction progress on a daily basis.

C. Do not conceal any work until required information is recorded.

D. Drawings: Legibly mark to record actual construction:

1. Elevations of various structure elements in relation to finish floor or grade.

2. All underground piping with elevations and dimensions. Changes in piping location. Horizontal and vertical locations of underground utilities and appurtenances referenced to permanent surface improvements. Actual installed pipe material, class, etc.

3. Location of internal utilities and appurtenances concealed in the construction referenced to visible and accessible features of the structure.

4. Field changes of dimension and detail.

5. Changes made by Field Order or by Change Order.

6. Details not on original Contract Drawings.

7. Equipment and piping relocations.

8. Intersection details: Provide at least three ties to every valve and fitting, blow-off, fire hydrant and air release.

9. Services based on distance from main line pipe and property lines.

10. Backflow preventer assemblies locations with ties to physical features.

E. All horizontal locations, if not in the right-of-way, must relate to easement.

F. All elevations shall be in feet and tenths, referenced to NGVD 88.

G. Specifications and Addenda; legibly mark each Section to record:

1. Manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed.

2. Changes made by Field Order or by Change Order.

1.05 SUBMITTAL

A. At contract closeout, deliver record information to the *OWNER*:

1. Record all information in electronic format and provide a disk or CD in AutoCAD or PDF format of the project record data.

2. Submit the CD along with two (2) sets of blue/black line prints dated and with the words "Record Plan" above the title block and containing Contractor Certification as to the accuracy of the information shown. The plans must also be signed and sealed by a New Jersey licensed land surveyor.

3. Submit original marked drawings, CDs and all other record documents to the *ENGINEER*.

B. Accompany submittal with transmittal letter in duplicate containing:

1. Date

2. Project title and number.

3. Contractor's name and address.

4. Title and number of each record document.

5. Signature of Contractor or his authorized representative.

****END OF SECTION****

SECTION 01 78 45
(01750)
SPARE PARTS AND MAINTENANCE MATERIALS

PART 1 - GENERAL

1.01 SUMMARY

A. Work included:

1. Receipt, storage and maintenance of spare parts and maintenance materials.

B. Related work:

1. Other sections of the *Specifications* requiring spare parts and/or maintenance materials.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Compile and submit inventory of spare parts and maintenance materials with first application for payment.

C. Submit updated inventory monthly with each application for payment.

D. Prior to completion and acceptance of the work as defined in the General Conditions, provide a complete inventory of all spare parts with the Operation and Maintenance manuals.

1.03 DELIVERY, STORAGE AND HANDLING

A. Delivery:

1. Deliver materials in manufacturers original packaging with all tags and labels intact.

2. Receive and inventory spare parts prior to placement in storage.

B. Storage:

1. Provide secure storage space in *CONTRACTOR'S* field office or provide separate secure storage trailer for storage of spare parts and maintenance materials.

2. Provide heated space for temperature sensitive materials.

3. Store spare parts and maintenance materials in groups related to the specific pieces of equipment for which they are intended.

4. Maintain current inventory of spare parts and maintenance materials and update monthly.

C. Handling:

1. Handle spare parts and maintenance materials carefully to avoid damage to materials or packaging.

2. Spare parts and maintenance materials shall be tagged to identify the equipment for which they are intended.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to delivery to *OWNER*, carefully inspect spare parts and maintenance materials and verify that all required parts and materials have arrived.

B. Verify that all tags and labels are intact and legible.

C. Correct all deficiencies.

3.02 DELIVERY TO OWNER

A. At a time designated by *OWNER*, but not prior to completion, turn over all spare parts and maintenance materials to *OWNER*.

B. If spare parts and maintenance materials are stored in a separate secure space, turn over keys to *OWNER*. *OWNER* shall have 10 working days to remove spare parts and maintenance materials to *OWNER'S* storage area.

PART 4 - PAYMENT

4.01 SPARE PARTS AND MAINTENANCE MATERIALS:

A. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

B. Include all costs for *SPARE PARTS AND MAINTENANCE MATERIALS* in the prices bid for the various related items of work as designated in the Proposal.

****END OF SECTION****

SECTION 03 11 00
(03110)
CONCRETE FORMWORK

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Formwork for cast-in-place concrete, with shoring, bracing, and anchorage.

2. Openings for other affected Work.

3. Form accessories.

4. Stripping forms.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 03 20 00: Concrete Reinforcement*

3. *Section 03 30 00: Concrete*

4. *Section 31 23 00: Excavating, Filling and Grading*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *CONCRETE FORMWORK* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SYSTEM DESCRIPTION

A. Design Requirements:

1. Design and construction of all forms and form supports, shoring and

bracing methods, and their adequacy shall rest with the Subcontractor.

2. Design formwork so it will safely support vertical and lateral loads that might be applied, until such loads can be supported by the concrete structure with a minimum factor of safety of 2.0 and maximum deflection shall not exceed a clear span length L/400 minimum.

3. Carry vertical and lateral loads to ground by formwork system and in-place construction that has attained adequate strength for that purpose.

4. Design forms and falsework to include assumed values of live load, dead load, weight of moving equipment operated on the formwork, concrete mix, height of concrete drop, vibrator frequency, ambient temperature, foundation pressures, stresses, lateral stability, and other factors pertinent to safety of the structure during construction.

5. Provide shop drawings that have been signed and sealed by a qualified Professional Engineer in accordance with *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Performance Requirements:

1. Tolerances for construction of formwork shall be as necessary to provide completed concrete structures within the concrete tolerances specified in *Section 03 30 00, Concrete*.

2 Provide positive means of adjustment to maintain tolerances before and during concrete placement.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required to demonstrate compliance with the specified requirements.

C. Shop drawings showing precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provisions in construction to

accommodate the work of this section.

1. Show the forms to be used indicating form construction, type and location of form ties, reveal strips, chamfer, drip, groove, and method of sealing forms against grout leakage. Lay out form ties in regular, symmetrical patterns.

2. Show pattern for exposed textured or Architectural concrete.

D. Samples: Submit drawings and samples of formwork for textured or Architectural concrete illustrating full range of colors, finishes and patterns available.

E. Manufacturer's recommended installation procedures.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

D. Perform the work of this Section in accordance with the following standards as modified and supplemented herein:

1. ACI 301; Specifications for Structural Concrete for Buildings

2. ACI 347; Recommended Practice for Concrete Formwork

1.05 DELIVERY, STORAGE, AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 FORM MATERIALS

A. Plywood, lumber, steel, fiberglass reinforced plastic, or any material that will produce concrete with the required finish and within the specified tolerances.

B. Except for metal forms, use new materials. Materials may be reused during progress of the work, provided they are completely cleaned and reconditioned, recoated for each use, and capable of producing formwork of the required quality.

C. For footings and foundations, use boards or planks secured to wood or steel stakes, substantially constructed to shapes indicated and to support the required loads.

D. For studs, wales, and supports, use standard grade or better lumber, dimensions as required to support the loads but not less than 2" x 4".

E. Porous form materials shall be sealed to prevent absorption of water from the concrete.

F. Use of aluminum form materials in contact with concrete is prohibited.

G. Wall forms:

1. Exposed concrete surfaces:

a. Minimum for surfaces indicated to receive smooth form finish or any rubbed finish:

(1) BB plyform, Class 1, conforming to U.S. Product Standard PS-1; ¾-inch minimum thickness; free of raised grain, torn surfaces, worn edges, patches, or other defects which would impair the appearance of the concrete surface;

(2) Wood form materials shall be new at the start of the work and may be reused subject to the approval of the *ENGINEER*.

b. Seal edges and coat both faces with colorless coating, which will not affect application of applied finishes.

2. Unexposed concrete surfaces:

a. Use 1" x 6" shiplap Douglas Fir boards, surfaced one side and two edges, or ¾" minimum thickness BB plyform, Class I or II, conforming to U.S. Product Standard PS-1, sanded both sides, mill-oiled.

H. Column forms, if required:

1. For square or rectangular columns, use 2" thick Douglas Fir planks or joists, surfaced one side and two edges, or use metal forms.

2. For round columns, use metal forms or patented paper tube forms approved by the *ENGINEER*.

3. Construct column forms with tight joints and securely clamped together with steel clamps.

2.03 FORM TIES

A. Hold inner and outer forms for vertical concrete together with combination steel ties and spreaders approved by the *ENGINEER*.

1. Space ties symmetrically in tiers and rows, each tier plumb from top to bottom and each row level.

2. At horizontal pour lines, locate ties not more than 6" below the pour lines. Tighten after concrete has set and before the next pour is made.

3. For exposed concrete surfaces, provide form ties of removable type with she-bolts equipped with permanent plugs and a system approved by the *ENGINEER* for fixing the plugs in place.

2.04 EARTH FORMS

A. Side forms for footings may be omitted, and concrete may be placed directly against excavation, only when requested by the Contractor and approved by the *ENGINEER*.

B. When omission of forms is accepted, provide additional concrete 1" on each side of the minimum design profiles and dimensions shown on the Drawings.

2.05 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 FORM CONSTRUCTION

A. General:

1. Construct forms complying with ACI 347 to the exact sizes, shapes, lines, and dimensions shown, and as required to obtain accurate alignment, location, grades, and level and plumb work in the finished structure.

2. Provide for openings, offsets, keyways, recesses, moldings, reglets, chamfers, blocking, screeds, bulkheads, anchorages, inserts, and other features as required.

3. Tolerances shall be in accordance with Section 3.3.1 of ACI 347.

4. Erect, support, brace, and maintain formwork so it will safely support vertical and lateral loads that might be applied, until such loads can be supported by the concrete structure.

5. Carry vertical and lateral loads to ground by formwork system and in-place construction that has attained adequate strength for that purpose.

6. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position.

7. Provide shores and struts with positive means of adjustment capable of taking up formwork settlement during concrete placing operations, using wedges or jacks or a combination thereof.

8. Provide trussed supports when adequate foundations for shores and struts cannot be secured.

9. Support form materials by structural members spaced sufficiently close to prevent objectionable deflection.

10. Fit forms placed in successive units for continuous surfaces to accurate alignment, free from irregularities, and within the allowable tolerances.

11. Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placement. Solidly butt joints, and provide backup material at joints as required to prevent leakage and prevent fins.

12. Provide camber in formwork as required for anticipated deflections due to weight and pressures of fresh concrete and construction loads.

B. Fabrication:

1. Fabricate forms for easy removal without hammering or prying against concrete surfaces.

2. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces.

3. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and assure ease of removal.

4. Provide top forms for inclined surfaces where so directed by the *ENGINEER*.

C. Forms for exposed concrete:

1. Drill forms to suit ties being used, and to prevent leakage of cement paste around tie holes. Do not splinter forms by driving ties through improperly prepared holes.

2. Provide sharp, clean corners at intersecting planes, without visible edges or offsets. Back the joints with extra studs or girts to maintain true, square intersections.

3. Use extra studs, wales, and bracing to prevent objectionable bowing of forms between studs, and to avoid bowed appearance in concrete. Do not use narrow strips of form material, which will produce bow.

D. Corner treatment:

1. Unless shown otherwise, form chamfers with 1" x 1" strips, accurately formed and surfaced to produce uniformly straight lines and tight edges.

2. Extend terminal edges to required limit, and miter the chamfer strips at changes in direction.

E. Locate control joints as indicated on the Drawings and, where required but not shown on the Drawings, as approved by the *ENGINEER*.

F. Provisions for other trades:

1. Provide openings in concrete formwork to accommodate work of other trades.

2. Verify size and location of openings, recesses, and chases with the trade requiring such items.

3. Accurately place and securely support items to be built into the concrete.

3.03 FORM COATINGS

A. Coat form contact surfaces with form coating compound before reinforcement is placed.

1. Do not allow excess form coating material to accumulate in the forms or to come in contact with surfaces, which will bond to fresh concrete.

2. Apply the form coating material in strict accordance with its manufacturer's recommendations.

3.04 REMOVAL OF FORMS

A. General:

1. Do not disturb or remove forms until the concrete has hardened sufficiently to permit form removal with complete safety.

2. Do not remove shoring until the member has acquired sufficient strength to support its own weight, the load upon it, and the added load of construction, but no sooner than seven (7) days.

3. Do not strip floor slabs in less than two(2) days.

4. Do not strip wall concrete in less than 24 hours. Do not backfill until concrete has cured seven (7) days.

5. When stripping time is less than specified curing time, measures shall be taken to provide adequate curing and thermal protection of the stripped concrete.

B. Finished surfaces:

1. Exercise care in removing forms from finished concrete surfaces so that surfaces are not marred or gouged, and that corners are true, sharp, and unbroken.

2. Release sleeve nuts or clamps, and pull the form ties neatly.

3. Do not permit steel spreaders, form ties, or other metal to project from, or be visible on, any concrete surface except where so shown on the Drawings.

4. Solidly pack form tie holes, rod holes, and similar holes in the concrete. For packing, use the cement grout specified in *Section 03 30 00, Concrete* of these Specifications, flushing the holes with water before packing, screeding off flush, and grinding to match adjacent surfaces.

3.05 FIELD QUALITY CONTROL

A. Inspect and check complete formwork, falsework, shoring and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties and parts are secure.

B. Contact *ENGINEER* when formwork is complete and has been cleaned.

C. For all exposed concrete surfaces do not re-use wood type formwork more than three (3) times. Do not patch formwork.

****END OF SECTION****

SECTION 03 20 00
(03200)
CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included: Provide concrete reinforcement where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 03 11 00: Concrete Formwork*

3. *Section 03 30 00: Concrete*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *CONCRETE REINFORCEMENT* in the prices bid for the various related items of work as designated in the Proposal.

1.02 REFERENCE STANDARDS

A. American Concrete Institute

1. ACI-301, Specifications for Structural Concrete for Buildings.

2. ACI-315, Details and Detailing of Concrete Reinforcement.

3. ACI-318, Building Code Requirements for Reinforced Concrete Structures.

B. Concrete Reinforcing Steel Institute:

1. Manual of Standard Practice.

C. American Society for Testing and Materials:

1. ASTM A-615; Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

2. ASTM A-1064; Specification for Carbon Steel Welded Wire Reinforcement, Plain and Deformed for Concrete

3. ASTM D-3963; Standard Specification for Epoxy Coated Reinforcing Steel.

4. ASTM A-884; Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.

5. ASTM A-767; Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.

6. ASTM A-1022; Specification for Deformed and Plain Stainless Steel Wire and Welded Wire for Concrete Reinforcement..

7. ASTM A-1060; Specification for Zinc Coated (Galvanized) Steel Welded Wire Reinforcement, Plain and Deformed for Concrete.

1.03 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Comply with pertinent provisions of the following codes and standards, except as modified herein. Where there is a conflict, the more stringent code or standard shall govern.

1. ACI-301, Specifications for Structural Concrete for Buildings.

2. ACI-315, Details and Detailing of Concrete Reinforcement.

3. ACI-318, Building Code Requirements for Reinforced Concrete Structures.

4. ICC, International Building Code, 2021, as modified by the Uniform Construction Code of the State of New Jersey.

1.04 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required to demonstrate compliance with the specified requirements.

3. Submit copies of mill test reports for shipments of reinforcing steel prior to placing reinforcement into the work.

C. Shop Drawings showing details of bars, anchors, and other items, if any, provided under this Section.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage:

1. Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use.

2. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

3. Store in a manner to prevent excessive rusting and fouling with dirt, grease, and other bond-breaking coatings.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 REINFORCEMENT MATERIALS AND ACCESSORIES

A. Bars:

1. Provide deformed billet steel bars complying with ASTM A615, using grades shown on the Drawings.

2. Where grades are not shown on the Drawings, use Grade 60.

3. Use epoxy coated bars conforming to ASTM D-775 where shown.

4. Use galvanized bars with a Class 1 coating conforming to ASTM A-767 where shown.

B. Steel wire:

1. Comply with ASTM A1064: Standard Specification for Carbon Steel Welded Wire Reinforcement, Plain and Deformed for Concrete.

2. For tie wire, comply with Fed Spec QQ-W-461, annealed steel, black, 16 gage minimum (use coated wire for coated bars).

C. Welded wire reinforcement:

1. Provide plain welded steel, complying with ASTM A1064.

2. Provide epoxy coated welded wire fabric complying with ASTM A-884, Class A, Type 2.

3. Provide galvanized welded wire fabric complying with ASTM A-1060.

4. Provide stainless steel welded wire fabric complying with ASTM A-1022.

D. Synthetic Fiber Reinforcement:

1. Acceptable Manufacturers:

a. Propex Concrete Systems Corp., 6025 Lee Highway, Suite 425, Chattanooga, Tennessee 37427. Toll Free (800) 621-1273. Phone (423) 892-8080. Fax (423) 892-0157.

b. Or equivalent.

2. Synthetic fiber reinforcement: Fibermesh 150.

a. Material: 100 percent virgin homopolymer polypropylene multifilament fibers, containing no reprocessed olefin materials.

b. Conformance: ASTM C 1116, Type III.

c. Fire classifications:

(1) UL Report File No. R8534-11.

(2) Southwest Certification Services (SWCS), Omega Point Laboratories No. 8662-1.

d. Fiber length: Graded.

e. Alkali resistance: Alkali proof.

f. Absorption: Nil.

g. Specific gravity: 0.91.

h. Melt point: 324 degrees F (162 degrees C).

E. Welding electrodes: Comply with AWS A5.1, low hydrogen, E70 series.

F. Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement in place:

1. Use wire bar type supports complying with CRSI recommendations, unless otherwise shown on the Drawings.

2. Do not use wood, brick, or other non-complying material.

3. For slabs on grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

4. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with either hot-dip galvanized or plastic-protected legs.

2.03 FABRICATION

A. General:

1. Fabricate reinforcing bars to conform to the required shapes and dimensions, with fabrication tolerances complying with the CRSI Manual.

2. In case of fabricating errors, do not straighten or re-bend reinforcement in a manner that will weaken or injure the material.

3. Reinforcement with any of the following defects will not be acceptable.

a. Bar lengths, depths, and/or bends exceeding the specified fabrication tolerances;

b. Bends or kinks not shown on the Drawings;

c. Bars with reduced cross-section due to excessive rusting or other cause.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General:

1. Comply with the specified standards for detail and method of placing reinforcement and supports, except as may be modified herein.

2. Clean reinforcement to remove loose rust and mill scale, earth, and other materials, which reduce or destroy bond with concrete.

3. Position, support, and secure reinforcement against displacement by formwork, construction, and concrete placing operations.

4. Locate and support reinforcement by metal chairs, runners, bolsters, spacers, and hangers, as required.

5. Place reinforcement to obtain minimum coverages for concrete protection.

6. Arrange, space, and securely tie bars and bar supports together with the specified tie wire.

7. Set wire ties so twisted ends are directed away from exposed concrete surfaces.

B. Epoxy Coated Reinforcing:

1. The steel reinforcing bars to be used at the construction site shall meet the requirements of ASTM-D-3963 and this Specification.

2. All systems for handling coated bars shall have padded contact areas. The bars or bundles shall not be dropped or dragged. Coated bars shall be stored on padded wooden or steel cribbing.

3. Coated bars shall be tied with coated tie wire or any suitable non-conductive material acceptable to the *ENGINEER* or purchaser that will not damage or cut the coating and provide sufficient strength.

4. The Contractor shall be responsible for the repair of the coating due to damage during installation and handling at the construction site. The coated bars shall meet the requirements of this Specification.

C. Galvanized Reinforcing:

1. The steel reinforcing bars to be used at the construction site shall meet the requirements of ASTM-A-767, Class 1 coating and this Specification.

2. All systems for handling coated bars shall have padded contact areas. The bars or bundles shall not be dropped or dragged. Coated bars shall be stored on padded wooden or steel cribbing.

3. Coated bars shall be tied with coated tie wire or any suitable non-conductive material acceptable to the *ENGINEER* or purchaser that will not damage the coating and provide sufficient strength.

4. The Contractor shall be responsible for the repair of the coating due to damage during installation and handling at the construction site.

5. Cut ends of reinforcing and all damage shall be repaired using an organic zinc-rich coating containing 95% metallic zinc, by weight in the dried film; recognized under the Component Program of Underwriter's Laboratories, Inc., as an equivalent to hot-dip galvanizing; conforming to Federal Specification DODP-21035 (formally MIL-P-21035A) for repair of hot-dip galvanizing and meeting requirements of Military Specification MIL-P-26915A USAF Specification for Zinc-Rich Paints. Repair coating shall be as manufactured by ZRC Worldwide, Marshfield, MA or equivalent.

D. Welded Wire Fabric:

1. Install welded wire fabric in as long lengths as practical, lapping adjoining pieces. Laps of adjoining pieces shall be not less than one spacing of the cross wires plus two inches and in no case less than six inches whichever is greater.

2. Epoxy coated or galvanized welded wire fabric shall be tied with coated tie wire or any suitable non-conductive material acceptable to the *ENGINEER* or purchaser that will not damage the coating and provide sufficient strength.

3. Stainless steel welded wire fabric shall be tied with stainless steel tie wire or any suitable non-conductive material acceptable to the *ENGINEER* or purchaser that will provide sufficient strength.

E. Synthetic Fiber Reinforcing:

1. Add synthetic fiber reinforcement to concrete mixture in accordance with manufacturer's instructions.

2. Add synthetic fiber reinforcement into concrete mixer before, during, or after batching other concrete materials.

3. Application Rate: Add synthetic fiber reinforcement at standard application rate of 1.5 pounds per cubic yard (0.90 kg/m^3) of concrete.

4. Mix synthetic fiber reinforcement in concrete mixer in accordance with mixing time and speed of ASTM C 94 to ensure uniform distribution and random orientation of fibers throughout concrete.

F. Provide sufficient numbers of supports, and of strength to carry the reinforcement.

G. Do not place reinforcing bars more than 2" beyond last leg of any continuous bar support.

H. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.

3.03 SPLICES

A. Lap splices: Tie securely with the specified wire to prevent displacement of splices during placement of concrete.

B. Splice devices:

1. Obtain the *ENGINEER'S* approval prior to using splice devices.

2. Install in accordance with manufacturer's written instructions.

3. Splice in a manner developing at least the full tensile strength of the bar.

C. Welding: Do not weld reinforcing bars without written permission from *ENGINEER*. If welding is permitted, perform in accordance with AWS D1.4.79.

D. Do not splice bars except at locations shown on the Drawings, except as otherwise specifically approved by the *ENGINEER*.

3.04 TESTING

A. Samples:

1. Samples for physical tests of reinforcement will consist of at least two pieces, each 18" long, of each size of reinforcement steel, selected by the testing agency from material at the building site or at the fabricator's or supplier's yard.

2. Material to be sampled at the building site shall have been delivered thereto at least 72 hours before it is needed.

B. Tests:

1. Where samples are taken from bundles as delivered from the mill, with the bundles identified as to heat number, and provided mill analyses accompany the report, then one tensile test and one bend test will be made from a specimen of each ten tons or fraction thereof of each size of reinforcement steel.

2. Where positive identification of the heat number cannot be made, or where random samples are taken, then one series of tests will be made from each 2½ tons or fraction thereof of each size of reinforcement steel.

3. Payment for testing is described in *Section 01 45 29, Testing Laboratory Services* of these Specifications.

****END OF SECTION****

SECTION 03 30 00
(03300)
CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Provide all plain and reinforced cast-in-place concrete, complete in place, as indicated on the Plans, specified herein, and needed for complete and proper installation. This work includes, but is not limited to the following:

1. Fiber-reinforced structural and miscellaneous concrete.

2. Fiber-reinforced footings and foundations.

   a. Foundations shall include all concrete, formwork, concrete finishing, grout, anchor bolts and subgrade preparation required to support and transfer all design loads to the soil in accordance with the specified design criteria.

3. Fiber-reinforced slabs.

4. Sidewalks and curbs.

B. Related work specified elsewhere:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 01 45 29: Testing Laboratory Services*

3. *Section 03 11 00: Concrete Formwork*

4. *Section 03 20 00: Concrete Reinforcement*

5. *Section 03 35 00: Concrete Finishing and Curing*

6 *Section 31 23 00: Excavating, Filling and Grading*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *CONCRETE* in the prices bid for the various related items of work as designated in the Proposal.

1.02 REFERENCES

A. American Concrete Institute (ACI):

1. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavy-Weight and Mass Concrete.

2. ACI 223 - Standard Practice for use of Shrinkage Compensating Concrete.

3. ACI 301 - Specification for Structural Concrete.

4. ACI 305R - Hot Weather Concreting.

5. ACI 306.1 - Cold Weather Concreting.

6. ACI 309R - Guide to Consolidation of Concrete.

7. ACI 315 - Details and Detailing of Concrete Reinforcement.

8. ACI 318 - Building Code Requirements for Reinforced Concrete.

9. ACI 350 - Environmental Engineering Concrete Structures.

B. American Society for Testing and Materials (ASTM):

1. ASTM C31 - Test Methods for Making and Curing Concrete Test Specimens in the Field.

2. ASTM C33 - Specification for Concrete Aggregate.

3. ASTM C94 - Specification for Ready Mixed Concrete.

4. ASTM C109 - Test Method for Compressive Strength of Hydraulic Cement Mortars.

5. ASTM C143 - Test Method for Slump of Portland Cement Concrete.

6. ASTM C150 - Specification for Portland Cement.

7. ASTM C260 - Specification for Air-Entraining Admixtures for Concrete.

8. ASTM C494 - Specification for Chemical Admixtures for Concrete.

9. ASTM C920 - Specification for Elastomeric Joint Sealants.

10. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation

11. ASTM C1621 - Test Method for Compressive Properties of Rigid Cellular Plastic.

12. ASTM D1751 - Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.

13. ASTM D1752 - Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

14. ASTM E329 - Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.

C. U.S. Army Corps of Engineers:

1. CRD C48 - Method of Test for Water Permeability of Concrete

2. CRD-C572 - Corps of Engineers Specifications for Polyvinylchloride Waterstops.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Provide specific submittals specified in ACI-301.

C. Submit name and address of *CONTRACTOR's* testing laboratory.

D. Submit sample concrete delivery slip.

E. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section including but not limited to:

    a. Concrete Accessories

    b. Admixtures

    c. Joint systems and fillers

    d. Waterstops

2. National Sanitation Foundation (NSF) certification for materials to be used in contact with potable water.

3. Specifications and other data required that demonstrate compliance with the specified requirements.

F. Mixes:

1. The Contractor shall furnish for approval mix proportions prepared by a testing laboratory approved by the *ENGINEER*.

2. Submit mixture proportions and related data for each concrete mixture.

3. Provide chemical analysis of cement and gradation of aggregate.

G. Concrete delivery slips:

1. Submit two (2) legible copies of the delivery slip for each load of concrete to the *ENGINEER* or his representative.

2. All deliveries of concrete shall be accompanied by delivery slips conforming to ASTM C-94 and shall show:

    a. Name of ready-mix batch plant,

    b. Serial number of ticket,

    c. Date,

    d. Truck number,

    e. Name of purchaser,

    f. Specific designation of job (name and location),

g. Specific class or designation of the concrete in conformance with that employed in job,

h. Amount of concrete in cubic yards,

i. Time loaded or of first mixing of cement and aggregates,

j. Water added by receiver of concrete and his initials,

k. Type and brand, and amount of cement,

l. Type and brand, and amount of admixtures,

m. Information necessary to calculate the total mixing water added by the producer. Total mixing water includes free water on the aggregates, water, and ice batched at the plant, and water added by the truck operator from the mixer tank.

n. Maximum size of aggregate,

o. Weights of fine and coarse aggregate,

p. Ingredients certified as being previously approved,

q. Signature or initials of ready-mix representative.

r. The batch plant shall indicate the amount of water that may be added at the jobsite without altering the water/cement ratio by adding the following statement to each batch ticket and filling in the blanks:

"*No more than __ . __ Gals/CY of water may be added at the site.*"

3. Record on each delivery slip the location where placed in the work and the time of placement.

H. Quality Control Submittals:

1. Submit two (2) copies of all quality control test results for approval by the *ENGINEER*.

1.04 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

B. Codes and Standards: Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:

1. American Concrete Institute:

a. ACI-301, "Specification for Structural Concrete".

b. ACI-318, "Building Code Requirements for Structural Concrete".

2. Concrete Reinforcing Steel Institute (CRSI):

a. "Manual of Standard Practice".

C. Concrete Testing Service:

1. Employ a testing agency acceptable to *ENGINEER* to perform material evaluation tests and to design concrete mixes.

2. Concrete testing shall be performed in accordance with *Section 01 45 29* by an approved laboratory and inspection service experienced in sampling and testing concrete. Testing agency shall meet the requirements of ASTM E329.

D. Quality control:

1. Concrete Sampling and Testing:

a. Testing by the Contractor shall include sampling and testing concrete materials proposed for use in the work and testing the design mix for each class of concrete.

b. Quality control testing during construction shall also be performed by the Contractor.

2. The testing services described in Section 1.6.3, 1.6.4, 1.6.5, 1.6.7, 1.6.8, 1.7.4, and 1.7.5 of ACI-301 which include compressive strength, air-content, slump and temperature tests shall be accomplished by the

Contractor as further detailed in *Section 01 45 29* and test results submitted to the *ENGINEER* for approval.

3. The testing for the amount of expansion of shrinkage compensating concrete shall be accomplished by the Contractor in accordance with ASTM C878.

4. The *ENGINEER* shall have the right to make check tests of aggregates and concrete, using the same materials, and to order changes as may be necessary to meet the specified requirements. Cylinders made in the field shall be made and cured in accordance with ASTM C-31; Standard Practice for Making and Curing Concrete Test Specimens in the Field. Laboratory tests and laboratory made cylinders shall conform to the appropriate tests and procedures specified above for testing aggregates and for determining the relation between water content and compressive strength.

5. If concrete of the required characteristics is not being produced, as the work progresses, the *ENGINEER* may order such changes in proportions of material as may be necessary to secure concrete of the specified quality. The Contractor shall make such changes at his own expense and no extra compensation will be allowed because of such change.

E. Field acceptance of concrete:

1. Air content: Concrete not within the limits of air-entrainment indicated in paragraph 2.03 and tested in accordance with paragraph 1.04D2 shall not be used in the Work.

2. Slump: Concrete not within the slump limits of paragraph 2.03 at the point of placement shall not be used in the Work.

3. Temperature: Concrete not within temperature limits of paragraph 1.05D shall not be used in the Work.

1.05 DELIVERY, STORAGE AND HANDLING

A. Comply with the requirements specified in ACI-301.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Concrete temperature:

1. When the average of the highest and lowest temperature during the period from midnight to midnight is expected to drop below 40° F for more than three successive days, deliver concrete to meet the following minimum temperatures immediately after placement:

a. 55° F for sections less than 12 in. in the least dimension

b. 50° F for sections 12 to 36 in. in the least dimension

c. 45° F for sections 36 to 72 in. in the least dimension; and

d. 40° F for sections greater than 72 in. in the least dimension.

2. The temperature of concrete as placed shall not exceed these values by more than 20° F. These minimum requirements may be terminated when temperatures above 50° F occur during more than half of any 24 hour duration.

3. Unless otherwise specified or permitted, the temperature of concrete as delivered shall not exceed 90 °F.

1.06 PROJECT CONDITIONS

A. Do not commence placement of concrete until mix designs have been reviewed and approved by the *ENGINEER* and all governmental agencies having jurisdiction, and until copies are at the job site, the batch plant, and the building department.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style,

type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. All concrete shall meet the requirements of ASTM C94, Option C.

D. All concrete shall be Class "E" unless otherwise specified or noted on the Contract Drawings.

E. Roadway Concrete:

1. Concrete for curb and islands shall conform to Section 607 of the Standard Specifications and shall be "Class B" as shown in Table 903.03.06-1 (NJDOT 2019).

2. Concrete for sidewalks, curb ramps, driveways and aprons shall conform to Section 606 of the Standard Specifications and shall be "Class B" as shown in Table 903.03.06-1 (NJDOT 2019).

2.02 MATERIALS

A. Cement:

1. Portland cement or blended cement:

a. Class E concrete: ASTM C150, Type I.

b. Class F & T: ASTM C595, Type IP (MS), IS (MS), or ASTM C150, Type II.

c. Class G concrete: ASTM C150, Type V.

d. When ASTM C595 blended cement is used, the maximum weight of fly ash, natural pozzolans, silicon fume, or ground blast furnace slug that is included in the concrete shall not exceed the percentages of total weight of cementitious materials shown in the table below.

Requirements for Concrete Exposed to Deicing Chemicals	
Cementitious Materials	Maximum Percent of Total Cementitious Materials by Weight*
Fly ash or other pozzolans conforming to ASTM C 618	25
Slag conforming to ASTM C 989	50
Silica fume conforming to ASTM C 1240	10
Total of fly ash or other pozzolans, slag, and silica fume	50†
Total of fly ash or other pozzolans and silica fume	35†
*Total cementitious material also includes ASTM C 150, C 595, and C845 cement. The maximum percentages above shall include: a) Fly ash or other pozzolans present in Type IP or I(PM) blended cement, ASTM C 595; b) Slag used in manufacture of an IS or I(SM) blended cement, ASTM C 595; and c) Silica fume, ASTM C 1240, presen in blended cement. †Fly ash or other pozzolans and silica fume shall constitute no more than 25 and 10%, respectively, of the total weight of cementitious materials.	

2. Use one brand of cement throughout Project unless otherwise approved by the *ENGINEER*.

B. Aggregate:

1. General:

   a. Provide hardrock aggregate complying with ASTM C33, with additional attributes as specified herein.

   b. Provide aggregates from a single source for exposed concrete.

2. Fine aggregate:

   a. Provide washed natural sand having strong, hard, durable particles, and containing not more than 2% by weight of deleterious matter such as clay lumps, mica, shale, or schist.

3. Coarse aggregate:

a. Provide coarse aggregate consisting of clean, hard, fine grained, sound crushed rock or washed gravel, or a combination of both, containing not more than 5% by weight of flat, chip-like, thin, elongated, friable, or laminated pieces, nor more than 2% by weight of shale or cherty material.

b. Maximum size of coarse aggregate shall be 1", size #57.

c. Maximum size of coarse aggregate for pea gravel concrete fill shall be 3/8 inch, size #8.

C. Water: Mixing water shall be potable, except that non-potable water may be used if mortar made with the water in question has 7- and 28- day strengths equal to at least 90 percent of the strength of similar specimens made with potable water, when tested in accordance with ASTM C109.

D. Admixtures:

1. All admixtures used in structures in contact with potable water shall be certified as meeting NSF/ANSI–61, Drinking Water System Components – Health Effects.

2. Air entraining:

a. Air entraining admixture conforming to ASTM C260 shall be used. Air entraining cement shall not be used.

b. Measure air content in accordance with ASTM C138, C173 or C231.

3. Calcium chloride and admixtures containing calcium chloride shall not be used.

4. Water reducing admixture:

a. The *CONTRACTOR* may at his option use a water reducing admixture.

b. This admixture shall conform to the requirements of ASTM C494, Type “A”, Normal Setting or Type “F”, High Range and meet the following supplementary requirements:

(1) Concrete made using the proposed admixture shall have a Relative Durability Factor of one hundred percent (100%). Admixture shall be chloride free.

(2) Test data shall be furnished to substantiate compliance with these requirements.

5. Waterproofing Admixture:

a. Waterproofing chemical admixture will be required for waterproof concrete. The chemicals in this admixture shall react with the moisture in fresh concrete and with the by-products of cement hydration to cause a catalytic reaction that generates a non-soluble crystalline formation throughout the pores and capillary tracts of the concrete and thus causes the concrete to become permanently sealed against the penetration of water or liquids from any direction. This waterproofing chemical admixture shall cause the waterproof concrete to have the following properties:

(1) Permeability: Treated samples shall show no measurable leakage when pressure tested to 150psi in accordance with U.S. Army Corps of Engineers CRD-C48,"Permeability of Concrete."

(2) Compressive Strength: Treated samples shall exhibit a minimum of 10% increase in compressive strength at 28 days over control samples when tested according to ASTM C39, "Compressive Strength of Cylindrical Concrete Specimens".

(3) When subjected to 300 freeze/thaw cycles (ASTM C 666 "Freeze/Thaw Durability), waterproof concrete samples shall have 94% relative durability.

b. Waterproofing admix shall be Xypex C-500, C-1000 or C-2000 as manufactured by Xypex Chemical Corporation, 13731 Mayfield Place, Richmond, B.C., Canada (Tel: 800 961.4477) or equal as recommended by manufacturer's based on mix design.

6. No other admixtures shall be used without the written consent of the *ENGINEER*.

E. Chloride Content:

1. The maximum water-soluble chloride content, expressed as a percent of cement, contributed from all ingredients of the concrete mix, including water, aggregates, cementitious materials and admixtures shall not exceed 0.10 percent when tested in accordance with ASTM C1218.

F. Premolded joint filler:

1. Structures and surfaces containing liquids, sludge or compost:

a. Closed cell sponge rubber conforming to ASTM D1752, Type I.

b. Cork conforming to ASTM D1752, Type II.

2. All other concrete structures:

a. Pre-molded joint filler shall be fiber expansion joint filler conforming to ASTM D1751.

3. Joint filler shall be of the thickness shown on the Plans, except when no thickness is shown use ½-inch thick material.

G. Joint sealer: Conforming to *Section 07 92 13, Sealants and Caulking*.

H. Mastic joint filler for contraction joints:

1. Type 2, 0.95 to 0.155 inch thick Protection Course as manufactured by W.R. Meadows, Inc., Elgin, IL, or equivalent.

I. Waterstops:

1. Conforming to CRD C572.

2. Waterstops shall be as manufactured by Vinylex Corporation, Knoxville, Tennessee, or equivalent.

3. PVC multirib, 6" wide x 3/8" thick (Catalog No. R6-38). At those locations specifically noted on the Plans where the walls have been designed to be free moving, the waterstop shall be 3/8" thick, 6" wide, center bulb (Catalog No. RB6-38H).

J. Reinforcing: Conforming to *Section 03 20 00, Concrete Reinforcement*.

K. Vapor Retarder:

1. Provide 10 mil polyethylene Class A vapor retarder meeting ASTM E-1745 and that is resistant to deterioration from organisms and substances in contacting soil when tested according to ASTM E154.

2. Acceptable products:

   a. Perminator™ 10 mil by W.R. Meadows.

   b. Stego-Wrap 10 mil by Stego Industries.

   c. Or equal.

2.03 MIXES

A. General:

1. Provide a mix design prepared by the approved testing agency, based on strengths of the approved materials, and meeting the requirements specified herein or shown on drawings.

2. Secure the *ENGINEER* approval of each mix design, including new mix designs required to the prepared should there occur a change in materials being used.

3. All materials used should be so proportioned as to produce a well-graded mixture of high density and maximum workability, with a specified 28-day compressive strength of 4,000 psi.

4. The concrete shall be proportioned in accordance with ACI-211, subject to the following special requirements:

   a. Maximum water-cement ratio: 0.45 by weight.

   b. Minimum cement content:

Coarse Aggregate No.	lb. Per Cubic Yard
57 (1" maximum)	536

   c. Slump (as determined in accordance with ASTM C143):

      (1) Before any ASTM C494, Type F admixture is added.

         (a) 1 inch minimum.

(b) 3 inch maximum for footings, caissons, substructure walls.
(c) 4 inch maximum for slabs, beams, reinforced walls, columns.

(2) After water reducing admixtures added maximum slump is 8".

B. Class T concrete:

1. General:

a. Concrete for structures that must be watertight and have moderate sulfate resistance. For example; structures that will come in contact with water, sewage, chemicals, or effluent.

b. Concrete shall conform to the general requirements and to the following additional requirements.

2. Cement:

a. See paragraph 2.02A.

b. Where Type II cement is used the C_3A content of the portland cement should be less than eight percent (8%) in all concrete in direct contact with sewage or effluent.

3. Air entrained:

a. 5% ± 1½ air content.

b. 6% ± 1½ when fly ash used.

4. Waterproofing admixture: See paragraph 2.02D.5.

5. Aggregates:

a. Fine aggregates shall conform to the provisions of ASTM C33 except Section 3.2 therein, which does not apply. For sanitary engineering structures in which density and watertightness are of prime importance, natural rather than manufactured fine aggregates shall be used.

b. Coarse aggregates shall be size No. 57, as described in ASTM C33, and shall conform to all quality requirements noted therein, and the following limitations shall apply:

(1) Soft particles: 2.0 percent.

(2) Chert as soft impurity (defined in Table 3 of ASTM C33): 1.0 percent.

(3) Total of soft particles and chert as a soft impurity: 2.0 percent.

(4) Flat and elongated particles (long dimension more than 5 times short dimension): 15.0 percent.

c. The nominal maximum size of coarse aggregate shall be as previously specified.

C. Class E Concrete:

1. General:

a. Concrete for curb, gutter, sidewalk, exterior concrete pads, exterior concrete paving, or footings, grade walls, thrust blocks where concrete is expected to be exposed to deicing salts and moderate sulfate resistance not desired.

b. Concrete shall conform to the general requirements and the following additional requirements.

2. Cement:

a. See paragraph 2.02A.

3. Air entrained: 6% ± 1½ air content.

E. Class F Concrete:

1. General:

a. Concrete for interior floors where moderate sulfate resistance is desired and deicing salts are not to be used.

b. Concrete shall conform to the general requirements and to the following additional requirements.

2. Cement:

a. See paragraph 2.02A.

3. Non-air entrained: Less than or equal 3% air content.

F. Class G Concrete:

1. General:

a. Concrete for structures that require severe sulfate resistance and must be watertight such as tanks, manholes and other wastewater structures containing sewage.

b. Concrete shall conform to the general requirements and the following additional requirements.

2. Cement:

a. See paragraph 2.02A.

3. Air entrained: 5% ± 1½ air content.

4. Waterproofing admixture: See paragraph 2.02D.5.

2.04 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXISTING CONDITIONS

A. Inspection:

1. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

2. Verify that the work of this Section may be installed in accordance with all pertinent codes and regulations, the original design, and the referenced standards.

B. Discrepancies:

1. In the event of discrepancy, immediately notify the *ENGINEER*.

2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 CONCRETE MIXING

A. Concrete for minor work, when approved by the *ENGINEER*, may be mixed at the site in a power mixer when the mixer has a capacity not less than one full sack batch.

B. Unless otherwise approved by the *ENGINEER*, use ready mixed concrete complying with ASTM C94, except as may be modified by the following:

1. Mixing:

a. Mix each batch of concrete not less than 15 minutes, five minutes of which shall be at the site.

b. Rotate the drum at the rate specified by the manufacturer of the mixer as "mixing speed".

c. Whenever there is a delay in unloading, rotate the drum at intervals to prevent incipient set of concrete.

C. Concrete consistency:

1. Use the amount of water established by the approved mix design.

a. Do not exceed the minimum quantity specified for the grade of concrete.

b. Use the minimum amount of water necessary to produce concrete of the workability required by the *ENGINEER*.

c. Do not supplement the predetermined amount of water with additional water for any reason.

2. Measure concrete consistency by ASTM C143 method.

a. As part of the routine testing and inspecting, test twice each day or partial day's run of the mixer.

b. Maintain a complete and accurate record of tests.

3. Provide maximum concrete slumps as specified in Article 2.03B.

D. Miscellaneous provisions:

1. Provide strengths of concrete as shown on the Drawings or specified herein.

2. Provide concrete dense and free from honeycomb and other defects.

3. Place and finish members to conform to the shapes and dimensions indicated, with all surface true to line, plumb, and level.

3.03 INSERTS, ANCHORS AND EMBEDDED ITEMS

A. Powder driven concrete fasteners:

1. In addition to their use where the pins are loaded in shear, powder driven concrete fasteners may be used in tension for support of light loads such as acoustical ceilings, ductwork, conduit, pipes, and similar items when such loads are limited to less than 75 lbs.

2. Testing:

a. Secure pre-qualification of operator, tool and fastener by an approved testing agency, who shall observe testing of the first ten fastener installations.

b. Apply a test “pull-out” load of not less than twice the design load or 150 lbs. whichever is the greater, to the pin in such a manner as not to resist the spalling tendency of the concrete surrounding the pin.

c. Thereafter, secure random tests by the approved testing agency of approximately one in ten pins; except that when the design load exceeds 75 lbs., test one-half of the pins.

d. Should failure occur on any pin tested, test all installations under observation of the approved testing agency, and replace all unqualifying pins at no additional cost to the *OWNER*.

e. Where Hilti "Kwik Bolts" or similar types of concrete anchor bolts are used for significant gravity loads or seismic anchorage, test in the presence of the approved testing agency:

(1) Proof test 50% of the bolts (alternate bolts in any group arrangement) to twice the allowable load;

(2) If there are any failures, also test the immediately adjacent bolt.

3. Where hanger rods, bolts, wire, or similar items are used to suspend construction items, place in the concrete as required and/or indicated.

4. Where suspended ceilings with metal carrying systems are called for on the Drawings:

a. Provide hanger wires in the slab, as shown on the Drawings or otherwise required, of sufficient length to extend 12" below the line of the finish ceiling;

b. Place the hanger wires in line to receive runner channels, beginning 6" from the walls parallel to the runners.

B. Reglets and rebates:

1. Form reglets and rebates as required to receive frames, flashing, and other equipment.

2. Verify the dimensions and positions of required reglets and rebates with trades whose work is related to or contingent upon such dimensions and positions.

3. If concrete slabs on earth join a wall or other perpendicular concrete surface, form a reglet in the wall to receive and carry the horizontal concrete work.

a. Provide reglet full thickness of the slab and 3/4" deep, unless otherwise shown on the Drawings.

b. Exterior walks need not be provided for in this way except where so detailed on the Drawings.

C. Embedded piping and rough hardware:

1. Coordinate the various trades who are required to fasten work to the structure, or are required to insert therein any sleeve, box, bolt, anchor, insert, or other rough hardware.

2. Provide every facility for setting all required items accurately in the forms.

3. Be responsible for changes in position of such items after they have been set.

4. Provide in the forms for all sleeves, boxes, bolts, anchors, inserts, strap anchors for frames, and other rough hardware required for the work, and which are shown or required to be embedded in the concrete.

5. Conduits and sleeves:

a. Locate so as not to reduce the strength of construction. Do not place pipes, except conduits, in a slab of less than 3½" thickness.

b. In supported concrete slabs, do not bury conduit having an outside diameter greater than 33% of the thickness of the slab. Increase slab thickness locally to meet this requirement.

c. Do not place conduit between the bottom of reinforcing steel and the bottom of supported slab.

d. In placing conduits at slabs on earth, place below the reinforcement, and encase in concrete by increasing thickness of the slab locally to at least 3" of concrete around the conduit on all sides.

D. Where openings in floors and walls are required by the various trades, but are not detailed on the Drawings, reinforce as directed by the *ENGINEER*.

E. Waterstops:

1. All construction, expansion and contraction (control) joints in structures containing liquids or placed below ground shall have continuous waterstops placed as shown on the Plans.

2. Waterstops shall be installed as follows:

a. Center bulb or middle of the waterstop shall be placed exactly in the middle of the joint, unless otherwise shown on the Drawings.

b. Concrete around waterstop to be thoroughly vibrated. All voids or honeycombs to be eliminated to assure complete bonding of concrete to waterstop ribs.

c. For second pour, place copperclad steel anchors as far as possible into the waterstop and then secure to the forms and/or reinforcing bars using No. 16 gauge tie-wire. Space ties on centers suitable to maintain proper positioning under placement of concrete.

d. Splicing: All straight run, connecting and intersecting joints to be securely spliced in accordance with manufacturers recommendations. Splices joints to provide bond equal to strength of waterstop section. All field spliced shall be heat fused.

F Vapor Retarders:

1. Installation shall be in accordance with manufacturer's instructions and ASTM E 1643.

2. Unroll vapor retarder with the longest dimension parallel with the direction of the pour.

3. Lap Vapor Retarder over footings and seal to foundation walls.

4. Overlap joints 6 inches and seal with Vapor Bond Tape or other 4" wide pressure sensitive tape.

5. Seal all penetrations (including pipes) with manufacturer's pipe boot.

6. No penetration of the Vapor Retarder is allowed except for reinforcing steel and permanent utilities.

7. Repair damaged areas by cutting patches of Vapor Retarder, overlapping damaged area 6 inches and taping all four sides with Vapor Bond Tape or other 4" wide pressure sensitive tape.

3.04 CONTRACTOR FIELD ACCEPTANCE OF CONCRETE

A. Review and accept concrete only with a completed delivery slip.

B. Review and accept concrete only if it meets the requirements of paragraph 2.03, Mixes and 1.04, Final Acceptance of Concrete.

3.05 CONVEYING AND PLACING CONCRETE

A. General:

1. All concrete work shall comply with ACI-301 and ACI-318 except as modified by the Supplemental Requirements herein.

B. Cold-Weather Placement: Comply with provisions of ACI-306 and as follows.

1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

C. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.

1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

2. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

D. Hot-Weather Placement: When hot weather conditions exist that would impair quality and strength of concrete, place concrete in compliance with ACI-305R and as specified.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 deg F (32 deg C). Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.

3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.

4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, only when approved by the *ENGINEER*.

E. Concreting under water will not be permitted.

F. Before placing concrete, thoroughly clean forms, wash out with water, and make tight.

1. Do not place concrete until reinforcement, conduits, outlet boxes, anchors, sleeves, hangers, bolts, and other embedded materials are securely and properly fastened in their correct positions.

2. Secure the *ENGINEER's* approval of reinforcement before commencing placement of concrete.

G. Preparation:

1. Before new concrete is deposited upon or against concrete that has taken its initial set or has hardened, remove all incrustations from forms and reinforcement.

2. Remove all laitance, oil, and loose particles from concrete and concrete surfaces, and thoroughly clean the forms with water under stiff pressure.

3. Remove laitance after concrete has hardened partially (not less than two hours nor more than four hours after placing) by brushing with stiff bristles, or by directing a stream of water from a 1/4" nozzle, or by other method approved by the *ENGINEER*, to expose the clean to surface of the coarse aggregate.

4. Where cleaning is not satisfactory to the *ENGINEER,* sandblast the surface and then wash again.

H. Method of placing:

1. Place concrete only under the degree of inspection described elsewhere in these Specifications, and as required by governmental agencies having jurisdiction.

2. Do not place concrete outside of regular working hours unless required inspection authorities have been notified properly and are present.

3. Spouts, pipes, troughs, belts, chain buckets, and other equipment may be used in conveying concrete, but the manner and method used shall be only as approved by the *ENGINEER*.

4. Do not permit concrete to free drop more than 5'-0".

5. Deposit concrete directly into conveyances, and direct from conveyances to final points of repose, except where troughs, buckets, or the like are used, in which case dump concrete into hoppers and then into the conveyances.

6. Where tremies are used, or where the free drop is 5'-0" or more, and through reinforcement, use a dumping box or board, moving the concrete therefrom by shovels or hoes.

7. Deposit concrete so that the surface is kept level throughout, a minimum being permitted to flow from one position to another, and place as rapidly as practicable after mixing.

8. Do not use in this Work any concrete not placed within 30 minutes after leaving the mixer.

I. Tamping and conveying:

1. Consolidation: All concrete shall be consolidated by vibration, spading, rodding or forking so that the concrete is thoroughly worked around the reinforcement, around embedded items, and into corners of forms, eliminating all air or stone pockets which may cause honeycombing, pitting, or planes of weakness. Internal vibrators used shall be the largest size and the most powerful that can be used properly in the work, as described in Table 5.1.5 of ACI 309R. They shall be operated by competent workmen. Use of vibrators to transport concrete within form shall not be allowed. Vibrators shall be inserted and withdrawn at points approximately eighteen inches (18") apart. At each insertion, the duration shall be sufficient to consolidate the concrete but not sufficient to cause segration, generally from 5 to 15 seconds. A spare vibrator shall be kept on the job site during all concrete placing operations. Where the concrete is to have an as-cast finish, a full surface of mortar shall be brought against the form by the vibration process, supplemented if necessary by spading to work the coarse aggregate back from the formed surface.

2. Completely compact with tamping poles and by tapping forms until the concrete is thoroughly compact and without voids. Determine the number of tampers needed by the amount and method of placing concrete.

3. Exercise care to tamp concrete vigorously and thoroughly to obtain maximum density.

4. Use manual tampers as well as mechanical vibrators.

   a. Exercise care to direct the quick handling of vibrators from one position to another.

   b. Do not over-vibrate concrete.

   c. Do not move concrete by use of vibrator.

J. Stoppages:

1. Stop concrete placing only when and where approved by the *ENGINEER*.

2. Maintain flow surfaces of freshly placed concrete as level whenever a pour is stopped, providing tight dams to accomplish this.

3. Make construction joints only where unavoidable, and then only at points determined by the *ENGINEER*.

4. Make horizontal construction joints only where shown on the Drawings or specifically approved by the *ENGINEER*.

5. Provide keys and dowels at construction joints where indicated on the Drawings, and where concrete placement is interrupted.

K. Bonding:

1. When specified, the surface of joints shall be prepared in accordance with the methods specified in Section 5.3.2.6 of ACI-301.

2. The hardened concrete of construction joints and of joints between footings and walls or columns, between walls or columns and beams or floors they support, joints in unexposed walls and all others not mentioned below shall be dampened (but not saturated) immediately prior to placing of fresh concrete.

3. The hardened concrete of horizontal construction joints in exposed work; horizontal construction joints in the middle of beams, girders, joists, and slabs; and horizontal construction joints in work designed to contain liquids shall be dampened (but not saturated) and then thoroughly covered with a coat of cement grout of similar proportions to the mortar in the

concrete. The fresh concrete shall be placed before the grout has attained its initial set.

4. Joints receiving an adhesive shall have been prepared and adhesive applied in accordance with the manufacturer's recommendations prior to placing of fresh concrete.

3.06 STEPS, SLABS, WALKS, AND PAVING ON EARTH

A. Preparation for slabs on earth:

1. Prepare the subgrade as specified in other Sections.

2. Dampen the subgrade for exterior slabs and paving prior to placing concrete, but do not dampen subgrade at interior floor slabs.

3. Provide the vapor retarder with bedding and covering shown on the Drawings, beneath floor slabs on grade.

a. Place the membrane in as large sheets as practicable, lapping 12", with the top lap placed in the direction concrete will be spread.

b. Carefully cut, fit, and seal the membrane to all pipes and conduits projecting through the membrane, using small sheets, where necessary, and pressure-sensitive tape.

c. Make necessary repairs to the membrane, and secure the *ENGINEER'S* approval before placing concrete.

d. Do not permit membrane to be punctured except at screed stakes and utility risers.

B. Placing and finishing:

1. Tamp the freshly placed concrete, except slabs to receive separate topping finish or mortar setting bed, using a heavy tamper, until at least 3/8" or mortar is brought to the surface.

2. Use tampers having a face consisting essentially of a grid of parallel metal bars.

3. Tamp with a light tamper, and screed with a heavy straightedge, until depressions and irregularities are worked out and the surface is true to finish grades and elevations.

4. Remove excess water and debris worked to the surface in compacting and screening.

5. At slabs to receive separate topping finish or mortar setting beds, do not continue tamping to raise the mortar described in subparagraph 3.05.B.1 above.

6. Remove laitance as described in subparagraph 3.05.G.3 above.

7. When concrete has hardened sufficiently, float to compact and smooth surface.

8. Provide the finish surfaces shown on the Drawings or otherwise directed by the *ENGINEER*.

3.07 SODA AND ACID WASH

A. At concrete surfaces to receive plaster, paint, or other finish, and which have been formed by oil-coated forms, scrub with a solution of 1½ lbs. caustic soda to one gallon of water.

B. On surfaces where smooth wood or waste molds have been used, scrub with a solution of 20% muriatic acid or hydrochloric acid.

C. After the surfaces have been scrubbed, wash with clean water as soon as possible.

3.08 DEFECTIVE CONCRETE

A. The following concrete will be deemed to be defective and shall be removed promptly from the job site.

1. Concrete, which is not formed as indicated, is not true to intended alignment, is not plumb or level where so intended, is not true to intended grades and levels;

2. Has voids or honeycomb that have been cut, resurfaces, or filled, unless with the approval of the *ENGINEER*;

3. Has sawdust, shavings, wood, or embedded debris;

4. Does not conform fully to provisions of the *Contract Documents*.

B. Repairs and replacements:

1. Where defective concrete is found after removal of the forms, cut out the defective concrete, if necessary, and make the surfaces match adjacent surfaces.

2. Work uneven surfaces and angles of concrete to a surface matching adjacent concrete surfaces.

3.09 GROUTING AND CEMENT POINTING

A. After steel columns have been installed and leveled, drypack the space between the bottom of the plate and concrete, using cement grout driven in to completely fill the space and forming solid bearing for the column base plate.

3.10 MISCELLANEOUS CONCRETE ITEMS

A. Walls and curbs:

1. Construct header walls and curbs as shown on the Drawings.

2. Trowel exposed concrete surfaces smooth.

B. Leave openings in floor slabs for foundations for machines, equipment and platforms in dimensions and arrangements required for the approved machines, equipment and platforms.

****END OF SECTION****

SECTION 03 35 00
(03345)

CONCRETE FINISHING AND CURING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Finishing and curing of cast-in-place concrete as needed for a complete and proper installation.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 03 30 00: Concrete*

3. *Section 03 11 00: Concrete Formwork*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *CONCRETE FINISHING AND CURING* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

1.03 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

B. Except as may be modified herein or otherwise directed by the Engineer, comply with ACI 301, "Specifications for Structural Concrete for Buildings."

1.04 PRODUCT HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacement necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Deliver materials in manufacturer's original unopened packaging with all tags and labels intact and legible of time of use.

E. Store and handle material in strict accordance with manufacturers directions and in such a manner as to avoid damage; store at site under cover.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 MATERIALS

A. General:

1. Carefully study the *Contract Documents* and determine the location, extent, and type of required concrete finishes.

2. As required for the work, provide the following materials, or equivalents approved in advance by the *ENGINEER*.

B. Concrete materials: Comply with pertinent provisions of Section 03300, except as may be modified herein.

C. Liquid bonding agent: "Weld-Crete," manufactured by the Larsen Products Corporation, or equal.

D. Curing and protection paper:

1. Approved products:

a. "Sisalkraft, Orange Label";

b. Equal products complying with ASTM C171.

2. Where concrete will be exposed and will be subjected to abrasion, such as floor slabs, use non-staining paper such as "Sisalkraft, Seekure 896," or equal paper faced with polyethylene film.

3. 6 mil, white polyethylene sheeting.

E. Liquid curing compound:

1. Concrete sealer: "VOCOMP-30" acrylic concrete curing and sealing material by W.R. Meadows or equivalent.

F. Slip-resistant abrasive aggregate:

1. Provide aluminum oxide, 14/36 grading.

2. Acceptable manufacturers:

a. Carborundum Company

b. Norton Company

c. L.M. Scofield Company

2.03 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 REQUIRED FINISHES

A. Formed Surfaces:

1. Formed surfaces of concrete which will be exposed to view and which will not be painted shall receive a grout cleaned finish.

2. Formed surfaces of concrete that will be painted shall receive a smooth form finish. Surfaces designated for immersion service shall not be "Bagged."

3. Formed surfaces of concrete that will not be exposed to view but which will receive waterproofing shall be given a smooth form finish.

4. Formed surfaces of concrete that will not be exposed to view and which are not scheduled to receive paint and/or waterproofing shall be given a rough form finish.

5. Unspecified finish: If the finish of formed surfaces is not specified herein, provide the following finishes as applicable.

a. Rough form finish:

(1) For all concrete surfaces not exposed to public view.

b. Smooth form finish:

(1) For all concrete surfaces exposed to public view.

B. Slabs:

1. Tanks and other structures containing water and/or sewage.

a. Surfaces of foundation slabs beneath tank walls that are not anchored to the slab (free floating) shall receive a steel troweled finish.

b. Surfaces of foundation slabs designated to receive a grout topping shall receive a scratched finish.

c. All other surfaces of foundation slabs, floor slabs, and unformed surfaces of footings that will be exposed to view when the structure is empty shall receive a troweled finish except that hand troweling subsequent to power troweling will not be required. One additional pass with a power trowel using steel trowel blades may be substituted for hand troweling. Hand troweling will only be required in areas that are not accessible to a power trowel.

2. Floor slabs of buildings including stair landings and miscellaneous areas and garage floors shall receive a troweled finish. Floor slabs that will not receive tile, carpet or paint shall also receive floor sealer as specified herein.

3. Unformed surfaces of equipment foundations shall receive a floated finish.

4. Sidewalks, ramps and all exterior slabs on grade that are intended as walking surfaces shall receive a broom finish.

5. Exterior platforms, steps and landings and exterior and interior pedestrian ramps shall receive a non-slip finish.

6. Unspecified finish: If the finish of slab surfaces is not specified herein, provide the following finishes as applicable:

a. Scratched finish:

(1) For surfaces scheduled to receive bond-applied cementitious applications and slate or stone paving.

b. Floated finish:

(1) For surfaces intended to receive roofing.

c. Troweled finish:

(1) For floors intended as walking surfaces.

(2) Floors scheduled to receive floor coverings or waterproof membrane.

d. Broom finish:

(1) Exterior pedestrian ramps.

e. Non-slip finish:

(1) Platforms, steps, and landings;

(2) Exterior or interior walkways near process equipment.

3.03 FINISHING OF FORMED SURFACES

A. General:

1. After removal of forms, give the concrete surfaces one or more of the finishes specified below.

2. Patch all bug holes, voids and cracks.

3. Revise the finishes as needed to secure the approval of the *ENGINEER*.

B. As-cast finish:

1. Rough form finish (below grade surfaces only):

    a. Leave surfaces with the texture imparted by forms, except patch tie holes and defects.

    b. Remove fins exceeding 1/4" in height.

2. Smooth form finish:

    a. Coordinate as necessary to secure form construction using smooth, hard, uniform surfaces, with number of seams kept to a practical minimum and in a uniform and orderly pattern.

    b. Patch tie holes and defects.

    c. Remove fins completely.

C. Rubbed finishes:

1. Provide these finishes only on a “smooth form finish” base as described above.

2. Smooth rubbed finish:

    a. Produce on newly hardened concrete no later than the day following form removal.

    b. Wet the surfaces, and rub with carborundum brick or other abrasive until uniform color and texture are produced.

    c. Do not use a cement grout other than the cement paste drawn from the concrete itself by the rubbing process.

3. Grout cleaned finish:

    a. Do not start cleaning operations until all contiguous surfaces to be cleaned are completed and accessible.

    b. Do not permit cleaning as the work progresses.

    c. Mix one part portland cement and 1½ parts fine sand with sufficient water to produce a grout having the consistency of thick paint.

d. Substitute white portland cement for part of the gray portland cement as required to produce a color matching the color of surrounding concrete, as determined by a trial patch.

e. Wet the surface of the concrete sufficiently to prevent absorption of water from the grout, and apply the grout uniformly with brushes or spray gun.

f. Immediately after applying the grout, scrub the surface vigorously with a cork float or stone to coat the surface and fill all air bubbles and holes.

g. While the grout is still plastic, remove all excess grout by working the surface with a rubber float, sack, or other means.

h. After the surface whites from drying (about 30 minutes at normal temperatures) rub vigorously with clean burlap.

i. Keep the surface damp for at least 36 hours after final rubbing.

3.04 FINISHING SLABS

A. Definition of finishing tolerances:

1. "Class A": True plane within 1/8" in ten feet as determined by a ten foot straightedge placed anywhere on the slab in any direction.

2. "Class B": True plane within 1/4" in ten feet as determined by a ten foot straightedge placed anywhere on the slab in any direction.

3. "Class C" True plane within 1/4" in two feet as determined by a two foot straightedge placed anywhere on the slab in any direction.

B. Scratched finish: After the concrete has been placed, consolidated, struck off, and leveled to a Class C tolerance, roughen the surface with stiff brushes or rakes before the final set.

C. Floated finish:

1. After the concrete has been placed, consolidated, struck off, and leveled, do not work the concrete further until ready for floating.

2. Begin floating when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation.

3. During or after the first floating, check the planeness of the surface with a ten-foot straightedge applied at not less than two different angles.

4. Cut down high spots and fill low spots, and produce a surface with a Class B tolerance throughout.

5. Refloat the slab immediately to a uniform sandy texture.

D. Troweled finish:

1. Provide a floated finish as described above, followed by a power troweling and then a hand troweling.

a. Produce an initial surface which is relatively free from defects, but which still may show some trowel marks.

b. Provide hand troweling when a ringing sound is produced as the trowel is moved over the surface.

c. Thoroughly consolidate the surface by hand troweling.

2. Provide a finished surface essentially free from trowel marks, uniform in texture and appearance, and in a plane of Class A tolerance.

a. On surfaces intended to support floor coverings, use fringing or other means as necessary and remove all defects in such magnitude as would show through the covering.

E. Broom finish:

1. Provide a floated finish as described above.

2. While the surface is still plastic, provide a textured finish by drawing a fiber bristle broom uniformly over the surface.

3. Unless otherwise directed by the *ENGINEE*R, provide the texturing in one direction only.

4. Provide “light,” “medium,” or “coarse” texturing as directed by the *ENGINEER* or otherwise called for on the Drawings.

3.05 CURING, SEALING AND PROTECTION

A. Beginning immediately after placement, protect concrete from premature drying, excessively hot and cold temperatures and mechanical injury.

B. Where application of specified finish materials will be inhibited by use of curing or sealing agents, cure the surface by water only; do not use chemical cure. Do not use curing or sealing compound on surfaces to receive tile or crystalline waterproofing.

C. Liquid curing or sealing compounds shall not be used on any surface against which additional concrete or other material is to be bonded unless it is proven that the curing compound will not prevent or reduce bond, or unless positive measures are taken to remove it completely from such areas.

D. Preservation of moisture:

1. Unless otherwise directed by the *ENGINEER*, apply one of the following procedures to concrete not in contact with forms, immediately after completion of placement and finishing.

a. Ponding or continuous sprinkling.

b. Application of absorptive mats or fabric kept continuously wet.

c. Application of sand kept continuously wet.

d. Continuous application of steam (not exceeding 150ºF) or mist spray.

e. Application of waterproof sheet materials specified in Part 2 of this section.

f. Application of other moisture retaining covering as approved by the *ENGINEER.*

g. Application of the curing agent specified in Part 2 of this section or elsewhere in the contract Documents.

(1) Apply curing compound when the surface water has disappeared and walking workmen will not mar the concrete surface.

(2) Apply at the rate of 1/10 of a gallon per minute. Spray on in a fine, fog pattern without spurts and dribbles to form a thin, continuous film. Avoid puddling in low areas. Brush or roll out all puddles.

2. Where forms are exposed to the sun, minimize moisture loss by keeping the forms wet until they can be removed safely.

3. Cure concrete by preserving moisture as specified above for at least seven days.

E. Sealing:

1. Apply specified sealing compound to concrete curbs, sidewalks, driveways and aprons, designated floors and exterior flat work not designated to receive other finishes. Material may be used as a curing compound on these surfaces in accordance with manufactures directions.

F. Temperature, wind, and humidity:

1. Cold weather:

a. When the mean daily temperature outdoors is less than 40ºF, maintain the temperature of the concrete between 50ºF and 70ºF for the required curing period.

b. When necessary, provide proper and adequate heating system capable of maintaining the required heat without injury due to concentration of heat.

c. Do not use combustion heaters during the first 24 hours unless precautions are taken to prevent exposure of the concrete to exhaust gases, which contain carbon dioxide.

2. Hot weather: When necessary, provide wind breaks, fog spraying, shading, sprinkling, ponding, or wet covering with a light colored material, applying as quickly as concrete hardening and finishing operations will allow.

3. Rate of temperature change: Keep the temperature of the air immediately adjacent to the concrete during and immediately following the curing period as uniform as possible and not exceeding a change of 5ºF in any one hour period, of 50ºF in any 24-hour period.

G. Protection from mechanical injury:

1. During the curing period, protect the concrete from damaging mechanical disturbances such as heavy shock, load stresses, and excessive vibration.

2. Protect finished concrete surfaces from damage from construction equipment, materials, and methods, by application of curing procedures, and by rain and running water.

3. Do not load self-supporting structures in such a way as to overstress the concrete.

****END OF SECTION****

SECTION 04 01 00
(04900)
MASONRY CLEANING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Description of the system:

1. Restoration cleaning of exterior masonry surfaces by use of:

a. Chemical restoration cleaners

b. Detergents

c. Paint strippers.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *MASONRY CLEANING* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with

the specified requirements.

C. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 MOCKUP

A. Clean a wall panel, 10 x 10 ft to determine extent of cleaning and cleaning methods.

B. Repeat, using different cleaning methods up to three different panels, until acceptable.

C. Locate where directed by *ARCHITECT/ENGINEER*.

D. Acceptable panel [illustrating results of [restoration] [and] [cleaning]] will become standard for work of this section.

1.05 PRE-INSTALLATION MEETINGS

A. Pre-installation meeting. Convene minimum one week prior to commencing work of this section.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.07 ENVIRONMENTAL CONDITIONS

A. Masonry surfaces shall be cleaned only when air temperatures are above 40 degrees F and will remain so until masonry has dried out, but for not less than 7 days after completion of the work.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers:

1. Prosoco, Inc., 3741 Greenway Circle, Lawrence, KS 66046, (800) 255-4255, (785) 865-4200.

2. Diedrich Technologies, Inc., 7373 S. 6th St, Oak Creek, WI 53154, (800) 323-3565, (414) 764-6993

3. EaCo Chem., Inc., 765 Commerce Avenue, New Castle, PA 16101, (724) 656-1055, (800) 313-8505

4. Or equivalent.

2.02 MATERIALS

A. Prosoco "Restoration Cleaner, #20030," General-purpose acidic restoration cleaner for brick, terra cotta, sandstone, granite, and many other masonry surfaces. Dissolves heavy atmospheric soiling. Not suitable for limestone, marble, travertine, concrete, or cast stone surfaces.

B. EaCo Chem "SafeRestore" non-hydrofluoric restoration detergent safe for brick, limestone, sandstone, concrete, pre-cast concrete, exposed aggregate, granite, unpolished marble, synthetic stone, terrazzo, anodized aluminum, EIFS, uncoated stainless steel, stucco, roofs, glass.

C. Water: Potable water shall be obtained from a local source and shall be filtered to remove minerals resulting in a neutral pH, prior to application. Backflow prevention devices shall be provided at the point of connection to the water supply.

2.03 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

2.04 EQUIPMENT

A. Spray Equipment

1. Spray equipment for chemical cleaners shall be low-pressure tanks or chemical pumps suitable for chemical cleaner indicated, and shall be equipped with stainless steel, cone-shaped spray-tip.

2. Spray equipment for water shall disperse water through a fan-shaped spray tip at an angle of not less than 15 degrees.

3. Spray equipment shall deliver water at a pressure not greater than 500 psi and at a volume between 2.5 and 3 gpm.

4. Spray equipment for heated water shall be capable of maintaining temperature, at flow rates indicated, between 140 and 180 degrees F.

B. Brushes

1. Brushes shall have natural or nylon fiber bristles only.

2. Wire brushes shall not be used.

3. Scrapers and application paddles shall be made of wood with rounded edges.

4. Metallic tools shall not be used.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Verify that surfaces to be cleaned are ready for the work of this section.

D. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Protect surrounding areas, landscaping, building interior, building occupants, pedestrians, vehicles, and non-masonry surfaces during the work from contact with cleaners, residues, rinse water, fumes, wastes, and cleaning effluents in accordance with manufacturer's instructions.

B. Seal and mask materials and surfaces not receiving work of this section to protect from damage.

C. Divert and protect pedestrian and auto traffic.

D. Avoid wind drifting of spray of chemical cleaning products, residues, and rinse water.

E. Clean masonry before installation of replacement windows and doors.

F. Immediately remove stains, efflorescence, or other excess resulting from work of this section.

3.03 MASONRY CLEANING

A. Cleaning shall conform to BIA Tech Note 20.

B. Open joints shall be temporarily caulked or otherwise protected to prevent water and cleaner intrusion into the interior of the structure from pressure spraying.

C. Non-masonry materials and severely deteriorated masonry shall be protected by approved methods prior to initiation of cleaning operations.

D. Masonry cleaning shall remove all organic and inorganic contaminants from the surface and pores of the substrate, returning the masonry to its natural color.

E. Surfaces shall be evenly cleaned with no evidence of streaking or bleaching. The cleaning process shall not affect the density, porosity, or color of the masonry or mortar.

F. Cleaned masonry shall have a neutral pH.

G. Cleaning shall proceed in an orderly manner, working from top to bottom of each scaffold width and from one end of each elevation to the other.

H. Cleaning shall be performed in a manner which results in uniform coverage of all surfaces, including corners, moldings, interstices and which produces an even effect without streaking or damage to masonry. The cleaning materials, equipment, and methods shall not result in staining, erosion, marring, or other

damage to the surfaces of the structure.

I. The surface cleaning shall be completed prior to start of repair work.

J. The cleaning shall provide for the complete cleaning of all exterior masonry surfaces of the structures, removing all traces of moss, dirt, and other contaminants.

K. The cleaning shall provide a clean masonry surface to allow determination of the masonry's color and shades, finish and texture, and other properties.

L. Following completion of the surface cleaning the masonry shall be dried prior to the start of any repair work.

M Chemical cleaners shall be applied in strict accordance with the manufacturers printed instructions. Protect surfaces that may be damaged by cleaners in accordance with manufacturers instructions.

3.04 CLEANING

1. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

2. Remove and dispose of all debris.

****END OF SECTION****

SECTION 04 01 20
(04530)
BRICK REPOINTING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Repoint existing brick walls.

2. Replace damaged or missing brick.

3. Reset loose bricks.

4. Cleaning of masonry.

B. Related work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 04 22 00: Concrete Unit Masonry*

3. *Section 07 19 23: Silane/Siloxane Water Repellant System*

4. *Section 07 92 13: Sealants and Caulking*

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Samples: Two cubes of hardened mortar, approximately 2 in. (51 mm), for color selection and matching.

D. Reports of quality control tests.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 60, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 JOB CONDITIONS

A. Environmental requirements:

1. Cold weather conditions: Lay no masonry when the temperature of the outside air is below 40ºF, unless suitable means are provided to heat materials; protect work from cold and frost and insure that mortar will harden without freezing.

2. Hot weather conditions: Protect masonry construction from direct exposure to wind and sun when erected in an ambient air temperature of 90ºF, in the shade with relative humidity less than 50%.

2.03 MORTAR MIXES

A. The new mortar shall match the existing mortar in materials, color, texture and tooling.

1. Proportions of binder, sand and other constituents shall be determined by laboratory testing.

2. The sand, binder and other constituents shall match the sand, binder and other constituents in the existing mortar.

3. The new mortar shall be as vapor permeable and as soft (measured in compressive strength) as the existing mortar.

B. The mortar mix to be used shall be determined by laboratory analysis of samples obtained from the existing masonry work.

1. Not less than three samples shall be collected from different locations in the masonry work. Such samples shall be properly labeled indicating the date of sampling, approximate location where each sample was taken and the name and contact information of person and laboratory taking the sample.

2. The size of each sample shall be as required by the laboratory performing the analysis.

C. Laboratory analysis shall be performed on EACH sample in accordance with ASTM C1324 and reports provided for the samples taken. The reports shall provide the information required in paragraph 11 of ASTM C1324 as well as the paste constituents, aggregate size, air content and compressive strength. The report shall also recommend a replacement mix referencing ASTM C270.

D. The materials used in the mortar mix shall be based on the test results and all aggregate shall match existing in size and color.

E. Acceptable mortar matching firms:

1. U. S. Heritage Group
3516 North Kastner Ave.
Chicago, IL
Tel: 773-286-2100

2. Abstract Masonry Restoration, Inc.
599 High Street
Medford, MA
Tel: 781-488-3088

3. Abstract Masonry Restoration, Inc.
681 South 4050 west
Salt Lake City, UT

Tel: 801-505-4967

4. Or equivalent.

2.04 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Where bricks are missing or spalled, provide new bricks of the same color, texture and quality as the existing bricks.

B. Remove softened, disintegrated or open mortar joints to a depth of at least 3/4 inch with power tools.

C. After cutting, remove all loose material with a brush or hose stream.

D. Prehydrate pointing mortars to reduce shrinkage and improve workability.

1. Thoroughly mix all ingredients dry.

2. Mix again adding only enough water to produce a damp workable mix which will retain its form when pressed into a ball.

3. Keep mortar in this dampened condition for one to two hours.

4. Add sufficient water to bring water to the proper consistency (somewhat drier than conventional masonry mortar).

E. Wet mortar joints thoroughly before applying fresh mortar.

F. Allow water to soak into wall.

G. Pack mortar tightly in thin layers until joint is filled.

H. Tool joints to provide a "V" shaped joint.

3.03 CLEANING

A. Dry brush masonry surface after mortar has set, at end of each day's work and after final pointing.

B. Leave work and surrounding surfaces clean and free of mortar spots and droppings.

C. Thoroughly clean masonry surfaces to be exposed whether painted or unpainted. Do not use muriatic acid. Apply specified cleaner in strict accordance with the manufacturer's instructions.

D. Before applying any cleaning agent to the entire wall, apply agent to a sample wall area of approximately twenty square feet in a location approved by the *ENGINEER*. No further cleaning work shall proceed until the sample area has been approved by the *ENGINEER*, after which time the same cleaning materials and method shall be used on the remaining wall.

3.04 PRESSURE WASHING

A. Thirty (30) days after completion of pointing, stuccoing and cleaning, pressure wash all masonry surfaces with high pressure water and cleaning agent.

B. All exposed masonry surfaces shall be cleaned free of all atmospheric dirt, mildew and carbon formations so as to restore the masonry surface. Masonry cleaning compound shall be Sure Klean Heavy Duty Restoration Cleaner applied in strict accordance with the manufacturers printed instructions. Sandblasting, wet aggregate blasting or use of other abrasive materials is not allowed.

C. All window glass and non-masonry surfaces shall be protected from exposure to the cleaning materials. Test panels (minimum 4' x 4') shall be cleaned prior to beginning full scale cleaning operations to determine the effectiveness of the cleaning compound and precise cleaning procedures. Tests shall be available for inspection and approval by the *ENGINEER*.

PART 4 - PAYMENT

4.01 BRICK REPOINTING

A. Payment for this item shall be on a lump sum basis as defined in the Proposal and shall include furnishing all materials, labor, tools and equipment and all other miscellaneous items required to repoint bricks and clear the walls as shown on the Plans as specified herein.

****END OF SECTION****

SECTION 04 22 00
(04220)
CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Concrete unit masonry for:

a. Building walls.

b. Foundation walls.

2. Masonry core insulation

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 03 20 00: Concrete Reinforcement*

3. *Section 03 30 00: Concrete*

4. *Section 07 19 23: Silane Water Repellant System*

5. *Section 07 92 13: Sealants and Caulking*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for the *CONCRETE UNIT MASONRY* in the prices bid for the various related items of work as designated in the Proposal.

1.02 REFERENCE STANDARDS

A. American Society for Testing Materials Standards (ASTM):

1. ASTM A82: Steel Wire, Plain, for Concrete Reinforcement

2. ASTM A116: Zinc-Coated, (Galvanized) Iron or Steel Farmfield and Railroad Right-Of-Way Wire Fencing

3. ASTM A153: Zinc Coating (Hot Dip) on Iron and Steel Hardware

4. ASTM A307: Carbon Steel Externally and Internally Threaded Standard Fasteners

5. ASTM A615: Reformed and Plain Billet - Steel Bars for Concrete Reinforcement

6. ASTM C90: Hollow Load-Bearing Concrete Masonry Units

7. ASTM C91: Specification for Masonry Cement

8. ASTM C129: Non Load-Bearing Concrete masonry Units

8. ASTM C144: Aggregate for Masonry Mortar

10. ASTM C145: Solid Load-Bearing Concrete Masonry Units

11. ASTM C150: Portland Cement

12. ASTM C207: Hydrated Lime

13. ASTM C236: Test Method for Thermal Conductance and Transmittance of Built-Up Sections by Means of the Guarded Hot Box.

14. ASTM C270: Mortar for Unit Masonry

15. ASTM C423: Test Method for Sound Absorption and Sound Absorption Coefficiency by the Reverberation Method

16. ASTM E72: Methods of Conducting Strength Tests of Panels for Building Construction

17. ASTM E518: Test Methods for Flexural Bond Strength of Masonry

18. ASTM E519: Diagonal Tension (Shear) in Masonry Assemblages

19. ASTM C-578: Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

3. Test reports indicating that block complies with ASTM Standards C236, E72, E518 and E519.

C. Shop drawings for fabrications, bending and placement of concrete masonry reinforcing bars. Comply with ACI 315 showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of masonry reinforcement.

D. Manufacturer's recommended installation procedures.

E. Samples: Before any concrete unit masonry materials are delivered to the job site, submit two samples of each proposed concrete masonry unit to the *ENGINEER* for approval.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

D. Requirements of regulatory agencies:

1. All construction shall be in compliance with currently adopted International Building Code – New Jersey Edition and Local Ordinances.

2. All masonry walls over eight feet in height shall be adequately braced to prevent overturning and to prevent collapse unless the wall is adequately supported so that it will not overturn or collapse. The bracing shall remain in place until permanent supporting elements of the structure are in place. Walls shall be braced in accordance with the "Standard Practice for Bracing Masonry Walls Under Construction" as published by the Council for Masonry Wall Bracing and OSHA Requirements.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Deliver material in manufacturer's original packaging with all tags and labels intact and legible.

D. Store materials under cover in a dry place and to prevent damage or intrusion of foreign matter, contact with soil, or exposure to elements. During freezing weather, protect all masonry units with tarpaulins or other suitable material. Store concrete masonry units under covers that will permit circulation of air and prevent excessive moisture absorption. Store cement and lime in watertight enclosures with elevated floors. Protect reinforcement from the elements. Reinforcement shall be free from rust, ice or other foreign coatings that will destroy or reduce bond. Concrete masonry units shall be protected against wetting prior to use.

E. Handle units on pallets or flat bed barrows.

F. Do not permit free discharge from conveyor units or transporting in mortar trays.

PART 2 - MATERIALS

2.01 GENERAL

A. Products: Whenever material or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 CONCRETE MASONRY UNITS

A. Hollow or solid, load bearing, conforming to ASTM C90, Type 1.

1. Unit Compressive Strength: Provide units with minimum average net area compressive strength of 1900 psi.

2. Weight Classification: Normal weight unless otherwise shown.

B. Decorative masonry units:

1. Conforming to ASTM C90, Type I, manufactured with normal weight aggregate with block face ribbed and split or split as shown on the Contract Drawings. Split face block is also known as rock faced.

2. Provide complete with sash and corner units as required.

3. Color as selected by *ENGINEER*.

C. Standard dimensions: Use standard module dimensions.

D. Provide accessory shapes as indicated or otherwise required.

E. Blocks shall be sound and free of cracks or other defects that would interfere with proper placing of the unit or impair the strength or performance of the construction.

F. Where units are used in exposed wall construction, the face or faces exposed shall be free of chips, cracks, or other imperfections.

G. Precast concrete masonry lintels (grade beams) shall be of the same material and shall have the same compressive strength as concrete masonry units used in wall construction. Each lintel shall be reinforced with at least one - No. 4 reinforcing bars shall be placed in bottom of lintel.

H. All masonry units and precast lintels used in exterior walls shall have an integral water repellent additive. Water repellent additive shall be "Dry-Block Admixture" as manufactured by Grace Construction Products, or equivalent.

I. Provide an Integral Flashing System composed of FlowBlox™ units with integral water repellent, bottom coat and Diverter Shields. Units shall be manufactured by a producer licensed by The Proudfoot Company, Inc., Monroe, Connecticut. Units shall conform to the requirements of ASTM C90, have penetrated moisture diversion capability equivalent to conventional membrane flashing when tested in accordance with ASTM E514, and have a minimum net compressive strength of 2500 psi. Minimum oven dried density shall be 125 pounds per cubic foot when tested in accordance with ASTM C140. Provide accessory units designed for vertical reinforcing including stretcher and corner units where shown.

2.03 MASONRY CORE INSULATION

A. Korfil molded polystyrene unit masonry insulation as manufactured by CBIS/Korfil Incorporated, P. O. Box 1000, West Brookfield, MA 01585 or equivalent.

B. Insulation shall conform to the applicable physical property requirements of ASTM C578, Type 1.

C. Thermal capabilities of insulated block walls when tested in accordance with ASTM C236.

1. 6-inch: Lightweight (density of 80-100 lb/ft^3), U-Value of 0.17; Normal weight (density of 120-140 lb/ft^3), U-Value of 0.24.

2. 8-inch: Lightweight, U-Value of 0.16; Normal weight, U-Value of 0.24.

3. 10-inch: Lightweight, U-Value of 0.15, Normal weight, U-Value of 0.22.

4. 12-inch: Lightweight, U-Value of 0.14, Normal weight, U-Value of 01.19.

5. 12-inch cavity wall with 8-inch CMU: Lightweight, U-Value of 0.13; Normal weight, U-Value of 0.18.

D. Place insulation in block cores at the block manufacturer's plant in conformance with Korfil installation requirements.

2.04 JOINT REINFORCEMENT

A. Standard weight, truss type, galvanized "Dur-O-Wal" (as manufactured by Dur-O-Wal National, Inc.), "Truss-Mesh-Lock" (as manufactured by Hohmann and Barnard) or approved equivalent.

1. Joint reinforcement shall be Dur-O-Wal "DA 3100, No.8" for 8" CMU and "DA 3100, No.12" for 12" CMU unless otherwise shown on the drawings, or approved equivalent.

B. Width shall be two inches less than nominal wall thickness in which used.

C. All reinforcement shall be hot dip galvanized in accordance with ASTM A153, Class B-2.

2.05 PORTLAND CEMENT: ASTM C150, Type IIA.

2.06 MASONRY CEMENT: ASTM C91, Type "S" or "N" as shown in Table 1.

2.07 MORTAR CEMENT: ASTM C1329, Type "S" or "N" as shown in Table 1.

2.08 HYDRATED LIME: ASTM C207, Type S.

2.09 QUICK LIME: ASTM C5 (for Lime Putty).

2.10 AGGREGATE: ASTM C144.

2.11 WATER: Clean, clear potable water.

2.12 MORTAR COLORANT

A. SES concentrated mortar colors as manufactured by Solomon Colors Inc., 4050 Color Plant Road, Springfield, IL, (800-624-0261) or equal. Colorant shall contain no calcium chloride.

2.13 ANCHORS AND TIES

A. Zinc coated steel conforming to ASTM A153 (hardware); ASTM A116 for Class 2 coating (steel wire).

B. Hohmann and Barnard, Inc., or approved equal.

2.14 MASONRY CLEANER

A. "Sure Klean 600" as manufactured by PROSOCO, Inc., 3741 Greenway Circle , Lawrence, KS 66046, Tel**:** (800) 255-4255, or approved equal.

2.15 ANCHOR BOLTS: ASTM A307 - Carbon Steel Threaded Standard Fasteners.

2.16 MORTAR MIXES: Mortar shall conform to ASTM C270, and shall be Type S as shown in Table 1.

TABLE 1
MORTAR PROPORTIONS
Parts by Volume

Mortar Mix	Mortar Type (ASTM C270)	Portland Cement or Blended Cement	Mortar Cement (Type)	Masonry Cement (Type)	Hydrated Lime or Lime Putty	Aggregate Ratio
Cement - Lime	S	1	-	-	Over ¼ to ½	Not less than 2¼ and not more than 3 times the sum
Mortar Cement	S S	1/2 -	1(N) 1(S)	- -	- -	

Masonry Cement	S S	1/2 -		1(N) 1(S)	- -	of the separate volumes of cement & lime

B. Adjust consistency of mortar to satisfaction of mason; add only enough water as is compatible with convenience of using mortar.

C. Use a mechanical mixer of one sack minimum capacity. Mix mortar for at least five minutes after all materials have been added. Mix only as much mortar as can be used in one hour after water has been first mixed into the batch. Do not retemper mortar.

D. Mortar for use with colored block shall be tinted to match block color.

E. Water Repellent:

1. All mortar used in exterior walls shall have an integral water repellent additive compatible with and manufactured by the same manufacturer of the water repellent additive used in the masonry units.

2. Water repellent shall be the Dry-Block II as manufactured by Grace Construction Products, or equivalent.

2.17 GROUT

A. Grout for filling cells of unit masonry shall comply with ASTM C 476.

1. Use Fine grout where grout space is less than 3" in its' least dimension.

2. Use Coarse grout where grout space is 3" or greater in its' least dimension.

B. When the minimum grout compressive strength is to be 2000 psi or greater, provide laboratory mix design prepared as required of concrete mix design under Section 03 30 00 of these Specifications.

2.18 MISCELLANEOUS MASONRY ACCESSORIES

A. Nonmetallic Expansion Joint Strips: Premolded neoprene filler strips complying with ASTM D1056, Type 2 (closed cell), Class A (cellular rubber and rubber-like materials with specific resistance to petroleum base oils), Grade 1 (compression-

deflection range of 2-5 psi (14 - 35 kPa)), compressible up to 35 percent, of width and thickness indicated.

B. Preformed Control Joint Gaskets: styrene-butadiene rubber compound ASTM D2000, Designation 2AA-805 designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond Breaker Strips: Asphalt-saturated organic roofing felt complying with ASTM D226, Type I (No. 15 asphalt felt).

D. Weep Holes: Medium-density round plastic polyethylene tubing, 3/8-inch (9.53 mm) outside diameter by 4 inches (102 mm) long.

2.19 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be as selected by the Contractor subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 INSPECTION

A. Inspection: Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 ENVIRONMENTAL CONDITIONS

A. Cold Weather Construction:

1. Implement the following requirements when:

   a. The ambient temperature falls below 40°F (4.4°C), or;

   b. The temperature of masonry units is below 40°F (4.4°C).

2. Do not lay masonry units having a temperature below 20°F (-6.7°C). Remove visible ice on masonry units before the unit is laid in the masonry.

3. Heat mortar sand or mixing water to produce mortar temperatures between 40°F (4.4°C) and 120°F (48.9°C) at the time of mixing. Maintain mortar above freezing until used in masonry.

4. When ambient temperature is between 25°F (-3.9°C) and 20°F (-6.7°C) use heat sources on both sides of the masonry under construction and install windbreaks when wind velocity is in excess of 15 mph (24.1 km/h).

5. When ambient temperature is below 20°F (-6.7°C), provide an enclosure for the masonry under construction and use heat sources to maintain temperature above 32°F (0°C) within the enclosure.

6. When mean daily temperature is between 40°F (4.4°C) and 32°F (0°C), protect completed masonry from rain or snow by covering with a weather-resistive membrane for 24 hours after construction.

7. When mean daily temperature is between 32°F (0°C) and 25°F (-3.9°C), completely cover completed masonry with a weather-resistive membrane for 24 hours after construction.

8. When mean daily temperature is between 25°F (-3.9°C) and 20°F (-6.7° C), completely cover completed masonry with insulating blankets or equal protection for 24 hours after construction.

9. When mean daily temperature is between 20°F (-6.7°C), maintain masonry temperature above 32°F (0°C) for 24 hours after construction by enclosure with supplementary heat, by electric blankets, by infrared heat lamps, or by other acceptable methods.

10. Do not lay glass unit masonry during cold weather construction periods as defined in Article 1.8 C.1.a or 1.8 C.1.b. Maintain temperature of glass unit masonry above 40°F (4.4°C) for the first 48 hours after construction.

B. Hot Weather Masonry Construction:

1. When ambient temperature is above 100°F or above 90°F with a wind > 8 MPH, maintain sand piles in a damp loose condition. Maintain temperature of mortar and grout below 120°F. Flush mixer. Mortar transport container, and mortar boards with cool weather before they come into contact with mortar ingredients or mortar. Maintain mortar consistency by retempering with cool water. Use mortar within a maximum of 2 hours of initial mixing.

2. When ambient temperature is above 115°F or above 105°F with a wind > 8 MPH, maintain sand piles in a damp loose condition. Maintain

temperature of mortar and grout below 120°F. Flush mixer. Mortar transport container, and mortar boards with cool weather before they come into contact with mortar ingredients or mortar. Maintain mortar consistency by retempering with cool water. Use mortar within a maximum of 2 hours of initial mixing. Materials and equipment shall be shaded from direct sunlight. Use cool mixing water for mortar and grout. Ice is permitted in the mixing water as long as it is melted prior to use. Do not permit ice in mixing water when added to the other mortar or grout materials.

3. When ambient temperature is above 100°F or above 90°F with a wind > 8 MPH, fog spray all newly constructed masonry until damp, at least four times a day until masonry is three days old.

3.03 GENERAL

A. Lay only dry masonry units.

B. Do not use chipped or broken units. If any such units are discovered in the finished wall, the *ENGINEER* may require their removal and replacement with new units at no additional cost to the *OWNER*.

C. Use masonry saws to cut and fit masonry units.

D. Bond: Running bond with vertical joints located at center of masonry units in alternate course below, unless otherwise shown on Plans.

E. Set units plumb, true to line, and with level courses accurately spaced.

F. Adjust masonry unit to final position while mortar is soft and plastic.

G. If units are displaced after mortar has stiffened, remove, clean joints and units of mortar and relay with fresh mortar.

H. Adjust shelf angles to keep masonry level and at proper elevation.

I. Provide pressure-relieving joints by placing a continuous 1/8-inch foam neoprene pad under the shelf angle and seal joint with sealant.

J. When joining fresh masonry to set or partially set masonry construction, clean exposed surface of set masonry and remove loose mortar prior to laying fresh masonry.

K. If necessary to stop off a horizontal run of masonry, rack back one-half block length in each course.

L. Do not use toothing to join new masonry to set or partially set masonry when continuing a horizontal run.

M. Units at jambs of windows, doors and masonry openings shall be solid and shall be of the shapes and sizes required to bond with wall units.

N. Bearings under lintels shall be mortar filled blocks.

O. Construct partitions continuous from floor to underside of roof construction above. Fill joints at top with mortar.

P. Replace insulation damaged in transit or handling for insulated masonry.

Q. Sound absorbing units shall be laid with open ends of cavities facing downward in full bed mortar.

R. Slots in sound absorbing units shall be exposed to the area where sound absorption is required.

S. Keep slots in sound absorbing units free of all mortar and debris and the mortar at the bottom of each slot shall be neatly tooled.

3.04 INTEGRAL FLASHING UNITS

A. Provide Integral Flashing Unit course at the base of all walls, immediately above bond beams and over all masonry openings unless otherwise shown

B. Unless shown otherwise on the drawings, install the Integral Flashing Units with the solid base down and the weep slot on the exterior face of the wall.

C. The Integral Flashing Unit course shall be installed on a 100% solid course or other 100% solid substrate.

D. Lay out walls at the flashing elevation as much as possible to a 16" running bond module. Lay up the Integral Flashing Units with full head and 100% full bed joints. Tool joints concave and at the Integral Flashing Unit weep slot, do not create an obstruction, which will impede the free flow of cavity moisture away from the joint. Install the Diverter Shield across adjacent end webs so that water will shed into the drainage cavity of the Integral Flashing Units.

E. Do not cut the Integral Flashing Unit to make up odd dimensions. Make up odd block lengths at the jambs of openings or at control joints by cutting a regular CMU and grouting it solid. Cap the grouted unit with copper laminate flashing or Perm-a-barrier by W. R. Grace with 1/4" embedment on three sides and a turned down edge into the Integral Flashing Unit drainage cavity. Refer to manufacturers' details for corner and odd coursing requirements.

F. Provide finished outside corners as shown on the drawings. Do not drill through the base of the Integral Flashing Units or otherwise penetrate the base. Use special Integral Flashing Unit stretcher and corner units where reinforcing is required.

G. Keep Integral Flashing Unit weep slots and drainage cavities free of mortar accumulation. Fill the drainage cavity with washed 3/8" gap graded pea gravel.

3.05 PROTECTION OF WORK

A. Protect sills, ledges, expansion joints, and off-sets from mortar drippings or other damage during construction.

B. Remove misplaced mortar or grout immediately.

C. Cover top of walls with non-staining waterproof coverings when work is not in progress.

D. Provide minimum two feet overhang of protective covering each side of wall and securely anchor.

E. Protect face materials against staining.

3.06 SHRINKAGE AND CRACK CONTROL

A. Place continuous joint reinforcement in every second joint (where spacing is not indicated on Contract Drawings) of concrete block walls, beginning sixteen inches above the footings. Also place continuous reinforcement in the first joint above and below openings. Lap reinforcement six inches (6"). Cut and bend reinforcement at all corners.

B. Where an interior concrete block wall abuts an exterior wall, install in every second course (where spacing is not indicated on Contract Drawings), "Dur-O-Wal" tees, or equal, forming a continuous reinforcement.

C. Place non-continuous reinforcement in concrete block walls in the second joint above the below openings, terminating reinforcement two feet each side of opening. Lap reinforcement six inches. Cut and bend reinforcement at corners.

3.07 REINFORCEMENT

A. Provide reinforcement as shown on the Drawings, fully embedded in grout and not in mortar or mortar joints.

B. Provide required metal accessories to ensure adequate alignment of steel during grout filling operations.

3.08 MORTAR BEDS

A. Hollow units:

1. Lay with full mortar coverage on horizontal and vertical face shells.

2. Provide full mortar coverage on horizontal and vertical face shells and webs in all courses of following:

a. Piers, columns, and pilasters.

b. Starting course on footings and solid foundation walls.

c. Where adjacent to cells or cavities to be filled with grout.

B. Solid units: Lay with full mortar coverage on horizontal and vertical joints.

C. All mortar shall contain the specified integral water repellant.

3.09 JOINTS

A. Horizontal and vertical face joints:

1. Normal thickness: 3/8-inch.

2. Construct uniform joints.

3. Shove vertical joints tight.

4. Strike joints flush in surfaces to be plastered, stuccoed, or covered with other masonry, or other surface applied finish other than paint.

5. Point joints tight in unparged masonry below ground.

6. Tool joints in exposed or to be painted surfaces when thumbprint hard with a round or "v"-groove jointer. Jointer shall be slightly larger than the width of the mortar so that a complete contact is made along the edges, compressing and sealing the surface of the joint. Trowel point exterior joints below grade. Flush out all other joints not tooled.

7. Remove mortar protruding into cells of cavities to be reinforced or filled.

8. Fill horizontal joints with mortar between top of masonry partitions and underside of concrete slabs or beams.

B. Collar joints: Except in cavity walls, fill with mortar by back parging either facing or backing wythe and shoving or grouting.

3.10 GROUTING

A. Perform grouting in strict accordance with the provisions of the governing building code.

B. Solidly fill vertical cells containing reinforcement.

C. Consolidate grout at time of pour by puddling with a mechanical vibrator, filling all cells of the masonry, and then reconsolidating later by puddling before the plasticity is lost.

3.11 BUILT-IN WORK

A. Avoid cutting and patching.

B. Install bolts, anchors, nailing blocks, inserts, frames, vents, flashings, conduit and other built-in items as masonry work progresses.

C. Solidly grout spaces around built-in items. Set lintels in bed of mortar. Fill solid with mortar around jambs and heads of metal door bucks and frame. Point around all sides of metal door and window frames with mortar.

D. Provide outside joint around exterior door and window frames and other framed wall openings:

1. Width: ¼-inch to ⅜-inch

2. Rake and tool smooth to a uniform depth equal to the width of the joint.

3.12 CHASES

A. Build chases in; do not cut.

B. Minimum installation distance from jambs or openings: One concrete masonry unit length.

3.13 POINTING AND CLEANING

A. At final completion of unit masonry work, fill holes in joints and tool, point up all exposed concrete block masonry, fill all holes and joints, remove loose mortar.

B. Do not fill weep holes.

C. Cut out and repoint defective joints.

D. Dry brush masonry surface after mortar has set, at end of each day's work and after final pointing.

E. Leave work and surrounding surfaces clean and free of mortar spots and droppings.

F. Thoroughly clean masonry surfaces to be exposed whether painted or unpainted. Do not use muriatic acid. Apply specified cleaner in strict accordance with the manufacturer's instructions.

G. Before applying any cleaning agent to the entire wall, apply agent to a sample wall area of approximately twenty square feet in a location approved by the *ENGINEER*. No further cleaning work shall proceed until the sample area has been approved by the *ENGINEER*, after which time the same cleaning materials and method shall be used on the remaining wall.

3.14 PARGING

A. Parge pre-dampened exterior of all foundation walls down to bottom of footing with ½-inch thick Type S mortar.

B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of ⅛ inch per foot (3.175 mm per m). Form a wash at top of parging and a cove at bottom.

C. Damp cure parging for at least 24 hours and protect until cured.

D. Dampproofing: After completion of final cleaning, apply dampproofing specified in *Section 07 19 23* according to the manufacturer's installation instructions ensuring that all exposed masonry surfaces receive full coverage from grade down to footing.

****END OF SECTION****

SECTION 05 31 23
(05312)

STEEL ROOF DECKING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Steel roof decking.
2. Closures and fillers
3. Fastening of deck

B. Related documents:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.
2. *Section 05 12 00: Structural Steelwork*
3. *Section 05 50 00: Metal Fabrications*
4. *Section 09 90 00: Painting*

1.02 REFERENCES

A. Codes and standards: Comply with provisions of the following codes and standards, except as otherwise shown or specified:

1. ASTM A 611 - Standard Specification for Steel, Sheet, Carbon, Cold-Rolled, Structural Quality.
2. ASTM A653/A653M - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-iron Alloy coated (Galvannealed) by the Hot-Dip Process.
3. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

4. AWS D1.3 - Structural Welding Code - Sheet Steel; American Welding Society.

5. Fire Resistance Directory; Underwriters Laboratories Inc. (UL).

6. SDI 29 - Steel Deck Institute Design Manual for Composite Decks, Form Decks, Roof Decks, and Cellular Metal Floor Deck with Electrical Distribution; Steel Deck Institute, Inc. (SDI).

7. SDI DDM02 - Diaphragm Design Manual; Steel Deck Institute, Inc. (SDI).

8. SDI Manual of Construction with Steel Deck; Steel Deck Institute, Inc.

9. Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Manufacturer's product data:

1. Submit for each type of decking specified, including dimensions of individual components, profiles, and finishes.

2. Mechanical fasteners: Test reports from a qualified independent testing agency evidencing compliance with requirements based on comprehensive testing.

C. Shop drawings: Submit detailed drawings showing layout and types of deck panels, anchorage details, and conditions requiring closure panels, supplementary framing, sump pans, cant strips, cut openings, special jointing or other accessories.

D. Product Certificates: Signed by the manufacturer of the steel deck, certifying that the supplied products comply with specified requirements.

E. Welder Certificates.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions, as approved by the *ENGINEER*, will provide the basis for acceptance or rejection of the work performed under this section.

D. Qualification of field welding:

1. Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure". Each welder shall have satisfactorily passed A.W.S. Qualification tests for welding processes involved, and if applicable, shall have undergone recertification.

2. Welded decking in place is subject to inspection and testing. Expense of removing and replacing portions of decking for testing purposes will be borne by *OWNER* if welds are found to be satisfactory. Remove work found to be defective and replace with new acceptable work.

3. Performance requirements:

a. Uplift loading: Install and anchor roof deck units to resist gross uplift loading of 45 lbs. per square foot at eaves overhand and 30 lbs. per square foot for other roof areas.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage:

1. Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

2. If ground storage is needed, store deck bundles off the ground, with one end elevated to provide drainage. Protect bundles against condensation with a ventilated waterproof covering. Stack bundles so there is no danger of tipping, sliding, rolling, shifting or material damage. Check bundles periodically for tightness, and retighten as necessary so wind cannot loosen sheets.

3. Place deck bundles on the building frame near a main supporting beam at a column or wall. Do not place bundles on unbolted frames or on unattached or unbridged joists. Ensure that the structural frame is properly braced to receive the bundles.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable Manufacturers:

1. United Steel Deck, Inc.
   14 Harmich Rd.
   South Plainfield, NJ 07080
   Tel: 908-277-1617
   Tel: 800-631-1215
   Fax: 908-277-1619.

2. Or equivalent.

2.02 MATERIALS

A. Steel Roof Deck: Provide the following type; with depth, design thickness, and design configuration in accordance with the requirements of the SDI.

1. Wide rib (Type B):

   a. Depth: 1.5"
   b. Design Thickness: 20 gage
   c. Service Loads: 50 PSF live, 20 PSF Dead, 5' - 0" Span or as indicated on drawings.
   d. Minimum Allowable diaphragm shear strength: 300 PLF

B. Sheet Steel for Galvanized Roof Deck and Accessories: ASTM A653 Structural Quality, Grade 33 (230 MPa) or higher. Galvanizing: ASTM A924 with a minimum coating class of G60 as defined in A653.

C. Where fire resistance rated assemblies are required, provide UL-listed units. Identify steel deck bundles with labels bearing the UL mark.

1. UL Design Number: As indicated on the drawings.

D. Where deck is indicated to be painted, do not treat to prevent wet storage stain.

2.03 ACCESSORIES

A. Furnish ridge and valley plates, flat plates at change of deck direction, sump pans, column closures and end closures of the types required by the Steel Deck Institute and to provide a finished surface for the application of roof insulation and roof covering.

2.04 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Examine support framing and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of work of this section.

C. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

D. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Place deck in accordance with approved placement plans.

B. Locate deck bundles to prevent overloading of support members.

3.03 INSTALLATION

A. General:

1. Do not use deck units as a working platform or storage area until units are permanently attached in position.

2. Do not impose construction loads that exceed load carrying capacity of deck.

3. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.

4. Install deck units and accessories in accordance with manufacturer's recommendations and final shop drawings, and as specified herein.

5. All structural steel shall be permanently connected prior to installing decking.

6. Place deck panels on structural supports and adjust to final position with ends lapped or butted over structural supports with a minimum end bearing of 1.5 inches. Attach the deck panels firmly to the supports immediately after placement in order to form a safe working platform. Do not stretch or contract side lap interlocks.

7. Place deck units in straight alignment for entire length of run of cells and with close alignment between cells at ends of abutting units.

8. Place deck units flat and square, secured to adjacent framing without warp or excessive deflection.

9. Cut and neatly fit deck and accessories at skew conditions, around openings, and at other work projecting through or adjacent to the decking.

10. Do not cut unscheduled openings through the deck without the approval of the *ENGINEER*; reinforce openings as shown or directed.

B. Fastening deck units:

1. Comply with AWS requirements and procedures for manual shielded metal arch welding, appearance and quality of welds, and methods used in correcting welding work.

   a. Use welding washers and indicate on shop drawings.

   b. All welding during construction shall be performed from the top side.

2. Anchor deck units to steel supporting members by arc spot puddle welds or approved mechanical fasteners.

   a. Arc spot puddle welds shall be 5/8″ minimum visible diameter with the attachment pattern shown on placement drawings.

   b. Mechanical fasteners, either powder actuated, pneumatically driven, or self drilling screws may be used in lieu of welding,

provided product data has been submitted and approved by the *ENGINEER*.

3. Side lap attachment: Fasten side laps of deck units with spans greater than 5 feet at mid span or 36" intervals, whichever distance is smaller, or as shown on design drawings using one of the following methods:

   a. #10 self-drilling screws, unless otherwise shown.

   b. Arc spot puddle welds ⅝ inch (15 mm) minimum visible diameter or 1 inch (25 mm) long arc seam or fillet weld.

4. Perimeter Edge Attachment: Fasten perimeter edges of deck units at minimum 36 inches (1 m) intervals or as shown on design drawings using one of the following methods:

   a. Arc spot puddle welds ⅝ inch (15 mm) minimum visible diameter or 1-inch (25 m) long arc seam or fillet weld.

   b. Mechanical fasteners, either powder actuated, pneumatically driven or self drilling screws may be used in lieu of welding, provided product data has been submitted and approved by the *ENGINEER*.

5. Anchor accessories to supporting members by arc spot welds or self-drilling screws at 12 inches maximum intervals or as shown on design drawings.

6. Reinforcement at openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking and support of other work shown.

7. Roof sump pans: Place over openings provided in roof decking and weld to top decking surface. Space welds not more than 12" o.c. with at least one weld at each corner. Cut openings in roof sump bottom to accommodate drain size indicated.

8. Closure strips: Provide metal closure strips at open uncovered ends and edges of roof decking, and in voids between decking and other construction. Weld into position to provide a complete decking installation. Closure strips shall have at least same metal thickness as deck units.

9. Touch-up painting:

a. After decking installation, wire brush, clean and paint scarred areas, welded and rust spots on top and bottom surfaces of decking units and supporting steel members.

b. Touch-up galvanized surfaces with galvanized repair paint applied in accordance with manufacturer's instructions.

****END OF SECTION****

SECTION 05 40 00
(05400)
COLD FORMED METAL FRAMING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Cold formed metal framing, where shown on the Plans.

B. Related work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 05 12 00: Structural Steelwork*

3. *Section 05 50 00: Metal Fabrications*

1.02 REFERENCES

A. ASTM Standards:

1. A-446 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.

2. C-840 Standard Specification for the Application and Finishing of Gypsum Board.

3. C-842 Standard Specification for the Application of Interior Gypsum Plaster.

4. C-841 Standard Specification for the Installation of Interior Lathing Furring.

5. C-926 Standard Specification for the Application of Portland Cement Based Plaster.

6. C-954 Steel Drill Screws for the Application of Gypsum Board to Steel Studs from 00333 in. to 0.112 in. in thickness.

7. C-955 Load Bearing (transverse and axial) Steel Studs, Runners (Track) and Bracing for Screw Application of Gypsum Board and Metal Plaster Base.

B. American Iron and Steel Institute (AISI):

1. Cold-Formed Steel Design Manual - "Specification for the Design of Cold-Formed Steel Structural Members", latest edition.

C. American Welding Society (AWS); Structural Welding Code (D1.1) Specification for Welding Sheet Steel in Structures (D1.3).

D. Military Specification (Mil. Spec.) MIL-P-21035, Paint, High Zinc Dust Content, Galvanizing Repair.

E. Federal Specifications (Fed. Spec.) FF-P-395, Pin. Drive, Guided and Pin Drive, Power Actuated (Fasteners for Power Actuated and hand Actuated Fastener Tools) FF-S-325...Shield, Expansion; Nail, Expansion; and Nail, Drive Screw (Devices, Anchoring Masonry).

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer’s product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

3. Certifications: Certifications from the manufacturer that the materials conform to the appropriate requirements as required by local codes and authorities.

C. Shop drawings:

1. Shop drawings showing precise dimensions of the work of this section, and all other data needed to ensure proper installation and operation of the work of this section.

2. Shop drawings shall illustrate materials, shop coatings, steel thicknesses, details of fabrication, details of attachment to adjoining work, size, location, and spacing fasteners for attaching framing to itself, details of attachment to the structure, accessories and their installation, and critical installation procedures. Drawings may include plans, elevations, sections, and details.

D. Samples: Samples shall be representative pieces of all framing component parts and accessories. Unless otherwise specified, pieces shall be 12" long and tagged with name of part and manufacturer.

E. Calculations: Engineering calculations or data shall be submitted verifying the framing assembly's ability to meet or exceed design requirements as required by local codes and authorities.

1. Steel framing used to support rigid materials shall be designed for an allowable deflection of L/360, steel framing used to support semi-rigid materials shall be designed for an allowable deflection of L/240.

2. All connections (member-to-member-to-structure) shall be carefully designed.

3. Selected exterior and interior walls shall be designed to provide frame stability and lateral load resistance. If diagonal steel strapping is used to transfer lateral loads to the structure and foundation, additional studs may be required to resist the vertical component of the load from the diagonal bracing.

4. Wall bridging shall be designed to provide resistance to minor axis bending and rotation of wall studs.

5. Minimum stud spacing shall be 16" O.C.

F. Descriptive literature:

1. Manufacturer’s literature containing product and installation specifications and details.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection:

1. Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

2. Products shall be protected from conditions that may cause any physical damage.

C. Replacements:

1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

2. *CONTRACTOR* or his appointed personnel shall determine what material is damaged. (e.g. rusted, dented, bent, or twisted). Any damaged materials shall be removed from the job site immediately.

D. Delivery and storage:

1. Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use.

2. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

3. Products shall be protected from conditions that may cause any physical damage.

4. Materials shall be stored on a flat plane.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 MATERIALS

A. All materials shall be equal to those manufactured by Marino/Ware Corp., U.S. Gypsum or equivalent.

B. All studs and/or joists and accessories shall be of the type, size, gauge, and spacing shown on the Shop Drawings or approved by the *ENGINEER*. Studs, runners (track), bracing and bridging shall be manufactured per ASTM Specification C-955.

C. All galvanized studs, joists and accessories, 16 gauge or heavier, shall be formed from steel that conform to the requirements of ASTM A-446 with a yield of 50ksi

and as set forth in section 1.2 of the AISI "Specification for the Design of Cold-Formed Steel Structural Members", latest edition.

D. All galvanized studs, joists and accessories, 18 gauge, shall be formed from steel that conforms to the requirements of ASTM A-446, with a yield of 37ksi and as set forth in Section 1.2 of the AISI "Specification for the Design of Cold-Formed Steel Structural Members", latest edition.

E. All galvanized studs, joists and accessories, 20 gauge, shall be formed from steel that conforms to the requirements of ASTM A-446, with a yield of 33ksi and as set forth in Section 1.2 of the AISI "Specification for the Design of Cold-Formed Steel Structural Members", latest edition.

F. All galvanized studs, joists and accessories shall have a minimum G-60 coating.

G. Physical properties and allowable load capabilities of members shall be developed in accordance with AISI "Specification for the Design of Cold-Formed Steel Structural Members", latest edition.

H. In accordance with Section 5.1 of the AISI "Specification for the Design of Cold-Formed Steel Structural Members", latest edition, rigid collateral facing materials may be considered as adequate support of members against rotation.

2.03 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION - GENERAL

A. Methods of construction may be either piece by piece (stickbuilt), or by fabrication into panels either on or off-site.

B. Connections shall be accomplished with self-drilling screws or welding so that the connection meets or exceeds the design loads required at that connection.

C. Transversely loaded studs need not sit squarely in tracks but must be attached to them.

D. Axially loaded studs shall be installed seated squarely (within 1/16") against the web portion of the top and bottom tracks. Tracks shall rest on a continuous uniform bearing surface.

E. Cutting of steel framing members may be accomplished with a saw or shear. Torch cutting of load bearing members is not permitted.

F. Temporary bracing shall be provided and left in place until work is permanently stabilized.

G. Bridging shall be of size and type shown on the drawings and as called for in the design calculations.

H. Diaphragm rated materials may be submitted for bridging, however, it shall be installed prior to loading the wall. if such a material is installed on one side of the wall, only then the other stud flanges shall be bridged with suitable bridging. Bridging may be removed or left in place when this material is installed.

I. Install headers in all openings in axially loaded walls that are larger than the stud spacing in that wall. Form headers as shown on the drawings.

J. Insulation equal to the job requirements shall be placed in all jamb and header type conditions that will be inaccessible after their installation into the wall.

K. Jack studs provide support at each end of headers. These studs shall be securely connected to the header and must seat squarely in the lower track of the wall, and be properly attached to it.

L. If by design, a header is low in the wall, the less than full-height studs (cripples) that occur over the header shall be designed to carry all imposed loads.

M. Wall track shall not be used to support any load unless specifically designed for that purpose.

N. All axially loaded members shall be aligned vertically, to allow for full transfer of the loads down to the foundation. Vertical alignment shall be maintained at floor/wall intersections or alternate provisions for load transfer may be made.

O. Holes that are field cut into steel framing members shall be within limitations of the product and its design. Provide reinforcement where holes are cut through load bearing members in accordance with manufacturer's recommendations and as approved by the *ENGINEER*.

P. Touch up all steel bared by welding using zinc-rich paint.

Q. Studs shall be spaced to suit the design requirements and limitations of collateral facing materials.

R. Care shall be taken to allow for additional studs at intersections, corners, doors, windows, control joints, etc., and as called for in the shop drawings or design calculations.

S. Provision for structure movement shall be allowed where indicated and necessary by design or code requirements.

T. Splicing of axially loaded members shall not be permitted.

3.03 INSTALLATION: PANELIZED CONSTRUCTION

A. Panels shall be designed to resist construction and handling loads as well as live loads.

B. Handling and lifting of prefabricated panels shall not cause permanent distortion in an member or collateral materials.

C. Make all stud to track connections prior to hoisting of panel.

D. Where splicing of track is necessary between stud spacings, a piece of study shall be placed in the track fastened with two screws or welds per flange to each piece of track.

E. Complete bearing shall be maintained under tracks to provide for load transfer in axially loaded assemblies. If the erecting Contractor is bearing on work set by another trade, it is his responsibility to ensure that bearing criteria are met. Any discrepancy shall be brought to the attention of the *ENGINEER*.

F. Attachment of the panel to the structure shall be as shown on the Shop Drawings.

G. Align all panels to provide continuity of any wall/floor surface.

3.04 INSTALLATION - NON-PANELIZED (STICKBUILT) CONSTRUCTION

A. Align track accurately at supporting structure and fasten to structure as shown on Shop Drawings.

B. Track intersections shall butt evenly.

C. Studs shall be plumbed, aligned, and securely attached to flange or web of upper and lower tracks. Axially loaded studs shall be seated squarely in both top and bottom tracks.

D. Where splicing of track is necessary between study spacings a piece of study shall be placed in the track fastened with two screws or welds per flange to each piece of track.

E. Complete bearing shall be maintained under tracks to provide for load transfer in axially loaded assemblies. If the erecting Contractor is bearing on work set by another trade, it is his responsibility to ensure that bearing criteria are met. Any discrepancy shall be brought to the attention of the *ENGINEER*.

3.05 INSTALLATION: JOISTS

A. Joist shall be located directly over-bearing studs of a load distribution member shall be provided to transfer loads.

B. Provide web stiffeners where necessary at reaction points, and at points of concentrated loads, as shown on the Shop Drawings.

C. Joists shall be installed with their web area perpendicular to the bearing surface.

D. Bridging, either steel strap or solid, shall be provided as shown on the Shop Drawings.

E. Provide additional joints under parallel partitions where the partition length exceeds ½ of the joist span.

F. Provide additional framing around all floor/roof openings where are larger than the joist spacing and as noted on the Shop Drawings.

G. End blocking shall be provided where joist ends are not otherwise restrained from rotation.

H. Joist ends must be built solidly into masonry construction where masonry occurs.

I. All bridging, bracing, blocking, strapping, masonry construction, web reinforcement, etc. must be in place prior to loading of floors.

J. Care must be taken by all trades not to disturb joist placement, alignment, plumbness, etc. prior to the completion of the floor system.

L. Care must be taken not to overload the floor system during construction. Place heavy loads, materials, equipment, etc. directly over structural supports, bearing walls or as directed by the *ENGINEER*.

3.06 FASTENINGS AND ATTACHMENTS

A. Anchorage of the tracks to the structure shall be with methods designed for the specific application of sheet steel to that surface. Size, penetration type and spacing shall be determined by design.

B. Welds shall conform to the requirements of AWS D.1.1, AWS D1.3, and AISI Manual Section 4.2. Welds may be butt, fillet, spot, or groove type, the appropriateness of which shall be determined by, and within the design calculations. All welds shall be touched-up using zinc-rich paint.

C. Steel drill screws shall be of the minimum diameter indicated by the design of that particular attachment detail. penetration through joined materials shall not be less than 3 exposed threads.

D. Screws shall have a protective coating at least equal to cadmium plating (ASTM A-165 Type NS) for use in exterior assemblies except where finishing of screw heads with joint compound is necessary.

E. Wire tying in structural applications is not permitted.

3.07 TOLERANCES

A. Vertical alignment (plumbness) of studs shall be within 1/960th (1/8" in 10"0") of the span.

B. Horizontal alignment (levelness) of walls shall be within 1/960th (1/8" in 10"0") of their respective lengths.

C. Spacing of studs shall not be more than ±1/8" from the designed spacing providing that the cumulative error does not exceed the requirements of the finishing materials.

D. Prefabricated panels shall not be more than 1/8" out of square within the length of that panel.

3.08 INSPECTIONS

A. Inspections shall be performed in order to assure strict conformance to the Shop Drawings at all phases of construction.

B. All members shall be checked for proper alignment, bearing, completeness of attachments, proper alignment, reinforcement, etc.

C. All attachments shall be checked for conformance with the Shop Drawings. All welds shall be touched up as specified herein.

D. General inspection of structure shall be completed prior to applying loads to those members.

E. Inspections where and as required by local codes shall be controlled inspections.

3.09 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Remove and dispose of all debris.

****END OF SECTION****

SECTION 05 50 00
(05500)
METAL FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Work included:

1. Support framing as shown.
2. Loose bearing and leveling plates.
3. Loose lintels.
4. Shelf and ledger angles.
5. Floor Plates.
6. Anchors and inserts.
7. Miscellaneous framing, supports and trim.
8. All other miscellaneous metal work shown on the *Contract Drawings*.
9. Field painting of all metal fabrications and miscellaneous metals.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.
2. *Section 03 30 00: Concrete*
3. *Section 05 40 00: Cold Formed Metal Framing*
4. *Section 05 52 14: Architectural Aluminum Pipe Railing*
5. *Section 09 90 00: Painting*

C. Payment:

1. Unless otherwise noted in the *Proposal* Section, no separate payment shall be made for this item.

2. Include all costs for *METAL FABRICATIONS* in the prices bid for the various related items of work as designated in the *Proposal*.

D. Standards: Comply with the provisions of the following (as applicable):

1. AISC – "Specification for Design, Fabrication, and Erection of Structural Steel for Building".

2. The Aluminum Association – "Aluminum Design Manual".

3. AWS – "Structural Welding Code D1".

4. ASME – "Structural Welding code Section IX".

5. FEMA Bulletin 3-93, #102 and #114.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Shop drawings.

1. Show each type of structure, details of anchor bolt settings; longitudinal and transverse cross sections; framing and details; and all accessory items; materials; finishes; construction and installation details; and other pertinent information required for proper and complete fabrication, assembly and erection.

2. Submit an anchor bolt setting plan with the following information included:

a. Where using cast-in place anchor bolts, show anchor bolt locations, diameters, material, plate washer sizes (if used), and projection and embedment lengths above and below the bearing face of concrete.

b. Where anchor bolts are drilled in concrete, show anchor bolt locations, diameters, material, projection and embedment lengths above and below the bearing face of concrete, the anchor bolt manufacturer's model number and description along with the manufacturer's current allowable load tables with recommended installation, use and safety factor data. The manufacturer's dimensional limits regarding bolt spacing, edge distance, embedment length and their effect upon allowable stresses shall be included.

c. For all types of anchor bolts, provide base plate thickness and size and depth of grout to be provided.

D. Manufacturer's current recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. Perform shop and/or field welding required in connection with the work of this Section in strict accordance with pertinent recommendations of the American Welding Society. Welders shall be certified as meeting the requirements of the American Welding Society AWS D1.1.

4. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PROJECT CONDITIONS

A. Field Measurements:

1. Check actual locations and other construction to which metal fabrications must fit, by accurate field measurements before fabrication.

2. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection.*

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER.*

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER.*

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style,

type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 MATERIALS

A. In fabricating items that will be exposed to view, limit materials to those that are free from surface blemishes, pitting, rolled trade names, and roughness.

2.03 IRON AND STEEL

A. All steel shapes, plates and bars shall be hot dip galvanized after fabrication in accordance with ASTM A123.

B. Comply with following standards, as pertinent.

1. Steel plates, shapes, and bars:

   a. ASTM A36, except “W” and “WT” shapes; 36 KSI minimum yield.

   b. ASTM A572 or ASTM A992 for “W” and “WT” shapes; 50 KSI minimum yield.

2. Steel plates to be bent or cold-formed: ASTM A283, Grade C;

3. Steel tubing (hot-formed, welded, or seamless): ASTM A501;

4. Steel bars and bar-size shapes: ASTM A306, Grade 65, or ASTM A36;

5. Cold-finished steel bars: ASTM A108;

6. Cold-rolled carbon steel sheets: ASTM A336;

7. Cast steel: ASTM A27, Grade N2;

8. Galvanized carbon steel sheets: ASTM A526, with G90 zinc coating in accordance with ASTM A525;

9. Gray iron castings: ASTM A48, Class 10;

10. Malleable iron castings: ASTM A47;

11. Steel pipe: ASTM A53, Grade B, Schedule 40, black finish unless otherwise noted;

12. Checkered floor plate shall conform to ASTM A36 with a symmetrical raised diamond pattern.

2.04 ALUMINUM

A. Aluminum work shall be fabricated of plates and rolled or extruded shapes. All aluminum shall conform to the appropriate current ASTM Specification and alloy listed below.

Application	ASTM Designation	ASTM Alloy
Permanent Mold Castings	B108	SG-70B-T61
Sand Castings	B26	SG-70A-T6
Plate	B209	6061-T6
Bolts, Screws	B211	2024-T4*
Nuts, 5/16" Tap and Under	B211	6061-T6
Rolled or Extruded Shapes	B308	6061-T6
Extruded Bar and Tube	B221	6061-T6
Drawn Tube	B210	6061-T6
Pipe	B241	6061-T6
Shims	B209	1100-0
Flat Washers	B209	2024-T4
Lock Washers	B211	7075-T6

*This alloy should have an anodic coating of 0.002-inch minimum thickness, with dichromate or boiling water seal.

B. Checkered plate:

1. Checkered plates and frames: Aluminum checkered plates shall be of an approved non-slip pattern and the thickness indicated on the *Contract Drawings*. Sheared edges shall be ground smooth.

2. Checkered plates shall be set in neatly made and fitted angle frames, as indicated on the *Contract Drawings* or approved. Checkered plates shall be divided into sections and provided with handles as indicated on the *Contract Drawings* or approved.

2.05 STAINLESS STEEL

A. Pipe: ASTM A312, Type 304 unless otherwise shown and with a mill finish.

B. Shapes and Bars: A276, Type 304 unless otherwise shown and with a mill finish.

C. Sheet: ASTM 666, type and gage as shown with a mill finish for areas not visible to the public and a #4 finish otherwise.

D. Forgings: ASTM A473.

E. Wire: ASTM A580.

F. Checkered Plate: ASTM A793.

G. Wire Rope:

1. Wire conforming to ASTM A492, Type 304**.**

2. Type II for cargo handling conforming to MIL-DTL-83140A, Wire Rope, Steel, (Stainless Steel) Preformed, Nonrotating, for Aircraft Rescue Hoist and Cargo Handling (Winching)

H. Stainless steel checkered floor plates shall incorporate an anti-slip stainless steel surface covering 100% of the substrate and consisting of a random hatch matrix with a surface hardness between 55 – 63 on the Rockwell "C" scale and a surface to substrate bond strength of at least 4,000 psi. The non-slip surface shall have a minimum coefficient of friction of 0.8 and be listed as slip resistant by Underwriters Laboratories.

1. Acceptable manufacturers

a. Algrip
b. SlipNot
c. Or equivalent

2.06 FASTENERS

A. General:

1. For exterior use and where built into exterior walls, provide zinc-coated fasteners.

2. Provide fasteners of type, grade and class required for the particular use.

3. Thread lubricant to prevent galling: Molybdenum disulfide reinforced grease.

B. Comply with following standards as pertinent:

1. Carbon steel:

a. Threaded Weld studs:

(1) Mild steel conforming to ASTM A108 and with the following characteristics:

Yield, 0.2% offset (psi), Re	49,000
Ultimate Tensile (psi), Rm	61,000
% Elongation, A5, 0.2% at 2" gage length	17
% Area Reduction	N/A

(2) Weld studs shall be Nelson Type CFL, fully threaded studs with UNC-2A coarse threads full length unless otherwise shown.

b. Bolts and nuts: Provide hexagon-head regular type complying with ASTM A307, Grade A;

c. Lag bolts: Provide square-head type complying with Fed Spec FF-B-561;

d Machine screws: Provide cadmium plated steel type complying with Fed Spec FF-S-111;

e. Washers:

(1) Plain washers: Comply with Fed Spec FF-W-92, round, carbon steel;

(2) Lock washers: Comply with Fed Spec FF-W-84, helical spring type carbon steel;

f. Toggle bolts: Provide type, class, and style needed but complying with Fed Spec FF-B-588;

2. Stainless Steel:

a. Bolts: Hexagon-head Type 316 Stainless Steel complying with ASTM F-593, Alloy Group 1.

b. Nuts: Hexagon-head Type 316 Stainless Steel complying with ASTM F-594, Alloy Group 1. Cotter pins for castle type lock nuts shall also be stainless steel.

c. Washers: Type 316 Stainless Steel complying with ASTM F-593, Alloy Group 1.

3. Aluminum:

a. Bolts: Hexagon-head aluminum bolts, Alloy 6061-T6 complying with ASTM F-468.

b. Nuts: Self-locking, hexagon-head aluminum nuts, Alloy 6061-T6, complying with ASTM F-467.

c. Washers: Aluminum washers, Alloy 6061-T6.

C. Concrete stud anchors shall be H4L headed concrete anchors as manufactured by Nelson Stud Welding Division of TRW, Incorporated. Anchors shall be welded to steel in accordance with manufacturer's instructions.

2.07 CONCRETE ANCHOR BOLTS

A. General: Concrete anchor bolts are either cast-in or drilled-in concrete as indicated on the plans. Drilled-in concrete anchors shall be either adhesive or expansion anchors. However, unless specifically indicated as otherwise on the plans, all drilled-in concrete anchor bolts shall be adhesive anchors.

B. Materials:

1. Cast-in concrete anchors shall be either stainless steel ASTM F593 (AISI 304) or carbon steel ASTM A36. Unless specifically indicated as otherwise on the plans, all cast-in concrete anchors shall be stainless steel ASTM F593 (AISI 304).

2. Drilled-in concrete anchors:

a. Adhesive anchors: All adhesive anchors shall consist of an all thread anchor rod, nut, washer and adhesive material. Anchor rods shall be AISI Type 304 stainless steel that meets the requirements of ASTM F593. The adhesive anchors shall be Hilti “HIT-HY

200" injection adhesive anchors or equivalent. All drilled-in concrete anchors shall be adhesive anchors unless specifically indicated as otherwise on the plans.

b. Expansion anchors shall be Hilti Kwik Bolts III concrete expansion anchors as manufactured by Hilti Fastening Systems, Tulsa, Oklahoma. Expansion anchors shall be made of AISI Type 304 stainless steel. Expansion anchors shall be used only when specifically indicated on the plans.

2.08 SHOP PAINT

A. Primer: As specified in *Section 09 90 00, Painting*.

B. Galvanizing Repair:

1. All damage to galvanized surfaces shall be repaired using an organic, zinc-rich coating containing 95% metallic zinc by weight in the dried film. Material shall be recognized under the Component Program of Underwriter's Laboratories, Inc., as an equivalent to hot-dip galvanizing and conform to Federal Specification DOD-P-21035 (formerly MIL-P-21035A) for repair of hot-dip galvanizing and meet requirements of Military Specification MIL-P-26915A USAF Specification for Zinc-Rich Paints. Repair coating shall be "DEVCON Z," " KoldGalv 920Z," "ZRC COLD GALVANIZING COMPOUND," or equivalent.

2. Galvanizing repair

a. Surface preparation: SSPC-SP11, Power Tool Cleaning to Bare Metal.

b. Cold galvanizing compound: 1 coat at 4 mils DFT

2.09 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

2.10 FABRICATION

A. General:

1. Except as otherwise shown on the *Contract Drawings* or the approved Shop *Contract Drawings*, use materials of size, thickness, and type required to produce reasonable strength and durability in the work of this Section.

2. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

3. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

4. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss. Temperature change (Range): 100 deg F (38 deg C).

5. Shear and punch metals cleanly and accurately. Remove burrs.

6. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

7. Remove sharp or rough areas on exposed traffic surfaces.

8. Weld corners and seams continuously to comply with AWS recommendations and the following:

    a. When welding painted or galvanized steel, the zinc or paint coating shall be removed to bare metal at least 1” to 4” (2.5-10 cm) from either side of the intended weld zone and on both sides of the pieces.

    b. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

    c. Obtain fusion without undercut or overlap.

d. Remove welding flux immediately.

e. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matched those adjacent.

9. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

10. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

11. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

12. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.

13. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

14. Prior to shop painting or priming, properly clean metal surfaces as specified in *Section 09 90 00, Painting*, for the applied finish and for the proposed use of the item.

15. On surfaces inaccessible after assembly or erection, apply two (2) coats of the specified primer. Change color of second coat to distinguish it from the first.

16. Insulate aluminum surfaces that will come in contact with concrete, masonry, plaster, or metals other than stainless steel, zinc or white bronze by giving a coat of heavy-bodied alkali resisting bituminous paint or other approved paint in shop.

17. Stainless steel materials and fabrications shall be cleaned and passivated in accordance with ASTM A380 after fabrication.

C. Loose Lintels

1. Fabricate loose structural steel lintels from steel angles and shapes of size indicated for opening and recesses in masonry walls and partitions at locations indicated.

2. Weld adjoining members together to form a single unit where indicated.

3. Size loose lintels for equal bearing of one inch per foot of clear span but not less than 8 inches (203 mm) bearing at each side of openings, unless otherwise indicated.

4. Galvanize all loose lintels in accordance with ASTM A123.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 COORDINATION

A. Coordination as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

3.03 INSTALLATION

A. General:

1. Set work accurately into position, plumb, level, true, and free from rack.

2. Anchor firmly into position.

3. Where field welding is required, comply with AWS recommended procedures of manual-shielded metal-arc welding for appearance and quality of weld and for methods to be used in correcting welding work.

4. When welding painted or galvanized steel, the zinc or paint coating shall be removed to bare metal at least 1" to 4" (2.5-10 cm) from either side of the intended weld zone and on both sides of the pieces.

5. Grind exposed welds smooth, and touch-up shop prime coats or galvanized surfaces as applicable.

6. Do not cut, weld, or abrade surfaces which have been hot-dip galvanized after fabrication and which are intended for bolted or screwed field connections.

B. Stud Welding:

1. Stud welding shall be by the electric-arc method.

2. Properly mark and layout positions of studs for tank mounted pipe supports prior to performing welding.

3. Comply with AWS C5.4 for procedures, appearance and quality of welds and methods used in correcting welding work. Avoid overheating. Cool reverse side of tank walls to avoid damaging paint on interior of tank walls.

4. Clean the surfaces to be welded and the adjacent surfaces in accordance with AWS C5.4. These surfaces must be completely cleansed of all hydrocarbon and other contaminants, such as cutting fluids, grease, oil, waxes, primers and paint.

5. Thoroughly remove all welding slag by chipping and wire brushing or mechanical polishing with non-ferrous tools.

6. Test all stud welds using the dye penetrate (ASTM E 165) or other non-destructive method(s) approved by the *ENGINEER*. Certify that the welds are correctly made.

3.04 FIELD PAINTING

A. Immediately after erection, clean the field welds, bolted connections, and abraded areas of shop priming. Paint the exposed areas with same material used for shop priming.

B. Field paint all surfaces in accordance with *Section 09 90 00*.

C. Do not paint aluminum or stainless steel unless otherwise indicated.

****END OF SECTION****

SECTION 05 52 14
(05522)
ARCHITECTURAL ALUMINUM PIPE RAILINGS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Provide and install architectural aluminum pipe railing for building access where shown.

B. Related work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 03 30 00: Concrete.*

3. *Section 05 50 00: Metal Fabrications (Concrete Anchors)*

C. Payment:

1. Unless otherwise noted in the *PROPOSAL* Section, no separate payment shall be made for this item.

2. Include all costs for *ARCHITECTURAL PIPE RAILINGS* in the prices bid for the various related items of work as designated in the *PROPOSAL*.

1.02 DESIGN REQUIREMENTS

A. Loads:

1. Handrail assemblies and guardrail systems shall be designed to resist a load of 50 lb/ft (pound-force per linear foot) (0.73 kN/m) applied in any direction at the top and to transfer this load through the supports to the structure. For one- and two-family dwellings, the minimum load shall be 20 lb/ft (0.29 kN/m).

2. All handrail assemblies and guardrail systems shall be able to resist a single concentrated load of 200 lb (0.89 kN), applied in any direction at

any point along the top, and have attachment devices and supporting structure to transfer this loading to appropriate structural elements of the building. This load need not be assumed to act concurrently with the loads specified in the preceding paragraph.

3. Intermediate rails (all those except the handrail), balusters, and panel fillers shall be designed to withstand a horizontally applied normal load of 50 lb (0.22 kN) on an area not to exceed 1 square ft (305 mm^2) including openings and space between rails. Reactions due to this loading are not required to be superimposed with those of either preceding paragraph.

B. Shall submit calculations to the *ENGINEER* for approval. Testing of base castings or base extrusions by an independent lab (meeting the requirements of the Aluminum Association) will be an acceptable substitute for calculations. Calculations will be required for approval of all other design aspects. Calculations and test results must be signed and sealed by a Professional Engineer licensed in the State of New Jersey.

C. Post spacing shall be a maximum of 5-0". The handrail manufacturer shall provide posts of a schedule that provides adequate strength to meet the loading requirements. If the manufacturer's posts alone are not of adequate strength, the manufacturer shall add reinforcing dowels as base anchorages to meet loading requirements.

D. Samples of all components, bases, toe plate and pipe must be submitted for approval. Expansion and contraction shall be accommodated by means of internal joint splices spaced at a maximum of twenty-four feet (24') intervals. Where required, locate within 6" of posts.

E. Posts shall not interrupt the continuation of the top rail at any point along the railing, including corners and end terminations (OSHA 1910.23). The top surface of the top railing shall be smooth and shall not be interrupted by projecting fittings.

F. The top rail and bottom rail at a corner return shall be able to withstand a 200# load without loosening. The manufacturer is to determine the maximum post offset dimension for their system. Provide physical tests from a laboratory to confirm compliance.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer’s product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. *Specifications* and other data required that demonstrate compliance with the specified requirements.

3. Submit for *ENGINEER* review the manufacturer's assembly and installation instructions.

C. Shop Drawings:

1. Shop drawings: Indicate sizes, shapes, configuration, sections, locations, fabrication and installation details. Indicate fabricated sizes. Certify that railings and guardrails meet code requirements for vertical and horizontal loading.

2. Indicate all required field measurements.

D. Calculations:

1. Submit calculations that verify that the pipe rail system including rails, posts, base plates and anchor bolts meet the requirements for strength as described in these *Specifications*. Calculations shall be signed and sealed by a Professional Engineer registered in New Jersey.

E. Samples:

1. Color and finish samples: Indicating each color and finish to be expected in completed work.

2. Railings: Submit 2’-0” long sample of each type railing with post and rails indicating construction, welded joints, rail end cap closure and finish.

F. Manufacturer's current recommended installation procedures.

G. Maintenance instructions: Submit for finished aluminum components including cleaning materials, methods and precautions.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

D. Requirements of regulatory agencies: All design and installations shall be in compliance with the International Building Code, as modified by the New Jersey Uniform Construction Code, Local Ordinances, and the Occupational Safety and Health Administration (OSHA), 29 CFR1910.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection.*

B. Protection:

1. Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

2. Protection: Maintain protective covering on pipe until installation is complete.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER.*

D. Delivery and storage:

1. Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use.

2. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER.*

3. Store all materials in clean, dry location, away from uncured concrete and masonry.

4. Cover with waterproof paper, tarpaulin or polyethylene sheeting.

1.06 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. Manufacturer shall warrant the railing against defects in materials and workmanship for a period of twenty years from date of installation. Finishes shall be guaranteed against chalking, yellowing, peeling, cracking, pitting, corroding, non-uniformity of color or gloss deterioration for a period of ten years.

C. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 MATERIALS

A. Post and rails:

1. All rails and posts shall be extruded aluminum alloy 6061-T6 with a clear anodized finish. Posts and rails shall be a minimum diameter of 1½" (1.90" O.D.).

B. Fittings:

1. Type: Pressure fit.

2. Aluminum: Cast, ASTM B26.

C. Handrail brackets:

1. Metal: Aluminum

2. Type: Cast

3. Style: As indicated on Plans.

D. Finish: (PICK one or more from below or specify another)

1. Powder Coat Paint Meeting AAMA 2605, *Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels*.

2. U.V. resistance and scratch & mar resistance formula shall consist of super durable TGIC polyester resin system with flocked and color stable full pigmentation.

3. Chemical pretreatment:

a. Alkaline cleaner applied at 160 degrees F. for duration of 3 to 5 minutes.

b. D.I. water rinse.

c. Conversion phosphate coating applied at 140 degrees F. for 3 to 5 minutes.

d. D.I. water rinse.

e. Application on non-chromate, chrome sealer amorphous chromium phosphate that meets or exceeds ASTM D1730, Type B, Method 5.

f. D.I. water rinse, and dry in place.

4. Coating Application:

a. Electrostatic application of super TGIC system powder with a minimum dry film thickness of 3.5 to 5.5 mils cured coating.

5. Color shall be White.

a. Finish shall be clear anodized in accordance with Aluminum Association M10-C22-A41 (215-R1). The pipe shall be plastic wrapped. The plastic wrap is to be removed after erection. (Note to Specifier: M10 is an "as fabricated" mechanical finish)

E. Dissimilar materials: Aluminum surfaces in contact with concrete, grout or dissimilar metals will be protected with a coat of bituminous paint, zinc chromate primer, mylar isolators or other approved material.

F. Strength:

1. The rail system shall be designed and constructed in accordance with the criteria set forth in Section 1607.7.1 of the 2021 International Building Code as modified by the New Jersey Uniform Construction Code, unless otherwise specified in this section.

G. Expansion and contraction:

1. Allow for expansion and contraction in top rail by means of an internal expanding splice at a maximum of twenty-four foot (24') intervals.

H. Miscellaneous:

1. All other aluminum parts and/or fittings shall be fabricated from 6061-T6 aluminum.

2.03 FABRICATION

A. Form rail-to-end post connections and all changes in rail direction by radius bends or by approved fittings.

B. Remove burrs from all exposed cut edges with no chamfer.

C. Form elbow bends and wall returns to uniform radius, free from buckles and twists, with smooth finished surfaces, or use prefabricated bends.

D. Locate intermediate rails midway between top rail and finish floor or center line of tread.

E. Close aluminum pipe ends by using prefabricated fittings.

F. On posts set on stair stringers, weld ⅝" thick plate to bottom, for field welding or bolting to top flange of stringer.

G. Welding:

1. Accurately miter and cope intersections of posts and rails and weld all around.

2. Thoroughly fuse without undercutting or overlap.

3. Remove spatter, grind exposed welds where necessary for blending and contour surfaces to match those adjacent.

4. Discoloration of finished surfaces will not be acceptable.

H. Provide pressure relief holes at closed ends of pipe or tube.

I. Fabricate joints which will be exposed to the weather so as to exclude water, or provide weep holes where water may accumulate.

J. Blend in color discrepancies on anodized aluminum areas, due to welding, exposed fasteners, etc., using approved lacquer.

K. Workmanship - All pipe cuts shall be square and accurate for minimum joint-gap. Cuts shall be clean and straight, free of "chamfer" from deburring, burrs, and nicks. All holes shall be drilled and countersunk the proper size, as required for a tight, flush fit. Where protection is applied for prevention of dissimilar materials electrolysis, care shall be taken that none of the protective material is visible when assembly is completed.

2.04 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their

respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

B. Concrete anchors:

1. Anchors shall be provided in accordance with the requirements of *Section 05 50 00* of these *Specifications*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Drill holes of proper size and depth for adhesive anchors. Clean all holes in accordance with printed instructions furnished by Anchor Manufacturer.

B. Protection of dissimilar materials - Surfaces of aluminum components in contact with other metals and concrete surfaces shall be painted as directed in paragraph 2.01E of these Specifications to prevent contact between the two surfaces.

C. Set posts plumb and aligned to within ⅛" in 12'.

D. Set rails horizontal or parallel to rake of steps or ramp to within ⅛" in 12'.

E. Assemble and install in accordance with printed instructions of the manufacturer.

F. Fitted assembly:

1. Assemble tubes with pressure-fit fittings at joints and drive together to provide tight joints.

2. Use wood blocks and padding to prevent damage to tube and fittings.

3. Seal recessed holes of exposed locking screws using plastic filler cement colored to match finish of pipe.

G. Drill holes of proper size for screws and countersink to a flush fit.

H. Expansion joints:

1. Provide at intervals of not more than twenty-four feet (24').

2. Provide slip joint with internal sleeve extending 2" beyond joint each side.

3. Fasten internal sleeve securely to one side.

4. Locate joints within 6" of posts.

I. Support wall handrails on brackets spaced not more than 5' on centers.

3.03 CLEANING

A. As installation is completed, wash thoroughly, using clean water and soap; rinse with clean water.

B. Do not use acid solution, steel wool or other harsh abrasives.

C. If stain remains after washing, remove finish and restore in accordance with fabricator's recommendations.

3.04 REPAIR OF DEFECTIVE WORK

A. Remove stained or otherwise defective work and replace with material that meets Specification requirements.

****END OF SECTION****

SECTION 06 20 00
(06150)
CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Wood, nails, bolts, screws, framing anchors and other rough hardware

2. Framing, sheathing and siding.

B. Related Work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 06 65 00: Plastic Simulated Wood Trim*

3. *Section 07 21 00: Building Insulation*

4. *Section 09 90 00: Painting*

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance: The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Deliver the materials to the job site and store, in a safe area, out of the way of traffic, and shored up off the ground surface.

C. Protect all lumber from the weather by use of suitable covers.

D. Identify framing lumber as to grades, and store each grade separately from other grades.

E. Protect metals with adequate waterproof outer wrapping.

F. Use extreme care in off loading of lumber to prevent damage, splitting, and breaking of materials.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 DIMENSION LUMBER

A. Provide lumber complying with the currently adopted International Building Code, New Jersey Edition and PS-20, American Softwood Lumber Standard and with applicable grading rules.

1. Inspection Agencies:

a. RIS - Redwood Inspection Service.

b. NLGA - National Lumber Grades Authority (Canadian).

c. SPIB - Southern Pine Inspection Bureau.

d. WCLIB - West Coast Lumber Inspection Bureau.

e. WWPA - Western Wood Products Association.

B. Grade stamps:

1. Identify each piece of lumber with grade stamp of inspection agency evidencing compliance with grading rules and showing agency, grade, species and moisture content.

C. Dimensions:

1. Nominal sizes are indicated. Provide actual sizes as required by P.S.-20.

2. Provide dressed lumber, S4S, unless otherwise indicated.

3. Provide seasoned lumber with 19% moisture content.

4. For structural framing provide the following grade and species.

a. No. 2 grade, yellow pine or;

b. Any species and grade that complies with the requirements of Chapter 23 of the International Building Code and AF&PA NDS-05, *National Design Specification (NDS) for Wood Construction with 2005 Supplement*, as referenced in the Building Code.

2.03 WOOD SHEATHING

A. Provide APA performance rated panels complying with requirements designated under each application for grade, span rating, exposure, thickness and edge detail.

1. Wall sheathing:

a. APA rated sheathing complying with IBC, Article 2304.6.

b. Exposure: exterior.

c. Span rating: to suit stud spacing.

2. Roof sheathing:

a. APA rated sheathing complying with IBC, Article 2304.7.

b. Exposure durability rating: Exposure 1.

c. Thickness: 19/32" unless otherwise indicated.

d. Fire-retardant treated panels shall conform to IBC, Article 2303.2.

2.08 PRESERVATIVE TREATED WOOD

A. Wood installed above ground in the locations specified herein and in Sections 2304.11.2.1 through 2304.11.2.7 of the IBC shall be naturally durable wood or preservative-treated wood that uses waterborne preservatives, and shall be treated in accordance with AWPA U1 (Commodity Specification A or F) for above ground use. (IBC, Section 2304.11.2)

1. Where wood joists or the bottom of a wood structural floor without joists are closer than 18 inches, or wood girders are closer than 12 inches, to the exposed ground in crawl spaces or unexcavated areas located within the perimeter of the building foundation, the floor assembly (including posts, girders, joists and subfloor). (IBC, Section 2304.11.2.1)

2. Wood framing members, including wood sheathing, that rest on exterior foundation walls and are less than 8 inches from exposed earth; and wood framing members and furring strips attached directly to the interior of exterior masonry or concrete walls below grade. (IBC, Section 2304.11.2.2 and 2304.11.2.3)

3. Sleepers and sills on a concrete or masonry slab that is in direct contact with earth. (IBC, Section 2304.11.2.4)

4. The ends of wood girders entering exterior masonry or concrete walls shall be provided with a ½-inch air space on top, sides and end, unless durable or preservative-treated wood is used. (IBC, Section 2304.11.2.5)

5. Clearance between wood siding and earth on the exterior of a building shall not be less than 6 inches except where siding, sheathing and wall framing are of naturally durable or preservative-treated wood. (IBC, Section 2304.11.2.5)

6. Posts or columns supporting permanent structures and supported by a concrete or masonry slab or footing that is in direct contact with the earth. (IBC, Section 2304.11.2.6)

    a. Posts or columns that are either exposed to the weather or located in basements or cellars, supported by concrete piers or metal pedestals projected at least 1 inch above the slab or deck and 6 inches above exposed earth, and are separated therefrom by an impervious moisture barrier are not required to be treated. (IBC, Section 2304.11.2.6, Exception 1)

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    b. Posts or columns in enclosed crawl spaces or unexcavated areas located within the periphery of the building, supported by a concrete pier or metal pedestal at a height greater than 8 inches from exposed ground, and are separated therefrom by an impervious moisture barrier are not required to be treated. (IBC, Section 2304.11.2.6, Exception 2)

7. The portions of glued laminated timbers that form the structural supports of a building or other structure and are exposed to weather and not properly protected by a roof, eave or similar covering shall be pressure treated with preservative, or be manufactured from naturally durable or preservative-treated wood. (IBC, Section 2304.11.3)

8. Wood in contact with the ground (exposed earth) that supports permanents structures shall be of naturally durable or preservative treated wood using

waterborne preservatives and shall be treated in accordance with AWPA C2, C9 or other applicable AWPA standard for soil or fresh water contact, where used in the location specified in Sections 2304.11.4.1 and 2304.11.4.2 (IBC, Section 2304.11.4)

a. Untreated wood may be used where such wood is continuously and entirely below the ground water level or submerged in fresh water. (IBC, Section 2304.11.4, Exception)

9. Posts and columns supporting permanent structures that are embedded in concrete in direct contact with the earth or embedded in concrete exposed to the weather, or in direct contact with the earth. (IBC, Section 2304.11.4) (IBC, Section 2304.11.4.1)

10. Wood structural members that support moisture-permeable floors or roofs that are exposed to the weather, such as concrete or masonry slabs, shall be of naturally durable or preservative-treated wood unless separated from such floors or roofs by an impervious moisture barrier. (IBC, Section 2304.11.4.2)

11. For those portions of wood members that form the structural supports of buildings, balconies, porches or similar permanent building appurtenances where such members are exposed to the weather without adequate protection from a roof, eave, overhand or other covering to prevent moisture or water accumulation on the surface or at joints between members. (IBC, Section 2304.11.5)

12. In geographical areas where hazard of termite damage is know to be very heavy, the floor framing shall be of natural durable or preservative-treated wood, or provided with approved methods of termite protection. (IBC, Section 2304.11.6)

13. Wood installed in retaining or crib walls shall be of preservative-treated wood treated in accordance with AWPA C2 or C9 for soil and fresh water contact. (IBC, Section 2304.11.7)

B. Items of naturally durable wood including, but not limited to, all-heart material of cedar, cypress, or redwood will not require preservative treatment, except when in direct contact with soil.

C. Effective December 31, 2003, products containing ammoniacal copper zinc arsenate ACZA) or chromated copper arsenate (CCA) may only be used for preservative treatment as indicated in the Federal Register; April 9, 2003 (Volume 68, Number 68) and in accordance with one of the following categories of forest products and in accordance with the respective cited standard (noted

parenthetically) of the 2001 edition of the American Wood-Preservers Association Standards: Lumber and Timber for Salt Water Use Only (C2), Piles (C3), Poles (C4), Plywood (C9), Wood for Highway Construction (C14), Round, Half Round and Quarter Round Fence Posts (C16), Poles, Piles and Posts Used as Structural Members on Farms, and Plywood Used on Farms (C16), Wood for Marine Construction (C18), Lumber and Plywood for Permanent Wood Foundations (C22), Round Poles and Posts Used in Building Construction (C23), Sawn Timber Used To Support Residential and Commercial Structures (C24), Sawn Crossarms (C25), Structural Glued Laminated Members and Laminations Before Gluing (C28), Structural Composite Lumber (C33), and Shakes and Shingles (C34). Forest products treated with this product may only be sold or distributed for uses within the AWPA Commodity Standards under which the treatment occurred.

D. Exposed areas of treated wood that are cut or drilled after treatment shall receive a field treatment in accordance with AWPA M4.

E. Lumber, timber, plywood, piles and poles supporting permanent structures required by Section 2304.11 to be preservative-treated shall conform to the requirements of AWPA Standard U1 and M4, for species, product, preservative and end use. Preservatives shall be as listed in Section 4 of AWPA U1. (IBC 2021, Subsection 2303.1.8)

1. Lumber and timbers shall be treated in accordance with the AWPA "Commodity Specifications" of the "Use Category System," AWPA U-1.

2. Composite wood products include, but are not limited to, plywood, glue laminated members, and structural composite lumber.

a. Composite wood products shall be treated in accordance with AWPA "Commodity Specification F" of the "Use Category System," AWPA U-1.

F. Moisture Content

1. At the time lumber and other materials are delivered and when installed in the work their moisture content shall be as follows:

a. Treated and Untreated Lumber except Roof Planking:

(1) 4 inches or less, nominal thickness, 19 percent maximum.

(2) 5 inches or more, nominal thickness, 23 percent maximum in a 3 inch perimeter of the timber cross-section.

b. Roof Planking: 15 percent maximum.

c. Materials other than lumber: In accordance with standard under which product is produced.

2.09 FIRE-RETARDANT TREATED WOOD

A. Fire-retardant treated wood shall be pressure treated in accordance with AWPA C-20 or AWPA C-27 and have, when tested in accordance with ASTM E-84, a listed flame spread of 25 or less and shall show no evidence of significant progressive combustion when tested for an additional 20-minute period. In addition the flame front shall not progress more 10.5 feet beyond the centerline of the burners at any time during the test. (IBC 2021, Section 2303.2)

B. Fire-retardant treated wood shall be labeled in accordance with IBC, Section 2303.2.1.

C. Fire-retardant treated wood exposed to the weather shall be identified as "Exterior" as required by IBC, Section 2303.2.3)

D. Fire-retardant treated wood exposed to interior humid conditions shall be identified as "Interior Type A" as required by IBC, Section 2303.2.4)

2.10 AIR BARRIER/WEATHER RESISTANT BARRIER

A. Complying with the following requirements:

1. Moisture vapor transmission rate (ASTM E96): 125 or less.

2. Flame spread (ASTM E84): 25 or less, Class 1.

3. Air stoppage: ASTM D-283 65% or less at 15 MPH wind.

B. Acceptable manufacturers:

1. "Tyvek CommercialWrap"
Fibers Department
DuPont Company

2. "Rufeo-Wrap"
Raven Industries

3. "Barricade Building Wrap"

Simplex Products Division
Anthony Industries, Inc.

4. Or equivalent.

2.11 ROUGH HARDWARE

A. Fasteners for preservative-treated and fire-retardant treated wood shall be of hot-dipped zinc coated galvanized steel, stainless steel, silicon bronze or copper.

B. Steel items:

1. Comply with ASTM A7 or ASTM A36.

2. Use Hot Dip galvanized at exterior locations.

C. Machine bolts: Comply with ASTM A307, Hot Dip galvanized at exterior locations.

D. Lag bolts: Comply with Fed Spec FF-B-561, Hot Dip galvanized at exterior locations.

E. Nails:

1. Use common except as otherwise noted.

2. Use spirally grooved or ring shank nails for exterior decks and ramps.

3. Use finishing nails for trim.

4. Comply with Fed Spec FF-N-105.

5. Use Hot Dip galvanized at exterior locations.

F. Framing anchors:

1. Provide metal framing anchors of type, size, metal, and finish indicated that comply with requirements specified including the following:

a) Provide products for which model code evaluation/research reports exist that are acceptable to authorities having jurisdiction and that evidence compliance with International Building Code, 2021.

2. Galvanized steel sheet: Steel sheet hot-dip galvanized prior to fabrication to comply with ASTM A525 for coating designation G60 and with ASTM A446, Grade A (structural quality); ASTM A526 (commercial quality); or ASTM A527 (lock forming quality).

2.12 BUILDING PAPER: Kraft paper complying with Fed Spec UU-B-790a.

2.13 VAPOR BARRIER: No. 15 asphalt saturated organic felt conforming to ASTM D-226.

2.14 WOOD BASE and CHAIR RAIL

A. Base: Pine, Hemlock; “Ranch Base”, 9/16" x 3¼".

B. Chair rail: Pine, Hemlock; “Standard Chair Rail”, 9/16" x 3"..

2.15 IMPORTED HARDWOODS

A. All imported exotic hardwood shall be sourced and supplied in compliance with Certified Forest Products Council Purchasing Policy Guidelines. A certificate of Environmental Compliance from an independent third party inspection and grading agency shall be submitted prior to delivery confirming that the wood supplied was produced from legally harvested logs and was supplied in compliance with all foreign and domestic laws and regulations pertaining to the harvest and trade of timber products.

C. All lumber shall be third party graded and inspected to Premium Clear All Heart grading rules, defined as follows:

1. Lumber shall be graded four faces, and four edges.

2. Lumber shall be straight grained and parallel cut without heart center.

3. Lumber shall be all heartwood; no sapwood is permitted.

4. Lumber shall be in sound condition, free from worm holes or knots.

5. Allowable Imperfections are defined as - Small drying cracks, small end splits (less than 5/32 inches in width), that do not impair the strength of the material or fastening, Discoloration caused by weathering or chemical reaction, Bow or twist that can be removed using normal installation methods and tools, Roey/Scale grain (one face only).

6. Not Allowable Imperfections are defined as - Longitudinal heart cracks, Internal cracks, Firm or soft sap-wood, Fungi Affects - (blue to gray, brown to red, white to yellow, or incipient decay), Bow or twist that cannot be removed by normal installation methods and tools.

2.16 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 WORKMANSHIP

A. Produce joints which are tight, true, and well nailed, with members assembled in accordance with the Drawings and with pertinent codes and regulations.

B. Selection of lumber pieces:

1. Carefully select the members.

2. Select individual pieces so that knots and obvious defects will not interfere with placing bolts or proper nailing, and will allow making of proper connections.

3. Cut out and discard defects which render a piece unable to serve its intended function.

4. Lumber may be rejected by the *ARCHITECT*, whether or not it has been installed, for excessive warp, twist, bow, crook, mildew, fungus, or mold, as well as for improper cutting and fitting.

C. Do not shim any framing component.

3.03 GENERAL FRAMING

A. General:

1. Comply with AF&PA, "Manual for Wood Frame Construction" and the International Building Code, 2021.

2. In addition to framing operations normal to the fabrication and erection indicated on the Drawings, install wood blocking and backing required for the work of other trades.

3. Set horizontal and sloped members with crown up.

4. Do not notch, cut, or bore members for pipes, ducts, or conduits, or for other reasons except as shown on the Drawings or as specifically approved in advance by the *ENGINEER/ARCHITECT*.

B. Bearings:

1. Make bearings full unless otherwise indicated on the Drawings.

2. Finish bearing surfaces on which structural members are to rest so as to give sure and even support.

3. Where framing members slope, cut or notch the ends as required to give uniform bearing surface.

3.04 BLOCKING AND BRIDGING

A. Install blocking as required to support items of finish including hardware, toilet room accessories and other wall mounted items.

B. Bridging:

1. Install wood cross bridging (not less than 2" x 3" nominal), metal cross bridging of equal strength, or solid blocking between joists where the span exceeds 8'-0".

2. Provide maximum distance of 8'-0" between a line of bridging and a bearing.

3. Cross bridging may be omitted is permitted by code, except where otherwise indicated on the Drawings.

4. Install solid blocking between joists at points of support and wherever sheathing is discontinuous. Blocking may be omitted where joists are supported on metal hangers.

3.05 FIREBLOCKING AND DRAFTSTOPPING

A. Fireblocking and draftstopping materials and installation shall conform to Section 717 of the International Building Code, 2021.

B. Install firesblocking and draftstopping where required by Sections 717 and 1406 of the International Building Code, 2021.

3.06 ALIGNMENT

A. On framing members to receive a finished surface, align the finish subsurface to vary not more than 1/8" from the plane of surfaces of adjacent furring and framing members.

3.07 INSTALLATION OF WOOD SHEATHING

A. Placement:

1. Place plywood with face grain perpendicular to supports and continuously over at least two supports, except where otherwise shown on the Drawings.

2. Center joints accurately over supports, unless otherwise shown on the Drawings.

B. Protect plywood from moisture by use of waterproof coverings until the plywood in turn has been covered with the next succeeding component or finish.

3.08 INSTALLATION OF VAPOR BARRIER

A. Install one layer of vapor barrier horizontally on sheathed walls.

B. Weather lap ends and edges minimum of 6".

C. Stagger vertical joints.

D. Staple or nail in place.

3.09 AIR BARRIER

A. Install air infiltration barrier in accordance with manufacturers directions.

3.10 INSTALLATION OF WOOD SIDING

A. Install bevel siding using single course method with 3½" exposure.

B. Nail at 12" o.c. Fasten siding in place level and plumb. Blind nail except trim. Nail to aligned pattern.

C. Miter horizontal joints tight at 45E. Butt siding tight to corner boards.

D. Install siding for natural shed of water.

E. Position cut ends over bearing surfaces. Sand cut edges smooth and clean.,\

F. Install corner boards, closures and trim.
.

G. Install metal flashing at sills and heads of wall openings.

3.11 FASTENING

A. General:

1. Comply with the “Fastening Schedule,” Table 2304.9.1 and Chapter 23 of the International Building Code, 2021.

2. Install items straight, true, level, plumb, and firmly anchored in place.

3. Where blocking or backing is required, coordinate as necessary with other trades to ensure placement of required backing and blocking in a timely manner.

4. Nail trim with finish nails of proper dimension to hold the member firmly in place without splitting the wood.

B. Nailing:

1. Use only common wire nails or spikes of the dimension required, except where otherwise specified or noted on the Drawings.

2. Provide penetration into the piece receiving the point of not less than 1/2 the length of the nail or spike, provided, however, that 16d nails may be used to connect two pieces of 2" (nominal) thickness.

3. Nail without splitting wood.

4. Pre-bore as required.

5. Remove split members and replace with members complying with the specified requirements.

C. Bolting:

1. Drill holes 1/16" larger in diameter than the bolts being used.

2. Drill straight and true from one side only.

3. Do not bear bolt heads on wood, but use washers under head and nut where both bear on wood, and use washers under all nuts.

D. Screws:

1. For lag screws and wood screws, prebore holes same diameter as root of threads, enlarging holes to shank diameter for length of shank.

3.12 JOINTING

A. Make joints to conceal shrinkage; miter exterior joints; cope interior joints; miter or scarf end-to-end joints.

B. Install trim in pieces as long as possible, jointing only where solid support is obtained.

3.13 INSTALLATION OF OTHER ITEMS

A. Install items in strict accordance with the Drawings and the recommended methods of the manufacturer as approved by the Architect, anchoring firmly into position at the prescribed locations, straight, plumb, and level.

3.14 FINISHING

A. Sandpaper finished wood surfaces thoroughly as required to produce a uniformly smooth surface, always sanding in the director of the grain; except do not sand wood which is designed to be left rough.

B. No coarse grained sandpaper mark, hammer mark, or other imperfection will be accepted.

3.15 CLEANING UP

A. Keep the premises in a neat, safe, and orderly condition at all times during execution of this portion of the Work, free from accumulation of sawdust, cut-ends, and debris.

B. Sweeping:

1. At the end of each working day, and more often if necessary, thoroughly sweep surfaces where refuse from this portion of the Work has settled.

2. Remove the refuse to the area of the job site set aside for its storage.

3. Upon completion of this portion of the Work, dispose of all debris and thoroughly broom clean all surfaces.

****END OF SECTION****

SECTION 06 64 00
(06423)
FIBERGLASS PANELING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Fiberglass wall panels.

2. Trim and accessories.

B. Related Work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 09 21 16: Gypsum Wallboard System*

3. *Section 09 28 00: Cement Board*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for the *FIBERGLASS PANELING* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Shop Drawings: Show layout, profiles and product components, including anchorage, accessories, finish colors, patterns and textures. Indicate location and dimension of joints and fastener attachment.

D. Samples: Submit samples showing full range of colors and textures from Manufactures standard product line.

E. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The Contractor and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers:

1. Crane Composites, Inc.
   Channahon, IL 60410-3220
   Tel: (888) 332-6377
   Tel: (815) 467-8600
   Fax: (815) 467-8666

("Glasbord")

2. Lasco Panel Products
Florence, KY
(606) 371-7720
("Lasco-Board, Sta-Clean")

3. Nudo Products, Inc.
Springfield, IL
(217) 528-5636
("Fiber-Lite")

4. Or equal.

2.02 FIBERGLASS REINFORCED PLASTIC PANELS

A. Wall panels shall be Fire-X Glasbord fiberglass reinforced plastic panels as manufactured by Crane Composites, or equivalent, where shown.

B. Dimensions:

1. Panel thickness shall be . 0.09" for "Fire-X Glasbord".

2. Wall panels shall be 4' wide and 8', 10' or 12' long to suit application. Horizontal joints shall not be permitted.

3. Ceiling panels where called for shall be 2'x 4'.

4. Wall panels shall be embossed; ceiling panels shall be smooth.

5. Panels shall meet USDA/FSIS requirements.

C. Panels shall have the following characteristics:

1. “Fire-X-Glasbord”.

a. Water absorption: 0.4%.

b. Coefficient of linear expansion: 1.7×10^{-5}.

c. Flame spread and smoke developed: “Class A” ASTM-E84.

D. Panels shall meet the requirements specified for interior finish under the Uniform Construction Code of the State of New Jersey and the International Building Code, 2021.

2.03 ACCESSORIES

A. Provide manufacturer's standard P.V.C. trim for joints and corners. Floor trim shall be 6" high vinyl cove base unless otherwise shown or specified.

B. Adhesive: "Titebond" *GREENChoice Advanced Polymer Panel Adhesive*, or equivalent, or as recommended by panel manufacturer.

C. Sealant shall be Acrylic latex caulk with silicone meeting ASTM C920, Type S, Grade NS, Class 25 or as recommended by the manufacturer.

D. Fasteners shall be nylon drive rivets as provided by the manufacturer.

2.04 OTHER MATERIALS

A. Vapor Barrier: Polyethylene sheeting, 6 mils thick.

B. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the Contractor subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General: Install the work of this section in strict accordance with the manufacturer's recommendations as approved by the ENGINEER.

B. Cut and drill panels with carbide tipped saw blades or drill bits, or cut with snips.

C. Install panels with manufacturer’s recommended gap for panel field and corner joints.

1. Pre-drill fastener holes in panels, 1/8 inch (3.2 mm) greater in diameter than fastener.

2. Install panels in a full spread of adhesive. For trowel type and application of adhesive, follow adhesive manufacturer’s recommendations.

D. Install trim accessories with adhesive and nails or staples. Do not fasten through panels.

E. Sealant:

1. Fill grooves in trim accessories with sealant before installing panels and bed inside corner trim in a bead of sealant.

2. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths.

3.03 CLEANING

A. Clean exposed surface of all grease, dirt and other foreign materials.

B. Touch up all marred or abraded surfaces as specified herein.

****END OF SECTION****

SECTION 06 65 00
(06060)
PLASTIC SIMULATED WOOD TRIM

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Cellular PVC trim boards for corner boards, soffits, fascias, battens, door pilasters, frieze boards, rake boards, architectural millwork, door/window trim and elsewhere as shown.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 06 20 00: Carpentry*

3. *Section 07 92 13*: *Sealants and Caulking*

4. *Section 09 90 00: Painting*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *SIMULATED WOOD TRIM* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Samples: Submit three (3) material samples representative of the texture, thickness and widths shown.

D. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage:

1. Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use.

2. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

3. Store materials on a flat and level surface on a full shipping pallet.

4. Handle materials to prevent damage to product edges and corners.

5. Store materials under a protective covering to prevent jobsite dirt and residue from collecting on the boards.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. Provide manufacturer's 25-year warranty against defects in manufacturing that cause the products to rot, corrode, delaminate, or excessively swell from moisture.

C. The *CONTRACTOR* and/or manufacturer shall be responsible for all costs of warranty repair work including removal, shipping and reinstallation during the maintenance period.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable Manufacturers:

1. AZEK® Trimboards
Vycom Corporation
801 Corey Street
Moosic, PA 18507.

2. Or equivalent.

2.02 PRODUCTS

A. Trim Boards:

1. Trim Boards shall be of free foam cellular PVC that is homogeneous and free of voids, holes, cracks, and foreign inclusions and other defects. Edges must be square, and top and bottom surfaces shall be flat with no convex or concave deviation. Surfaces shall be uniform and free from cupping, warping, and twisting.

2. Allowable Tolerances:

a. Variation in component length: -0.00 / +1.00"

b. Variation in component width: ± 1/16"

c. Variation in component thickness: ± 1/16"

d. Variation in component edge cut: ± 2°

e. Variation in density: -0% + 10%

3. Performance and physical characteristic requirements:

ASTM

PROPERTY	UNITS	VALUE	METHOD
PHYSICAL			
Density	g/cm	0.55	D 792
Water Absorption	%	0.15	D 570
MECHANICAL			
Tensile Strength	psi	2256	D 638
Tensile Modulus	psi	144,000	D 638
Flexural Strength	psi	3329	D 790
Flexural Modulus	psi	144,219	D 790
Nail Hold	Lbf/in of penetration	35	D 1761
Screw Hold	Lbf/in of penetration	680	D 1761
Staple Hold	Lbf/in of penetration	180	D 1761
Gardner Impact	in-lbs	103	D 5420
Charpy Impact @23°C	ft-lbs	4.5	D 256
THERMAL			
Coefficient of Linear Expansion	in/in/°F	3.2 x 10-5	D 696
Burning Rate	in/min	No burn when flame removed	D 635
Flame Spread Index	--	25	E 84
Heat Deflection Temp 264 psi	°F	150	D 648
Oil Canning (@140°F)	°F	Passed	D 648

2.03 ACCESSORIES

A. Fasteners:

1. Use fasteners designed for wood trim and wood siding (thinner shank, blunt point, full round head) with AZEK®.

2. Use stainless steel or hot-dipped galvanized fasteners.

3. Staples, small brads and wire nails shall not be used as fastening members.

4. The fasteners shall be long enough to penetrate the solid wood substrate a minimum of 1½".

B. Adhesives: AZEK Adhesive as supplied by manufacturer.

C. Sealants:

1. Use urethane, polyurethane or acrylic based sealants without silicone as specified in *Section 07 92 13, Sealants and Caulking*.

2.04 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General: Install the work of this section in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

B. Cutting:

1. Do not rip ⅜" and ½" sheet product into trim pieces. These profiles shall be glued to a substrate and mechanically fastened.

2. Cut material using the same tools used to cut lumber.

3. Use carbide tipped blades designed to cut wood. Avoid fine tooth metal cutting blades.

4. Rough edges from cutting may be caused by excessive friction, poor board support, or worn or improper tooling.

C. Drilling:

1. Pre-drilling is typically not required unless a large fastener is used or product is installed in low temperatures.

2. Drill using the same tools used to drill lumber.

3. Drilling is similar to drilling a hardwood. Care should be taken to avoid frictional heat buildup.

4. Use standard woodworking drills. Do not use drills made for normal rigid PVC.

5. Periodic removal of shavings from the drill hole may be necessary.

D. Milling:

1. Mill material using standard milling machines used to mill lumber.

2. Relief Angle 20° to 30°.

3. Cutting speed to be optimized with the number of knives and feed rate.

E. Routing:

1. Material can be routed using standard router bits and the same tools used to rout lumber.

2. Carbide tipped router bits are recommended.

F. Edge Finishing:

1. Finish edges by sanding, grinding or filing with traditional woodworking tools.

G. Nailing:

1. Standard nail guns may be used with AZEK trim products.

2. Use 2 fasteners per every framing member for trimboard applications.

3. Trimboards over 12" or wider, as well as sheets, require additional fasteners.

3. Fasteners must be installed no more than 2" from the end of each board.

4. Material shall be fastened into a flat, solid substrate. Fastening material into hollow or uneven areas shall be avoided.

H. Gluing:

1. Glue all AZEK to AZEK joints such as window surrounds, long fascia runs, etc. with AZEK Adhesive to prevent joint separation.

2. The glue joint shall be secured with a fastener and/or fastened on each side of the joint to allow adequate bonding time.

3. AZEK Adhesive has a working time of 10 minutes and will be fully cured in 24 hours.

4. Do not use standard PVC cements.

5. Surfaces to be glued shall be smooth, clean and in complete contact with each other.

6. To bond AZEK to other substrates, various adhesives may be used. Consult adhesive manufacturer to determine suitability.

I. Thermal Expansion and Contraction:

1. Material expands and contracts with changes in temperature.

2. Properly fastening material along its entire length will minimize expansion and contraction.

3. Allow ⅛" per 18 foot of product for expansion and contraction.

4. Joints between pieces shall be glued to eliminate joint separation. When gaps are glued on a long run of material, allow expansion and contraction at ends of the run.

J. Painting:

1. No special surface preparations are required prior to painting, sanding is not necessary for paint adhesion.

2. Surface must be clean and dry. Remove all grease, dirt and other foreign materials.

3. Fill nail holes with polyurethane or acrylic based caulk.

4. Paint in accordance with manufacturers directions and as specified in *Section 09 90 00, Painting*.

3.03 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Remove and dispose of all debris.

****END OF SECTION****

SECTION 07 19 23
(07150)
SILANE/SILOXANE WATER REPELLANT SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Work included:

1. Water based Silane/Siloxane water repellent sealer for use on:

a. Brick unit masonry.
b. Concrete unit masonry

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 03 30 00: Concrete*

3. *Section 04 21 13: Brick Masonry*

4. *Section 04 22 00: Concrete Unit Masonry*

5. *Section 07 92 13: Sealants and Caulking*

6. *Section 09 90 00: Painting*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *SILANE/SILOXANE WATER REPELLANT SYSTEM* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required to demonstrate compliance with the specified requirements.

3. M.S.D.S. sheets indicating V.O.C. content and safety pre-cautions.

4. Pre-Installation Conference: Submit report verifying project site conditions, approval of jobsite Mock-Up panels, manufacturer's instructions and requirements.

5. Provide protection plan of surrounding areas and non-masonry surfaces.

6. V.O.C. Certification: Submit certification of compliance that water-repellent materials furnished comply with regulations controlling the use of Volatile Organic Compounds (VOC).

C. Contract Close-out Submittals:

1. Warranty: Manufacturer's executed standard warranty form with authorized signatures and endorsements.

D. Certification: Upon completion of the work of this section, and as a condition of its acceptance, deliver to the *ENGINEER* the certification required herein.

E. Manufacturer's current recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

D. Manufacturer's certification: Prior to start of installation of the work of this section, and during progress of that work, secure a visit to the job site by an authorized representative of the manufacturer of the water repellant material, who shall inspect and shall certify:

1. That the surface to which material is to be applied is compatible and acceptable.

2. That the surfaces to which water repellant material was applied were in a condition suitable for that application;

3. That the materials applied conform to the specified requirements;

4. That the materials were applied in complete accordance with the manufacturer's current recommendations.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection.*

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER.*

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER.*

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

1.06 JOB CONDITIONS

A. Sequencing, scheduling: Do not begin application until environmental conditions meet the requirements of these Specifications.

B. Surfaces shall be clean, dry and free of alkali, efflorescence, sand, dirt, dust, grease, oil, chemical films or other contaminants.

C. Concrete and masonry surfaces shall be fully cured.

D. Environmental requirements:

1. Comply with manufacturer’s recommendations as to environmental conditions under which water repellant systems can be applied.

2. Air, material and surface temperature shall be 40°F or higher during application and cure.

3. Do not apply water repellants when surrounding air temperature is expected to fall below 40°F within 4 hours of application.

PART 2 - PRODUCTS

2.01 GENERAL

A. Proprietary Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable Manufactures:

1. BASF Building Systems
   889 Valley Park Drive
   Shakopee, MN 55379
   Customer Service: 800- 433-9517
   Technical Service: 800-243-6739
   Direct Phone: 952-496-6000

2. Or equivalent.

2.02 WATER REPELLANT – BRICK MASONRY

A. A high-performance, water-based, VOC-compliant, clear silane/siloxane sealer designed for dense, vertical masonry brick surfaces: “MasterProtect H 177”, or equivalent. (Formerly “Enviroseal Double 7 Brick”)

B. Performance Requirements:

1. Flash point: > 212 degree F (> 100 degree C) per ASTM D 3278.

2. VOC compliant.

3. Percentage reduction of leakage on brick wall: 94.8% per ASTM E 514.

4. Moisture-vapor transmission rate at 75° F (24° C) ASTM D 1653:

   a. 49.8 g/sf/24 hours.

2.03 WATER REPELLANT – CONCRETE UNIT MASONRY

A. Water-based silane/siloxane water-repellent sealer for porous substrates: “Master Protect H185”, or equivalent.

C. Performance Requirements:

1. Flash point: > 212 degree F (> 100 degree C) per ASTM D 3278.

2. VOC compliant.

3. Water repellency: 95 % reduction in water absorption (ASTM C-140).

4. Percentage reduction of leakage on block wall: 99% per ASTM E 514.

2.04 OTHER MATERIALS

A. Sealants: Refer to *Section 07 92 13* for sealant requirements.

B. Mortar Joint Repair: ChemRex Inc./Thoro Division - “Thorite 400” or “Dryjoint” installed as recommended by manufacturer.

C. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Verify substrates have been installed true in plane and have cured to full load bearing capacity (28 days).

D. Repair Concrete imperfections with ChemRex Inc./Thoro Division products "Thorite 400" repair materials installed per manufacturer's recommendations.

E. Repair mortar joints with ChemRex Inc./Thoro Division "Dryjoint". Cure replacement mortar at least 7 days prior to application of water repellent system.

F. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Protect surrounding surfaces and plantings not to be coated.

B. Prior to installation, clean substrates of substances that could impair penetration or reaction of water-repellent system. Coordinate cleaning and application to avoid contamination of newly treated surfaces.

C. Substrates shall be clean, dry, sound, and free of contaminants detrimental to water repellent system performance.

1. Remove contaminants by approved methods demonstrated at mock-up.

2. Allow cleaned, damp or water soaked surfaces to become unsaturated and dry before installation.

3. Efflorescence, mold, and mildew shall be treated, neutralized and removed prior to water repellent installation.

D. Prepare test panel of approximately 40 S.F. for review by *ENGINEER*. Do not proceed panel has been reviewed.

3.03 INSTALLATION

A. Apply transparent water-repellent to properly prepared surfaces indicated. Apply water repellent within time restrictions after mixing and surface preparation as recommended by manufacturer.

B. Application Techniques: Apply water-repellent by low-pressure spray techniques recommended by manufacturer to achieve desired results.

C. Apply one-component, water-based products from the bottom up with total saturation, providing a 6-8 inch run down. Apply water repellent material as demonstrated and approved at mock-up and not less than manufacturer's minimum

recommended coverage rate. Average coverage rates will vary between 80-175 square feet per gallon depending on substrate porosity, texture and profile.

D. Match approved samples for warrantable performance, appearance, and coverage. Remove, re-apply or re-coat work not in compliance with Contract Documents or Manufacturer's Warranty Requirements.

E. All materials shall be applied in strict accordance with the manufacturer's recommendations, covering all areas required to prevent penetration of moisture through the surface.

3.04 FIELD QUALITY CONTROL

A. Post Installation Testing: *OWNER* reserves the right to complete recommended testing required by the manufacturer at completion of work to assure warranty requirements, and contract compliance are met.

3.06 CLEANING AND PROTECTION

A. Remove temporary coverings and protection of adjacent work areas. Remove over-spray coating from windows or areas not intended to be coated with hot soap-water solution or a mild detergent cleaner.

B. Remove construction debris from site resulting from work in this section.

****END OF SECTION****

SECTION 07 21 00
(07210)
BUILDING INSULATION

PART 1 - GENERAL

1.01 SUMMARY

A. Work included:

1. Fiber fill, rigid, batt, spray, or granular insulation for:

a. Insulation under slabs on grade.

b. Foundation wall insulation (and supporting backfill).

c. Block/board cavity wall insulation.

d. Concealed and exposed board type building insulation.

e. Blanket type building insulation.

f. Sound attenuation blankets.

g. Fire safing insulation.

h. Firestopping of through penetrations.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 00 11 00: Statement of Work*

3. *Section 04 22 00: Concrete Unit Masonry*

4. *Section 07 54 23: Thermoplastic Polyolefin Roofing (Repairs)*

C. Payment:

1. Unless otherwise noted in the *Proposal* Section, no separate payment shall be made for this item.

2. Include all costs for *BUILDING INSULATION* in the prices bid for the various related items of work as designated in the *Proposal*.

1.02 REFERENCES

A. American Society for Testing and Materials:

1. ASTM C 578: Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

2. ASTM C 612: Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

3. ASTM C 665: Standard Specification for Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

4. ASTM C 991: Standard Specification for Flexible Fibrous Glass Insulation for Metal Buildings.

5. ASTM C1289: Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

6. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.

7. ASTM C203: Standard Test Method for Breaking Load and Flexural Properties of Block-Type Thermal Insulation.

8. ASTM D1621: Standard Test Method for Compressive Properties of Rigid Cellular Plastics.

9. ASTM D1622: Standard Test Method for Apparent Density of Rigid Cellular Plastics.

10. ASTM D2126: Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.

11. ASTM E96/E96M: Standard Test Method for Water Vapor Transmission of Materials.

12. National Fire Protection Association (NFPA) 285: Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Non-

Load-Bearing Wall Assemblies Containing Combustible Components Using the Intermediate-Scale, Multistory Test Apparatus.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Manufacturer's current recommended installation procedures.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with pertinent provisions of *Section 01 66 00, Storage and Protection*.

B. Deliver materials to project site in manufacturer's original packaging.

C. All insulation and components delivered to the job site shall bear the label of an approved agency showing the manufacturer’s name, product listing, product identification, R-value and information sufficient to determine that the end use will comply with the requirements of the International Building Code, IBC 2021.

D. Store materials off ground.

E. Protect against weather, condensation and damage.

F. Immediately remove damaged material from site.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products:

1. Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

2. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

B. Concealed installation:

1. Insulation materials, where concealed as installed in buildings of any type construction, shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 450. (IBC 719.2)

C. Exposed installation:

1. Insulation materials, where exposed as installed in buildings of any type construction, shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 450. (IBC 719.3)

2. Exposed insulation materials installed on attic floors shall also have a critical radiant flux of not less than 0.12 watt per square centimeter when tested in accordance with ASTM E 970. (IBC 719.3.1)

D. All insulation materials shall conform to the applicable sections of the International Building Code, IBC 2021.

2.02 BATT INSULATION

A. Acceptable manufacturers:

1. Certainteed Corporation

2. Owens Corning Fiberglass Corporation

3. Manville Building Insulation

4. Or equivalent.

B. Materials:

1. Non-Reflective: ASTM C665; Type II, Class A, Category 1, preformed glass fiber; friction fit.

2. Reflective: ASTM C665; Type III, Class A, Category 1, preformed glass fiber; friction fit.

3. Thermal resistance values:

a. Walls: R-19 unless otherwise shown.

b. Ceilings: R-30 unless otherwise shown.

4. Fasteners:

a. Staples shall be bronze or galvanized with a 7/16" crown and 1/2" shank.

b. Wire shall be 20 ga., galvanized steel.

5. Tape: Bright aluminum or Polyester to match insulation facing, self-adhering type, mesh reinforced, 2 inch wide.

6. Insulation Fasteners: Steel impale spindle and clip on flat metal base, self adhering backing, length to suit insulation thickness, capable of securely and rigidly fastening insulation in place.

7. Wire Mesh: Galvanized steel, hexagonal wire mesh.

2.03 FIRE SAFING INSULATION

A. Acceptable manufacturers:

1. Thermafiber, Inc

2. Or equivalent.

B. Safing Insulation:

1. "Thermafiber Safing Insulation" or equivalent, conforming to ASTM C 612, Type 1 and ASTM C 665, Type 1 and non-combustible when tested in accordance with ASTM E 136. Flame spread and smoke developed ratings of 0 when tested in accordance with ASTM E 84.

2. R-Value: 4.2 per inch.

3. Facing: Unfaced.

5. Density: Density: 6.0 pcf (actual).

2.04 SOUND ATTENUATION INSULATION

A. Acceptable manufacturers:

1. Thermafiber, Inc..
2. Or equivalent.

B. Materials

1. Type: Thermafiber Sound Attenuation Fire Blanket (SAFB).

2. R-Value: 3.7 per inch.

3. Density: 2.5 pcf (nominal).

4. Thickness: As shown

2.05 FOUNDATION INSULATION

A. Acceptable manufacturers:

1. Dow Chemical Company (Styrofoam)

2. Amoco Foam Products Company (Amofoam - RCY)

3. U.C. Industries, Inc. (Foamular)

4. Or equivalent.

B. Materials:

1. Insulation:

a. Conforming to ASTM C578, Type IV, CFC free.

b. Foam plastic insulation shall have a flame spread index of not more than 75 and a smoke developed index of not more than 450 where tested in the maximum thickness intended for use in accordance with ASTM E84. (IBC 2603.3)

c. 2" minimum thickness unless otherwise shown.

2. Adhesives and fasteners shall be as recommended and supplied by the insulation manufacturer.

2.06 ROOF INSULATION

A. Acceptable manufacturers

1. Hunter Panels
15 Franklin St.
Portland, ME 04101
Tel: 888-746-1114
Tel: 207-761-5678
Fax: 877-775-1769

2. Atlas Roofing Corporation
1775 The Exchange, Suite 160
Atlanta, GA 30339
Tel: 770-952-1442
Fax: 770-952-3170

3. Or equivalent.

B. Closed-cell HCFC FREE "LEED" certified polyisocyanurate foam board manufactured and bonded to 7/16 inch thick APA/TECO rated OSB on the top side and a fiber-reinforced felt facer on the bottom; UL-90 wind rating; compressive strength of 25 PSI; meeting ASTM C 1289, Type V, Grade 3.

C. Minimum insulation thickness shall be as shown not including nailable surface.

2.07 CAVITY WALL INSULATION

A. Acceptable Manufacturers:

1. Firestone Building Products
250 West 96th Street
Indianapolis, IN 46260
(800) 428-4442

2. Hunter XCI
15 Franklin Street
Portland, ME 04101
(877) 775-1769

3. Atlas Roofing Corporation
2000 River Edge Parkway
Suite 800
Atlanta, GA 30328
(770) 952-1492

4. Or equivalent.

B. Aluminum Foil-faced, Polyisocyanurate Board Insulation: ASTM C1289, Type I, Class 1 with maximum flame-spread and smoke-developed indexes of $\leq$ 25 and $\leq$ 450, respectively, per ASTM E84.

1. R value $\geq$ 6.5 as per ASTM C518 at 75°.

2. Minimum Compressive Strength ≥ 25 psi when tested per ASTM D1621.

3. Water Vapor Transmission ≤ 0.04 perms per inch when tested per ASTM E96.

4. Water Absorption Maximum ≤ 1% by volume when tested per ASTM C209.

5. Dimensional Stability, Maximum ≤ 2% length and width, and ≤ 3% thickness when tested per ASTM D2126.

6. NFPA 285 – Pass with brich veneer.

C. Acceptable Products:

1. Firestone Building Products; Enverge CI Foil Exterior Wall Insulation.
2. Hunter Xci Class A
3. Atlas Energy Shield Pro
4. Or equivalent.

D. Adhesive for Bonding Insulation: Polyurethane construction adhesive with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates and as recommended by insulation manufacturer meets ASTM C-557 and ASTM D-3498. Acceptable products include:

1. LN 950 as manufactured by Liquid Nails Adhesive, 15885 West Sprague Road, Strongsville, OH 44136, Phone: (800) 634-0015, e-mail: liquidnails@akzonobel.com, or equivalent.

2. Or equivalent.

E. Fasteners:

1. For mechanical attachment over wood or steel framing, provide the following as applicable:

   a. Rodenhouse Grip-Loc Auto Feed fastening system fasteners of length long enough to penetrate framing a minimum of 1 inch.
   b. Rodenhouse Thermal Grip ci washers with Grip Deck fasteners of length long enough to penetrate framing a minimum of 1 inch.
   c. Wind Lock Wind Devil plastic washer with coated fasteners of length long enough to penetrate framing a minimum of 1 inch.
   d. Or equivalent.

2. For mechanical attachment over masonry and concrete back-up, provide the following as applicable:

a. Rodenhouse Inc. Plasti-Grip PMF fasteners.
b. Or equivalent.

F. Insulation Board Joint Tape: Aluminum foil tape approved by insulation board manufacturer.

2.08 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Examine space allocated for insulation for proper depth of receive material.

D. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Remove or protect against projections in construction framing that may damage or prevent proper installation.

3.03 INSTALLATION:

A. General:

1. Fit insulation snugly between framing.

2. Maintain integrity of insulation over entire area to be insulated.

3. Insulate small areas between closely spaced framing members.

4. Carefully cut and fit insulation around pipes, conduits, and other obstructions.

5. Where pipes or conduit are located in stud spaces, place insulation between exterior wall and pipe, compressing insulation where necessary.

6. Do not install insulation requiring compression in excess of 10%.

7. Install insulation to attain minimum R-value as indicated for finished assembly.

B. Faced Insulation:

1. Staple facing flanges to sides of wood framing at 8 in. centers, or closer as necessary to hold flanges tightly to framing members.

2. Retain in place with wire mesh secured to metal framing members.

3. Exercise care to insure integral vapor barrier is continuous over entire surface.

4. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

5. Install faced insulation with integral vapor barrier toward warm-in-winter side of assembly.

C. Reflective Insulation:

1. Staple flanges of reflective faced insulation to sides of wood framing at 8 in. centers, or closer as necessary, to hold flanges tightly to framing members.

2. Retain in place with wire mesh secured to metal framing members.

3. Install reflective insulation so as to maintain minimum of 3/4 in. (19 mm) of unobstructed air space between reflective surface and wall materials.

4. Install to insure integrity of reflective surface over entire surface.

5. Do not install torn, punctured, or otherwise damaged reflective insulation.

6. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

D. Joists and Rafters: Provide supplemental support using wire ties securely fastened at 24 in. (600 mm) centers, maximum, to prevent sagging of insulation.

E. Metal Studs or Joists: Secure insulation in place using wire laced in crisscross fashion between studs or joists and tied or securely fastened to prevent displacement or sagging of material.

F. Metal building insulation:

1. Install metal building insulation on walls and roofs of metal buildings in accordance with manufacturers instructions.

2. On roofs all facing seams and all fabrication cuts or patches shall be sealed.

3. Pull roof insulation tightly to minimize wrinkles and sag in accordance with manufacturers instructions.

4. Tape seal butt ends, lapped edges, and tears or cuts in membrane.

G. Perimeter foundation insulation:

1. Adhere a 6 inches wide strip of polyethylene sheet over joints with double beads of adhesive each side of joint. Tape seal joints between sheets. Extend sheet full height of joint.

2. Install boards on foundation wall perimeter, horizontally. Place boards in a method to maximize contact bedding. Stagger end joints. Butt edges and ends tight to adjacent board and to protrusions.

3. Extend boards over expansion joints, un-bonded to foundation 12 inches either side of joint.

4. Protect below-grade insulation on vertical surfaces (from damage during backfilling) by application of protection board. Set in adhesive in accordance with recommendations of manufacturer of insulation.

5. Protect top surface of horizontal insulation (from damage during concrete work) by application of protection board.

H. Cavity Wall Installation on Masonry Back-Up:

1. Mechanical Fastener Installation:

   a. Fasten insulation to back-up using manufacturer's acceptable integral plastic washers and fasteners as applicable for type of back-up and insulation thickness.
   b. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.
   c. Install field fasteners at 12" o.c. vertically and 16" o.c. horizontally.
   d. Install edge fasteners at 12" o.c. around perimeter of each board.

3.04 CLEAN UP

A. Remove and dispose of excess materials, litter, and debris; leaving work areas in a clean condition.

****END OF SECTION****

SECTION 07 26 16

BELOW GRADE VAPOR RETARDER

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Surface preparation and application of a below grade vapor retarder.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 03 30 00: Concrete*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *BELOW GRADE VAPOR RETARDER* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance: The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable Manufacturers:

1. W. R. Meadows, Inc. (Perminator, 15mil)

2. Stego Industries, LLC. (Stego Wrap Vapor Retarder, 15mil)

3. Or equivalent.

2.02 VAPOR RETARDER

A. Vapor retarder membrane shall be manufactured from virgin polyolefin resins and

when tested according to all requirements of ASTM E1745, shall meet the following minimum performance requirements:

1. Maximum Water Vapor Permeance (ASTM E154 Sections 7, 8, 11, 12, 13, by ASTM E96, Method B or ASTM F1249)

   a. As received: 0.0093 perms.

   b. After Wetting and Drying: 0.0122 perms.

   c. Resistance to Plastic Flow and Temperature: 0.0121 perms.

   d. Low Temperature and Flexibility: 0.0138 perms

   e. Resistance to deterioration from organisms and substances in contacting soil: 0.0123 perms.

   f. Puncture Resistance (ASTM D1709): 4,374 grams.

   g. Tensile Strength ASTM E154, Section 9: 84 Lb. Force/Inch

2. Thickness: 15 mils

2.03 ACCESSORIES

A. Seam Tape: Manufacturers standard High Density Polyethylene Tape with pressure sensitive adhesive. Minimum width 4" (100 mm).

B. Pipe Collars: Construct pipe collars from vapor retarder material and pressure sensitive tape in accordance with manufacturer's instructions.

2.04 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General: Install the work of this section in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

B. Install the vapor retarder membrane in accordance with manufacturer's instructions and ASTM E-1643.

B. Unroll vapor retarder with the longest dimension parallel with the direction of the pour.

C. Lap vapor retarder over footings and seal to foundation walls.

D. Overlap joints 6" (152 mm) and seal with manufacturer's tape.

E. Seal all pipe penetrations with manufacturer's pipe boot.

F. Seal all other penetrations inn accordance with manufacturer's instructions.

G. No penetration of the vapor retarder is allowed except for reinforcing steel and permanent utilities and theses shall be sealed.

H. Repair damaged areas by cutting patches of vapor retarder, overlapping damaged area 6" (152 mm) and taping all four sides with tape.

3.03 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Remove and dispose of all debris.

****END OF SECTION****

SECTION 07 27 26

FLUID-APPLIED VAPOR PERMEABLE MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Fluid-applied, vapor permeable air barrier membrane system located in the non-accessible part of the wall including bridging and sealing air leakage pathways in roof and foundation junctions, window and door openings, control and expansion joints, masonry ties, piping and other penetrations through the wall assembly.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 04 21 13: Brick Masonry*

3. *Section 07 62 00: Flashing and Sheet Metal*

4. *Section 07 92 13: Sealants and Caulking*

1.02 PERFORMANCE REQUIREMENTS

A. Air barrier shall be capable of performing as a continuous vapor-permeable air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. To the extent that restoration of the façade veneer and window replacement is shown on the drawings, the building envelope shall be provided with a continuous air barrier to control air leakage into, or out of the conditioned space. The air barrier shall have the following characteristics:

1. It must be continuous, with all joints made airtight.
2. It shall have an air permeability not to exceed 0.004 cfm/sq. ft. under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.02 L/s. x sq. m. @ 75 Pa), when tested in accordance with ASTM E2178.
3. It shall have an air permeability not to exceed 0.04 cfm/sq. ft. under a pressure differential of 0.3 in. water (1.57 psf) (equal to 0.2 L/s. x sq. m. @ 75 Pa), when tested in accordance with ASTM E2357.
4. It shall be capable of withstanding positive and negative combined design wind, fan and stack pressures on the envelope without damage or displacement, and shall transfer the load to the structure. It shall not displace adjacent materials under full load.
5. It shall be durable or maintainable.
6. The air barrier shall be joined in an airtight and flexible manner to the air barrier material of adjacent systems, allowing for the relative movement of systems due to thermal and moisture variations and creep. Connection shall be made between:

    a. Foundation and walls
    b. Walls and windows or doors
    c. Different wall systems
    d. Wall and roof
    e. Wall and roof over unconditioned space
    f. Walls, floor and roof across construction, control and expansion joints
    g. Walls, floors and roof to utility, pipe and duct penetrations

7. All penetrations of the air barrier and paths of air infiltration/exfiltration shall be made airtight.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

B. Shop Drawings: Show locations and extent of air barrier. Include details for

substrate joints and cracks, counter-flashing strip, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.

1. Include details of interfaces with other materials that form part of air barrier
2. Include details of mockups

C. Samples: Submit representative samples of the following for approval:

1. Fluid-Applied membrane
2. Self-Adhered Transition Membrane
3. Self-Adhered Through Wall Flashing

D. Product Certificates: For air barriers, certifying compatibility of air barrier and accessory materials with Project materials that connect to or that come in contact with the barrier; signed by product manufacturer.

E. Qualification Data: For Applicator.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers, submit certified test report showing compliance with requirements specified for ASTM E2178.

G. Warranty: Submit a sample warranty identifying the terms and conditions specified herein.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ARCHITECT/ENGINEER*.

B. Qualifications of workmen:

1. Installer shall be licensed by the Air Barrier Association of America (ABAA) and certified by the manufacturer as an acceptable installer during the bidding period as well as for the duration of the installation.

2. Each worker who is installing air barriers must be either a Certified Applicator or an installer who is registered with ABAA.

3. Each Lead Certified Applicator can supervise a maximum of five registered installers. The Certified Applicator shall be thoroughly trained and experienced in the installation of air barriers of the types being applied. Lead Certified Applicators shall perform or directly supervise all air/vapor barrier work on the project.

4. Air barrier installers must be trained and certified by NECA (National Energy Conservation Association) and PSDI (Professional Skills Development Institute for energy conservation).

C. Pre-Installation Meeting:

1. Convene a meeting with installers and manufacturers affected by the Work of this Section a minimum of one week prior to commencing Work of this section. Agenda shall include materials, details of construction, compatibility of materials and sequencing of construction.

D. Mockups: Before beginning installation of air barrier, provide air barrier work for exterior wall assembly mockups, incorporating backup wall construction, external cladding, window, door frame and sill, insulation, and flashing to demonstrate surface preparation, crack and joint treatment, and sealing of gaps, terminations, and penetrations of air barrier membrane. Since this project involves restoration of existing work, mock-up requirements shall be fulfilled by utilizing the initial work area selected by the Contractor and approved by the *OWNER* and *ARCHITECT / ENGINEER*

1. Mock-up shall encompass an existing substrate area of approximately 200 SF.

2. Coordinate construction of mockup to permit inspection by *OWNER*'s testing agency of air barrier before external cladding is installed

3. If *ARCHITECT/ENGINEER* determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved

E. Basis of acceptance:

1. The manufacturer’s installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

2. In acceptance or rejection of the work of this section, the

ARCHITECT/ENGINEER will make no allowance for lack of skill on the part of workmen.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ARCHITECT/ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within recommended limits recommended for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Air barriers are not intended for uses subject to abuse or permanent exposure to the elements. Protect membrane from direct sunlight until ready for use.

C. Do not apply membrane when surfaces are frozen.

1.07 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. Submit manufacturer's standard 5-year warranty that the air barrier and accessories are free of defects at time of delivery and are manufactured to meet manufacturer's published physical properties and material specifications.

C. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-

start-up during the maintenance period.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ARCHITECT/ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers:

1. Perm-A-Barrier VP®
   W. R. Grace & Company

2. Air Shield™ LMP Vapor Permeable Air Barrier Membrane
   W.R. Meadows, Inc.

3. Or equivalent.

2.02 PRODUCTS

A. Fluid-Applied Air Barrier Membrane: Perm-A-Barrier® VP, as manufactured by Grace Construction Products, 62 Whittemore Avenue, Cambridge, MA; a fluid-applied, vapor permeable, acrylic membrane that cures to form a resilient, monolithic, fully bonded elastomeric membrane when applied to construction surfaces. The membrane provides superior protection against the damaging effects of air and liquid water ingress on the building structures. Product shall have the following minimum physical properties:

1. Membrane Air Permeance: ASTM E2178: Not to exceed 0.0004 cfm/sq. ft. under a pressure differential of 0.3 in. water.

2. Assembly Performance: Provide a continuous air barrier assembly that has an air leakage not to exceed 0.0008 cfm/sq. ft. of surface area under a pressure differential of 0.3 in. water (1.57 psf) when tested in accordance with ASTM E2357.

3. Membrane Vapor Permeance: ASTM E96, Method B: 11.2 perms

4. Peel Adhesion: ASTM D903: min. 5 pli or substrate failure to glass faced wall board, min. 20 pli to concrete/CMU

5. UV Exposure Limit: Not more than 180 calendar days

B. Transition Membrane: Perm-A-Barrier Detail Membrane manufactured by Grace Construction Product; a 0.9 mm (36 mils) of self-adhesive rubberized asphalt integrally bonded to 0.1 mm (4 mil) of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming with the following:

1. Water Vapor Transmission: ASTM E96, Method B: 0.05 perms max.

2. Air Permeance at 75 Pa (0.3 in. water) pressure difference: 0.00012 cfm/ sq. ft. max.

3. Puncture Resistance: ASTM E154: 40 lbs. min.

4. Lap Adhesion at 25ºF: ASTM D1876: 5.0 lbs./in. of width.

5. Low Temperature Flexibility: ASTM D1970: Unaffected to -45ºF.

6. Tensile Strength: ASTM D412, Die C Modified: min. 400 psi.

7. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C: min. 200%

C. Flexible Membrane Wall Flashing: Perm-A-Barrier Wall Flashing manufactured by Grace Construction Products; a 0.8 mm (32 mils) of self-adhesive rubberized asphalt integrally bonded to 0.2 mm (8 mil) of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, conforming with the following:

1. Water Vapor Transmission: ASTM E96, Method B: 0.05 perms max.

2. Water Absorption: ASTM D570: max. 0.1% by weight

3. Puncture Resistance: ASTM E154: 80 lbs. min.

4. Tear Resistance

a. Initiation ASTM D1004: min. 13.0 lbs. M.D.
b. Propagation ASTM D1938: min. 9.0 lbs. M.D.

5. Lap Adhesion at 25ºF: ASTM D1876: 5.0 lbs./in. of width.

6. Low Temperature Flexibility: ASTM D1970: Unaffected to -45ºF.

7. Tensile Strength: ASTM D412, Die C Modified: min. 800 psi.

8. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C: min. 200%.

2.03 PRIMERS

A. Wall Primer for Self-adhered transition membrane and Self-adhered flexible membrane wall flashing: Perm-A- Barrier WB Primer manufactured by Grace Construction Products; a water-based primer which imparts an aggressive, high tack finish on the treated substrate.

1. Flash Point: No flash to boiling point

2. VOC Content: Not to exceed 10 g/L

3. Application Temperature: -4°C (25°F) and above

4. Freezing point (as packaged): -7°C (21°F)

B. Primer for Primary Self-adhered air barrier membrane: Perm-A-Barrier Primer Plus manufactured by Grace Construction Products; a water-based primer which imparts an aggressive, high tack finish on the treated substrate. Product shall have the following minimum physical properties:

1. Color: Milky White (wet), Clear (dry)

2. Weight: 8.25 lbs./gal.

3. Solids Content (by wt.): 53-57%

4. Solvent Type: Water

5. VOC Content: Not to excess 1 g/L

6. Application Temperature: 4°C (40°F) and above

2.04 PENETRATIONS & TERMINATION SEALANT

A. Liquid Membrane for Details and Terminations: Bituthene Liquid Membrane manufactured by Grace Construction Products; a two-part, elastomeric, trowel grade material designed for use with fluid-applied membranes, self-adhered membranes and tapes. 10 g/L max. VOC content.

B. Substrate Patching Membrane: Bituthene Liquid Membrane manufactured by Grace Construction Products; a two- part, elastomeric, trowel grade material designed for use with fluid-applied membranes, self-adhered membranes and tapes. 10 g/L max. VOC content.

C. Sealant for Details, Terminations and Joint Treatment: S100; One part neutral curing, ultra low modulus silicone sealant manufactured by Grace Construction Products. 98 g/L max. VOC content.

2.05 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ARCHITECT/ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Do not begin installation until substrates have been properly prepared. Before installation, verify substrate is in compliance with manufacturer's instructions. Do not begin surface preparation or application until unacceptable conditions have been corrected.

C. Verify that work may be completed in strict accordance with the original design and with the manufacturer’s recommendations as approved by the *ARCHITECT/ENGINEER*.

D. Do not proceed until unsatisfactory conditions are corrected.

3.02 SURFACE PREPARATION

A. Refer to manufacturer's literature for requirements for preparation of substrates. Surfaces shall be sound and free of voids, spalled areas, loose aggregate and sharp protrusions. Remove contaminants such as grease, oil and wax from exposed surfaces. Remove dust, dirt, loose stone and debris. Use repair materials and methods that are acceptable to manufacturer of the fluid-applied air barrier assembly.

B. Exterior sheathing panels: Ensure that the boards are sufficiently stabilized with corners and edges fastened with appropriate screws. Pre-treat all board joints with 50 – 75 mm (2-3 in.) wide, manufacturer's recommended mesh-style wallboard tape. Gaps greater than 6 mm (¼ in.) shall be filled with mastic or caulk, allowing sufficient time to fully cure before application of the mesh-style wallboard tape and fluid applied air barrier system.

C. Masonry Substrates: Apply air and vapor barrier over concrete block and brick with smooth trowel-cut mortar joints, struck full and flush. Fill all voids and holes, particularly in the mortar joints, with a lean mortar mix, non-shrinking grout or parge coat.

D. Related Materials: Treat construction joints and install flashing as recommended by manufacturer.

E. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.

F. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

G. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

H. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate patching membrane.

I. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

J. At changes in substrate plane, apply sealant or Bituthene Liquid Membrane at sharp corners and edges to form a smooth transition from one plane to another.

K. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.03 JOINT TREATMENT

A. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C1193 and air barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D4258 before coating surfaces.

1. Prime substrate as required.

B. Gypsum Sheathing:

1. Fill joints greater than 1/4 inch with sealant according to ASTM C1193 and with air barrier manufacturer's written instructions. Apply mesh-style wallboard tape to joint prior to installing fluid air barrier membrane.
2. Joints smaller than ¼-inch may be filled with either sealant or mesh-style wallboard tape in accordance with the air barrier manufacturer's written instructions.

3.04 AIR BARRIER MEMBRANE INSTALLATION

A. Apply air barrier membrane to achieve a continuous air barrier according to air barrier manufacturer's written instructions.

B. Apply air barrier membrane within manufacturer's recommended application temperature ranges.

C. Apply a continuous unbroken air barrier to substrates according to the following minimum thickness. Apply membrane in full contact around protrusions such as masonry ties.

1. Vapor-Permeable Membrane Air Barrier: 90-mil (2.4-mm) wet film thickness, 42~45-mil (1.2-mm) dry film thickness.

D. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

E. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.05 TRANSITION MEMBRANE INSTALLATION

A. Install strips, transition membrane, and auxiliary materials according to air barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.

B. Apply primer to substrates to receive transition membrane at required rate and allow to dry. Limit priming to areas that will be covered by transition tape in same day. Re-prime areas exposed for more than 24 hours.

1. Prime glass-fiber-surfaced gypsum sheathing not covered with air membrane material with number of prime coats needed to achieve required bond, with adequate drying time between coats.

C. Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, concrete below-grade structures, floor-to floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

D. At end of each working day, seal top edge of strips and transition membrane to substrate with termination sealant.

E. Apply joint sealants forming part of air barrier assembly within sealant manufacturer's recommended application temperature ranges. Consult sealant manufacturer when sealant cannot be applied within these temperature ranges.

F. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition membrane so that a minimum of 3 inches (75 mm) of coverage is achieved over both substrates.

1. Transition Membrane: Roll firmly to enhance adhesion.

G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air barrier membrane with foam sealant.

H. Repair punctures, voids, and deficient lapped seams in strips and transition membrane. Slit and flatten fish-mouths and blisters. Patch with transition membrane extending 6 inches (150 mm) beyond repaired areas in strip direction.

3.04 PROTECTION

A. Cover air barrier membrane as soon as possible, within 30 days, since it is not designed for permanent exposure.

B. Protect installed products until completion of project.

C. Touch-up, repair or replace damaged product.

3.05 FIELD QUALITY CONTROL

A. Testing Agency:

1. *OWNER* may engage a qualified agency to perform tests and/OR inspections and prepare test reports.

B. Inspections: Air barrier materials and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Continuous structural support of air barrier system has been provided.
3. Masonry and concrete surfaces are smooth, clean and free of cavities, protrusions, and mortar droppings.
4. Site conditions for application temperature and dryness of substrates have been maintained.
5. Maximum exposure time of materials to UV deterioration has not been exceeded.
6. Surfaces have been primed, if applicable.
7. Laps in strips and transition membrane have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fish-mouths.
8. Termination sealant has been applied on cut edges.
9. Strips and transition membrane have been firmly adhered to substrate.
10. Compatible materials have been used.
11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies (membrane and sealants) have complied with requirements for cleanliness, preparation and priming of surfaces, structural support, integrity, and continuity of seal.
13. All penetrations have been sealed.

C. Tests: Testing to be performed will be determined by *OWNER*'s testing agency in accordance with the following:

1. Qualitative Testing: Air barrier assemblies will be tested for evidence of air leakage according to ASTM E1186.

D. Remove and replace deficient air barrier components and retest as specified above.

3.05 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Remove and dispose of all debris.

****END OF SECTION****

SECTION 07 54 23
(07540)
THERMOPLASTIC POLYOLEFIN (TPO) ROOFING REPAIRS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Roofing scope of work is limited to the area of roof top equipment, piping and related system installations. Repair existing roofing after installation of the roof top equipment. Contractor shall verify existing warranty and work with roofing manufacturer and previous roofing installer to maintain existing roof warranty.

2. Removal and disposal of all existing roofing including tapered edge and cant strips, base flashings, parapet coping, pipe boots, pitch pockets and membrane system.

3. Deck preparation including replacement of deteriorated decking, if and when directed.

4. Provide a single-ply, fully adhered, fleece-back, thermoplastic polyolefin roofing system.

4. Provide new tapered insulation crickets where shown.

5. Provide new cant strips, parapet coping, flashing and flashing accessories, drain leads, pipe boots and pitch pockets.

6. Removal and disposal of existing scuppers and providing new scuppers and overflow scuppers where shown.

7. Traffic surfacing.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 07 60 01: Flashing and Sheet Metal*

3. *Section 07 71 00: Roof Specialties and Accessories*

1.02 SYSTEM DESCRIPTION

A. New single-ply, thermoplastic polyolefin roofing system with a twenty (20) year NDL warranty, **GAFMC Specification #T-FA-T-N-80FB** and **#T-FA-T-I-80FB**, or equivalent.

B. Work of this section shall comply with the manufacturer's specifications and good roofing practice. Any deviation shall be authorized by the materials manufacturer in writing and approved by the *OWNER'S* representative.

C. Defective applications, regardless of cause, shall be removed and replaced in accordance with the application specification.

D. Performance Requirements:

1. Roofing system shall achieve an Underwriters Laboratories Class A rating for roof slopes indicated.
2. Roofing system shall achieve a Factory Mutual wind uplift rating of FM 1-90 as listed in the current FM Approval Guide.

1.03 REFERENCES

A. Factory Mutual (FM Global) – Approval Guide:

1. Factory Mutual Standard 4470 – Approval Standard for Class 1 Roof Covers.

B. American National Standards Institute:

1. ANSI/SPRI FX-1-2006 - Standard Field Test Procedure For Determining The Withdrawal Resistance Of Roofing Fasteners

C. American Society for Testing and Materials (ASTM) – Annual Book of ASTM Standards.

1. ASTM C1289 – Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

2. ASTM D1079 – Standard Terminology Relating to Roofing, Waterproofing and Bituminous Material.

3. ASTM D6878 – Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing.

D. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) Architectural Sheet Metal Manual.

E. National Roofing Contractors Association (NRCA).

F. American Society of Civil Engineers (ASCE):

1. ASCE 7 - Minimum Design of Loads for Buildings and Other Structures.

1.04 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 and the glossary of the National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual for definitions of roofing terms related to this section.

1.05 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Submit product data, including manufacturer's technical data sheet for all specified products.

C. Shop Drawings: Submit shop drawings showing roof configuration, sheet layout and details of application.

D. Samples: Submit selection and verification samples of manufacturer's product line.

E. Quality Assurance Submittals: Submit the following:

1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.

2. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

3. Manufacturer's Instructions: Manufacturer's Installation Instructions.

4. Manufacturer's Field Reports: Manufacturer's field reports specified herein.

F. Closeout Submittals: Submit the following:

1. Maintenance Data: Maintenance data for installed products. Include methods for maintaining and repairing installed products and precautions against cleaning materials and methods detrimental to finishes and performance.

2. Warranty: Warranty documents specified herein.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Installer shall have a minimum of five (5) years experience in the application of thermoplastic membrane and shall be currently certified by the manufacturer of the membrane system to provide the specified warranty.

B. Manufacturer Qualifications: Membrane manufacturer shall have a minimum of ten (10) years experience in the production of ethylene-interpolymer scrim reinforced membrane for use as roofing membrane.

C. Membrane Qualifications: Membrane shall be factory certified, first run material; seconds are not permitted. Material and packaging to bear the FM label on the roll.

D. Regulatory Requirements:

1. Federal:

a. Worker protection:

(1) 29 CFR 1926.59, Hazard Communication Program
(2) 29 CFR 1910.134, Respiratory Protection Standard
(3) 29 CFR 1926.20, General Safety and Health Provisions
(4) 20 CFR 1910.94 and 1926.57, Ventilation
(5) 29 CFR 1910.97, Non-Ionizing Radiation
(6) General Duty Clause 5(a)(1) of the 1970 OSH Act, which requires employers to provide safe work conditions for their employees.
(7) 29 CFR 1926.55; Gases, Vapors, Fumes, Dusts and Mists
(8) 29 CFR 1910.1000, Air Contaminants

b. Ambient air quality:

(1) 40 CFR 50.6, National Primary and Secondary Ambient Air Quality Standards for Particulate Matter

c. Water quality:

(1) 40 CFR 261, identification and Listing of Hazardous Waste
(2) 30 CFR 262, Standards Applicable to Generators of Hazardous Waste
(3) 40 CFR 263, Standards Applicable to Transporters of Hazardous Waste

2. State of New Jersey:

a. New Jersey Fire Prevention Code; NJAC 5:70-3.1(a), F-405 Asphalt (Tar) Kettles

b. NJAC 7:10-1 et. seq.; New Jersey Safe Drinking Water Regulations

c. NJAC 7:27-16; Misc. Metal Parts and Products Rule

d. NJAC 7:27-23; Architectural Coatings Rule

e. NJAC 8:59-5.1, et. seq.; New Jersey Worker and Community Right to Know Act

1.07 PRE-INSTALLATION CONFERENCE

A. Prior to scheduled commencement of the roofing installation and associated work conduct a meeting at the project site with the Installer, *ARCHITECT*, *OWNER*, Manufacturer's Representative and any other persons directly involved with the performance of the work. The installer shall record conference discussions to include decisions, agreements and open issues and furnish copies of recorded discussions to each attending party. The primary purpose of the meeting is to review foreseeable methods and procedures related to roofing work.

1.08 DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact and in sufficient quality to allow for continuity of work.

C. Storage and Protection:

1. Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

2. Leave product wrapped and protected in original packing with identification labels until ready for use on the job.

3. Store in a clean, dry, well ventilated area protected from weather and other trades.

4. All rolls of membranes shall be stored, lying down, elevated above the roof deck and completely protected from moisture with tarpaulins.

5. Insulation shall be stored on pallets, fully protected from moisture with tarpaulins.

6. Adhesives shall be safely stored, at temperatures above 45°F. Flammable materials shall be stored in a cool dry area away from sparks and open flames.

7. Manufacturer's Material Safety Data Sheets are to be available at the project and all precautions and safety instructions followed.

D. Damages: Damaged materials shall be immediately removed from the construction site and replaced at no cost to the *OWNER*.

1.09 PROJECT CONDITIONS

A. Weather:

1. Proceed with the roof installation only when existing and forecasted weather conditions permit.

2. Ambient Temperatures shall be above 45°F when applying hot steep asphalt, water based adhesives or urethane adhesives.

1.10 WARRANTY

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. Manufacturer shall provide written twenty (20) year No Dollar Limit, labor and material warranty against faulty materials and workmanship for a period of twenty (20) years.

1. Manufacturer of roofing system shall make repairs to membrane, base flashing and roof insulation as necessary to correct leaks at no cost to *OWNER*. There shall be no dollar limit on covered repairs.

2. The Manufacturer's Technical Service Representative shall inspect the completed Roof System, and upon acceptance, the Manufacturer shall issue the specified warranty, subject to the terms and conditions of the sample warranty and the contract documents commencing on Date of Substantial Completion.

C. Warranty shall be GAFMC "Diamond Pledge NDL Roof Guarantee," or equivalent.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable Manufacturers:

1. GAF Materials Corporation
   1361 Alps Road
   Wayne, NJ 07470
   Tel: (973) 628-3000

2. Flex Membrane International, Inc.
   2670 Leiscz's Bridge Road, Suite 400

Leesport, PA 19533
Tel: (800) 969-0108

3. Or equivalent.

2.02 MATERIALS

A. Membrane and Flashing:

1. GAF EverGuard® white, 80 mil polyester reinforced thermoplastic polyolefin membrane (TPO), or equivalent with the following physical properties:

Property	**Test Method**	**Specification**
Color		White
Thickness	ASTM D751	.080", nominal
Roll Size		80 mil: 10'x 50'
Breaking Strength	ASTM D751	360 lbf x 340 lbf.
Seam Strength	ASTM D751	140 lbf (membrane failure
Elongation @ Break	ASTM D751	30%
Heat Aging	ASTM D573	100%
Tear Strength	ASTM D751	60 lbf. x 150 lbf.
Cold brittleness	ASTM D2137	(-40°C)
Puncture Resistance	FTM 101C, Method 2031	>380 lbs.
Permeance	ASTM E96	0.01 Perms
Dimensional Change	ASTM D1204	@ 158°F, 6 hour 0.4%
Water Immersion	ASTM D471	@ 158°F, 1 week 0.7%
Hydrostatic Pressure	ASTM D751	>430 psi
Ozone Resistance	ASTM D1149	Pass
Reflectivity	ASTM C1549	0.76
Emissivity	ASTM C1371	0.90

2.03 RELATED MATERIALS

A. All materials shall be acceptable to and approved by the system manufacturer.

B. Adhesives: Supplied by the same manufacturer as the membrane and formulated for use with thermoplastic polyolefin membrane. Each container shall have the manufacturers name, material identification and shelf life date marked on a label.

1. Solvent-based Bonding Adhesive: Solvent based rubberized adhesive for use with EverGuard TPO membranes, EverGuard 1121 Bonding Adhesive, by GAFMC, or equivalent.

2. Low VOC solvent-based Bonding Adhesive: Solvent based rubberized adhesive for use with EverGuard TPO membranes, EverGuard Low VOC Bonding Adhesive, by GAFMC, or equivalent.

3. Water-based Bonding Adhesive: Water based rubberized adhesive for use with EverGuard TPO membranes, EverGuard H_2O Bonding Adhesive, by GAFMC, or equivalent.

4. Solvent based liquid, required to protect field cut edges of EverGuard TPO membranes. Applied directly from a squeeze bottle, EverGuard TPO Cut Edge Sealant, by GAFMC, or equivalent.

5. Solvent based primer for preparing surfaces to receive butyl based adhesive tapes, EverGuard TPO Primer, by GAFMC, or equivalent.

6. Low VOC solvent based primer for preparing surfaces to receive butyl based adhesive tapes, EverGuard TPO Low VOC Primer, by GAFMC, or equivalent.

7. Solvent based seam cleaner used to clean exposed or contaminated seam prior to heat welding, EverGuard TPO Seam Cleaner, by GAFMC, or equivalent.

8. Commercial grade roofing sealant suitable for sealing the upper lip of exposed termination bars and penetrations and around clamping rings and comes with a 20 yr ltd warranty against leaks caused by manufacturing defects. Meets the performance criteria of ASTM D412, ASTM D2196, ASTM D1475 and ASTM D1644, FlexSeal™ Roof Sealant, by GAF-Elk, or equivalent.

9. One part butyl based high viscosity sealant suitable for sealing between flashing membrane and substrate surface behind exposed termination bars and for sealing between roofing membrane and drain flange. EverGuard® Water Block, by GAFMC, or equivalent.

10. 100% solids urethane based two-part sealant suitable for filling sealant pans at irregularly-shaped penetrations. EverGuard® 2-Part Pourable Sealant, by GAFMC, or equivalent.

C. Flashing:

1. Reinforced Membrane: Same material, color and thickness as roof membrane.

2. Smooth type, unreinforced thermoplastic polyolefin based membrane for use as an alternative flashing/reinforcing material for penetrations and corners. Required whenever preformed vent boots cannot be used, 0.055 inches (55 mils) nominal thickness, color to match roofing membrane; EverGuard® TPO Detailing Membrane, by GAFMC, or equivalent.

3. An 8 inch (20 cm) wide smooth, polyester scrim reinforced thermoplastic polyolefin membrane strip for use as a cover strip over coated metal and stripping-in coated metal flanges and general repairs: 0.045 inches (45 mils) nominal thickness in color to match roofing membrane; EverGuard® TPO Flashing Membrane, by GAFMC, or equivalent.

4. Extruded aluminum termination bar with angled lip caulk receiver and lower leg bulb stiffener with pre-punched slotted holes at 6" on center or 8" on center; ¾" x 10' with 0.090" cross section; EverGuard® Lip Termination Bar**,** by GAFMC, or equivalent.

5. .045" reinforced TPO membrane with pressure sensitive adhesive, to be installed on horizontal surfaces using plates and fasteners as a base attachment in fully adhered systems, 6" wide x length as required; EverGuard® RTA (Roof Transition Anchor) Strip™, by GAFMC, or equivalent.

6. 24 gauge steel with 0.025" thick TPO based film as required for fabrication into metal gravel stop and drip edge profiles, metal base and curb flashings, sealant pans, and scupper sleeves, color to match roofing membrane; EverGuard® TPO Coated Metal, by GAFMC or equivalent.

D. Wall & Curb Accessories:

1. 55 mil TPO membrane and 24 gauge coated metal prefabricated into standard and custom size thru wall scuppers**.** Available in two sizes: 4" x 6" x 12" (l x w x d) with a 5.75" x 3.75" opening and 8" x 10" x 12" (l x w x d) with a 9.75" x 7.75" opening; EverGuard® TPO Scupper**,** by GAFMC, or equivalent.

2. 0.060" thick reinforced TPO membrane fabricated corners in four standard sizes to flash curbs that are 24", 36", 48", and 60" in size. Four corners are required to flash the curb, EverGuard® Corner Curb Wraps**,** by GAFMC, or equivalent.

3. 0.060" thick molded TPO membrane outside corners of base and curb flashing. Hot-air welds directly to EverGuard TPO membrane. Size 4" x 4" with 6" flange, EverGuard® TPO Universal Corners by GAFMC, or equivalent.

4. 0.055" molded TPO membrane inside corners of base and curb flashing. Hot-air welds directly to Everguard TPO membrane. Size 6" x 6" x 5.5" high EverGuard® TPO Preformed Corners by GAFMC, or equivalent.

5. 8" diameter, nominal .050" vacuum formed un-reinforced TPO membrane for use in flashing outside corners of base and curb flashings, EverGuard® TPO Fluted Corner, by GAFMC, or equivalent.

E. Penetration Accessories

1. 0.075" thick molded TPO membrane sized to accommodate most common pipe and conduits, (1" to 6" diameter pipes), including square tube. Hot-air welded directly to EverGuard TPO membrane, supplied with stainless steel clamping rings, EverGuard® TPO Preformed Vent Boots by GAFMC, or equivalent.

2. 0.60" thick molded TPO membrane preformed boots, split to accommodate most common pipes and conduits and available in three standard sizes, EverGuard® TPO Split Pipe Boots, by GAFMC, or equivalent.

3. 0.60" thick molded TPO membrane preformed square boots, split to accommodate most common square penetrations and conduits and available in three standard sizes, EverGuard® TPO Square Tube Wraps, by GAFMC, or equivalent.

4. .070" thick molded penetration pocket to provide structure and foundation for the application of a pourable sealant for a variety of roof penetrations , weldable and 9" x 6" x 4" (l x w x h) . EverGuard TPO Pourable Sealer Pocket by GAFMC, or equivalent.

5. 0.055" thick, smooth, un-reinforced thermoplastic polyolefin membrane designed for use as a conforming membrane seal over T-joints in 60 and 80 mil membrane applications. EverGuard® TPO Drain by GAFMC, or equivalent.

F. Field Of Roof Accessories

1. Pre-manufactured expansion joint covers used to bridge expansion joint openings in a roof structure. Fabricated to accommodate all roof-to-wall

and roof-to-roof applications, made of .060" reinforced TPO membrane, EverGuard® TPO Expansion Joint Covers**,** by GAFMC, or equivalent.

2. 0.055" thick smooth, un-reinforced thermoplastic polyolefin membrane designed for use as a conforming membrane seal over T-joints in 60 and 80 mil membrane applications; EverGuard® T-Joint Patches, by GAFMC, or equivalent.

G Mechanical Fasteners and Plates:

1. Use Factory Mutual approved corrosion resistant membrane fasteners and plates supplied and approved by the roofing system manufacturer for the membrane application and substrate condition as established by pull out tests.

2. Withdrawal resistance test criteria:

   a. Withdrawal resistance tests shall be performed to verify acceptable pullout values when a fastener other than a toggle bolt is utilized. The withdrawal resistance test shall be conducted by the fastener manufacturer, their designated representative or an independent laboratory at the *CONTRACTOR's* expense.

   b. The fastener pullout tests shall be conducted in accordance with ANSI/SPRI FX-1. Perform a minimum of ten (10) pullout tests for up to 50,000 square feet, and five (5) additional pullouts for each additional 50,000 square feet or portion thereof. Perform the pullout tests in various areas of the roof, including corners, perimeter, and field, to provide a representative sampling of roof area. 50% of the tests shall be performed in the corners and perimeter areas.

   c. The minimum pullout resistance and fastener spacing shall be as recommended by the roofing system manufacturer.

   d. Submit results of pullout tests on ANSI.SPRI FX-1, Forms A and B.

3. Threaded fasteners shall be corrosion resistant heavy-duty roofing fasteners with a shank diameter of .202, a thread diameter of .275 and a head diameter of .435. The fastener must have twelve (12) threads per inch and have a 30° spade point. Fasteners must be heat treated per OMG Products specification OMG-1. The fastener shall be used with a Factory Mutual approved round pressure plate. Fasteners shall be coated to meet or exceed Factory Mutual Approval Standard 4470.

4. Pressure plates: Galvalume, 3" (7.6 cm) diameter, Factory Mutual approved and suitable for use with specified fasteners. Drill•Tec™ Insulation Plates by GAFMC, or equivalent.

5. Fasteners and plates shall be as supplied by the roofing system manufacturer.

F. Traffic or Walkway Pads: 1/8" thick extruded and embossed TPO roll, 30" x 50', heat welds directly to roofing membrane. Herringbone traction surface. EverGuard® TPO Walkway Rolls, GAFMC, or equivalent.

G. Architectural Metals:

1. Specifically designed for roof perimeter securement. Components from the membrane manufacturer approved for FM 1-90 rating and ANSI/SPRI ES-1-03 Wind Design Standard for Edge Systems.

2. Metal edge securement for low-slope membrane roof systems, except gutters, shall be designed and installed for wind loads in accordance with Chapter 16 of the International Building Code, 2021 and tested for resistance in accordance with ANSI/SPRI ES-1, except the basic wind speed shall be determined from Figure 1609 of the IBC, 2021. (Paragraph 1504.5 of the IBC, 2021)

3. Parapet Coping shall be as specified in *Section 07 71 00*. Coping shall be .050" aluminum, formed as indicated with allowance for expansion and contraction. The standard length is 10' with standard corners having 24"nominal length. All inside and outside corners shall be factory fabricated and have factory welded miters. The support shall be manufacturer's 20 gauge galvanized steel coping cleats. The face and back leg height shall be as shown. Concealed 6" splice plate shall match color and finish. All exposed metal shall have Kynar 500® finish, color as selected by the *ENGINEER/ARCHITECT*.

H. Retrofit Drains:

1. Designed for use with roofing system manufacturer's membranes and available in sizes to retrofit existing 2" through 6" drains. Aluminum construction with drain flange.

2. EverGuard® TPO Drain by GAFMC, or equivalent.

I. Wood Nailers: Lumber, #2 grade free from warping and visible decay; pressure-treated with ACQ to meet AWPA, Use Category UC3B, Commodity

Specification A, 0.25 pcf retention, and marked. Installed at edges, roof penetrations and other areas where secure mechanical attachment is required. Attach to structural deck in a Factory Mutual approved manner.

J. Vapor Barrier: For use over high humidity interiors, when outside January's temperatures below 40°F and interior winter relative humidity is greater than 45%: follow roofing membrane manufacturer's recommendations, FM/UL rated acceptable for use with specified insulation.

K. Insulation:

1. Flat and tapered polyisocyanurate roof board meeting ASTM C1289, Type II, Class 1, Grade 2 with a UL Class A rating and FM 1-90 approval. Thickness: 2 inches min. or as shown, maximum size: 4 ft. x 8 ft, "EverGuard® Polyiso," by GAFMC, or equivalent.

L. Recover Board: DensDeck® or DensDeck® Prime Roof Boards by Georgia-Pacific, or equivalent, ¼", ½" and ⅝" thick.

M. Metal band Clamps: Worm drive type; 300 series stainless steel band, housing and hex-head safety collared screw; minimum band width of 1/2"; with manufacturers name stamped, etched or embossed on band.

2.04 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's requirements.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Protection:

1. Coordinate with *ENGINEER* one (1) week prior to beginning work.

2. Protection of exterior:

a. Cover wall adjacent to debris container with tarp such that coverage along wall is two (2) times container length.

b. Provide chutes, tarps or other means to get debris into disposal containers. Do not drop or throw material from roof.

c. Do not place disposal containers within 5 feet of any building surface.

3.03 INSTALLATION

A. General: Install the work of this section in strict accordance with the manufacturer's requirements.

B. Existing Roof Covering:

1. Remove all standing water by sweeping, pumping, brooming or other appropriate means. DO NOT ALLOW ANY STANDING WATER TO DRAIN TO AREA BELOW. Contractor shall be responsible for ANY damage caused to building contents as a result of his allowing water to drain through deck.

2. Do Not Remove more roofing than can be replaced in the same day.

3. Existing roofing system including insulation, cants, flashing and termination strips shall be removed down to deck.

4. Remove all existing fasteners. DO NOT CUT OFF!

5. Inspect deck in presence of *ENGINEER* for excessive deterioration. Perform insulation fastener pull-out resistance tests.

6. Replace or repair damaged deck if and when directed by the *ENGINEER* in accordance with *Section 06 20 00, Carpentry*.

7. Substrates shall be clean, smooth, dry, free of protrusions and fins and loose and foreign materials.

B. Insulation:

1. The insulation board shall be secured to the existing deck with specified fasteners and 3" insulation plates. Fastener spacing, pattern and installation shall be in accordance with Factory Mutual Guidelines and roofing system manufacturer.

2. Insulation boards shall be the maximum size recommended by the manufacturer for the application.

3. Do not install wet, damaged or warped insulation boards.

4. Install insulation boards with staggered board joints in one direction.

5. Insulation boards shall be installed so that no gaps larger than ¼" are found at the end joints and the adjoining top surfaces are flat and smooth. All gaps in excess of ¼" shall be filled with like insulation material.

6. If more than one layer of insulation board is to be installed, the joints of the subsequent layers shall be staggered. Stagger the joints in the additional layers a minimum of 6" from the underlying insulation boards to eliminate vertical gaps.

7. Do not install any more insulation than will be completely waterproofed each day.

C. Roof Board:

1. Roof boards shall be mechanically attached in accordance with the system manufacturers directions and to meet FM 1-90 requirements

2. Roof boards shall be installed so that no gaps larger than ¼" are found at the end of the joints and that the adjoining top surfaces are flat and smooth.

3. Stagger the joints in the roof board a minimum of 6" from the underlying insulation boards to eliminate vertical gaps.

4. Do not install any more roof board than will be completely waterproofed each day.

D. Membrane Installation:

1. Fully adhere membrane to substrate with manufacturer's recommended adhesive applied at the rate specified by the manufacturer.

2. The roof surface must be clean, dry and free of foreign material. The ambient air temperature shall be above 45°F for the use of cold adhesives.

3. Position sheets as indicated on approved shop drawings. Measure and chalk lines on the substrate to establish proper alignment of the sheet.

4. Place the roll on the line and unroll the membrane sheet its entire length and allow the membrane to relax. The relaxation time required is dependent on the ambient air temperature.

5. Fold one end of the membrane sheet on top of itself until both ends meet. Apply the substrate adhesive to the prepared roof surface. The sheet can then be pulled and laid into the bonding material using care not to create any wrinkles.

6. Carefully push and broom into place from fold line to overlap, avoiding wrinkles and air pockets. Roll with a heavy roller (minimum 200 lbs.) to insure proper adhesion.

7. Repeat procedure for other half of the sheet.

8. Overlap roof membrane a minimum of 3" (15 cm) for side laps and 3" (15 cm) for end laps.

9. Install membrane so that the side laps run across the roof slope lapped towards drainage points.

10. All exposed sheet corners shall be rounded a minimum of 1".

11. All seams must be checked with a needle probe and any voids repaired with the heat gun the same day they are made.

F. Seam Welding:

1. All seams must be clean and dry prior to proceeding with the hot air welding procedure. The seams may be cleaned using a clean cotton rag dampened with manufacturers recommended cleaner. Allow the seams to thoroughly dry after cleaning.

2. All seams greater than 10' in length shall be welded with an automatic type welding unit. Hand held welders may be used for the remaining seams and all detail welding.

3. A properly welded seam shall be a minimum of 1½" in width for automatic machine welding and a minimum 2" in width for hand welding.

G. Inspections:

1. All seams are to be completed by the hot air welding method each day as the installation progresses.

2. The *CONTRACTOR* is to designate a responsible person to inspect the completed installation each day as the installation progresses. The inspection is to include hand probing of all welded seams.

3. Any defects found during these inspections shall be immediately corrected.

3.04 FLASHING

A. Flash all penetrations, walls, curbs, expansion joints, drains as shown on details and approved shop drawings with the specified flashing membrane.

1. Use Manufacturer's supplied flashing accessories or components such as sealant pockets and prefabricated vent / pipe flashing.

2. Mechanically fasten flashing at terminations according to approved details.

a. Fastening the flashing membrane through counter-flashing metal is not acceptable.

3. Flashing membranes shall be installed fully adhered to the approved substrate using the specified flashing adhesive. Flashing membrane shall be installed flat and wrinkle free. Flashings shall be rubbed or rolled onto the substrate for proper adhesion.

3.05 COPING INSTALLATION

A. The installation shall conform to the manufacturer's written instructions for mechanical fastening. The flashing membrane shall extend up the wall and over the outside of the wooden nailer a minimum of 2" to the exterior side of the

parapet wall. The substrate shall be flat and level from front to back. Shims may be used for areas not level. Install coping cleats, concealed 6" splice plates, and prefabricated accessories in accordance with roofing system manufacturer's specifications and details. The coping cleats shall be placed every five foot (5') on center and shall have a minimum of four (4) mechanical fasteners (screws) per cleat installed on top and two 1½" galvanized steel roofing nails installed on the exterior face of the cleat. The concealed splice plate shall be placed over the coping cleats at each joint before the coping cap is installed to cover.

B. Install the specified prefabricated coping corners in accordance with the manufacturers instructions.

3.06 WOOD NAILERS

A. Locate and install as shown on details along gravel stops and drip edges and other areas as required by membrane manufacturer.

B. Anchor nailer to structural deck with manufacturer's approved fasteners, spaced as required for the specified installation; minimum withdrawal resistance is one hundred pounds.

3.07 DAILY SEAL

A. At the end of each working day or at the first sign of inclement weather, install temporary, 100% watertight seal where the completed new roofing adjoins the existing roof surface.

B. The *CONTRACTOR* is responsible for creating and maintaining the temporary seal in such a manner as to prevent moisture from entering into the new and or the existing roof system.

C. Material for construction of the temporary seal to be from the membrane manufacturer's list of approved products and accessories.

D. Prior to commencing additional roof installation, cut out and remove all contaminated membrane, insulation and temporary sealant and properly dispose of as specified.

3.08 INSTALLING WALKWAY PADS

A. The walkway pads shall be hot air welded to the field membrane by utilizing the hot air welding technique or installed with system manufacturer's bonding adhesive.

B. Walkway rolls are to be cut in lengths as indicated on the drawings, but no longer than 10'sections with minimum 2" spacing between sections.

C. Walkway pads are to be positioned on the field of roof so as to not cover the hot air welded seams of the installed field membrane.

3.09 INSTALLING PREMOLDED BOOTS

A. Pre-molded pipe flange shall be installed with metal band clamps with an approved caulking applied at the top of the vertical flashing.

3.10 FIELD QUALITY REQUIREMENTS

A. Manufacturer's Field Services:

1. Provide manufacturer's field service consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

2. Site Visits: Coordinate site visit schedule with manufacturer's technical service department. Final inspection and acceptance of the installation by the manufacturer's technical representative is required before a warranty can be issued.

B. Roof Protection:

1. Protect all partially and fully completed roofing work from other trades until completion.

2. Whenever possible stage materials in such a manner that foot traffic is minimized over the completed roof sections.

3. Temporary platforms and walkways shall be installed in order to protect all completed roof sections from traffic and material handling during the application process.

3.11 CLEANING

A. All work areas are to be kept clean, clear and free of debris at all times.

B. Do not allow trash, waste or debris to collect on the roof. These items shall be removed from the roof on a daily basis.

C. Dispose of or recycle all trash and excess material in a manner conforming to current NJDEP and EPA regulations and local laws.

D. Upon completion, clean the installed products in accordance with the manufacturer's instructions prior to owner's acceptance.

E. Clean and unclog all drains, scuppers, leaders and downspouts.

F. Clean and restore all damaged surfaces to their original condition.

****END OF SECTION****

SECTION 07 62 00
(07601)
FLASHING AND SHEET METAL

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. At areas of roof top equipment, piping and conuit support, and other related areas, provide flashing and sheet metal not specifically described in other Sections of these Specifications but required to prevent penetration of water through the exterior shell of the building.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. Section 07 55 23: Thermoplastic Polyolefin Roofing

3. *Section 07 71 00: Roof Specialties*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for the *FLASHING AND SHEET METAL* in the prices bid for the various related items of work as designated in the Proposal.

1.02 PERFORMANCE REQUIREMENTS

A. Metal edge securement for low-slope membrane roof systems, except gutters, shall be designed and installed for wind loads in accordance with Chapter 16 of the International Building Code and tested for resistance in accordance with ANSI/SPRI ES-1, except the basic wind speed shall be determined from Figure 1609 of the IBC. (Paragraph 1504.5 of the IBC)

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Shop drawings showing precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provision in conformance with the SMACNA Architectural Sheet Metal Manual.

D. Manufacturer’s recommended installation procedures.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

D. In addition to complying with pertinent codes and regulations, comply with pertinent recommendations contained in current edition of "Architectural Sheet Metal Manual" published by the Sheet Metal and Air Conditioning Contractors National Association (SMACNA).

E. Standard commercial items may be used for flashing, trim, reglets, and similar purposes provided such items meet or exceed the quality standards specified.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 MATERIALS AND GAGES

A. Where sheet metal is required, and no material or gage is indicated provide the highest quality and gage commensurate with the referenced standards.

2.03 ALUMINUM

A. Fed. Spec. QQ-A-250D, alloy 3003-H14 or ASTM B209.

B. Alclad 3003, Alclad 3004 or Alclad 3005 shall be clad on one side.

C. Aluminum alloy, extruded shapes: ASTM B221.

D. Gage/thickness

1. Scuppers: 0.032
2. Valley Flashing: 0.032
3. Base Flashing (Step Flashing): 0.032
4. Hip & Ridge Flashing: 0.032
5. Apron Flashing: 0.032
6. Ledge Flashing: 0.032
7. Expansion Joints: 0.032:

D. Finish:

1. Clear anodized: AA-M12C22A41.

E. All scuppers and scupper boxes shall be not less than 0.032".

2.04 COPPER

A. Fed. Spec. QQ-C576b or ASTM B370, cold rolled temper, 16 oz, 20 oz., 24 oz., or 32 oz. per square foot as indicated or required. Where copper weights are not indicated, provide 16 oz. Gutters and downspouts shall be fabricated from 24 oz. copper. Cleats shall be 32 oz. copper.

2.05 STAINLESS STEEL

A. Zinc-Tin Alloy-Coated Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, dead-soft, fully annealed stainless-steel sheet, coated on both sides with a zinc-tin alloy (50 percent zinc, 50 percent tin).

1. Built-in Gutters: Stainless Steel, 0.0156 (min.), dead soft.
7. Scuppers: 0.0188 Stainless Steel
8. Valley Flashing: 0.0250 Stainless Steel
9. Base Flashing (Step Flashing): 0.0188 Stainless Steel
10. Hip & Ridge Flashing: 0.0188 Stainless Steel
11. Apron Flashing: 0.0188 Stainless Steel
12. Crickets at Chimneys: 0.0188 Stainless Steel
13. Ledge Flashing: 0.0188 Stainless Steel
14. Expansion Joints: 0.0188 Stainless Steel
15. Roof penetration Flashing: 0188 Stainless Steel
16. Pipe Flashing: 0.0188 Stainless Steel (dead soft.
17. Rain Collars: 0.0188 Stainless Steel

2.10 SEALANT

A. Approved type of silicone, polysulfide, butyl or urethane.

2.11 ROOFING FELT

A. Type IV, conforming to ASTM D2178.

2.12 NAILS, RIVETS, FASTENER

A. Type and form of metal fastener same as or compatible with base material and support structure.

B. All fasteners exposed to the weather shall be hot dip galvanized or stainless steel.

2.13 DRAW BANDS, CLAMPS

A. Worm gear clamps meeting military specification WWC-440 with manufacturers name clearly embossed thereon and having a 7/16" wide (min) 300 series stainless steel band and housing and type 305 stainless steel screw.

2.14 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 WORKMANSHIP

A. General:

1. Form sheet metal accurately and to the dimensions and shapes required, finishing molded and broken surfaces with true, sharp, and straight lines and angles and, where intercepting other members, coping to an accurate fit and soldering securely.

2. Unless otherwise specifically permitted by the *ARCHITECT*, turn exposed edges back 1/2".

B. Form, fabricate, and install sheet metal so as to adequately provide for expansion and contraction in the finished Work.

C. Weatherproofing:

1. Finish watertight and weathertight where so required.

2. Make lock seam work flat and true to line, sweating full of solder.

3. Make lock seams and lap seams, when soldered, at least 1/2" wide.

4. Where lap seams are not soldered, lap according to pitch, but in no case less than 3".

5. Make flat and lap seams in the direction of flow.

6. All seams in aluminum scuppers and scupper boxes shall be welded.

7. All seams in copper scuppers and scupper boxes shall be soldered.

D. Joints:

1. Join parts with rivets or sheet metal screws where necessary for strength and stiffness.

2. Provide suitable watertight expansion joints for runs of more than 20'-0", except where closer spacing is indicated on the Drawings or required for proper installation.

E. Nailing:

1. Whenever possible, secure metal by means of clips or cleats, without nailing through the exterior metal.

2. In general, space nails, rivets, and screws not more than 8" apart and, where exposed to the weather, use lead washers.

3. For nailing into wood, use barbed roofing nails 1¼" long by 11 gage.

4. For nailing into concrete, use drilled plugholes and plugs.

3.03 EMBEDMENT

A. Embed metal in connection with roofs in a solid bed of sealant.

3.05 FIELD QUALITY CONTROL

A. Tests: Upon request of the *ARCHITECT*, demonstrate by hose or standing water that the flashing and sheet metal are completely watertight.

3.06 CLEANING

A. Clean exposed surface of all grease, dirt and other foreign materials.

B. Touch up all marred or abraded surfaces in accordance with manufacturer's directions.

****END OF SECTION****

SECTION 07 71 00
(07700)
ROOF SPECIALTIES AND ACCESSORIES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included for Repair of Roofing and accessories during the installation of roof top equipment, piping and related items:

1. Reglets and counter flashing

2. Penetration flashing

3. Roof curbs

B. Related work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 01 11 00: Statement of Work*

3. *Section 07 54 23: Thermoplastic polyolefin Roofing*

4. *Section 07 60 01: Flashing and Sheet Metal*

5. *Section 09 90 00: Painting*

C. Payment:

1. Unless otherwise noted in the *PROPOSAL* Section, no separate payment shall be made for this item.

2. Include all costs for the *ROOF SPECIALTIES AND ACCESSORIES* in the prices bid for the various related items of work as designated in the *PROPOSAL*.

1.02 PERFORMANCE REQUIREMENTS

2. Provide shop fabricated assemblies based on NRCA tested details by NRCA authorized fabricators.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. *Specifications* and other data required to demonstrate compliance with the specified requirements, including testing required by 1.02, Performance Requirements.

C. Shop drawings showing precise dimensions of the work of this section and all other data needed to ensure proper and adequate provisions to accommodate the work of this section; show all details of:

1. Fabrication

2. Flashing

3. Installation

D. Manufacturer's recommended installation procedures.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for

their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.05 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer’s recommendations as approved by the *ENGINEER*.

1.06 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

1.07 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 PREFABRICATED REGLETS (RECEIVERS) AND COUNTER FLASHING

A. Prefabricated receivers and counter flashings of materials specified. Receivers shall have a 3 inch factory-formed end lap; flashing shall have a 3-inch end lap. Provide factory manufactured miters and sealed corners. Aluminum shall have Kynar factory finish. Color to be selected by the *ARCHITECT*.

B. Two Piece, Surface Applied:

1. Factory fabricated, surface applied receiver of 0.050" aluminum with snap-in counter flashing of .032" aluminum. Receiver to have factory punched horizontal slots 12"o.c. to receive fasteners. The top of the receiver shall be provided with a caulking flange.

2. Acceptable Products:

a. "Drive Lock To-Wall Counter Flashing" by W. P. Hickman, Ashville, NC

b. Keystone Flashing Co., Inc., Philadelphia, PA

c. "CFW2-500" by Metal-Era Roof Edge System, Waukesha, WI

d. Or equivalent.

C. One Piece, Surface Applied:

1. Factory fabricated surface applied counter flashing of 0.050" aluminum or 28 ga. stainless steel with factory punched horizontal slots 12"o.c. to receive fasteners. The top of the receiver shall be provided with a caulking flange.

2. Acceptable Products:

a. “Surface Mount Counter Flashing” by W. P. Hickman, Ashville, NC

b. National Sheet Metal Systems

c. “CFW-562” by Metal-Era Roof Edge System, Waukesha, WI

d. Or equivalent.

D. Two Piece, Surface Applied:

1. Factory fabricated, surface applied receiver of 0.050" aluminum with snap-in counter flashing of .032" aluminum. Receiver to have factory punched horizontal slots 12”o.c. to receive fasteners. The top of the receiver shall be provided with a caulking flange.

2. Acceptable Products:

a. “In-Wall Drive Lock Reglet” by W. P. Hickman, Ashville, NC

b. Keystone Flashing Co., Inc., Philadelphia, PA

c. “CFR2-500” by Metal-Era Roof Edge System, Waukesha, WI

d. Or equivalent.

E. One Piece, Reglet:

1. Factory fabricated surface applied counter flashing of 0.050" aluminum or 28 ga. stainless steel with factory punched horizontal slots 12"o.c. to receive fasteners. The top of the receiver shall be provided with a caulking flange.

2. Acceptable Products:

a. "CFR-525" by Metal-Era Roof Edge System, Waukesha, WI

b. Or equivalent.

F. Two Piece, In-Wall with receiver provided with a top flange for use with masonry.

1. Factory fabricated receiver with snap-in counter flashing shall be manufactured of [16 oz copper] [plain] [lead-coated] or [28 ga. stainless steel] [28 Ga. Terne coated stainless steel]. Receiver shall extend into masonry wall the depth of masonry unit, unless otherwise shown, with back edge turned up ¼ inch and exposed edge designed to receive and lock counter flashing upper edge when inserted.

2. Acceptable Products:

a. Keystone Flashing Co., Inc., Philadelphia, PA

b. "Thru-Wall Custom" by Metal-Era Roof Edge System, Waukesha, WI

c. Or equivalent.

G. For use with stucco and exterior insulation and finish system or where reglet is to be applied behind system.

Product: KCFC2-500 - Custom Counter Flashing.

2.03 ROOF CURBS FOR PACKAGED ROOFTOP HVAC UNITS

A. Acceptable manufacturers

1. Curb Technologies, LLC
Opelika, AL 36804
Tel: 334-826-9538
Fax: 334-826-9539

2. Thybar Corporation
Addison, IL 60101
Tel: 630-543-5300
Fax: 630-543-5309

3. Badger Corporation

Pompano Beach, FL
Tel: (800) 813-1822

4. Plenums Inc.
Pinellas Park, FL 33780-1890
Tel: 727-521-3567

5. MGM Products
Conyers, GA
Tel: 770-483-0055
Tel: 800-341-3535
Fax: 770-483-0130

6. Or equivalent.

B. Roof Curbs for Flat Roofs:

1. Factory fabricated and assembled, 14-gage galvanized steel mounting curb designed and manufactured by unit manufacturer.

1. Fabricate curb a minimum of 16 inches high with wood nailer strip.

2. Perimeter type with support of air handling section and rail support of condensing section.

3. Furnish supply and return opening duct frames as part of curb structure allowing duct connections to be made directly to curb.

4. Match roof curb to slope of roof. Curb top surface shall be level in both axes.

5. Furnish gaskets for field mounting.

2.04 ROOF CURBS FOR FANS AND VENTILATORS

A. Manufacturer:

1. LM Curbs
609 Fisher Road
P.O. Box 5299
Longview, Texas 75604
Tel: 903-759-1331

2. Or equivalent.

B. Roof Curbs:

1. Box section design of 0.80" aluminum with all seams welded and a full height metal liner.

2. Built-in raised cant to accommodate insulation thickness required.

3. Curbs shall be constructed to match slope of roof and provide a level top surface for mounting of equipment.

4. 1½" thick, 3 lb density fiberglass insulation factory installed.

5. Galvanized metal liner, full height.

6. Minimum height of Curb shall be such that the top is 12" above finished roof surface.

7. Curb flange shall be constructed to match configuration of roof panel. Side flange shall extend to the next natural seam in the roof panels and conform to seam configurations. Curb shall have a water diverter cricket.

8. Finish to match roofing specified elsewhere.

2.05 CURB EXTENSIONS

A. Acceptable manufacturers

1. Roof Products and Systems Corp.
Bensenville, IL
Tel: 312-595-7320

2. Greenheck Fan Corp.
Schofield, WI
Tel: 715-359-6171

3. Or equivalent.

B. Curb extensions:

1. Box section design of 0.064 Aluminum for curbs up to 50"x50" square and 0.080 Aluminum for curbs over 50" x 50" square.

2. All seams welded.

3. 1½" thick, 3 lb density fiberglass insulation factory installed.

4. Aluminum liner, full height.

5. Rubber curb seals.

6. Minimum height of curb extensions shall be not less than 4".

C. Adaptor / reducer curbs

1. Same construction as extension curbs.

2.06 FASTENERS

A. All fasteners shall be stainless steel

B. All exposed fasteners shall have neoprene washers.

2.07 EQUIPMENT RAILS AND PIPE PEDESTALS

A. Acceptable manufacturers

1. Roof Products and Systems Corp.
Bensenville, IL
312-595-7320

2. Or equivalent.

B. Equipment rails:

1. 18 gauge galvanized steel, monolithic construction with integral base plate, continuous welded corner seams, factory installed wood nailer, 18 gauge galvanized steel counter flashing complete with screws and built-in cant. Height shall be 12".

C. Pipe mounting pedestals:

1. Pedestals shall include equipment rails specified herein with steel slide channel attached to “U” shaped mounting brackets and be secured to equipment rail with supplied lag bolts.

2. Pipe rollers shall have 18" long galvanized threaded rods for vertical height adjustment, galvanized removable pipe retainer bracket, cast iron pipe rollers, and lateral adjust spacer bracket for horizontal adjustment.

A. Rails and pedestals shall be fabricated to accommodate slope of roof while maintaining top surface level and shall have flat flanges for flat roofs and flanges matching the panel profile for metal roofs.

E. Lumber **shall not** be used.

2.08 CONDUIT SUPPORTS

A. Conduit on the roof shall be supported by a polyethylene foam block with an integral strut channel for receiving standard strut clamps and accessories. Support shall be installed according to manufacturer's recommendations. Roof conduit supports shall be spaced according to industry standards and shall be installed to allow for expansion and contraction.

B. Roof conduit supports shall be *Pipe Pier*™ as manufactured by ERICO International Corporation, Solon, Ohio (440-248-0100) or approved equal.

C. Lumber **shall not** be used.

2.09 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer’s recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General: Install the work of this section in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

3.03 CLEANING

A. Clean exposed surface of all grease, dirt and other foreign materials.

B. Touch up all marred or abraded surfaces as specified herein.

****END OF SECTION****

SECTION 07 84 00
(07270)
FIRESTOPPING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Firestopping of penetrations through fire-resistance-rated roof construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.

2. Firestopping of penetrations through fire-resistance-rated walls, partitions and ceilings including both empty openings and openings containing cable, pipes, ducts, conduits, and other penetrating items.

3. Firestopping of curtain wall openings between exterior walls and connecting floor assemblies.

4. Firestopping of expansion joints in fire-rated walls and floors.

5. Firestopping of all other penetrations in fire-rated construction.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 07 92 13: Sealants and Caulking*

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM) Publications:

1. E 814: Standard Method of Fire Tests of Through-Penetration Fire Stops.

2. E 119: Methods of Fire Tests of Building Construction and Materials.

3. E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.

4. C 719: Adhesion and Cohesion of Elastomeric Joint Sealants under Cyclic Movements.

5. C 920: Standard Specification for Elastomeric Joint Sealants.

B. Underwriters Laboratories Inc. (UL) Publications:

1. UL 1479: Fire Tests of Through-Penetration Firestops.

2. UL 263: Fire Tests of Building Construction and Materials.

3. UL 723: Surface Burning Characteristics of Building Materials.

4. Underwriters Laboratories "Fire Resistance Directory" (Current Year).

C. International Building Code, New Jersey Edition, 2021.

1.03 DEFINITIONS

A. Firestopping: A material, or combination of materials, to restore the integrity of fire-rated walls and floors by maintaining an effective barrier against the spread of flame, smoke and toxic gases. It shall be used in specific locations as follows:

1. Duct, cable, conduit, and piping penetrations through floor slab and through time-rated partitions or fire walls.

2. Openings between floor slabs and curtain walls, including inside hollow curtain walls at the floor slab.

3. Penetrations of vertical service shafts.

4. Openings and penetrations in time-rated partitions or fire walls containing fire doors.

5. Locations where specifically shown on the drawings or where specified in other sections of the Project Manual.

1.04 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Submit copies of manufacturer's specifications, recommendations, installation instructions, and maintenance data for each type of material required. Include letter indicating that each material complies with the requirements and is recommended for the application shown.

3. Submit a copy of UL or WH illustration and system number of each proposed system.

C. Certificates:

1. Contractor's certification that installer has the specified experience.

D. Shop drawings:

1. Show the work of this section, and all other data needed to ensure proper and adequate provisions in construction to accommodate the work of this section.

2. Show schedule of firestopping locations, proprietary system proposed for each location, system details, and UL or WH System Number for each system.

E. Samples:

1. Submit samples if requested by *ARCHITECT/ENGINEER*.

1.05 QUALITY ASSURANCE

A. Qualification of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEE*R.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be throughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions, as approved by the *ENGINEER*, will provide the basis for acceptance or rejection of the work performed under this section.

1.06 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.07 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

1.08 MAINTENANCE MANUALS

A. Maintenance data shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

PART 2 _ PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers:

1. The Carborundum Company
   Fibers Division
   P. O. Box 808
   Niagra Falls, NY 14302

2. Nelson Firestop Products
   P. O. Box 726
   Tulsa, OK 74101

3. Hilti, Inc.
   Tulsa, OK

4. Or equivalent.

2.02 MATERIALS

A. Compatibility: Provide firestopping materials that are compatible with one another and with substrates under conditions of application and service as demonstrated by Manufacturer, based on testing and field experience.

B. Structural considerations: Firestopping materials do not re-establish the structural integrity of a load-bearing assembly. Consult a Structural Engineer prior to drilling or coring operations in any load-bearing assembly. Firestop systems may not support live loads and traffic. Curbs or cover plates may be required to restrict or accommodate potential live loads and traffic. Contractor shall notify Architect/Engineer if Contractor has reason to believe the integrity of any load-bearing assembly has been violated.

C. All sealant materials for use in firestopping applied to construction joints and in voids subject to movement shall meet the requirements of ASTM C 719 - "Adhesion and Cohesion of Elastomeric Joint Sealants under Cyclic Movements" and ASTM C 920 - "Standard Specification for Elastomeric Joint Sealants".

D. Use firestopping materials meeting the requirements of ASTM E 814 - "Standard Method of Fire Tests of Through-Penetration Fire Stops" or UL 1479 "Fire Tests of Through-Penetration Firestops". For installations or configurations not covered by firestopping materials, an engineered judgement shall be obtained from the manufacturer for the specific application.

E. Firestopping materials shall comply with the interior finish flame spread and smoke developed requirements, for the area in which they are installed, per ASTM E 84 "Standard Test Method for Surface Buring Characteristics of Building Materials" (in addition to ASTM E 814 - "Standard Method of Fire Tests of Through-Penetration Fire Stops"). Interior finish requirements are specified by the International Building Code, 2021.

F. Painting or coating of installed firestop systems: Follow firestopping materials manufacturer's recommendations for painting or coating.

G. All products shall be free of asbestos.

H. All firestopping materials shall meet the requirements of the International Building Code, 2021, New Jersey Edition.

2.03 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence..

B. Examine openings, voids or joints where firestopping is to be installed and verify they are in accordance with manufacturer's drawings.

C. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

D. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Follow the manufacturer's instructions and guidelines for surface preparation prior to installation of the firestopping system.

B. Provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces. Remove masking materials promptly following product application.

3.03 INSTALLATION

A. Firestop systems: Installation shall be in accordance with the appropriate manufacturer's instructions and drawings.

B. Protection: Protect installed firestopping to prevent contact with contaminating substances or damage from other trades.

3.04 FIELD QUALITY CONTROL

A. All firestopping materials, after they are installed, shall be properly identified. Identification shall occur at the location where the firestopping material has been installed. Identification shall include:

1. Identify the firestopping material that has been installed as being a “Rated Through-Penetration Firestop System - Do Not Disturb.”

2. Specify the appropriate firestop system reference number.

B. Contractor will submit reports on the items stated below:

1. Verify that proper, specified firestopping materials are used in the Firestop System.

2. Verify that the firestopping material is installed in exact accordance with the manufacturer’s latest published requirements.

3. Verify that the firestopping material complies with the appropriate building code requirements.

4. Verify that the firestopping material is installed in all specified and/or indicated locations in rated assemblies.

3.05 CLEANING

A. Maintain the work area in an orderly manner and clean up the work area daily.

B. Dispose of all waste materials in compliance with regulatory requirements.

C. Remove equipment, materials and debris. Leave the area in a clean and undamaged condition.

D. Remove any excess firestopping material from surfaces not required to be firestopped.

****END OF SECTION****

SECTION 07 92 13
(07920)
SEALANTS AND CAULKING

PART 1 - GENERAL

1.01 SUMMARY

A. Work included:

1. Throughout the work, seal and caulk joints where shown on the Drawings and elsewhere as required to provide a positive barrier against passage of moisture, air and water.

2. The work of this section includes preparation of substrate surfaces, backing material and sealant.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 09 90 00: Painting*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for the *SEALANTS AND CAULKING* in the prices bid for the various items of related work designated in the Proposal.

1.02 REFERENCES

A. American Society for Testing and Materials:

1. ASTM C790: Standard Practices for use of Latex Sealing Compounds.

2. ASTM C804: Standard Practice for use of Solvent-Release type Sealants.

3. ASTM C834: Standard Specification for Latex Sealing Compounds.

4. ASTM C919: Standard Practice for use of Sealants in Acoustical Applications.

5. ASTM C920: Standard Specification for Elastomeric Joint Sealants.

6. ASTM C1330: Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required to demonstrate compliance with the specified requirements.

C. Shop drawings showing precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provision in concrete forming, reinforcement, and placement to accommodate the work of this section.

D. Manufacturer's recommended installation procedures.

E. Samples: Upon request of the *ENGINEER*, submit Samples of each sealant, each backing material, each primer, and each bond breaker proposed to be used.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for

their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

E. Do not retain at the job site material, which has exceeded the shelf life recommended by its manufacturer.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Do not install solvent curing sealants in enclosed building spaces.

B. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

PART 2 - PRODUCTS

2.01 GENERAL

A. Proprietary Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers:

1. Polymeric Systems, Inc. (PSI)
   Phoenixville, PA
   (800) 228-5548

2. Bostik
   Middleton, MA
   (8088) 603-8558

3. Sika Corporation
   Lyndhurst, NJ
   (800) 933-7452

4. ChemRex, Inc. (Sonneborn)
   Shakoppe, MN
   (800) 433-9517

5. Pecora Corporation
   Harleysville, PA
   (800) 523-6688

6. Tremco
   Beachwood, OH
   (800) 321-7906

7. G. E. Silicones
   Wilton, CT
   (800) 255-8886

8. Dow Corning Corporation
   Midland, MI

(517) 496-6000

9. W. R. Meadows, Inc
Hampshire, IL
Phone: (847) 214-2100

10. Or equivalent.

2.02 SEALANTS

A. Provide the following sealants where specified, called for on the Drawings, or otherwise required for a complete and proper installation.

1. Sealant Type “A”:

a. Self leveling, complying with ASTM C920, Type M, Grade P, Class 25, use T, A and M.

b. Acceptable products:

(1) Bostik “Chem-Calk 550"
(2) Vulkem 245
(3) Pecora NR-200
(4) Tremco THC-900
(5) Sonneborn “Sonalastic SL-2"
(6) Or equal.

2. Sealant Type “B”:

a. Non-sag, complying with ASTM C920, Type S, Grade NS, Class 25, use NT, M, A and O.

b. Acceptable products:

(1) Vulkem 116
(2) Tremco Dymonic
(3) Bostik “Chem-Calk 900"
(4) Sika Sikaflex 1A
(5) Sonneborn “Sonolastie NP1”
(6) Or equal.

3. Sealant Type “C”:

a. Non-sag, fungicidal silicone complying with ASTM C920, Type S, Grade NS, Class 25, use NT, G, A and O.

b. Acceptable products:

(1) Rhodorsil 6B sanitary white
(2) Bostik silicone rubber bathroom caulk
(3) GE sanitary 1700
(4) Dow Corning 786
(5) Or equal

4. Sealant Type "D":

a. Acoustical sealant:

(1) Non-hardening, gunnable (not-exposed):

(a) PTI 808
(b) Tremco acoustical sealant
(c) Or equal.

(2) Paintable, non-staining, gunnable (exposed):

(a) Pecora AC-20
(b) Tremco Acrylic Latex 834
(c) Red Devil Acrylic Latex 15 yr. Caulk
(d) Or equal.

5. Sealant Type "E":

a. Conforming to ASTM C920, Type M, Grade P or NS, Class 25 and specifically suitable and NSF certified for Immersion Service in Potable Water Service.

b. Acceptable Products:

(1) PSI RC-270 (gun grade) (urethane)

(2) PSI RC-270 SL (self leveling) (urethane)

(3) Or equal.

6. Sealant Type "F":

a. Conforming to ASTM C-920, Type M or S, Grade P or NS, Class 25 and specifically suitable for Immersion Service in Wastewater Treatment Facilities.

b. Acceptable Products:

(1) Sonolastic "Polysulfide" (gun grade)

(2) Pecora "GC-2" (2 part polysulfide)

(3) PSI RC-270 (gun grade) (urethane)

(4) PSI RC-270 SL (self leveling) (urethane)

(5) W.R. Meadows Deck-O-Seal 785 (2 part polysulfide)

(6) Or equal.

B. For other services, provide products especially formulated for the proposed use and approved in advance by the *ENGINEE*R.

C. Colors:

1. Colors for each sealant installation will be selected by the *ENGINEER* from standard colors normally available from the specified manufacturer.

2. Should such standard color not be available from an approved substitute manufacturer except at additional charge, provide such colors at no additional cost to the *OWNER*.

3. In concealed installations, and in partially or fully exposed installations where so approved by the *ENGINEER*, use standard gray or black sealant.

2.03 PRIMERS

A. Use only those primers that have been tested for durability on the surfaces to be sealed and are specifically recommended for this installation by the manufacturer of the sealant used.

2.04 BACKUP MATERIALS

A. Use only those backup materials that are non-absorbent, non-staining, and specifically recommended for this installation by the manufacturer of the sealant used.

B. Cylindrical Sealant Backings: ASTM C 1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:

1. Type C: Closed-cell material for exterior, horizontal applications only.

2. Type O: Open-cell material for all applications including hot poured sealants to 500 ºF and chemical sealant products except exterior, horizontal applications.

3. Type B: Bi-cellular material for vertical and horizontal joints, or where joints are more irregular, and to fill air-gap spaces in general construction. NOT for hot poured or chemical sealant applications unless specifically recommended otherwise by the manufacturer.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.05 MASKING TAPE

A. For masking tape around joints, provide an appropriate masking tape that will effectively prevent application of sealant on surfaces not scheduled to receive it, and that is removable without damage to substrate.

2.06 OTHER MATERIALS

A. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants with joint substrates.

B. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. General:

1. Clean and prime joints in accordance with manufacturer's instructions.

2. Remove loose materials and foreign matter, which might impair adhesion of sealant.

3. Verify that joint backing and release tapes are compatible with sealant.

4. Perform preparation in accordance with ASTM C804 for solvent release sealants and ASTM C790 for latex base sealants.

5. Protect elements surrounding the work of this Section from damage or disfiguration.

B. Concrete surfaces:

1. Install only on surfaces, which are dry, sound, and well brushed, wiping free from dust.

2. At open joints, remove dust by mechanically blown compressed air if so required.

3. To remove oil and grease, use sandblasting or solvent cleaning and wire brushing.

4. Where surfaces have been treated, remove the surface treatment by sandblasting or wire brushing.

5. Remove laitance and mortar from joint cavities.

C. Steel surfaces:

1. Steel surfaces in contact with sealant:

a. Sandblast as required to achieve acceptable surface for bond.

b. If sandblasting is not practical, or would damage adjacent finish, scrape the metal or wire brush to remove mill scale and rust.

c. Use solvent to remove oil and grease, wiping the surfaces with clean white rags only.

2. Remove protective coatings on steel by sandblasting or by using a solvent which leaves no residue.

D. Aluminum surfaces:

1. Aluminum surfaces in contact with sealant:

a. Remove temporary protective coatings, dirt, oil, and grease.

b. When masking tape is used for protective cover, remove the tape just prior to applying the sealant.

2. Use only such solvents to remove protective coatings as are recommended for that purpose by the manufacturer of the aluminum work, and which are non-staining.

3.03 INSTALLATION OF BACKUP MATERIAL

A. Backup material shall be used when and where recommended by the manufacturer of the sealant.

B. When using backup of tube or rod stock, avoid lengthwise stretching of the material. Do not twist or braid hose or rod backup stock.

C. Measure joint dimensions and size material to achieve required width/depth ratios.

D. Install joint backing to achieve a neck dimension no greater than 1/3 the joint width.

E. Install bond breaker where joint backing is not used or where required.

F. Installation tool:

1. For installation of backup material, provide a blunt-surfaced tool of wood or plastic, having shoulders designed to ride on the adjacent finished surface and a protrusion of the required dimensions to assure uniform depth of backup material below the sealant.

2. Do not, under any circumstance, use a screwdriver or similar tool for this purpose.

3. Using the approved tool, smoothly and uniformly place the backup material to the depth indicated on the Drawings or otherwise required, compressing the backup material 25% to 50% and securing a positive fit.

3.04 PRIMING

A. Use only the primer approved by the manufacturer for the particular installation, applying in strict accordance with the manufacturer's recommendations as approved by the Architect.

3.05 INSTALLATION OF SEALANTS

A. Prior to start of installation in each joint, verify the joint type according to details on the Drawings, or as otherwise directed by the Architect, and verify that the required proportion of width of joint to depth of joint has been secured.

B. Equipment:

1. Apply sealant under pressure with power-actuated hand gun or manually-operated hand gun, or by other appropriate means.

2. Use guns with nozzle of proper size, and providing sufficient pressure to completely fill the joints as designed.

C. Thoroughly and completely mask joints where the appearance of primer or sealant on adjacent surfaces would be objectionable.

D. Install the sealant in strict accordance with the manufacturer's recommendations, thoroughly filling joints to the recommended depth.

E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

G. Tool joints to the profile shown on the Drawings, or as otherwise required if such profiles are not shown on the Drawings.

1. Provide uniformly smooth joints with slightly concave surface.

2. Do not use tooling agent unless specifically so recommended in writing by the manufacturer of the sealant.

3.06 CLEANING UP

A. Remove masking tape immediately after joints have been tooled.

B. Clean adjacent surfaces free from sealant as the installation progresses, using solvent or cleaning agent recommended by the manufacturer of the sealant used.

C. Upon completion of the work of this Section, promptly remove from the job site all debris, empty containers, and surplus material derived from this portion of the work.

D. Repair or replace defaced or disfigured finishes caused by work of this Section.

3.07 PROTECTION OF FINISHED WORK

A. Protect sealants until cured.

B. Repair or replace disfigured or damaged sealants where necessary or required to provide finished appearance.

3.08 SCHEDULE

A. The following schedule of sealant locations is provided as a guide only and is not all inclusive or limiting as to the quantity of work specified herein.

B. Sealant schedule:

LOCATION		SEALANT TYPE
1.	Interior & Exterior Traffic Bearing Joints.	Type A
2.	Perimeter of Interior & Exterior Frames; Coping Joints; Coping to Facade Joints; Cornice & Wash (Horizontal) Joints; Interior and Exterior Control Joints; around Entrances, Store Fronts and Windows; Interior and Exterior Electrical and Mechanical Fixtures, Flashing.	Type B
3.	Showers, Restroom Fixtures, Restrooms.	Type C
4.	For Sound Transmission Reduction	Type D
5.	Immersion Service and splash zones in potable water facilities.	Type E
6.	Immersion Service and splash zones in Wastewater Treatment Facilities	Type F

****END OF SECTION****

SECTION 08 11 13
(08100)
METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Steel Doors
2. Steel door frames
3. Sidelight frames
4. Borrowed-light frames
5. Fire-rated door and frame assemblies
6. Fire-rated window assemblies

B. Related work specified elsewhere:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.
2. *Section 06 20 00: Carpentry*
3. *Section 07 92 13: Sealants and Caulking*
4. *Section 08 71 00: Hardware*
5. *Section 08 80 00: Glazing*
6. *Section 09 90 00: Painting*

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Product Data: Provide manufacturer's standard catalog data for specified products demonstrating compliance with referenced standards.

C. Shop Drawings: Show layout, profiles, product components, anchorages, accessories, and finish colors.

1. Indicate door type, frame, steel, core, material thickness, mortises, reinforcements, exposed fastener locations, openings (glazed, paneled, or louvered), and hardware arrangements.

2. Door schedule using same reference designations as indicated on drawings.

D. Certificates: Product certificates signed by the manufacturer certifying material compliance with ANSI A250.8, specified performance characteristics and criteria, and physical requirements.

E. Installation Instructions: Manufacturer's printed installation instructions, if other than as specified in SDI-105.

F. Operation and Maintenance Data: Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance, if other than as specified in SDI-124.

G. Manufacturers' warranty documents.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection* and ANSI A250.8.

B. Protection:

1. Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

2. Protect materials from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage:

1. Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use.

2. Store doors protected at corners to prevent damage or marring of finish.

3. Store doors in upright position under cover on building site on wood sills or on floors in a manner to prevent rust and damage.

4. Store frames in upright position under cover on building site on wood sills or on floors in a manner to prevent rust and damage.

5. Do not use non-vented plastic or canvas shelters.

6. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

E. Shipment: For welded type frames, provide temporary steel spreaders fastened across bottom of frames; where construction will permit concealment, leave spreaders in place after installation, otherwise remove spreaders after frames are set and anchored. Before shipping, label each frame with metal or plastic tags to show their location, size, door swing and other pertinent information.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable Manufacturers:

1. Amweld Building Products, Inc.

2. Ceco Door Products

3. Curries Company

4. Deansteel Manufacturing Co.

5. Mesker Door, Inc.

6. Pioneer Industries, Inc.

7. Republic Builders Products

8. Steelcraft

9. Or equivalent.

D. All work of this Section shall be the products of a single manufacturer.

2.02 METAL FRAMES

A. Type and Design:

1. Frames shall comply with ANSI/SDI A250.8-2003 and as specified herein.

2. Provide frames in the dimensions and types shown on the Drawings, non-labeled and labeled as indicated on the Drawings, steel galvanized in accordance with ASTM A653, with an A60 galvanized coating and prime painted, properly reinforced for the finish hardware being provided under *Section 08 71 00, Hardware* of these Specifications.

3. Frames shall be of the same Grade and performance level as the doors unless otherwise indicated.

4. Welded Frames:

a. Provide Full Profile Welded (Fully Welded or Continuously Welded) frames for masonry construction. The joints between all elements of the head and jamb profiles, i.e., soffit, stops, rabbets, faces and returns, shall be completely arc welded. Faces and returns may be arc welded either internally or externally; all other frame elements shall be welded internally. Faces and returns shall be ground and finished smooth with no visible seam. The joint at other frame elements shall appear as a hairline seam on the external side. Face joints at meeting mullions or between mullions and other frame members shall be completely externally welded on the faces only, welds shall be ground and finished smooth.

b. Welded frames shall be provided with a temporary spreader bar for shipping and handling purposes only. This temporary spreader bar shall be removed and a setting spreader, supplied by the installer, shall be used for installation of the frame.

5. Knock Down Frames: Provide knock down frames for interior frame construction. Knock down frames shall have rigidly interlocked frame joints so as to maintain alignment and assure performance of completed frames when field assembled.

6. Slip-On Drywall Frames: Frames for installation in existing drywall construction shall be of the slip-on drywall type.

B. Anchors:

1. Sill anchors shall be furnished for attaching frames to floor, and jamb anchors for bonding to wall.

2. Jamb members shall have one (1) integral compression anchor to provide bearing surface against the wall.

3. Provide metal anchors of shapes and sizes required for the adjoining type of wall construction.

4. Fabricate jamb anchors of steel, not lighter than the gauge used for frame.

5. Locate anchors on jambs near the top and bottom of each frame and at intermediate points not over 24 inches apart.

6. Provide 10-inch long, corrugated or other deformed type adjustable anchors at jambs.

7. Each jamb shall be provided with snap-in sill anchors designed to be attached with no notching of the wallboard. There shall be no visible fastening devices along the faces of the frames.

8. Frames for metal building walls shall be of self-flashing design.

C. Rubber Door Silencers:

1. Provide three (3) silencers on strike jamb of single door frames and 3 silencers each strike jamb of double door frames with removable mullions.

2. Provide two (2) silencers on head of double door frames without removable mullions.

3. Omit silencers at gaskets.

4. Install plastic plugs to keep holes clear during construction.

2.03 DOORS

A. Type and design:

1. Doors shall comply with ANSI/SDI A250.8-2003 and as specified herein.

2. Provide seamless design, fabricated from metal complying with ASTM A653, with an A60 galvanized coating and prime painted, with continuous flush top and inverted bottom channel closure and beveled lock edge, in the dimensions and types shown on the Drawings, reinforced for the finish hardware being provided under *Section 08 71 00, Hardware* of these Specifications, and in the following grades:

a. Exterior Doors (Insulated): ANSI A250.8, 1¾" thick.

(1) Level 2 – Heavy Duty, Model 1, full flush design.
(2) Level 2 – Heavy Duty, Model 2, seamless design.
(3) Level 3 – Extra Heavy Duty, Model 1, full flush design.
(4) Level 3 – Extra Heavy Duty, Model 2, seamless design.
(5) Level 3 – Extra Heavy Duty, Model 3, stile and rail flush design.

b. Interior Doors (Non-Rated): ANSI A250.8, 1¾" thick.

(1) Level 2 – Heavy Duty, Model 1, full flush design.
(2) Level 2 – Heavy Duty, Model 2, seamless design.
(3) Level 3 – Extra Heavy Duty, Model 1, full flush design.
(4) Level 3 – Extra Heavy Duty, Model 2, seamless design.
(5) Level 3 – Extra Heavy Duty, Model 3, stile and rail flush design.

c. Interior Doors (Fire Rated): ANSI 250.8, 1¾" thick.

(1) Level 2 – Heavy Duty, Model 1, full flush design.
(2) Level 2 – Heavy Duty, Model 2, seamless design.
(3) Level 3 – Extra Heavy Duty, Model 1, full flush design.
(4) Level 3 – Extra Heavy Duty, Model 2, seamless design.
(5) Level 3 – Extra Heavy Duty, Model 3, stile and rail flush design.

4. Exterior doors shall be thermal rated with a polyurethane or polystyrene core.

5. Restroom and office doors shall be sound deadened.

B. Where indicated on the Drawings, provide inserted louvers fabricated in a sightproof arrangement, complete with aluminum screen.

C. Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as shown or scheduled, provide doors and frames that have been fabricated as thermal insulating assemblies and tested in accordance with ASTM C236 or C976.

1. Unless otherwise indicated, provide exterior assemblies U-value rating of 0.24 BTU/hour or better (hour by sq. ft. by degree F).

D. Sound-Rated (Acoustical) Assemblies: Where shown or scheduled, provide door and frame assemblies fabricated as sound-reducing type, tested according to ASTM E 1408, and classified according to ASTM E 413.

1. Unless otherwise indicated, provide acoustical assemblies with STC sound ratings of 33 or better.

E. Vision Lite Systems:

1. Manufacturer's standard kits consisting of glass lite moldings to accommodate glass thickness and size of vision lite indicated.

2. Glazing:

a. Glazing shall be as specified in Section 08 80 00 and in conformance with Chapter 24 of the International Building Code.

b. Glazing in fire rated doors shall conform to Subsection 714.2.6 of the International Building Code.

2.04 LABEL DOORS AND FRAMES

A. All doors and frames for fire rated openings shall be of the construction and design as furnished by the manufacturer, having a specific fire rating.

B. All doors and frames for fire rated openings shall be part of an assembly consisting of the door, door frame, hardware, glazing, louvers and accessories which, together, have been fire tested and found to be capable of providing a specific degree of fire protection. Such doors shall be labeled by an approved

third party inspection agency and such label shall be permanently affixed as required by the building code. All such assemblies shall conform to Article 715.0 of the International Building Code.

C. Construction details and hardware applications authorized by testing or certification laboratories shall take precedence over project details or specifications.

2.05 DOOR LOUVERS

A. Furnish extruded aluminum door louvers as manufactured by Anemostat Door Products, Carson, CA, (310) 835-7500, or equal. All blades, frames, and trim members to be 6063-T52 alloy, minimum 16 B & S gauge. All fastenings to be stainless steel or aluminum. A separate adjustable trim member shall be supplied to securely and neatly clamp louver in opening. Interior trim flange to be secured by counter-sunk Jackson Head Screws. All frames and trim members to be mitered at corners and rigidly secured by corner brackets. Colors to be as selected by the *ARCHITECT*.

B. Fire rated doors shall have Model #FL-DLUL louvers with fusible links. Louvers for all other doors to have louvers shall be inverted "Y", Non-Vision, Model #AF-DL.

C. Louvers shall be furnished in manufacturer's standard colors as selected by the *ENGINEER*.

2.06 SHOP FINISH

A. Pre-clean and shop prime each door and frame for finish painting which will be performed at the job site under Section 09 90 00 of these Specifications.

B. Finish: The finish on all doors and frames shall be capable of passing the following:

1. Salt Spray Test: In accordance with ASTM Designation B117 (latest issue) for a total exposure of 120 continuous hours.

2. Water Fog Test (humidity): In accordance with ASTM Designation 1735 (latest issue) for a total exposure of 250 continuous hours.

3. Film Adhesion Test: In accordance with ASTM Designation D1654 (latest revision).

2.07 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

D. Assure that frame openings correspond to dimensions of frame furnished.

E. Check that surfaces to contact frame are free of debris.

3.02 INSTALLATION

A. Install steel doors and frames in accordance with the manufacturers printed installation instructions as approved by the *ENGINEER*.

B. Fire rated assemblies shall be installed in accordance with the third party testing agencies' Fire Resistance Design Number in order to maintain the required fire resistance rating for the opening.

C. Placing frames:

1. Where practicable, place frames prior to construction of enclosing walls and ceilings.

2. Set frames accurately into position, plumbed, aligned, and braced securely until permanent anchors are set.

3. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.

4. At in-place construction, set frames and secure to adjacent construction with machine screws and suitable anchorage devices. Provide "Z" fillers at each screw location.

5. When installed in prepared openings in concrete construction, provide sealant between frame and concrete in accordance with provisions of *Section 07 92 13, Sealants and Caulking* of these Specifications.

3.03 ADJUSTMENT

A. Final adjustments:

1. Check and re-adjust operating finish hardware items in hollow metal work just prior to final inspection.

2. Leave work in complete and proper operating condition.

3. Remove defective work and replace with work complying with the specified requirements.

3.04 CLEANING

A. Clean exposed surface of all grease, dirt and other foreign materials.

B. Remove dirt and excess sealants or glazing compound from exposed surfaces.

C. Touch up marred or abraded surfaces to match original finish, as recommended by the manufacturer.

PART 4 - PAYMENT

4.01 METAL DOORS AND FRAMES

A. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

B. Include all costs for the *METAL DOORS AND FRAMES* in the prices bid for the various related items of work as designated in the Proposal.

****END OF SECTION****

SECTION 08 42 00
(08400)
ENTRANCES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Aluminum entrance systems, complete with reinforcing, fasteners, anchors and attachment devices.

2. Aluminum doors complete with hardware (per *Section 08 71 00*).

3. Accessories necessary to complete work.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 07 92 13: Sealants and Caulking*

3. *Section 08 43 13: Aluminum-Framed Storefronts*

4. *Section 08 71 00: Hardware*

5. *Section 08 80 00: Glazing*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for the *ENTRANCES* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SYSTEM REQUIREMENTS

A. Design Requirements:

1. Drawings are diagrammatic and do not purport to identify nor solve problems of thermal or structural movement, glazing, anchorage or moisture disposal.

2. Requirements shown by details are intended to establish basic dimension of units, sight lines and profiles of members.

3. Provide concealed fastening.

4. Provide entrance systems, including necessary modifications, to meet specified requirements and maintaining visual design concepts.

5. Attachment considerations are to take into account site peculiarities and expansion and contraction movements so there is no possibility of loosening, weakening or fracturing connection between units and building structure or between units themselves.

6. Anchors, fasteners and braces shall be structurally stressed not more than 50% of allowable stress when maximum loads are applied.

7. Provide for expansion and contraction without detriment to appearance or performance.

8. Assemblies shall be free from rattles, wind whistles and noise due to thermal and structural movement and wind pressure.

9. Not Permitted: Vibration harmonics, wind whistles, noises caused by thermal movement, thermal movement transmitted to other building elements, loosening, weakening, or fracturing of attachments or components of system.

B. Performance Requirements:

1. Air infiltration: For single acting offset pivot or butt hung entrances in the closed and locked position, the test specimen shall be tested in accordance with ASTM E 283 at a pressure differential of 6.24 psf for single doors and 1.567 psf for pairs of doors. A single 3'-0" x 7'-0" entrance door and frame shall not exceed 0.50 cfm per square foot. A pair of 6'-0" x 7'-0" entrance doors and frame shall not exceed 1.0 cfm per square foot.

2. Water infiltration: No uncontrolled water penetration when tested in accordance with ASTM E 331 at test pressure of 8.0 psf for Series 450 and 10.0 psf for Series IT450.

C. Thermal Requirements:

1. Framing systems shall accommodate expansion and contraction movement due to surface temperature differentials of 180 degrees Fahrenheit (82 degrees Celsius) without causing buckling, stress on glass, failure of joint seals, excessive stress on structural elements, reduction of performance, or other detrimental effects.

2. Ensure doors function normally within limits of specified temperature range.

3. Thermal Transmittance (U-factor): When tested to AAMA Specification 1503, the thermal transmittance (U-factor) shall not be more than:

1. Assembly Maximum U value:
Fixed-0.36
Entrance Door-0.63

2. Assembly Max. SHGC U value:
Fixed-0.36
Entrance Door-0.33

3. Assembly Minimum Visible Transmittance/ SHGC is 1.10 for all types.

D. Structural Requirements, as measured in accordance with ANSI/ASTM E330:

1. Wind loads for exterior assemblies:

a. Basic loading:

(1) 30 psf acting inward.

(2) 30 psf acting outward.

2. Deflection: Maximum calculated deflection of any framing member in direction normal to plane of wall when subjected to specified design pressures shall not exceed 1/175 of its clear span.

E. Testing Requirements: Provide components that have been previously tested by an independent testing laboratory.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.
2. Specifications and other data required that demonstrate compliance with the specified requirements.

3. Include information for factory finishes, hardware, accessories and other required components.

C. Shop drawings:

1. Submit shop drawings covering fabrication, installation and finish of specified systems.

2. Include following:

a. Fully dimensioned plans and elevations with detail coordination keys.

b. Locations of exposed fasteners and joints.

3. Provide detailed drawings of:

a. Composite members.

b. Joint connections for framing systems and for entrance doors.

c. Anchorage.

d. System reinforcements.

e. Expansion and contraction provisions.

f. Hardware, including locations, mounting heights, reinforcements and special installation provisions.

g. Glazing methods and accessories.

h. Internal sealant requirements as recommended by sealant manufacturer.

4. Schedule of finishes.

D. Samples:

1. Submit samples indicating quality of finish, in required colors, on alloys used for work, in sizes as standard with manufacturer.

2. Where normal texture or color variations are expected, include additional samples illustrating range of variation.

E. Test Reports:

1. Standard Systems: Submit certified copies of previous test reports substantiating performance of system in lieu of re-testing. Include other supportive data as necessary.

F. Certificates:

1. Submit manufacturer's certification stating that systems are in compliance with specified requirements.

G. Qualification Data:

1. Submit installer qualifications verifying years of experience.

2. Include list of projects having similar scope of work identified by name, location, date, and reference name and phone number.

H. Manufacturer's Instructions: Submit manufacturer's printed installation instructions.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

2. To ensure quality of appearance and performance, obtain materials for each system from either a single manufacturer or from manufacturer approved by each system manufacturer.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

2. Perform Work in accordance with AAMA SFM-1 and manufacturer's written instructions.

3. Conform to requirements of ANSI A117.1 and local amendments.

1.05 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.06 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01740, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping and reinstallation during the warranty period.

C. Provide written manufacturer's warranty, executed by company official, warranting against defects in materials and products for 2 years from date of Substantial Completion. Warrant door corner construction for the life of the project.

D. Provide written installer's warranty, warranting work to be watertight, free from defective materials, defective workmanship, glass breakage due to defective design, and agreeing to replace components which fail within two (2) years from date of Substantial Completion.

1. Warranty shall cover following:

a. Complete watertight and airtight system installation within specified tolerances.

b. Completed installation will remain free from rattles, wind whistles and noise due to thermal and structural movement and wind pressure.

c. System is structurally sound and free from distortion.

d. Glass and glazing gaskets will not break or "pop" from frames due to design wind, expansion or contraction movement.

e. Glazing sealants and gaskets will remain free from abnormal deterioration or dislocation due to sunlight, weather or oxidation.

PART 2 - PRODUCTS

2.01 GENERAL

A. Proprietary Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features,

general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. The products specified herein are manufactured by Kawneer Company, Inc., Norcross, GA.

1 Acceptable Entrance Doors:

a. Interior: Kawneer "500 Tuffline® Entrance;" or equivalent, wide stile, 5" vertical face dimension, 10¼" bottom rail height, 2" depth, 3/16" wall thickness door and frame for high traffic and high abuse areas.

b. Exterior: Kawneer "500 Tuffline® Entrance;" or equivalent, wide stile, 5" vertical face dimension, 10¼" bottom rail height, 2" depth, 3/16" wall thickness door and frame for high traffic and high abuse areas.

D. Equivalent products of U. S. Aluminum, Tubelite or others may be used in accordance with *Section 01 25 13, Substitutions*.

2.02 FRAMING

A. Aluminum:

1. ASTM B221, alloy 6063-T5 for extrusions; ASTM B209, alloy 5005-H34 for sheets; or other alloys and temper recommended by manufacturer appropriate for specified finish.

2. Door frame moldings 4¾" in depth shall be full tubular sections with minimum wall thickness of 3/16" at exposed faces and sides, 5/16" at recessed sidewalls receiving mortised or concealed hardware.

B. Internal Reinforcing:

1. ASTM A36 for carbon steel; or ASTM B308 for structural aluminum.

2. Shapes and sizes to suit installation.

3. Shop coat steel components after fabrication with alkyd type zinc chromate primer complying with FS TT-P-645.

C. Anchorage Devices:

1. Manufacturer's standard formed or fabricated steel or aluminum assemblies of shapes, plates, bars or tubes.

D. Fasteners:

1. Aluminum, non-magnetic stainless steel or other materials warranted by manufacturer to be non-corrosive and compatible with components being fastened.

2. Do not use exposed fasteners, except where unavoidable for application of hardware.

3. For exposed locations, provide countersunk Phillips head screws with finish matching items fastened.

4. For concealed locations, provide manufacturer's standard fasteners.

5. Provide nuts or washers in design to prevent disengagement; deforming of fastener threads is unacceptable.

E. Expansion Anchor Devices: Lead-shield or toothed-steel, drilled-in, expansion bolt anchors.

F. Protective Coatings: Cold-applied asphalt mastic complying with SSPC-Paint 12, compounded for 30 mil (0.77 mm) thickness for each coat; or alkyd type zinc chromate primer complying with FS TT-P-645.

G. Glazing Gaskets:

1. Compression type design, replaceable, molded or extruded, of neoprene, or ethylene propylene diene monomer (EPDM).

2. Conform to ASTM C509 or C864.

3. Profile and hardness as required to maintain uniform pressure for watertight seal.

4. Provide in manufacturer's standard color.

H. Weatherstripping:

1. Meeting stiles on pairs of doors shall be double weathered with one consisting of an adjustable astragal.

2. Provide EPDM or vinyl-blade gasket weatherstripping in bottom door rail, adjustable for contact with threshold.

I. Internal Sealants: Types recommended by sealant manufacturer.

J. "Anti-Walk" Edge Blocking: "W" shaped EPDM blocks for use in keeping glazing material stationary under vibration or seismic loading.

K. Baffles (at weep holes): Type as recommended by system manufacturer and shown in published installation instructions.

2.03 GLASS AND GLAZING ACCESSORIES

A. Glass shall conform to *Section 08 80 00, Glazing*.

B. Interior Doors: ¼" thick.

C. Exterior Doors: 1" thick insulated, "Low E", (See Section 08 80 00).

D. Glass stops shall be square.

E. All walls of the door members shall be a minimum 0.188" nominal in thickness with 0.050" thick glass stops.

F. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of entrance members are nominal and in compliance with Aluminum Standards and Data, published by The Aluminum Association.

G. Glazing gaskets shall be either EPDM elastomeric extrusions or a thermoplastic elastomer.

H. Provide adjustable glass jacks to help center the glass in the door opening.

2.04 DOOR HARDWARE

A. Hardware shall comply with the requirements specified in *Section 08 71 00, Hardware*.

B. Procedures:

1. Perform all fitting of finish hardware to doors and frames at the factory; except do not drill or tap for surface mounted items until time of installation at the site.

2. Comply with finish hardware manufacturer's instructions and template requirements.

3. Use concealed fasteners to the maximum extent practicable.

2.05 FABRICATION

A. Coordination of Fabrication:

1. Check actual frame or door openings required in construction work by accurate field measurements before fabrication.

2. Fabricate units to withstand loads which will be applied when system is in place.

B. General:

1. Conceal fasteners wherever possible.

2. Reinforce work as necessary for performance requirements and for support to structure.

3. Separate dissimilar metals and aluminum in contact with concrete utilizing protective coating or pre-formed separators, which will prevent contact and corrosion.

4. Comply with *Section 08 80 00, Glazing* for glazing requirements.

C. Aluminum Framing:

1. Provide members of size, shape and profile indicated, designed to provide for glazing from exterior.

2. Fabricate frame assemblies with joints straight and tight fitting.

3. Reinforce internally with structural members as necessary to support design loads.

4. Maintain accurate relation of planes and angles, with hairline fit of contacting members.

5. Seal horizontals and direct moisture accumulation to exterior.

6. Provide flashings and other materials used internally or externally that are corrosive resistant, non-staining, non-bleeding and compatible with adjoining materials.

7. Provide manufacturer's extrusions and accessories to accommodate expansion and contraction due to temperature changes without being detrimental to appearance or performance.

8. Make provisions in framing for minimum edge clearance, nominal edge cover and nominal pocket width for thickness and type of glazing or infill used in accordance with recommendations of manufacturer and FGMA Glazing Manual.

9. Provide tight fitting, injection molded, plastic water deflectors at all intermediate horizontals.

D. Entrance Doors:

1. Fabricate with mechanical joints using internal reinforcing plates and shear blocks attached with fasteners and by welding.

2. Provide extruded aluminum glazing stops of square design.

E. Hardware:

1. Receive hardware supplied in accordance with *Section 08 71 00, Hardware* and install in accordance with requirements of this Section.

2. Cut, reinforce, drill and tap frames and doors as required to receive hardware.

3. Comply with hardware manufacturer's templates and instructions.

4. Use concealed fasteners wherever possible.

F. Welding:

1. Comply with recommendations of the American Welding Society.

2. Use recommended electrodes and methods to avoid distortion and discoloration.

3. Grind exposed welds smooth and flush with adjacent surfaces; restore mechanical finish.

G. Flashings: Form from sheet aluminum with same finish as extruded sections. Apply finish after fabrication. Material thickness as required to suit condition without deflection or "oil-canning."

2.06 FINISH

A. Color Anodized:

1. Conforming to AA-M12C22A 44 and AAMA 608.1.

2. Architectural Class I, etched, medium matte, Dark Bronze colored anodic coating, 0.7 mil minimum thickness.

2.07 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General:

1. Install the work of this section in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

2. All items under this heading shall be set in their correct locations as shown in the details and shall be level, square, plumb, and at proper elevations and in alignment with other work, glazed and adjusted by experienced workmen in accordance with the manufacturer's installation instructions and/or approved shop drawings.

3. All frame materials shall be fastened in place using backing, masonry plugs, or anchor straps as required.

4. Remove protective coating completely from exposed surfaces as soon as progress of the Work will permit with safety.

5. When glazing is performed under this Section, provide the types of glass required and glaze in accordance with pertinent provisions of *Section 08 80 00, Glazing* of these Specifications.

B Erection Tolerances:

1. Limit variations from plumb and level:

   a. ⅛-inch (3 mm) in 10 feet (3 M) vertically.

   b. ⅛-inch (3 mm) in 20 feet (6 M) horizontally.

2. Limit variations from theoretical locations: ¼- inch (6 mm) for any member at any location.

3. Limit offsets in theoretical end-to-end and edge-to-edge alignment: 1/16 inch (2 mm) from flush surfaces not more than 2 inches (51 mm) apart or out-of-flush by more than ¼- inch (6 mm).

C. Set units plumb, level and true to line, without warp or rack of frame.

D. Anchor securely in place, allowing for required movement, including expansion and contraction.

E. Separate dissimilar materials at contact points, including metal in contact with masonry or concrete surfaces, with bituminous paint or pre-formed separators to prevent contact and corrosion.

F. Seal perimeter members as shown on manufacturer’s installation instructions or as required for unique job conditions. Set other members with internal sealants and baffles as called for in manufacturer’s installation instructions. Use sealants as recommended by sealant manufacturer.

G. Coordinate installation of perimeter sealant and backing materials between assemblies and adjacent construction in accordance with requirements of *Section 07 92 13, Sealants and Caulking*.

H. Glazing: Refer to requirements of *Section 08 80 00, Glazing*. Utilize "anti-walk" edge blocking on all vertical edges of glazing.

3.03 ADJUSTING

A. Test door operating functions. Adjust closing and latching speeds and other hardware in accordance with manufacturer's instructions to ensure smooth operation.

3.04 CLEANING

A. Clean surfaces in compliance with manufacturer’s recommendations; remove excess mastic, mastic smears, foreign materials and other unsightly marks.

B. Clean metal surfaces exercising care to avoid damage. Clean exposed surface of all grease, dirt and other foreign materials.

C. Protect exposed portions of the aluminum entrance work from damage by grinding and polishing compounds, plaster, lime, acid, cement or other contaminants. .

****END OF SECTION****

SECTION 08 43 13

ALUMINUM-FRAMED STOREFRONTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included: Architectural Aluminum Storefront System, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of storefront units.

B. Related Work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 03 30 00: Concrete*

3. *Section 07 92 13: Sealants and Caulking*

4. *Section 08 40 00: Entrances*

5. *Section 08 71 00: Hardware*

6. *Section 08 80 00: Glazing*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *ALUMINUM-FRAMED STOREFRONTS* in the prices bid for the various related items of work as designated in the Proposal.

1.02 DEFINITIONS

A. For fenestration industry standard terminology and definitions refer to American Architectural Manufactures Association (AAMA) – AAMA Glossary (AAMA AG).

1.03 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-framed storefront system shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

1. Design Wind Loads: Determine design wind loads applicable to the Project from basic wind speed indicated in miles per hour, according to ASCE 7, Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.

a. Basic Wind Speed (MPH): 126
b. Importance Factor (I, II, III): III
c. Exposure Category: B

B. Storefront System Performance Requirements:

1. Wind loads: Provide storefront system; include anchorage, capable of withstanding wind load design pressures of 22 lbs./sq. ft. inward and 30 lbs./sq. ft. outward. The design pressures are based on the 2021 International Building Code; New Jersey Edition.

2. Air Infiltration: The test specimen shall be tested in accordance with ASTM E 283. Air infiltration rate shall not exceed 0.06 cfm/ft^2 (0.3 1.a m^2) at a static air pressure differential of 6.24 psf (300 Pa).

3. Water Resistance: The test specimen shall be tested in accordance with ASTM E 331. There shall be no leakage at a minimum static air pressure differential of 8 psf (383 Pa) as defined in AAMA 501.

4. Uniform Load: A static air design load of 20 psf (958 Pa) shall be applied in the positive and negative direction in accordance with ASTM E330. There shall be no deflection in excess of L/175 of the span of any framing member. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.

5. Thermal Transmittance (U-factor): When tested to AAMA Specification 1503, the thermal transmittance (U-factor) shall not be more than:

a. Assembly Maximum U value:
Fixed-0.36
Entrance Door-0.63

6. Assembly Minimum Visible Transmittance/SHGC is 1.10 for all types.

7. Condensation Resistance (CRF): When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than:

   a. Glass to Exterior – 70 frame and 69 glass (low-e) or 69 frame and 58 glass (clear).

   b. Glass to Center – 62 frame and 68 glass (low-e) or 63 frame and 56 glass (clear).

   c. Glass to Interior – 56 frame and 67 glass (low-e) or 54 frame and 58 glass (clear).

8. Sound Transmission Class (STC) and Outdoor-Indoor Transmission Class (OITC): When tested to AAMA Specification 1801 and in accordance with ASTM E1425 and ASTM E90, the STC and OITC Rating shall not be less than:

   a. Glass to Exterior – 38 (STC) and 31 (OITC)

   b. Glass to Center – 37 (STC) and 30 (OITC)

   c. Glass to Interior – 38 (STC) and 30 (OITC)

9. Windborne-Debris-Impact-Resistance Performance: Shall be tested in accordance with ASTM E 1886 and information in ASTM E 1996 and /or AAMA 506.

   a. Large-Missile Impact: For aluminum-framed systems located within 30 feet (9.1 m) of grade.

   b. Small-Missile Impact: For aluminum-framed systems located more than 30 feet (9.1 m) above grade.

1.04 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, hardware, finishes, and installation instructions for each type of aluminum frame storefront system indicated.

C. Shop Drawings: Include plans, elevations, sections, details, hardware, and attachments to other work, operational clearances and installation details.

D. Samples for Initial Selection: For units with factory-applied color finishes including samples of hardware and accessories involving color selection.

E. Samples for Verification: For aluminum framed storefront system and components required.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for each type of aluminum-framed storefront.

G. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed systems, made from 12" lengths of full-size components and showing details of the following:

1. Joinery, including concealed welds.

2. Anchorage.

3. Expansion provisions.

4. Glazing.

5. Flashing and drainage.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: An installer which has had successful experience with installation of the same or similar units required for the project and other projects of similar size and scope.

B. Manufacturer Qualifications: A manufacturer capable of providing aluminum framed storefront systems that meet or exceed performance requirements indicated and of documenting this performance by inclusion of test reports and calculations.

C. Source Limitations: Obtain aluminum framed storefront system through one source from a single manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum framed storefront system and are based on the specific system indicated. Do not modify size and dimensional requirements.

1. Do not modify intended aesthetic effects, as judged solely by ARCHITECT/ENGINEER, except with ARCHITECT/ENGINEER's approval. If modifications are proposed, submit comprehensive explanatory data to *ARCHITECT/ENGINEER/ENGINEER* for review.

E. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of aluminum framed storefront openings by field measurements before fabrication and indicate field measurements on Shop Drawings.

1.08 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use.

E. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle storefront material and components to avoid damage. Protect storefront material against damage from elements, construction activities, and other hazards before, during and after storefront installation.

1.09 WARRANTY

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer’s warranty shall accompany the shop drawing submittal.

B. Manufacturers Warranty Period: Two (2) years from Date of Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment by manufacturer.

C. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers:

1. Kawneer Company Inc.

    a. Trifab® VG 451T Storefront System – 2" x 4-1/2" nominal dimension; Thermal; Front Mounted fabrication.

2. Or equivalent.

2.02 MATERIALS

A. Aluminum Extrusions: Alloy and temper recommended by aluminum storefront manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.070" wall thickness at any location for the main frame and complying with ASTM B 221, 6063-T6 alloy and temper.

B. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum window members, trim hardware, anchors, and other components.

C. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

D. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

E. Sealant: For sealants required within fabricated storefront system, provide permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.

F. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of storefront members are nominal and in compliance with AA Aluminum Standards and Data.

2.03 STOREFRONT FRAMING SYSTEM

A. Thermal Barrier (Trifab® VG 451T or equivalent): Kawneer IsoLock® Thermal Break with a 1/4" separation consisting of a two-part chemically curing, high-density polyurethane, which is mechanically and adhesively joined to aluminum storefront sections.

1. Thermal Break shall be designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 505.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials. Where exposes shall be stainless steel.

D. Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action

2.04 GLAZING SYSTEMS

A. Glazing: As specified in *Section 08 80 00, Glazing*.

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, extruded EPDM rubber.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

2.05 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in *Section 07 92 13, Sealants and Caulking*.

B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30 mil (0.762 mm) thickness per coat.

2.06 FABRICATION

A. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.

2. Accurately fit joints; make joints flush, hairline and weatherproof.

3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.

4. Physical and thermal isolation of glazing from framing members.

5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.

6. Provisions for field replacement of glazing.

7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

B. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

C. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.

D. Storefront Framing: Fabricate components for assembly using manufactures standard installation instructions.

E. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.07 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Color Anodized:

1. Conforming to AA-M12C22A 44 and AAMA 608.1.

2. Architectural Class I, etched, medium matte, Dark Bronze colored anodic coating, 0.7 mil minimum thickness.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ARCHITECT/ENGINEER*.

C. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight framed aluminum storefront system installation.

1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.

2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3-inches of opening.

3. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.

D. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing aluminum framed storefront system, accessories, and other components.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, [aligning with adjacent Work].

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent Work to form water tight dam.

G. Set sill members in bed of sealant or with gaskets, as indicated, for weather tight construction.

H. Install aluminum framed storefront system and components to drain condensation, water penetrating joints, and moisture migrating within sliding door to the exterior.

I. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

J. Coordinate attachment and seal of perimeter air and vapor retarder materials.

K. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

L. Install integral flashings and integral joint sealers.

M. Install infill panels using method required to achieve performance criteria.

N. Coordinate installation of glass with *Section 08 80 00, Glazing;* separate glass from metal surfaces.

O. Coordinate installation of perimeter sealants with *Section 07 92 13, Sealants and Caulking*.

P. Verify existing conditions, substrates and floor and ceiling anchor locations prior to ordering the materials.

3.03 FIELD QUALITY CONTROL

A. Field Tests: ARCHITECT/ENGINEER shall select storefront units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. Conduct tests for air infiltration and water penetration with manufacturer's representative present. Tests not meeting specified performance requirements and units having deficiencies shall be corrected as part of the contract amount.

1. Testing: Testing shall be performed by a qualified independent testing agency. Refer to Testing Section for payment of testing and testing requirements. Testing Standard per AAMA 503, including reference to ASTM E 783 for Air Infiltration Test and ASTM E 1105 Water Infiltration Test.

a. Air Infiltration Tests: Conduct tests in accordance with ASTM E 783. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft^2 whichever is greater.

b. Water Infiltration Tests: Conduct tests in accordance with ASTM E 1105. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 6.24 psf.

B. Manufacturer’s Field Services: Upon Owner’s written request, provide periodic site visit by manufacturer’s field service representative.

3.04 ADJUSTING, CLEANING, AND PROTECTION

A. Clean aluminum surfaces immediately after installing aluminum framed storefronts. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

B. Clean glass immediately after installation. Comply with glass manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels and clean surfaces.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

****END OF SECTION****

SECTION 08 71 00
(08710)
HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Door hardware.

2. Thresholds

3. Gasketing

4. Keying, master keying and grand master keying to meet *OWNER'S* requirements.

5. All trim, attachments and fastenings required.

6. All other hardware required for a complete installation.

7. Provide all new and existing doors with cylinders having interchangeable cores. New locks and latches shall be provided for all doors to remain as required to provide interchangeable cores.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 08 41 13: Entrances*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for the *HARDWARE* in the prices bid for the various related items of work as designated in the Proposal.

1.02 REFERENCES

A. American National Standards Institute

1.	ANSI A156.1	Butts & Hinges
2.	ANSI A156.2	Locks & Lock Trim
3.	ANSI A156.3	Exit Devices
4.	ANSI A156.4	Door Controls (Closers)
5.	ANSI A156.5	Auxiliary Locks
6.	ANSI A156.6	Architectural Door Trim
7.	ANSI A156.7	Template Hinge Dimensions
8.	ANSI A156.8	Door Controls (Overhead Holders)
9.	ANSI A156.9	Cabinet Hardware
10.	ANSI A156.10	Power Operated Pedestrian Doors
11.	ANSI A156.11	Cabinet Locks
12.	ANSI A156.12	Interconnected Locks & Latches
13.	ANSI A156.13	Mortise Locks & Latches
14.	ANSI A156.14	Sliding & Folding Door Hardware
15.	ANSI A156.15	Closer Holder Release Devices
16.	ANSI A156.16	Auxiliary Hardware
17.	ANSI A156.17	Self Closing Hinges & Pivots
18.	ANSI A156.18	Materials & Finishes
19.	ANSI A156.19	Power Assist and Low Energy Operated Doors
20.	ANSI A156.20	Strap and Tee Hinges and Hasps

21. ANSI A156.21 Thresholds

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required to demonstrate compliance with the specified requirements.

3. For fire rated assemblies, submit third party testing agencies' design number showing component parts and installation instructions.

C. Submit hardware schedule, product data, shop drawings, and keying schedule. Include product data on each type of hardware listed in hardware schedule.

1. Upon return of the reviewed finish hardware schedule, arrange for a keying meeting with the *ARCHITECT/ENGINEER* and *OWNER*, hardware supplier, and other involved parties to insure all locksets are functionally correct and keying fulfills the project requirements. As soon as possible after the keying conference, typed copies of the keying schedule shall be furnished to the *ENGINEER* and *OWNER*.

2. Approval of the hardware schedule by the *ENGINEER* shall not relieve the Contractor from the responsibility for furnishing all required finish hardware.

D. Samples: Within 15 calendar days after being so requested by the *ENGINEER*, deliver to the *ENGINEER* samples of each finish hardware item.

E. Operation and Maintenance data:

1. Submit operation and maintenance data under provisions of *Section 01 78 23*.

2. Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

F. Submit warranties as specified in *Section 01 78 36, Guarantees*.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. The locksmith shall be licensed in accordance with NJSA 45:5A-1 et seq. and as required by NJSA 45:5A-25.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

D. Fire rated openings: Comply with the requirements of Underwriters' Laboratories, Inc.

E. Provide the services of an AHC or DAHC member of the Door Hardware Institute to:

1. Be available for consultation with the ENGINEER at no additional cost to the OWNER during progress of construction;

2. Be present at completion of construction, and:

a. Inspect installation of all finish hardware items;

b. Make all minor adjustments required; and

c. Report to the ENGINEER on completeness of the installation.

1.05 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Deliver hardware items in their original factory shipping cartons.

C. Package and label each item of hardware individually for each opening to match hardware schedule.

D. Store and protect products under provisions of *Section 01 66 00*.

E. Protect hardware from theft by cataloging and storing in secure area.

F. Deliver permanent keys and interchangeable cores to *OWNER* by security shipment direct from hardware supplier.

G. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

1.06 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

1.07 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

1.08 MAINTENANCE

A. Maintenance materials:

1. Provide special wrenches and tools applicable to each different or special hardware component.

2. Provide maintenance tools and accessories supplied by hardware component manufacturer.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers (or approved equivalent):

1. Hinges: Hager, McKinney, Stanley, Lawrence

2. Locks and latches: Sargent, Yale, Schlage, Corbin, Best.

3. Exit devices: Sargent, Yale, Schlage, Monarch, Von Duprin

4. Pulls and plates: Rockwood, IVES, Builders Brass, LCN, Dorma

5. Closers:

   a. General environment: Sargent, Yale, Norton, LCN, Dorma

   b. Corrosive environment: Norton Series 7500SS.

6. Cylinders: Schlage, Sargent, Yale

7. Flush bolts: Rockwood, IVES

8. Removable mullion: Sargent, Yale, Schlage

9. Thresholds, drips, gaskets, astragals: Pemko, Reese, National Guard

2.02 MATERIALS

A. Materials shall be as specified herein, indicated in the schedule and in conformance with the referenced standards.

B. All hardware for fire rated openings shall comply with Article 1008.1.10.1 of the International Building Code, 2021, New Jersey Edition.

1. Panic hardware shall be listed in accordance with UL 305.

2. Fire exit hardware shall be listed in accordance with UL 10C and UL 305.

3. The maximum unlatching force shall not exceed 15 pounds.

4. All such hardware shall be labeled by an approved third party inspection agency and such label shall be permanently affixed as required by the building code.

C Hinges:

1. Hinges shall conform to ANSI A156.1, Grade 1.

2. Hinges for metal doors and frames shall also conform to ANSI A156.7.

3. Designated hinges shall have pins that are made non-removable by means of a set screw in the barrel, or safety stud, when the door is in the closed position.

D. Locksets and latchsets:

1. To the maximum extent possible, locksets, latch sets and dead locks, and all components thereof, including cylinders and removable cores, shall be for the products of a single manufacturer. Lock fronts for double-acting doors shall be rounded. Strikes for wood frames and pairs of wood doors shall be furnished with wrought boxes.

2. Mortise type:

a. Locksets and latchsets shall be heavy-duty mortise type with hinged, anti-friction, 3/4 inch throw latchbolt with anti-friction piece made of self-lubricating stainless steel. Functions and design as indicated in the hardware groups. Deadbolt functions shall be one inch projection with two hardened steel roll pins.

Both deadbolt and latchbolt to extend into lock case a minimum of 3/16 inch when fully extended.

b. Furnish locksets and latchsets with sufficient strike lip to protect door trim.

c. All mortise locksets and latchsets must conform to ANSI A156.13, Series 1000, Operational Grade 1 (Security Grade 2 for locksets in security areas) and be listed by U.L.

d. Locksets must fit ANSI A115.1 door preparation.

e. Locksets and latchsets to have self-aligning thru-bolted trim.

f. Auxiliary deadlatch to be made one piece stainless steel, permanently lubricated.

g. Locksets must be available with tactile or knurled knobs or levers for identification of hazardous areas.

h. Knobs must be brass or bronze material and a minimum of .100 inch thick at the thinnest point of the knob wall.

i. Lever handles must be of forged or cast brass, bronze or stainless steel construction and conform to ANSI A117.1. Levers which contain a hollow cavity are not acceptable.

2. Cylindrical type:

a. Locksets must be extra heavy-duty cylindrical type with 2-3/4 inch backset, or greater as specified, with a 9/16 inch throw latchbolt.

b. Knobs must be brass or bronze material and a minimum of .100 inch thick at the thinnest point of the knob wall.

c. Locksets and latchsets must conform to ANSI A156.2, Series 4000, Grade 1, and be U.L. Listed.

d. Locksets and latchsets with knobs must fit ANSI A115.2 door preparation.

e. Locksets and latchsets with levers must fit modified ANSI A115.2 door preparation.

f. Locksets must be available with tactile or knurled knob or lever for identification of hazardous areas.

E. Auxiliary locks and associated products:

1. Bored and mortise dead locks and dead latches, narrow style dead locks and dead latches, rim latches, dead latches, and dead bolts, and electric strikes shall conform to BHMA A156.5. Bolt and latch retraction shall be dead bolt style. Strike boxes shall be furnished with dead bolt and latch strikes for Grade 1. Electric strikes shall be locked or unlocked from a remote location in fail safe mode. Electric strike for rated openings shall be fail secured.

F Lock cylinders (Mortise, Rim and Bored):

1. Lock cylinders shall comply with BHMA A156.5. Lock cylinder shall have not less than six pins. A master keying system shall be provided or an extension of the existing keying system shall be provided. The cylinders shall be compatible with existing locks that were manufactured.

G. Exit devices:

1. Exit devices and accessories shall conform to ANSI A156.3, Grade 1.

2. Alarmed Exit Devices: Alarmed exit devices shall comply with ANSI A156.3, Grade 1 and ANSI A156.29. All alarmed exit devices shall be equipped with a battery operated alarm as an integral part of the device having a sound pressure level of 90-96db at 10ft. Depressing the touch bar, forcing the latch bolt or removing the cover shall sound the alarm. A mortise cylinder shall arm and disarm the alarm. A Red LED indicator shall be provided to indicate that the alarm is armed and in stand-by mode. Emergency alarm signage shall be provided with the device. Provide lock function as shown in hardware sets. Devices shall be NRTL listed for use as fire exit hardware.

H. Door closing devices:

1. Door closing devices shall conform to BHMA A156.4, Grade 1. Closing devices shall be products of one manufacturer for each type specified. The opening resistance of closing devices shall not exceed 67 N 15 lbf applied at the latch stile or exceed 22 N 5 lbf where low opening resistance is scheduled.

2. Door closers for use on labeled fire door assemblies shall be listed by an NRTL for such purpose.

3. Surface type closers shall be Grade 1, Series C02000 Full Cover with options PT-4H, Size 1 or 2 through Size 6, and PT-4D with back check position valve. Except as otherwise specified, sizes shall conform to the manufacturer's published recommendations. Closers for out swinging exterior doors shall have parallel arms or shall be top jamb mounted. Closers for doors close to a wall shall be of narrow projection so as not to strike the wall at the 90-degree open position.

4. All closers shall have operating forces conforming to ANSI A117.1.

5. Closers for use in and around wastewater treatment plants, pumping stations or water treatment plants shall be highly corrosion resistant and shall have all external body components of aluminum, zinc alloy or stainless steel material and all fasteners of stainless steel. Closers shall be enclosed in a molded resin cover. Closers shall be Norton Series 7500SS where designated.

2.03 FASTENERS

A. Furnish all hardware with all necessary screws, bolts, and other fasteners of suitable size and type to anchor the hardware in position for long life under hard use.

B. Furnish fastenings where necessary with expansion shields, toggle bolts, sex bolts, and other anchors approved by the *ENGINEER* according to the material to which the hardware is to be applied and the recommendations of the hardware manufacturer.

2.04 PADLOCKS

A. Padlocks shall conform to ASTM F883, Standard Performance Specification for Padlocks.

B. Padlocks shall be Type P01, Grade 6 with option "G".

C. Provide one padlock for each gate, fuel pump, each buried tank and each overhead door.

2.05 KEYING SCHEDULE

A. Each building or facility shall be keyed, masterkeyed, grandmasterkeyed with the other buildings and facilities as required by the *OWNER* and *ENGINEER*.

2.06 KEYS AND KEYING

A. Provide construction cores and keys during the construction period. Construction control and operating keys and cores shall not be part of the *OWNER'S* permanent keying system or furnished on the same keyway (or key section) as the *OWNER'S* permanent keying system. Permanent cores and keys (prepared according to the accepted keying schedule) will be furnished to the *OWNER* (by the local Best factory representative) prior to occupancy. (The *OWNER* or *OWNER'S* agent will install permanent cores and return the construction cores to the Best factory representative.) (Contractor will install permanent cores.)

B. All cylinders shall be 6-pin, interchangeable core and keyed into a (new) (existing) factory registered Grand Masterkey System with a restricted keyway.

C. Permanent keys and cores shall be stamped with the applicable key mark for identification. These visual key control marks or codes will not include the actual key cuts. Permanent keys will also be stamped ("Do Not Duplicate".)

D. Furnish keys in the following quantities:

2 each Grand Masterkeys
2 each Masterkeys per set
2 each Change keys each keyed core
6 each Construction Masterkeys
2 each Control keys

2.07 TOOLS AND MANUALS

A. With the delivery of permanent keys, deliver to the *OWNER* one complete set of adjustment tools and one set of maintenance manuals for locksets, latchsets, closers and panic devices.

2.08 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their

respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Stockpile all items sufficiently in advance to ensure their availability, and make all necessary deliveries in a timely manner to ensure orderly progress of the total work.

3.03 INSTALLATION

A. General:

1. Install the work of this section in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

2. A complete hardware schedule and templates are to be furnished to the door suppliers.

3. Install each hardware item in compliance with manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, install each item completely and then remove and store in a secure place during the finish application. After completion of the finishes, reinstall each item. Do not install surface mounted items until finishes have been completed on the substrate.

4. Fire rated assemblies shall be installed in accordance with the third party testing agencies' Fire Resistance Design Number in order to maintain the required fire resistance rating for the opening.

B. Locations:

1. Using only the specified finish hardware, and the proper equipment for this purpose, install all other finish hardware in the following locations throughout the work:

a. Armor plates: On the push sides of single-acting doors, and on both sides of double-acting doors.

b. Combination push-and-pull plates: Centered 40-5/16" above the finish floor.

c. Door pulls on plates: Centered 40-5/16" above the finish floor.

d. Door pulls, sectional: Centered 40-5/16" above the finish floor.

e. Door-closing devices: Install and adjust in strict accordance with the templates and printed instructions supplied by the manufacturer of the devices. Insofar as practicable, doors opening to or from halls or corridors shall have the closer mounted on the room side of the door.

f. Extension lever flush bolts: In the edge of the door. Center to bolt fronts 12" from bottom and 12" from top edge of the door.

g. Flush cap pulls: Centered 40-5/16" above the finish floor.

h. Key cabinet: Install where directed.

i. Kick plates: On single-acting doors, with kickplate on push side. On double-acting doors, with kickplate on both sides.

j. Mortise deadlock strike: Center 60" above the finish floor.

k. Knob lock and knob latch strikes: Center 40-5/16" above the finish floor.

l. Roller latch strikes: Center 40-5/16" above the finish floor.

m. Panic bolt cross bars: Align in horizontal position with top and bottom bolts and rods aligned vertically. Install the center line of strike 40-5/16" above the finish floor.

n. Push bars, single: Centered 42" above the finish floor.

o. Push bars, type 476: Centered 42" above the finish floor.

p. Push plates: Centered 48" above the finish floor.

q. Roller bumpers: Install at the top of the door near the edge of the lock stile.

r. Other hardware items, not described above: Install as directed.

C. Anchoring: Anchor all components firmly into position for long life under hard use. Use only the anchoring devices furnished with the hardware item, unless otherwise specifically directed.

3.04 FIELD QUALITY CONTROL

A. Tests:

1. Upon completion of this portion of the work and prior to acceptance by the *OWNER*, make all required tests and adjustments for free and smooth operation.

2. Secure all approvals from agencies having jurisdiction.

B. Field services:

1. Supplier shall inspect the completed installation and certify that the hardware has been furnished and installed in accordance with the manufacturers' instructions and as specified. The inspection report shall identify any malfunctioning items and recommend adjustment or replacement as appropriate.

2. The representative shall prepare and submit a written report to both the *CONTRACTOR* and *ENGINEER* regarding the installation, including any conditions which might affect the manufacturer's guarantee. The equipment shall not be accepted by the *OWNER* until such time as this report has been received and accepted by the *ENGINEER*.

3.05 PROTECTION AND CLEANING

A. After installation, clean metal surfaces on both interior and exterior of all mortar, plaster, paint and other contaminants. After cleaning, protect work against damage.

3.06 FINAL ADJUSTMENT

A. Whenever hardware is installed more than one month prior to acceptance or occupancy of a space or area, return during the week prior to acceptance or occupancy and make a final check and adjustment of all hardware items in such space or area.

B. At the completion of the project, manufacturers' suppliers or representatives shall inspect their hardware and make any corrections required due to errors or improper installation.

C. Submit certification that items specified have been properly installed and are functioning properly.

3.07 HARDWARE SCHEDULE

A. Hardware Set #1

Door #1 –Lobby to Vestibule

Item	ANSI Finish	ANSI #	REMARKS
2 Hinges	710	Continuous, Gear Type, Grade 1, Heavy duty, Surface mount, By Door Mfr	
2 Exit devices	710	Type 8, Func. 08, Lever Trim	
2 Closers	695	C02021	125º Stop, full cover
2 Kick Plates	630	J102	By Door Mfr
1 Threshold	710	J35130	Barrier Free
Astragal	710	R0Y724	By Door Mfr.
Door Gasket	Bronze		Pemko S88D or equal
1 ADA Push Plate at Wall			

B. Hardware Set #2
Door #2 – Vestibule to Exterior

Item	ANSI Finish	ANSI #	REMARKS
2 Hinges	710	Continuous, Gear Type, Grade 1, Heavy duty, Surface mount, By Door Mfr	
2 Pulls & Pull Plates	710	J405	
2 Magnetic Locks	710	F08531-600	Securitron Model 34
Touch Sense bar	710		Securitron TSB-3CL-xx
2 Closers	695	C02021	90º Stop, full cover
Astragal	710	R0Y724	Brush type
2 Kick Plates	630	J102	2" LDW
1 ADA Push Plate at Wall			

****END OF SECTION****

SECTION 08 80 00
(08800)
GLAZING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Provide 1" thick insulating glazing units for exterior storefronts and doors.

2. Provide tempered glass and glazing for all interior doors and windows.

3. Provide Aluminum Infill panels for existing storefront and window system. Existing Storefront/window frame to remain and new panels to match existing panels in size thickness, color and finish

3. All glass and glazing shall be as specified herein and shown on the Plans.

B. Related work:

1. Other sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 08 11 13: Entrances*

3. *Section 08 13 14: Aluminum Framed Storefronts*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for the *GLAZING* in the prices bid for the various related items of work as designated in the Proposal.

1.02 REFERENCE STANDARDS

A. Uniform Construction Code of the State of New Jersey; N.J.A.C. 5:23.

B. International Code Council, Inc.

1. International Building Code, 2021.

C. American National Standards Institute:

1. ANSI Z 97.1, Performance Specifications and Methods of Test for Safety Glazing Material Used in Buildings.

D. Sealed Insulating Glass Manufacturers Association: Number 65-7-2, Sealed Insulating Glass Units.

E. Code of Federal Regulations:

1. 16 CFR 1201; Safety Standard for Architectural Glazing.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Shop drawings: Sections and details of glass installation at framing members.

D. Manufacturer's recommended installation procedures.

E. Samples:

1. Two 12-inch x 12-inch pieces of each type of glass.

2. Two 12-inch lengths of each type of gasket employed.

3. One bead, approximately ¼-inch wide and 3-inches long of each sealant employed, indicating color of set or cured material.

F. Certificates:

1. Manufacturer’s certification that materials meet specification requirements.

2. Installer's certification of experience.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Installer qualifications: Minimum of three (3) years experience on comparable projects.

D. Requirements of regulatory agencies: Install glass and glazing to meet requirements of all applicable codes and regulations.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Deliver glass with manufacturer's labels intact.

E. Do not remove labels until glass has been installed.

F. Keep glass free from contamination by materials capable of staining glass.

G. Deliver glazing compounds and sealants in manufacturer's unopened, labeled containers.

1.06 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Perform glazing when ambient temperature is above 40ºF.

B. Perform glazing on dry surfaces only.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Materials shall comply with the applicable listed reference standards. In case of conflict, the requirements of the more stringent standard shall govern.

D. Acceptable Fire Resistive Glass Manufacturers:

1. Pilkington.
2. Technical Glass Products.
3. SAFTI First.
4. Vetrotech Saint-Gobain North America, Inc.
5. Or equivalent.

E. All glass and glazing shall be in conformance with Chapter 24 of the International Building Code, 2021.

F. Marking: Each light shall bear the manufacturer's mark designating the type and thickness of glass. Safety glazing shall bear a permanent identifying mark issued by an *approved agency* which specifies the marking agency, whether manufacturer or installer, and the test standard. The mark shall not be omitted from tempered glass. Each unit of tempered glass shall be permanently identified by the manufacturer's mark. The identifying mark shall be etched or ceramic fired on the glass and shall be visible when the unit is glazed. Tempered spandrel glass is exempted from permanent marking, but shall be provided with a removable paper marking by the manufacturer.

G. Impact loads:

1. Individual glazed areas, including glass mirrors, in locations such as those indicated below shall pass the test requirements of CPSC 16 CFR;1201.

a. Glazing in ingress and means of egress doors except jalousies.

b. Glazing in fixed and sliding panels of sliding (patio) door assemblies and panels in swinging doors.

c. Glazing in storm doors.

d. Glazing in all unframed swinging doors.

e. Glazing in doors and enclosures for hot tubs, whirlpools, saunas, steam rooms, bathtubs and showers. Glazing in any portion of a building wall enclosing these compartments where the bottom exposed edge of the glazing is less than 60 inches (1525 mm) above a standing surface.

f. Glazing in an individual fixed or operable panel adjacent to a door where the nearest exposed edge of the glazing is within a 24-inch (610 mm) arc of either vertical edge of the door in a closed position and where the bottom exposed edge of the glazing is less than 60 inches (1525 mm) above the walking surface.

g. Glazing in an individual fixed or operable panel, other than in those locations described in preceding items e and f which meets all of the following conditions:

(1) Exposed area of an individual pane greater than 9 square feet ($0.84m^2$).

(2) Exposed bottom edge of less than 18 inches (460 mm) above the floor.

(3) Exposed top edge greater than 36 inches (915 mm) above the floor; and

(4) One or more walking surface(s) within 36 inches (915 mm) horizontally of the plan of the glazing.

h. All glazing in guards and railing regardless of area or height above a walking surface. Included are structural baluster panels and non-structural in-fill panels.

2.02 FLOAT GLASS MATERIALS

A. Materials shall comply with the applicable listed reference standards. In case of conflict, the requirements of the more stringent standard shall govern.

B. Annealed Glass: ASTM C1036, Type 1 transparent flat, Quality Q3, float glass.

1. Furnish annealed glass except where heat strengthened or tempered glass is required to meet specified performance requirements.

C. Heat Strengthened Glass: ASTM C1048, Type 1 transparent flat, Quality Q3, Kind HS heat strengthened, Condition A uncoated, float glass.

1. Furnish heat strengthened glass where annealed glass cannot meet specified performance requirements.

D. Tempered Glass: ASTM C1048, Type 1 transparent flat, Quality Q3, Kind FT full tempered, Condition A uncoated, float glass with horizontal tempering.

1. Furnish tempered glass conforming to CPSC 16 CFR 1201 at locations where safety glass is required by the International Building Code.

E. Wired glass is not permitted.

2.03 FLOAT GLASS

A. Clear Glass: Annealed, heat strengthened and tempered float glass as specified; Class 1 clear.

1. Clear annealed glass (FG-CA).

2. Clear heat strengthened glass (FG-CH).

3. Clear tempered glass (FG-CT).

4. Minimum Thickness: ¼" unless otherwise indicated.

2.04 INSULATING GLASS

A. Formed of two pieces of Type I, Class 1, Quality Q3, ¼" thick glass separated by a ½" dehydrated air space and hermetically sealed.

B. Sealed insulating units shall be certified as Class A meeting requirements of ASTM E 774 through use of test methods ASTM E 546 and E 773.

C. Low "E" films and coatings shall be applied to the #2 surface unless otherwise required by the manufacturer or approved by the *ENGINEER*.

D. Performance characteristics:

1. Transmittance:

a.	UV	35%
b.	Visible	73%
c.	Total Solar Energy	43%

2. Reflectance:

a.	Visible Light	12%
b.	Total Solar Energy	21%

3. U-Value:

   a. Winter, Nightime 0.31
   b. Summer, Daytime 0.32

4. Shading coefficient: 0.59

5. Solar heat gain coefficient: 0.51

2.05 GLAZING INFILL PANELS

A. Panel:

GlazeGuard® 250 WR as manufactured by Citadel Architectural Products

1. Composition:
   Face: .010" (min) prefinished
   textured aluminum (or) .024"
   prefinished smooth aluminum
   Core: 3/16" high density polypropylene
   Back: .010" (min) prefinished
   textured aluminum (or) .024"
   prefinished smooth aluminum

2. Thickness: 1/4" (nominal)

3. Weight: 0.61 lbs/ft² (textured skins), 1.00 lbs/ft² (smooth skins)

4. Tolera
   nce:
   Thickn
   ess:
   ±1/32"
   Length / Width: +0, -
   1/8" Squareness: 1/64"
   per lineal ft

5. Performance:
   a. Surface Burning Characteristics:
      Panel shall have a Class A rating with a Flame Spread Index less than 25, and a Smoke Developed Index less than 450. Testing shall be in accordance with ASTM E84.

B. Finish:

1. Polyester:

a. Type:
High performance, baked-on polyester coating.

b. Color:
1) As selected by Architect from manufacturer's color guide.
2) Custom color to match Architect's standard.

c. Composition:
1) Two-Coat Colors:
0.2-mil primer coat, 0.8-mil color coat

d. Performance:

1) Gloss:
Finish shall have a gloss value of 5-80 at 60°. Testing shall be in accordance with ASTM D523.

2) Pencil Hardness:
Finish shall have a value of F-2H.
Testing shall be in accordance with ASTM D3363.

3) Flexibility:
Finish shall have a value of 0-1 T-bend, no pick off. Testing shall be in accordance with ASTM D4145.

4) Reverse Impact:
Finish shall have a value of no pick off at 1500 x metal thickness. Testing shall be in accordance with ASTM D2794.

5) Salt Spray Resistance:
Finish shall have a value of No Face Blistering; None up to few #6 edge and scribe blisters when tested at 1000 hrs using 5% salt fog @ 95° F.
Testing shall be in accordance with ASTM B117.

6) Humidity Resistance:
Finish shall have a value of Passes 1000 hrs, None up to few #8 blistering using 100% relative humidity @ 95° F.
Testing shall be in accordance with ASTM D714, ASTM D2247.

7) Exterior Exposure:
Finish shall have a value of Max 8 fade and Max 6 chalk at 5 yrs @ 90°, south Florida.
Testing shall be in accordance with ASTM D2244, ASTM

D4214.

2. Polyvinylidene Fluoride (PVDF):

a. Type:
Kynar 500® coating using 70% resin.
Finish shall be in conformance with AAMA 2605.

b. Color:
1) As selected by Architect from manufacturer's color guide.
2) Custom color to match Architect's standard.

c. Composition:
1) Two-Coat Colors:
0.2-mil primer coat, 0.8-mil color coat
2) Three-Coat Colors:
0.2-mil primer coat, 0.8-mil color coat, 0.7-mil clear coat

d. Performance:
1) Gloss:
Finish shall have a gloss value of 20-35 at 60°. Testing shall be in accordance with ASTM D523.
2) Solar Reflectance:
Finish shall have a value of >25% initial, >15% after 3 years for Steep Slope and a value of >65% initial, >50% after 3 years for Low Slope.
Testing shall be in accordance with ASTM E903.
1) Emissivity:
Finish shall have a value of 0.80 (80%) min. Testing shall be in accordance with ASTM C1371.
2) Pencil Hardness:
Finish shall have a value of F-2H.
Testing shall be in accordance with ASTM D3363.
3) Flexibility:
Finish shall have a value of 0-2 T-bend, no pick off. Testing shall be in accordance with ASTM D4145.
4) Adhesion:
Finish shall have a value of No Adhesion Loss. Testing shall be in accordance with ASTM D3359.
5) Reverse Impact:
Finish shall have a value of No Cracking Or Adhesion Loss. Testing shall be in accordance with ASTM D2794.

6) Abrasion:
Finish shall have a value of 65-85 l/mil.
Testing shall be in accordance with ASTM D968.

7) Mortar Resistance:
Finish shall have a value of No Effect.
Testing shall be in accordance with ASTM C267.

8) Detergent Resistance:
Finish shall have a value of No Effect
using 3% detergent @ 100 F° (72 hrs).
Testing shall be in accordance with ASTM D2248.

9) Acid Resistance:
Finish shall have a value of No Effect using
10% muriatic acid (24 hrs) and No Effect
using 20% sulfuric acid (18 hrs). Testing
shall be in accordance with ASTM D1308.

10) Acid Rain:
Finish shall have a value of No
Objectionable Color Change after 15 cycle
min.
Testing shall be in accordance with Kesternich SO2, DIN 50018.

11) Alkalai Resistance:
Finish shall have a value of No Effect
using 10%, 25% NaOH (1 hr).
Testing shall be in accordance with ASTM D1308.

12) Salt Spray Resistance:
Finish shall have a value of No Face Blistering;
Max average 1/16" scribe creep, passes 4000 hrs
using 5% salt fog @ 95° F. Testing shall be in
accordance with ASTM B117.

13) Humidity Resistance:
Finish shall have a value of Passes 4000 hrs,
No #8 blisters using 100% relative humidity
@ 95° F.
Testing shall be in accordance with ASTM D714, ASTM D2247.

14) Exterior Exposure:
Finish shall have a value of Max 5 fade and
Max 8 chalk at 10 yrs @ 45°, south Florida.
Testing shall be in accordance with ASTM D2244, ASTM D4214.

3. Anodized:

a. Type:

AA-C22-A21 (clear)
AA-C22-A23 (colored)

b. Color:
As selected by Architect from manufacturer's color guide.

c. Composition:
1) Anodized (clear):
barrier, aluminum oxide, nickel/hydrate seal
2) Anodized (colored):
barrier, aluminum oxide, colorant, nickel/hydrate seal

d. Performance:
1) Salt Spray Resistance:
Testing shall be in accordance with ASTM B117.
2) Acid Dissolution:
Testing shall be in accordance with ASTM B680.
3) Gloss:
Testing shall be in accordance with ASTM D523.
4) Coating Mass:
Testing shall be in accordance with ASTM B137.

B. Accessories:

1. Extrusions:

a. Shall conform with ASTM B211 and the manufacturer's recommendations.
b. Shall be applied in accordance with the panel manufacturer's installation guidelines.

2. Sealants:

a. Selected from the panel manufacturer's approved list of sealants.
b. Shall be applied in accordance with both the panel manufacturer's installation guidelines and the sealant manufacturer's recommendations.

3. Fasteners:

a. Selected by contractor to suit project requirements.
b. Shall be applied using the recommended fastener schedule in accordance with panel manufacturer's installation guidelines.
c. Shall be coated to prevent corrosion and/or reaction with other materials.
d. Shall be concealed except where unavoidable. Exposed fasteners shall be finished to match adjoining metal.

4. Flashing:

a. Selected by contractor to suit project requirements.
b. Shall be installed in such a manner to maintain the integrity of the wall system against moisture intrusion.

2.05 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Check that glazing channels are free of burrs, irregularities, and debris.

D. Check that glass is free of edge damage or face imperfections.

E. Do not proceed with installation until conditions are satisfactory.

3.02 PREPARATION

A. Field measurements:

1. Measure size of frame to receive glass.

2. Compute actual glass size, allowing for edge clearances.

B. Preparation of surfaces:

1. Remove protective coatings from surfaces to be glazed.

2. Clean glass and glazing surfaces to remove dust, oil and contaminants, and wipe dry.

3.03 INSTALLATION

A. Apply primer-sealer to joint surfaces.

B. Positioning glass: Orient pattern, and draw of glass pieces in same direction.

C. Do not cut, seam, nip, or abrade tempered, heat strengthened, coated, or insulating glass.

D. Sealant glazing:

1. Install spacers in channel.

2. Install filler rod in channel.

3. Apply sealant to back and bottom of rabbet.

4. Bed glass in position, centered vertically and horizontally, with glazing points or clips.

5. Apply sealant to face with sufficient force to eliminate voids.

6. Trim sealant to form water shed sloping away from glass.

E. Tape glazing:

1. Cut glazing tape to length and set against permanent stops.

2. Remove paper backing from tape.

3. Position glass and press against tape for full contact.

4. Place glazing tape on free perimeter of glass.

5. Seal butt joints of tape with joint sealant.

6. Install removable stop, avoiding displacements of tape, and exert pressure on tape for full continuous contact.

F. Gasket Glazing:

1. Cut gasket to length of channel without stretching.

2. Cut lock strips 1/8 inch (3 mm) longer than gaskets.

3. Apply gasket to outside fixed edge of rabbet perimeter.

4. Place setting blocks at quarter points of sill rabbet.

5. Place glass on setting blocks and center horizontally.

6. Apply gaskets to inside stop, mitering corners.

7. Force locking strip into position in gasket channel.

G. Infill Panels

1. Glazing and/or curtain wall assembly shall be installed in accordance with the manufacturer's written installation guidelines and the approved set of shop drawings.

2. Erect glazing and/or curtain wall assembly level and true to the intended plane.

3. Maximum deviation from vertical and horizontal alignment of erected glazing and/or curtain wall assembly shall be no more than 1/4" in 20'-0".

4. Maximum deviation in panel flatness shall be 0.6% of the assembled units.

5. Seal all joints as required using methods and materials as recommended by the panel manufacturer.

3.04 CLEANING

A. Remove excess glazing compound from installed glass.

B. Remove labels from glass surface as soon as installed.

C. Wash and polish both faces of glass.

D. Remove debris from work site.

3.05 PROTECTION OF COMPLETE WORK

A. Attach crossed streamers away from glass face.

B. Do not apply markers to glass surface.

C. Replace damaged glass.

****END OF SECTION****

SECTION 08 83 13

MIRRORS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Stainless Steel framed tempered glass mirrors

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 08 80 00: Glazing*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for the work of this section in the prices bid for the various related items of work as designated in the Proposal.

1.02 REFERENCE STANDARDS

A. Uniform Construction Code of the State of New Jersey; N.J.A.C. 5:23.

B. International Code Council, Inc.

1. International Building Code, New Jersey edition

C. American National Standards Institute:

1. ANSI Z97.1, Performance Specifications and Methods of Test for Safety Glazing Material Used in Buildings.

D. Code of Federal Regulations:

1. 16 CFR 1201; Safety Standard for Architectural Glazing.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Manufacturer's recommended installation procedures.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance: The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.06 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. Furnish five-year warranty to include coverage for reflective coating on mirrors and replacement of same.

C. The *CONTRACTOR* and/or manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Do not install glazing when ambient temperature is less than 50 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing sealants.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded

as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 COMPONENTS

A. Tempered Safety Mirror Glass: ASTM C1048, Kind FT fully tempered, Type 1 transparent flat, Class 1 clear, Quality q1 mirror select; type with copper and silver coating, and organic overcoating.

1. Edges: Squared.
2. Thickness: Minimum 1/4 inch unless otherwise indicated.
3. Size: Sizes noted on Drawings.

2.03 OTHER MATERIALS

A. Elastomeric Glazing Sealant: Materials compatible with mirrors and adjacent materials.

1. Silicone Sealant: ASTM C920, Type S, Grade NS, Class and Use as recommended by manufacturer for mirror installation; single component; solvent curing; capable of water immersion without loss of properties; non-bleeding, non-staining, cured Shore A hardness of 15 to 25.

   a. Color: As selected.

2. Polysulfide Sealant: ASTM C920, Type M, Grade NS, Class and Use as recommended by manufacturer for mirror installation; two component; chemical curing, non-sagging type; cured Shore A hardness of 15 to 25.

   a. Color: As selected.

3. Polyurethane Sealant: ASTM C920, Type S, Grade NS, Class and Use as recommended by manufacturer for mirror glazing; single component, chemical curing, non-staining, non-bleeding, Shore A Hardness Range 20 to 35.

   a. Color: As selected.

C. Edge Sealer: Coating compatible with glass coating and approved by mirrored

glass manufacturer for use in protecting against silver deterioration at mirrored glass edges.

D. Setting Blocks: Neoprene, 70 to 90 Shore A hardness.

E. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness, self adhesive on one face.

F. Mirror Mastic: An adhesive setting compound, produced specifically for setting mirrored glass by spot application, certified by both mirrored glass manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrored glass will be installed.

1. Acceptable manufacturers:

a. Gunther Mirror Mastics.
b. Palmer Products Corporation.
c. Or equivalent

G. Mirror Top and Bottom Clips: Aluminum channel secured to walls, sized as required for loading from mirrors. Finish to be clear anodized aluminum. Provide additional finish trim design where indicated on drawings.

H. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

I. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

J. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General: Install mirrors to comply with printed directions of mirror manufacturer, and with referenced FGMA standard and NAMM document. Mount mirrors in place to avoid distorting reflected images and provide space for air circulation between back of mirror and face of mounting surface.

B. Mastic spot installation system: Install mirrors with mastic as follows:

1. Identify and examine surfaces over which mirror is to be mounted. Comply with manufacturer's printed installation directions for preparation of mounting surfaces including coating surfaces with mastic manufacturer's special bond coating where applicable.

2. Apply barrier coat to mirror backing where approved by manufacturers of mirror and backing material.

3. Apply mastic in spots to comply with mastic manufacturer's printed directions for coverage and to allow air circulation between back of mirror and face of mounting surface.

4. After mastic is applied, align mirror and press into place while maintaining a minimum air space of 3/16 inch between back of mirror and mounting surface.

5. For wall-mounted mirrors install permanent means of support at bottom and top edges with bottom support designed to withstand mirror weight and top support to prevent mirror from coming away from wall along top edges.

    a. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable.

    b. For continuous bottom supports, provide 1/8-inch by 4-inch setting blocks at quarter points. For channels or other continuous supports in which water could be trapped, provide two 1/4-inch diameter weeps drilled between setting blocks.

c. For wall application provide clips along top of mirror.

3.03 PROTECTION AND CLEANING

A. Protect mirrored glass from breakage and contaminating substances resulting from construction operations.

B. Do not permit edges of mirror to be exposed to standing water.

C. Maintain environmental conditions that will prevent mirror from being exposed to moisture from condensation or other sources for continuous periods of time.

D. Wash mirrors not more than four (4) days prior to date scheduled for inspections intended to establish date of Substantial Completion. Wash glass by methods recommended in NAMM document and by mirrored glass manufacturer. Use water or glass cleaners free from substances capable of damaging mirror edges or glass coating.

****END OF SECTION****

SECTION 08 91 19
(10210)
FIXED LOUVERS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Fixed wall or storefront/window intake louvers with all accessories.

B. Related Work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 05 50 00: Metal Fabrications*

3. *Section 07 62 00: Flashing and Sheet Metal*

4. *Section 07 92 13: Sealants and Caulking*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for the *FIXED LOUVERS* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required to demonstrate compliance with the specified requirements.

C. Shop drawings showing precise dimensions of the work of this section, and all other data needed to ensure proper installation.

D. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable Manufacturers

1. Pottorff
   Fort Worth, TX
   Tel: (817) 509-2300

2. Greenheck
3. Arrow United Industries
4. Airline Products Co.
5. Construction Specialties Inc.
6. Or equivalent.

2.02 FIXED ALUMINUM LOUVERS

A. Louver shall be Model EFD-437 by Pottorf or equivalent

B. Construction:

1. Material: 6063-T5 extruded aluminum, color and finish to match the storefront/window.

2. Frame: 4" deep x 0.081" thick (102 mm x 2 mm) channel.

3. Blades: 37½° x 0.081" (2 mm) thick Horizontal drainable style.

4. Screen: ½" x 0.063" (12.7 mm x 1.6 mm) expanded and flattened aluminum.

5. Mullion: Visible.

C. Performance Data:

1. Based on testing 48 inch x 48 inch (1222 mm x 1222 mm) size unit in accordance with AMCA 500L.

a. Free Area: 58.1% nominal

b. Free area size: 9.3 ft^2 (0.86 m^2)

c. Maximum Recommended Air Flow thru Free Area: 903 fpm (4.58 m/s).

d. Air Flow: 8,398 cfm (3.96 m^3/s).

e. Maximum Pressure Drop: 0.13 in. wg. (32 Pa).

f. Water penetration: Maximum of 0.01 ounces per square foot (3.1 g/m^2) of free area at an air flow of 903 fpm (4.58 m/s) free area velocity when tested for 15 minutes.

g. AMCA Seal: Product must be licensed to bear the AMCA Certified Ratings Seal for Water and Air Performance.

D. Design Load:

1. Wind Load: Louver designs shall withstand the effects of 30 psf (1.44 kPa) of uniform pressure acting inward or outward.

2. Seismic Performance: Louvers, including attachments to other construction, shall withstand seismic effects determined by ASCE-7.

E. Accessories

1. Blank-Off Panels

a. Insulated, aluminum skin with 1-Inch (25 mm) insulated core, closure frame with perimeter gasket, black finish, and factory installed.

2. Extended sills, aluminum, 0.050-inch (1.27 mm) nominal thickness, finished to match louver.

F. Finishes

1. Finish louvers after assembly as follows:

b. High Performance Fluoropolymer: Complying with AAMA 2605 and containing not less than 100 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions. Color and Gloss: as selected by Architect from manufacturer's full range.

2.03 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General: Install the work of this section in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

B. Install sill flashing as shown and in accordance with *Section 07 62 00, Flashing and Sheet Metal*.

C. Install the louver in the opening with the exterior face of the louver flush with exterior surface of wall.

D. Caulk the perimeter of the louver at the junction of the wall, applied as recommended by the manufacturer. Allow room for expansion and contraction without damage to the caulking.

E. Painting: Marred or abraded surfaces shall be cleaned and refinished in accordance with manufacturer's recommendations.

3.03 CLEANING

A. Clean exposed surface of all grease, dirt and other foreign materials.

B. Touch up all marred or abraded surfaces in accordance with manufacturer's directions.

****END OF SECTION****

SECTION 09 21 16
(09260)
GYPSUM WALLBOARD SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Gypsum drywall and accessories.

2. Provide finish for all gypsum board in accordance with the Gypsum Wallboard Finish Schedule.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 05 40 00: Cold Formed Metal Framing*

3. *Section 06 20 00: Carpentry*

4. *Section 09 90 00: Painting*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *GYPSUM WALLBOARD SYSTEM* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Shop drawings:

1. Typical gypsum board installation showing corner details, edge trim details and the like.

2. Typical sound rated assembly, showing treatment at perimeter of partitions and penetrations at gypsum board.

3. Typical shaft wall assembly.

4. Typical fire rated assembly and column fireproofing indicating details of construction same as that used in fire rating test.

D. Samples: For the following products:

1. Trim Accessories: Full-size sample in 12-inch length for each trim accessory.

E. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Regulatory requirements:

1. Where fire-resistance-rated gypsum board assemblies are indicated, provide gypsum board assemblies that comply with design designations in UL "Fire Resistance Directory" or in the listing of another testing and inspecting agency acceptable to authorities having jurisdiction.

2. Gypsum board assemblies shall have been tested for fire resistance according to ASTM E119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

3. Top runner in fire-resistance-rated assemblies shall be labeled and listed by UL, or another testing and inspection agency acceptable to authorities having jurisdiction.

D. Basis of acceptance:

1. The manufacturer's installation instructions, as approved by the *ENGINEER*, will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage:

1. Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use.

2. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

3. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum panels flat to prevent sagging.

4. Stack wallboard so that long lengths are not over short lengths.

5. Avoid overloading floor system.

6. Store adhesives in dry area, provide protection against freezing at all times.

1.05 PROJECT CONDITIONS

A. General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C840 requirements or gypsum board manufacturer's recommendations, whichever are more stringent.

B. Room temperatures:

1. For non-adhesive attachment of gypsum board to framing, maintain not less than 40 degrees F (4 degrees C).

2. For adhesive attachment and finishing of gypsum board, maintain not less than 50 degrees F (10 degrees C) for 48 hours before application and continuously after until dry.

3. Do not exceed 95 degrees F (35 degrees C) when using temporary heat sources.

C. Ventilation:

1. Provide ventilation during and following adhesives and joint treatment applications.

2. Use temporary air circulators in enclosed areas lacking natural ventilation.

3. Under slow drying conditions, allow additional drying time between coats of joint treatment.

4. Protect installed materials from drafts during hot, dry weather.

D. Protection: Protect adjacent surfaces against damage and stains.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 GYPSUM WALLBOARD

A. Regular board: ASTM C1396, 1/2" or ⅝" thick as shown.

B. Fire-rated board: ASTM C36, Type "X", ⅝" thick (water resistant where shown).

C. Water resistant board: ASTM C630, Regular or Type "X", ½" thick or ⅝" thick as required.

D. Abuse resistant board: ASTM C1629; Level 2, Moderate Duty

E. High Impact Board: ASTM C1629; Level 3, Heavy Duty

2.03 MOLD RESISTANT WALLBOARD

A. Fiberglass-Mat Faced Gypsum Board:
   1. Thickness: 1/2 inch.
   2. Width: 4 feet.
   3. Length: 8 feet - 12 feet.
   4. Weight: 2.02 pounds per square foot.
   5. Edges: Tapered.
   6. Surfacing: Coated fiberglass mat on face, back, and long edges.
   7. Flexural Strength, Parallel (ASTM C473, ASTM C1658): Not less than 80 lbf.
   8. Flexural Strength, Perpendicular (ASTM C473, ASTM C1658): Not less than 100 lbf.
   9. R-Value (ASTM C518): Not less than 0.56.

10. Nail Pull Resistance (ASTM C473, ASTM C1658): Not less than 80 lbf.
11. Humidified Deflection (ASTM C473, ASTM C1658): Not more than 1/4 inch.
12. Hardness, Core, Edges, and Ends (ASTM C473, ASTM C1396): Not less than 15.
13. Water Absorption (ASTM C630, ASTM C1396, ASTM C1658): Less than 5 percent of weight.
14. Mold Resistance (ASTM D3273): 10, in a test as manufactured.
15. Microbial Resistance (ASTM D6329, EPA 12-week protocol): Will not support microbial growth.
16. Acceptable Products:
    a. ½" Georgia-Pacific "DensArmor Plus Interior Panel"
    b. ½" Georgia-Pacific "DensArmor Plus Fireguard C."
    c. ½" Gold Bond "eXP® Interior Extreme"
    d. ½" Temple-Inland "GreenGlass"
    e. ½" USG Sheetrock "Mold Tough"

B. Fire-Rated Fiberglass-Mat Faced Gypsum Board:
1. Thickness: 5/8 inch.
2. Width: 4 feet.
3. Length: 8 feet.
4. Weight: 2.5 pounds per square foot.
5. Edges: Tapered.
6. Surfacing: Coated fiberglass mat on face, back, and long edges.
7. Flexural Strength, Parallel (ASTM C473, ASTM C1658): Not less than 100 lbf.
8. Flexural Strength, Perpendicular (ASTM C473, ASTM C1658): Not less than 140 lbf.
9. R-Value (ASTM C518): Not less than 0.67.
10. Nail Pull Resistance (ASTM C473, ASTM C1658): Not less than 90 lbf.
11. Humidified Deflection (ASTM C473, ASTM C1658): Not more than 1/8 inch.
12. Hardness, Core, Edges, and Ends (ASTM C473, ASTM C1396): Not less than 15.
13. Water Absorption (ASTM C630, ASTM C1396, ASTM C1658): Less than 5 percent of weight.
14. Mold Resistance (ASTM D3273): 10, in a test as manufactured.
15. Microbial Resistance (ASTM D6329, EPA 12-week protocol): Will not support microbial growth.
16. Acceptable Products:
    a. 5/8" Georgia-Pacific "DensArmor Plus Fireguard"
    b. 5/8" Georgia-Pacific "DensArmor Plus Fireguard C"
    c. 5/8" Gold Bond "eXP® Interior Extreme," Type X.
    d. 5/8" Temple-Inland "GreenGlass," Type X.
    e. 5/8 USG Sheetrock "Mold Tough" Type X

2.03 FRAMING

A. For non-load bearing construction: ASTM C645, galvanized.

B. For load bearing construction: Section 05 40 00.

2.04 FASTENERS

A. Self-drilling, self-tapping, bugle head, for use with power driven tool.

1. ASTM C-1002:

a. Type G, wallboard to wallboard, 1½" long (minimum)

b. Type S, wallboard to steel framing, 1" long (minimum)

c. Type W, wallboard to wood framing, 1¼" long (minimum)

2.05 TRIM

A. Trim features: Provide hot-dip galvanized 0.55 mm (0.0217") nominal thickness (26 gauge).

B. Casing beads: Channel shaped with concealed wing not less than 22 mm (⅞") wide, and an exposed wing.

C. Corner beads: Provide angle shaped with wings not less than 22 mm (⅞") wide and perforated for nailing and joint treatment, or with combination metal and paper wings, bonded together, not less than 32 mm (1¼") wide and suitable for joint treatment.

D. Edge beads for use at perimeter of ceilings shall be angle shaped with wings not less than 19mm (¾") wide. Concealed wing shall be perforated for nailing and exposed wing shall be folded flat. Exposed wing may be factory finished in a white color.

E. Control joints: Roll-formed zinc with ¼" open slot protected by plastic tape removed after finishing.

2.06 JOINTING SYSTEM

A. The jointing system shall include reinforcing tape and compound designed as a system to be used together and shall be only as recommended by the manufacturer of the gypsum wallboard used. Jointing compound may be used for finishing if so recommended by the manufacturer.

2.07 JOINTING MATERIALS

A. Tape: ASTM C475, perforated, paper.

B. Joint compound: ASTM C475, setting type.

1. Georgia Pacific - Tough Rock Setting compound
2. CertainTeed - Fibatape & ProRoc Setting compound
3. National Gypsum - ProForm 45 or ProForm 90 Setting compound
4. USG - Sheetrock Durobond 45 or Durobond 90 Setting compound

C. Water: Potable

2.08 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and operable installation of the work of this section, shall be new, first quality of their respective kinds, and subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 PREPARATION

A. Inspection:

1. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

2. Verify that gypsum drywall may be installed in strict accordance with all pertinent codes and regulations, the manufacturer's recommendations and the original design.

B. Discrepancies: Do not install gypsum drywall until all unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. General:

1. Framing:

a. Install framing in accordance with ASTM C754, "Specification for Installation of Steel Framing Members to Receive Screw Attached Gypsum Wallboard"; except that studs shall be spaced 16" o.c.

b. Install "Blocking" for all wall mounted equipment, accessories, and hardware shown or specified.

2. Wall board:

a. Install Gypsum Board in accordance with ASTM C840, Specification for Application and Finishing of Gypsum Board.

b. Install the gypsum wallboard with the separate boards in moderate contact but not forced into place. At internal and external corners, conceal the cut edges of the board by the overlapping covered edges of the abutting boards. Stagger the boards so that corners of any four boards will not meet at a common point except in vertical corners.

B. Ceilings: Install the gypsum wallboard to ceilings with the long dimension of the wallboard at right angles to the supporting members, except that wallboard may be installed with the long dimension parallel to supporting members that are spaced 40 cm (16") on center when attachment members are provided at end joints.

C. Walls: Install the gypsum wallboard to studs at right angles to the furring or framing members. Make end joints, where required, over furring or framing members.

D. Attaching: Drive the specified screws with clutch-controlled power screwdrivers, spacing the screws 25 cm (12") on centers at ceilings and 40 cm (16") on centers at walls, except that where framing members are spaced 50 cm (25") apart on walls screw spacing shall be 25 cm (12") on centers.

E. Access doors: By careful coordination with the drawings, install the specified access doors where required, anchoring firmly into position for long life under hard use aligning properly to achieve an installation flush with the finished gypsum drywall surface.

3.03 JOINT TREATMENT

A. General:

1. Inspect all areas to be joint treated, ascertaining that the gypsum wallboard fits snugly against supporting framework.

2. In areas where joint treatment and compound finishing will be performed, maintain a temperature of not less than 55 degrees F. for 24 hours prior to commencing treatment, for the entire period of treatment, and until joint and finishing compounds have dried.

3. Apply the joint treatment and finishing compound by machine or hand tool.

4. Provide a minimum drying time of 24 hours between coats, with additional drying time in poorly ventilated areas.

B. Apply finishing compound as specified herein in accordance with the required finish level.

1. Embedding compound: Apply to gypsum wallboard joints and fastener heads in a thin uniform layer. Spread the compound not less than 3" wide at joints, center the reinforcing tape in the joint, and embed the tape in the compound. Then spread a thin layer of compound over the tape. After this treatment has dried, apply a second coat of embedding compound to joints and fastener heads, spreading in a thin uniform coat to not less than 6" wide at joints, and feather edged. When thoroughly dry, sandpaper to eliminate ridges and high points.

2. Finishing compound: After embedding compound is thoroughly dry and has been completely sanded, apply a coat of finishing compound to all joints and fastener heads. Feather the finishing compound to not less than 12" wide. When thoroughly dry, sandpaper to obtain uniformly smooth surfaces, taking all necessary care to not scuff the paper surface of the wallboard.

C. Levels of gypsum board finish:

1. Level 1: All joints and interior angles shall have tape embedded in joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable.

2. Level 2: All joints and interior angles shall have tape embedded in joint compound and one separate coat of joint compound applied over all joints, angles, fastener heads, and accessories. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable.

3. Level 3: All joint and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. All joint compound shall be smooth and free of tool marks and ridges.

4. Level 4: All joints and interior angles shall have tape embedded in joint compound and three separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. All joint compound shall be smooth and free of tool marks and ridges.

5. Level 5: All joints and interior angles shall have tape embedded in joint compound and three separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. A thin skim coat of joint compound, or a material manufactured especially for this purpose, shall be applied to the entire surface. The surface shall be smooth and free of tool marks and ridges.

3.04 CORNER TREATMENT

A. Internal corners: Treat as specified for joints, except that the reinforcing tape shall be folded lengthwise through the middle and fitted neatly into the corner.

B. External corners:

1. Install a corner bead fitting neatly over the corner and secured with the same type fasteners used for applying the wallboard, spacing the fasteners approximately 6" on centers and driving through the wallboard into the framing or furring member.

2. After the corner piece has been secured into position, treat the corner with joint compound and reinforcing tape as specified for joints, feathering the joint compound out from 8" to 10" on each side of the corner.

3.05 CONTROL JOINTS

A. Control joints shall be either manufactured devices designed for this purpose or field fabricated from suitable materials.

1. Apply over face of gypsum board where specified or shown. Cut to length with a fine-toothed hacksaw (32 teeth per in.). Cut end joints, square, butt together and align to provide neat fit. Attach control joint to gypsum board with 9/16" Type G staples, or equivalent, spaced 6" o.c. max. along each flange. Remove plastic tape after finishing with joint compound.

B. Control joints shall be installed where specified herein or indicated on the plans. Full height door frames shall be considered equivalent to a control joint.

C. Control joints shall be provided where any of the following conditions exist.

1. A control joint shall be installed where a partition, wall, or ceiling traverses a construction joint (expansion, seismic, or building control element) in the base building structure.

2. Control joints shall be installed where a wall or partition runs in an uninterrupted straight plane exceeding 30 linear feet.

3. Control joints in interior ceilings with perimeter relief shall be installed so that linear dimensions between control joints do not exceed 50 ft and total area between control joints does not exceed 2500 sq ft.

4. Control joints in interior ceilings without perimeter relief shall be installed so that linear dimensions between control joints do not exceed 30 ft and total area between control joints does not exceed 900 sq ft.

5. Control joints in exterior ceilings and soffits shall be installed so that linear dimensions between control joints do not exceed 30 ft and total area between control joints does not exceed 900 sq ft.

6. A control joint or intermediate blocking shall be installed where ceiling framing members change direction.

7. Control joints shall be installed where specified by the architect or designer as a design accent or architectural feature.

D. Where a control joint occurs in an acoustical or firerated system, blocking shall be provided behind the control joint by using a backing material such as 5⁄8 in. Type X gypsum board, mineral fiber, or other tested equivalent.

E. Isolation joints:

1. Where gypsum board construction intersects structural components, provide isolation by stopping board a minimum of 1/4 inch from structure, for finishing by means of exposed or semi-exposed trim.

3.06 OTHER METAL TRIM

A. General: The drawings do not purport to show all locations and all requirements for metal trim in connection with the work of this section. Carefully study the drawings and the installation; provide in place all metal trim normally recommended by the manufacturer of the gypsum wallboard used.

B. Installation: Install the metal trim in strict accordance with the manufacturer's recommended methods of installation, providing not less embedment and finishing than specified above for corner treatment.

3.07 CLEANING UP

A. In addition to the requirements of *Section 01 74 00, Cleaning and Restorations* of these Specifications, use all necessary care during execution of this portion of the work to prevent scattering of gypsum wallboard scraps and dust and to prevent tracking of joint and finishing compound onto floor surfaces. At completion of each segment of installation in a room or space, promptly pick up and remove from the working area all scraps, debris, and surplus material of this section.

3.08 GYPSUM BOARD FINISH SCHEDULE

LOCATION	**FINISH LEVEL**
Plenums	Level 1
Tile Backer Board	Level 2
Storage Rooms	Level 3
Utility Rooms	Level 3
Closets	Level 3
Mechanical Rooms	Level 3
Generator Rooms	Level 3
Offices	Level 5
Corridors	Level 5
Laboratories	Level 5

Lunch Rooms	Level 5
Rest Rooms	Level 4
Meeting Rooms	Level 5

****END OF SECTION****

SECTION 09 28 00

CEMENT BOARD

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Cement board and accessories.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 06 20 00: Carpentry*

3. *Section 09 21 16: Gypsum Wallboard System*

4. *Section 09 30 13: Ceramic Tile*

C. References:

1. American National Standards Institute (ANSI):

a. A108.11: American National Standard for Interior Installation of Cementitious Backer Units.

b. A118.1: American National Standard Specifications for Dry-Set Portland Cement Mortar.

c. A118.4: American National Standard Specifications for Latex-Portland Cement Mortar.

d. A118.9: Test Methods and Specifications for Cementitious Backer Units.

e. A136.1: American National Standard Specifications for Organic Adhesives for Installation of Ceramic Tile.

2. American Society for Testing and Materials (ASTM):

a. C 473: Test Methods for Physical Testing of Gypsum Panel Products.

b. C 1325: Specification for Fiber-Mat Reinforced Non-Asbestos Cement Interior Substrate Sheets.

c. C 1002: Specification for Steel Drill screws for the Application of Gypsum Panel Products or Metal Plaster Bases.

d. D 2394: Methods for Simulated Service Testing of Wood and Wood-Based Finish Flooring.

D. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *CEMENT BOARD* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Shop drawings showing precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provision in concrete forming, reinforcement, and placement to accommodate the work of this section.

D. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance: The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

1.07 MAINTENANCE

A. Spare parts and materials:

1. Comply with provisions of *Section 01 78 45, Spare Parts and Maintenance Materials*.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers:

1. National Gypsum Company
   a. Cement Board:

(1) Tile Backer: PermaBase® Brand Cement Board
(2) Bendable Backer Board: PermaBase Flex® Brand Cement Board
(3) Underlayment: PermaBase Brand Underlayment
(4) Exterior Sheathing: PermaBase Brand Cement Brand

2. Or equivalent.

2.02 MATERIALS

A. Cement Board.

1. Backer Board: Cementitious, water durable, board; surfaced with fiberglass reinforcing mesh on front and back; long edges wrapped; and complying with ANSI A118.9 and ASTM C 1325 (PermaBase Brand Cement Board).

a. Thickness: ½ in., 5/8 in.
b. Width: 2 ft. 8 in., 3 ft., or 4 ft.
c. Length: 4 ft., 5 ft., 6 ft., or 8 ft.
d. Edges: Tapered.
e. Compressive Strength: Not less than 2250 lbs. per sq. in. when tested in accordance with ASTM D 2394.
f. Water Absorption: Not greater than 8 percent when tested for 24 hours in accordance with ASTM C 473.

2. Bendable Backer Board: Cementitious, water durable, board; surfaced with fiberglass reinforcing mesh on front and back; long edges wrapped; and complying with ANSI A118.9 (PermaBase Flex BRAND Cement Board).

a. Thickness: ½ in.
b. Width: 4 ft.
c. Length: 8 ft.
d. Edges: Tapered.
e. Compressive Strength: Not less than 2250 lbs. per sq. in. when tested in accordance with ASTM D 2394.
f. Water Absorption: Not greater than 8 percent when tested for 24 hours in accordance with ASTM C 473.

3. Underlayment: Cementitious, water durable, board; surfaced with fiberglass reinforcing mesh on front and back; long edges wrapped; and complying with ANSI A118.9 and ASTM C 1325 (PermaBase BRAND Cement Board Underlayment).

   a. Thickness: 1/4 in.
   b. Width: 3 ft. or 4 ft.
   c. Length: 4 ft. or 5 ft.
   d. Edges: Tapered.
   e. Compressive Strength: Not less than 2250 lbs. per sq. in. when tested in accordance with ASTM D 2394.
   f. Water Absorption: Not greater than 8 percent when tested for 24 hours in accordance with ASTM C 473.

4. Fasteners:

   a. Nails: 1½ in. long, hot dipped galvanized, and in accordance with FS FF-N-105B, Type 2, Style 20.
   b. Screws: Hi-Lo thread screws (No. 8) wafer head, corrosion-resistant, 1¼ in. or 1⅝ in. long, and complying with ASTM C 1002.
   c. Screws: Drill point screws (No. 8) wafer head, corrosion-resistant, 1¼ in. or 1⅝ in. long, and complying with ASTM C 1002.

5. Joint Treatment:

   a. Tape: Alkali-resistant fiberglass mesh tape intended for use with cement board.

6. Bonding Materials:

   a. Mortar: Dry-set portland cement mortar in accordance with ANSI A118.1.
   b. Mortar: Latex-portland cement mortar in accordance with ANSI A118.4.
   c. Adhesive: Organic adhesive in accordance with ANSI A136.1, Type 1.

2.03 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of

the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Cleaning: Immediately prior to installation of the work of this section, thoroughly clean all substrata and remove all oil, grease, paint, varnish, hardeners, and other items which would adversely affect the bond of adhesive.

B. Smoothing: Make all substrata level and free from irregularities. Assure one constant floor height after carpet is installed, grinding high spots and filling low spots as required.

3.03 INSTALLATION

A. General: Install the work of this section in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1. In accordance with the following reference standards and manufacturer's recommendations: ANSI A108.11.

3.04 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Remove and dispose of all debris.

3.04 TESTS

A. Upon completion of this portion of the work and prior to acceptance by the *OWNER*, make all required tests and adjustments for free and smooth operation.

B. Secure all approvals from agencies having jurisdiction.

3.05 INSTRUCTIONS

A. The manufacturer's representative shall instruct the *OWNER'S* operating personnel, at a time designated by the *OWNER*, as to the proper method of operation and recommended maintenance procedures.

B. The scheduling of the instruction shall be at the convenience of the *OWNER* and may not coincide with the start-up inspection.

****END OF SECTION****

SECTION 09 30 13
(09310)
CERAMIC TILE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Ceramic tile and accessories.

2. Cleaning ceramic tile floors and walls.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 07 92 13: Sealants and Caulking*

3. *Section 09 28 00: Cement Board*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for the *CERAMIC TILE* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

3. Submit data on proposed tile cleaning agents.

C. Shop drawings showing location of all seams and location and types of all accessories.

D. Samples of the full range of colors and patterns of tile and of exposed accessories available from the proposed manufacturers in the specified qualities.

E. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. All tile shall be of domestic manufacture, shall equal or exceed the Standard Grade requirements of ANSI A137.1 and Federal Specification SS-T-308c; and shall be the products of the DAL Tile or equivalent. Upon request, the manufacturer will issue a Master Grade Certificate stating grade, type and quantity of material.

2.02 TILE

A. Ceramic Floor Tile:

1. Manufacturers:

a. American Olean Corporation
b. Dal-Tile Corporation
c. Or equivalent

2. Composition: Ceramic

3. Face Size: 11-13/16 by 11-13/16 inches

4. Thickness: ¼ inch

5. Dynamic Coefficient of Friction: Not less than 0.42

6. Glaze: Mat, opaque

7. Tile Color and Pattern: Skybridge Glazed Ceramic floor tile - 12"x 12", as selected by Architect from manufacturer's full range.

8. Grout Color: As selected by Architect from manufacturer's full range, to match tile color.

9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable, and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes.

   a. Base Cove: Cover, module size 4".
   b. Base Cap: Surface bullnose module size, 4".
   c. Wainscot Cap: Surface bullnose module size 3".
   d. External Corners: Surface bullnose module size 3" x 3".
   e. Internal Corners: Cover, module size 4" x 4".
   f. Tapered Transition Tile: Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide reduction in thickness from 12.7 to 6.4 mm (½ to ¼ inch) across nominal 100-mm (4-inch) dimension.

B. Ceramic Glazed Wall Tile:

1. Manufacturers:

   a. American Olean Corporation
   b. Dal-Tile Corporation
   c. Or equivalent

2. Module Size: 4"x 8"

3. Face Size Variation: Rectified

4. Thickness: 8 mm (5/16 inch)

5. Finish: Mat, opaque

6. Tile Color and Pattern: As selected by Architect from manufacturer's full range, Skybridge Wall Tile - 4"x 8".

7. Grout Color: As selected by Architect from manufacturer's full range, to match wall tile.

8. Mounting: Factory, back mounted.

9. Mounting: Pregrouted sheets of tiles are factory assembled and grouted with manufacturer's standard white silicone rubber.

10. Trim Units: Coordinated with sizes and coursing of adjoin flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes.

    a. Base Coved, 4" x 4".
    b. Wainscot Cap: Surface bullnose module size 3" x 3".
    c. External Corners: Surface bullnose same size as adjoining flat file.
    d. Internal Corners: Field-butted square corners. For coved base and cap use angle pieces designed to fit with stretcher shapes.

C. Thresholds.

1. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

2. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1.5 mm (1/16 inch) above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 12.7 mm (½ inch) or less above adjacent.

3. Marble thresholds: ASTM C503/C503M, with a minimum abrasion resistance of 10, according to ASTM C1353 or ASTM C241/C241M and with honed finish. Uniform fine-to-medium-gained white stone with grey vaining.

D. Wainscot Cap: Match wall tile for moisture absorption, surface finish, and color; bull nosed top edge.

E. Trim: Provide all required shapes such as cove, bullnose, angles, strips, etc. Unless otherwise noted on the drawings, all internal corners shall be square and all external corners bullnosed.

F. Expansion joints: Must be provided where tile work abuts restraining surfaces such as walls, curbs, parapets, columns, pipes, drains, etc. For interior installations locate 24' to 36' each way in large areas.

G. Colors of wall tile shall be as selected by the *ARCHITECT* from the manufacturer's full range of standard and custom color selections.

2.03 ACCESSORIES

A. Mortar Materials:

1. Mortar Bed Materials: ANSI A108.1B; portland cement, sand, latex additive, and water; proportioned in accordance with applicable code.

2. Mortar Bond Coat Materials: Latex-Portland Cement type: ANSI A118.4.

B. Grout Materials:

1. Polymer Modified Cement Grout: ANSI A118.7, color as selected.

2. Grout sealant: As selected by CONTRACTOR subject to ENGINEER's approval.

C. Cleavage Membrane: 4 mil thick polyethylene film.

D. Waterproofing Membrane at Floors:

1. Nobleseal TS sheet membrane

2. Laticrete 9235 Anti-fracture membrane

3. Or equivalent.

E. Cementitious Backer Board: ANSI A118.9; High density, cementitious, glass fiber reinforced, ½- inch thick; 2-inch wide coated glass fiber tape for joints and corners.

F. Cleaning agents:

1. "Spic and Span," "Mr. Clean," or equivalent alkaline cleaners.

2. DO NOT use vinegar, muriatic acid or other acidic materials. These materials may attack the grout and will require regrouting of the tile at no additional cost to the OWNER.

3. DO NOT use “Murphy’s Oil,” “Pine Sol” or similar products. These products leave an oily residue that is slippery and attracts dirt. Their use will require re-cleaning of the tile at no additional cost to the OWNER.

2.04 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ARCHITECT*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Cleaning: Immediately prior to installation of the work of this section, thoroughly clean all substrata and remove all oil, grease, paint, varnish, hardeners, and other items which would adversely affect the bond of adhesive.

B. Smoothing: Make all substrata level and free from irregularities. Assure one constant floor height after carpet is installed, grinding high spots and filling low spots as required.

3.03 INSTALLATION

A. Install tile and grout in accordance with applicable requirements of ANSI A108.1 through A108.10, and TCA Handbook recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Place edge strips at exposed tile edges.

D. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor, base and wall joints.

E. Place tile with joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.

1. Ceramic Tile: 1/16 inch.

F. Form internal angles square and external angles bullnosed.

G. Sound tile after setting. Replace hollow sounding units.

H. Keep expansion and control joints free of adhesive or grout. Apply sealant to joints.

I. Allow tile to set for a minimum of 48 hours prior to grouting.

J. Grout tile joints.

K. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

L. Installation - Showers and Bathtub Walls:

1. At tiled shower receptors install in accordance with TCA Handbook Method B415C-09, mortar bed floor, and W244C-09, thin-set over cementitious backer unit walls.

2. At bathtub walls install in accordance with TCA Handbook Method B412, over cementitious backer units with waterproofing membrane.
3. Grout with silicone rubber grout.

4. Seal joints between tile work and other work with sealant Type specified in *Section 07 92 13, Sealants and Caulking*.

M. Installation - Wall Tile:

1. Over cementitious backer units install in accordance with TCA Handbook Method W244C-09, using membrane at toilet rooms.

N. Keep the tile clean, unstained, and undamaged until the final completion of the building.

3.04 CLEANING EXISTING TILE SURFACES

A. Apply specified cleaners in accordance with manufacturer's recommendations.

B. Use scrub brushes or mechanical scrubbers to clean surfaces. Rinse surfaces with clean, potable water. Remove water from tile surfaces, dry and then buff with clean cloths or buffing wheel.

C. Reseal gout using specified grout sealant.

3.05 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Clean exposed surface of all grease, dirt and other foreign materials.

C. Touch up all marred or abraded surfaces in accordance with manufacturer's directions.

****END OF SECTION****

SECTION 09 51 00
(09510)
ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Acoustical ceiling tile.
2. Acoustical Metal ceiling tile
3. Ceiling suspension system.
4. Accessories.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.
2. *Section 07 92 13: Sealants and Caulking*
3. *Section 09 21 16: Gypsum Wallboard System*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.
2. Include all costs for the *ACOUSTICAL CEILING* in the prices bid for the various related items of work as designated in the Proposal.

1.02 REFERENCES:

A. ASTM E-580: Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Requiring Seismic Restraint.

B. ASTM C635: Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.

C. ASTM C636: Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.

D. ASTM E1264: Standard Classification for Acoustical Ceiling Products

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Shop drawings showing all details of installation.

D. Samples:

1. Submit two (2) full size samples of each type of acoustical material to illustrate color and range of appearance.

2. Submit two (2) samples of grid system.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar

with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.05 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage:

1. Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use.

2. Store in dry, watertight enclosures and in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

3. Immediately before installation, acoustical units shall be stored for not less than 24 hours at the same temperature and relative humidity as the space where they will be installed in order to assure proper temperature and moisture acclimation.

1.06 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. Manufacturer's standard performance guarantees or warranties shall be provided. Standard performance guarantee or warranty shall contain an agreement to repair or replace acoustical panels that fail within the warranty period. Failures included, but are not limited to, sagging and warping of panels; rusting and manufacturers defects of grid system.

C. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Complete installation of dampening materials before beginning work.

B. Maintain humidity of 65% - 75% in area where acoustical materials are to be installed, 25 hours before, during and 25 hours after installation.

C. Maintain a uniform temperature in the range of 55º to 70ºF before, during and after installation of materials.

1.08 MAINTENANCE

A. Spare parts and materials:

1. Comply with provisions of *Section 01 78 45, Spare Parts and Maintenance Materials*.

B. Maintenance materials:

1. Furnish extra tiles of each type and color at the rate of 10 tiles for each 1000 tiles installed but not less than one standard carton. Tiles shall be from the same lot as those installed.

2. Furnish suspension system components in amount sufficient to install extra ceiling units.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable Manufacturers:

1. Armstrong Ceiling and Wall Solutions
P.O. Box 3001
Lancaster, PA 17604
Tel: 717-397-0611

2. Or equivalent.

2.02 MATERIALS

A. Suspension system:

1. Suspension system shall be standard, exposed-grid standard width flange as shown on drawings, and shall conform to ASTM C 635 for heavy-duty systems. Surfaces exposed to view shall be aluminum with a factory-applied white baked-enamel finish. Wall molding shall have a flange of not less than 15/16 inch. Inside and outside corner caps, standard corners shall be provided. Suspended ceiling framing system shall have the capability to support the finished ceiling, light fixtures, air diffusers, and accessories, as shown. The suspension system shall have a maximum deflection of 1/360 of span length. Seismic details shall conform to the guidance ASTM E580.

B. Ceiling panels:

1. Offices, Lobby, Corridors, Rooms, Restrooms:

a. Light reflectance coefficient: 0.75

b. Color: White

c. Noise reduction coefficient: NRC 0.45 - 0.55

d. Ceiling sound transmission class: CSTC 39

e. Edge detail: Square

f. Thickness: ⅝-inch

g. Size: 24 by 48 inches

h. Manufacturer: Armstrong “ARMTUFF” or equal.

C. Rough suspension:

1. Hanger wire: Minimum 12-gauge, galvanized, soft annealed, mild steel wire.

2. Hanger strap: 3/16/ inch thick, 1 inch, zinc coated, flat steel strap, for fixture support.

3. Wire ties: 18-gauge, galvanized annealed steel wire.

4. Hanger clips: Prefabricated metal clamps for fastening to structure.

5. Adhesive: ASTM D 1779.

D Metal ceiling system and frame

Manufacturer:

1. Metalworks linear ceiling with wood look- classic by Armstrong

2. Or equivalent

D. Access panels:

1. Access panels shall match adjacent acoustical units and shall be designed and equipped with suitable framing and fastening for removal and replacement without damage.

2. Panel shall be not less than 12 by 12 inches or more than 12 by 24 inches.

3. An identification plate of 0.032 inch thick aluminum, ¾-inch in diameter, stamped with the letters “AP” and finished the same as the unit, shall be attached near one corner on the face of each access panel.

E. Caulking: Non-staining type, acoustical sealant.

2.03 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General:

1. Acoustical work shall be provided complete with necessary fastenings, clips, and other accessories required for a complete installation.

2. Mechanical fastenings shall not be exposed in the finished work.

3. Hangers shall be laid out for each individual room or space.

4. Hangers shall be placed to support framing around beams, ducts, columns, grilles, and other penetrations through ceilings.

5. Main runners and carrying channels shall be kept clear of abutting walls and partitions.

6. At least two (2) main runners shall be provided for each ceiling span.

7. Wherever required to bypass an object with the hanger wires, a sub-suspension system shall be installed, so that all hanger wires will be plumb.

B. Suspension systems:

1. Suspension system shall be installed in accordance with ASTM C636, ASTM E580, and as specified herein.

2. There shall be no hanger wires or other loads suspended from underside of steel decking.

C. Hangers:

1. Hanger clips or inserts: Installed as recommended by manufacturer.

2. Space hanger wires or straps 4 feet on center, each direction.

3. Install additional hangers at ends of each suspension member and at light fixtures, 6 inches from vertical surfaces.

4. Hangers shall be plumb and shall not press against insulation covering ducts and pipes.

5. Where hangers must be splayed (sloped or slanted) around obstructions, the resulting horizontal force shall be offset by bracing, countersplaying, or other acceptable means.

6. Wrap wire a minimum of three times horizontally, turning ends upward.

D. Saddle tie carrying channels to main structure for indirect hung suspension system or as directed by *ENGINEER*.

E. Install carrying channels with leveling clips to main structure for indirect hung suspension system.

F. Main and cross runners:

1. Space main runners at 48 inches on center, at right angle to carrying channel.

a. Level and square to adjacent walls.

b. Wire clip to channels at all intersections.

2. Space cross runners at 24 inches on center.

G. Wall molding:

1. Install wall molding at intersection of suspended ceiling and vertical surfaces.

2. Miter corners where wall moldings intersect or install corner caps.

3. Apply continuous ribbon of acoustical adhesive or caulking compound on vertical web.

4. Attach to vertical surface with mechanical fasteners.

5. Install spring spacers at wall molding to hold acoustical unit snug on flange of wall molding.

H. Install splines in unsupported joints of acoustical tile, providing hairline joints, in a smooth even plane.

I. Acoustical units:

1. Install in level plane in straight line courses.

2. Place materials to bear all around on suspension members.

3. Minimum width of border tiles: One-half unit dimension.

4. Seal joints in acoustical units around pipes, ducts, and electrical outlets with caulking compound.

5. Install acoustical units surrounding recessed troffer lights with hold-down clips to prevent movement or displacement of units.

6. For ceiling units weighing less than l lb./S.F. hold down clips shall be placed 2' on center on all cross tees.

7. Hold down clips shall be provided on all ceiling units within ten feet (10') of any door regardless of ceiling unit weight.

J. Ceiling access panels:

1. Ceiling access panels shall be located directly under the items which require access.

K. Coordinate work with the electrical and HVAC work and provide adjustments, if necessary, for installation of lighting fixtures, diffusers and other equipment.

3.03 FIRE-RATED INSTALLATION

A. Installation shall be as specified in 3.02 with the following additions:

1. The installation shall conform to the acoustical material manufacturer's recommendations so as to achieve the fire resistive design where shown on the Plans.

2. The Contractor shall furnish and install the suspension system and acoustical material as specified above per the recommendation of ASTM C636 and the U.L. Design.

3.04 CLEANING

A. Clean exposed surface of all grease, dirt and other foreign materials.

B. Following installation, dirty or discolored surfaces of acoustical units shall be cleaned and left free from defects.

C. Units that are damaged or improperly installed shall be removed and new units provided as directed.

D. Remove and dispose of all debris.

****END OF SECTION****

SECTION 09 65 00
(09660)
RESILIENT FLOORING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Resilient tile flooring and accessories.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturers' product data:

1. Complete materials list of all items proposed to be furnished and installed under this section.

2. Manufacturer's specifications and other data required that demonstrate compliance with the specified requirements.

3. Samples of each item, color, and pattern available in the specified products from the proposed manufacturer.

4. Manufacturers' recommended methods of installation.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ARCHITECT*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ARCHITECT* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

C. Manufacturer shall warrant the materials and installation as follows:

1. Luxury vinyl tile: Ten (10) years, 100% material and labor.

2. Composition vinyl tile: Two (2) years, 100% material and labor; 2nd year 100% material, 50% labor; material only five (5) years.

3. Tire Tile: Three (3) years, 100% material.

4. Rubber Tile: Material guaranteed against manufacturing defects pro-rated over five (5) years.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. All tile shall be anti-slip in accordance with ANSI A117.1, Paragraph 4.5 and with a coefficient of friction of greater than 0.5 (wet or dry).

2.02 VINYL TILE

A. Office Room:

1. Luxury vinyl tile conforming to the following:

a. SS-T-312B Type III, vinyl.

b. Size 3" x 36" x 0.100 inches.

c. Critical radiant flux: 1.0 or more (ASTM E648).

d. Flame spread: Less than 75 (ASTM E84).

e. Static load limit: 250 psi (ASTM F970).

2. Materials

a. "Earthen Amur" by Armstrong.

B. Colors shall be as selected by the *ENGINEE/ARCHITECT* from manufacturers currently available range.

2.03 ACCESSORIES

A. Adhesives shall be a waterproof and stabilized type as recommended by the manufacturer of the approved resilient material. Asphalt emulsions and other non-waterproof types will not be acceptable.

B. Concrete slab primer shall be a non-staining type as recommended by the manufacturer of the resilient material to be applied over it.

C. Edging strips shall be 3 mm (1/8") thick, homogeneous vinyl or rubber composition, tapered or bullnose type, as approved by the *ENGINEER*.

D. Vinyl base shall be 10 cm (6") high, topset cove, Burke or equivalent. Color as selected by the OWNER from standard colors of the approved manufacturer.

E. Rubber base: 4" high sanitary cove base with a 1¾" - 2" toe conforming to ASTM F1344 and Federal Specification SS-W-40a, Type 1 rubber.

F. Stair tread, Type I:

1. R C Musson #225, heavy duty, long nose with two ¾" wide abrasive grit strips inlaid full length of tread, 1" from front edge and ¾" apart, slate color.

2. Or equivalent.

G. Coved stair riser, Type I:

1. R C Musson #505 CR molded coved stair riser, ⅛" thick, 7" high with ⅝" toe, slate color.

2. Or equivalent.

H. Wax: as recommended by manufacturer.

2.04 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be as recommended by the manufacturer of the resilient materials used, and as approved by the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

D. Following at least 90 days after placement of concrete and at least one week before beginning installation of floor covering perform all three (3) of the following tests. Obtain the services of a certified testing laboratory to perform the required testing.

1. Moisture vapor emission testing:

a. Moisture tests shall be conducted in accordance with ASTM F 1869 “Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride”.

b. Three tests shall be conducted for areas up to 1,000 sq. ft. and one additional test shall be conducted for each additional 1,000 sq. ft. of flooring.

c. Test locations shall be selected to provide moisture distribution information about the entire floor.

d. For slabs on or below grade provide at least one (1) test within 3’ of each exterior wall.

e. Results must not exceed 3 lbs. per 1,000 sq. ft. in 24 hours or as required by the manufacturers installation instructions when tested in accordance with ASTM F 1869.

f. If the tests results exceed the limitations, the installation shall not proceed until the problem has been corrected.

2. Relative Humidity testing:

a. Relative humidity tests shall be conducted in accordance with ASTM F 2170, “Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes”.

b. Three tests shall be conducted for areas up to 1,000 sq. ft. and one additional test shall be conducted for each additional 1,000 sq. ft. of flooring.

c. Test locations shall be selected to provide moisture distribution information about the entire floor.

d. For slabs on or below grade provide at least one (1) test within 3’ of each exterior wall.

e. Results must not exceed 75% relative humidity or as required by the manufacturers installation instructions when tested in accordance with ASTM F 2170.

f. If the tests results exceed the limitations, the installation shall not proceed until the problem has been corrected.

3. pH Test:

a. A pH test for alkalinity shall be conducted at the same rate as the moisture tests. Results should range between 7 and 9.

b. If the test results are not within the acceptable range of 7 to 9 or as required by the manufacturers installation instructions, the installation shall not proceed until the problem has been corrected.

E. Surface shall be smooth, level, at the required finish elevation, without more than ⅛" in 10' - 0' variation from level or slopes shown.

3.02 PREPARATION

A. Subfloors: Prior to start of laying tile units, broom clean or vacuum all surfaces to be covered and inspect the subfloors. Start of laying tile will indicate acceptance of subfloor conditions.

B. Concrete primer: Apply concrete slab primer if recommended by tile manufacturer, prior to application of the adhesive. Apply in compliance with manufacturer's directions.

3.03 INSTALLATION

A. General:

1. Install tile only after all finishing operations, including painting, have been completed and permanent heating system is operating. Moisture content of concrete slabs, building air temperature and relative humidity must be within limits recommended by tile manufacturer.

2. Concrete floors shall be smooth, free of any grooves and depressions, brushed and vacuumed clean of any foreign matter. Correct irregularities in concrete floors with leveling compound.

3. Installation shall be done by skilled craftsmen using the adhesives recommended by the manufacturer and in accordance with the manufacturer's instructions.

4. Place tile units with adhesive cement in strict compliance with the manufacturer’s recommendation. Butt tile units tightly to vertical surfaces, thresholds, nosings and edgings. Scribe as necessary around

obstructions and to produce neat joints, laid tight, even and in straight, parallel lines.

5. Extend tile units into toe spaces, door reveals, and in closets and similar openings.

6. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on the finish tile as marked in the subfloor. Use chalk or other non-permanent marking device.

7. Lay tile from center marks established with principal walls, discounting minor off-sets, so that tile at opposite edges of the room are of equal width. Adjust as necessary to avoid use of cut widths less than 3" at room perimeters. Lay tile square to room axis.

8. Install all tile with joints tight, floor true, level and even. Cut to and around all permanent fixtures.

B. Matching:

1. Match tiles for color and pattern by using tile from cartons in the same sequence as manufactured and packaged. Cut tile neatly to and around all fixtures. Broken, cracked, chipped or deformed tile are not acceptable.

2. Tightly cement tile to subbase without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks through tile, or other surface imperfections.

C. Edgestrips: Place the resilient edgestrips tightly butted to tile, and secure with adhesive. Provide edgestrips at all unprotected edges of tile, unless otherwise shown.

3.04 CLEANING AND PROTECTION

A. Remove excess adhesive or other surface blemishes from tile, using neutral type cleaners recommended by the tile manufacturer. Protect installed flooring from damage until acceptance by the *OWNER*.

3.05 FINISHING

A. After completion of the work and just prior to final inspection, thoroughly clean tile floors and accessories.

B. Apply wax and buff all vinyl floors with the type of wax, number of coats, and buffing procedures recommended by the tile manufacturer.

****END OF SECTION****

SECTION 09 68 13

TILE CARPETING

PART 1 – GENERAL

1.01 DESCRIPTION

A. Work included:

1. Provide all carpet tile, fully adhered with edges and control grid adhered matching roll carpet for direct-glued installation on stairs and accessories.

B. Related work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

C. Payment:

1. No separate payment will be made for this item. Include all costs for *TILE CARPETING* under various items as indicated under the Proposal Section.

2. The cost for this item shall include all materials, equipment, labor, and tools necessary and shall include those items that are considered to be an integral part of this work and that may be specified elsewhere.

1.02 REFERENCES

A. Carpet and Rug Institute:

1. CRI 104 - Standard for Installation of Commercial Carpet.

2. CRI Green Label Plus Testing Program.

B. Consumer Products Safety Commission:

1. CPSC 16 CFR 1630 - Standard for the Surface Flammability of Carpets and Rugs.

C. National Fire Protection Association:

1. NFPA 253 - Standard Method of Test for Critical Radiant Flux for Floor

Covering Systems Using a Radiant Heat Energy Source.

D. American Society for Testing and Materials

1. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

2. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23*, *Shop Drawings, Product Data and Samples.*

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Manufacturer's current recommended substrate preparation requirements and installation procedures.

1. Manufacturers literature shall specifically indicate the allowable Moisture Vapor Transmission rate or Moisture Vapor Emission rate and manufacturers required procedures to determine the Moisture Vapor Transmission rate.

D. Shop drawings showing location of all joints, edge bindings and moldings; pile direction, and types of all carpet metal and accessories.

E. Samples:

1. Carpet: Submit two samples illustrating color and pattern design for each carpet color selected.

2. Exposed Edge, Transition, and other Accessory Stripping: 12-inch- long Samples.

F. Manufacturer's recommended installation procedures.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance: The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.06 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

1.07 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

1.08 MAINTENANCE

A. Comply with provisions of *Section 01 78 45, Spare Parts and Maintenance Materials*.

B. Supply extra carpet tiles in the amount of 5% of each style, pattern and color used in the building.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. All carpet tile and accessories shall comply with the following:

1. Surface Burning Characteristics:

a. Class I, minimum 0.45 watts/sq cm when tested in accordance with NFPA 253.

2. CPSC 16 CFR 1630.

2.02 CARPET TILE

A. Acceptable Manufacturers:

1. Collins & Aikman Floor Coverings
2. Interface Flooring Systems, Inc.
3. Mannington Commercial Carpet
4. Milliken Carpet
5. Or Equivalent

B. Carpet Tile – Type 1: Patterned loop, nylon, Type 6, 6 conforming to the following criteria:

1. Mannington Commercial Palma 2 Collection
2. Color: To be selected by Owner
3. Pattern: EST10
4. Tile Size: 24" x 24"
5. Max. Electrostatic Charge: Less than 3.0 per AATCC 134.
6. Gauge: 5/64 inch
7. Stitches: 9.66 per inch
8. Density Factor: 7560 kilotex
9. Primary Backing Material: Infinity 2 modular synthetic/polymeric compound
10. Total Weight: 21 oz/sq yd.
11. Carpet: Maximum volatile organic compound content in accordance with CRI Green Label Plus Testing Program.

2.03 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet cushion manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by carpet and carpet cushion manufacturers.

1. VOC Limits: Provide adhesives that comply with the following limits for VOC content when tested according to ASTM D 5116:

    a. Total VOCs: 10.00 mg/sq. m x h.
    b. Formaldehyde: 0.05 mg/sq. m x h.
    c. 2-Ethyl-1-Hexanol: 3.00 mg/sq. m x h.

C. Tackless Carpet Stripping: Water-resistant plywood, in strips as required to match cushion thickness and that comply with CRI 104, Section 12.2.

D. Seam Adhesive: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for sealing and taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

E. Base Cap: Color as selected from samples by *ARCHITECT* and the *OWNER*.

F. Moldings and Edge Strips: Embossed aluminum, Rubber, or Vinyl; color as selected by *ARCHITECT* and the *OWNER*.

2.04 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and operable installation of the work of this section, shall be new, first quality of their respective kinds, and subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Verify that surface is dry and perfectly clean, free of all oil, grease, detergent film, Etc.

D. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. New and existing concrete surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, and bituminous products.

B. Moisture Testing: Perform tests required by manufacturer to determine Moisture Vapor Transmission rate and as follows.

.

1. Perform relative humidity test using in-situ probes in accordance with ASTM F 2170. Proceed with installation only after substrates are within manufacturers required relative humidity level.

   a. Perform 3 tests for the first 1000sf and at least 1 additional test for each additional 1000sf or fraction thereof. For purposes of determining floor area and performing the tests, the garage floor and mezzanine floors shall be considered separately.

   b. For slabs on or below grade perform at least 1 test within one meter of each wall.

   c. If the relative humidity exceeds the manufacturers allowable tolerances, apply the manufacturers recommended vapor mitigation system to lower the value to the acceptable limit.

2. Determine moisture vapor emission rate in accordance with ASTM F 1869. Proceed with installation only after substrates are within manufacturers required relative humidity level.

   a. Perform 3 tests for the first 1000sf and at least 1 additional test for each additional 1000sf or fraction thereof. For purposes of determining floor area and performing the tests, the garage floor and mezzanine floors shall be considered separately.

   b. For slabs on or below grade perform at least 1 test within one meter of each wall.

   c. If the moisture vapor emission rate exceeds the manufacturers allowable tolerances, apply the manufacturers recommended vapor mitigation system to lower the value to the acceptable limit.

B. Smoothing: Make all substrata level and free from irregularities. Assure one constant floor height after carpet is installed, grinding high spots and filling low spots as required.

3.03 INSTALLATION

A. Install carpet tile in accordance with [CRI 104].

B. Do not mix carpet from different cartons unless from same dye lot.

C. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

D. Install carpet tile in pattern, with pile direction parallel and /or alternating to next unit, set parallel to building lines as indicated on shop drawings

E. Locate change of color or pattern between rooms under door centerline.

F. Adhere carpet tile to substrate along centerline of rooms, at perimeter of rooms, where tiles are cut, and at 15 foot intervals throughout rooms. Install remainder of tile dry over substrate.

G. Adhere carpet tile with self-stick adhesive backing by removing protective membrane and pressing tile back onto clean and dry substrate.

H. Adhere carpet tile,roll carpet as base finish up vertical surfaces to form base.

I. Terminate top of base with cap strip.

J. Trim carpet tile neatly at walls and around interruptions.

K. Complete installation of edge strips, concealing exposed edges.

L. Installation On Stairs:

1. Use one piece of carpet for each tread and riser below. Apply seam adhesive to cut edges.

2. Install carpet with pile direction in length of stair.

3. Adhere carpet tight to stair treads and risers.

3.04 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*. Thoroughly clean all carpet surfaces prior to final acceptance of the carpeted areas

by the *OWNER*.

B. Remove excess adhesive from floor, base, and wall surfaces without damage.

C. Clean and vacuum carpet surfaces.

3.05 PROTECTION

A. Do not permit traffic on unprotected carpet.

B. Provide a heavy non-staining paper walkway over carpeting in direction of foot traffic, maintaining intact until final acceptance.

C. Do not use plastic sheeting or carpet protectors.

****END OF SECTION****

SECTION 09 77 16

FRAMED DECORATIVE PANEL SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Decorative prefinished panel with pre-engineered attachment clip, along with hardware and trim systems for installation directly to studs or solid substrate and may include:

a. Wood veneer on fiber board substrate panels.

b. Hardware.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 06 20 00: Carpentry*

C. References Standards:

1. American National Standards Institute (ANSI):

a. ANSI A208.2 Medium Density Fiberboard (MDF) for Interior Applications.

2. Architectural Woodwork Institute (AWI):

a. Architectural Woodwork Standards, 2nd Edition.

3. Architectural Woodwork Manufacturer's Association of Canada (AWMAC):

a. Architectural Woodwork Standards, 2nd Edition.

4. US Green Building Council (USGBC)

a. LEED NC Version 2.2 LEED (Leadership in Energy and

Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations.

D. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *FRAMED DECORATIVE PANELS SYSTEM* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

3. Product characteristics.

4. Safety Data Sheets (SDS) for adhesives, sealants and other pertinent materials prior to delivery to site.

C. Shop drawings showing precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provision in concrete forming, reinforcement, and placement to accommodate the work of this section.

D. Samples:

1. Submit manufacturer's standard color and pattern selection samples representing manufacturer's full range of available colors and patterns.

2. Submit sample for each component and for each exposed finish required, prepared on samples of size indicated below complete with exposed molding and trim samples.

a. Ensure samples indicate type, finish and color specified.

(1) Wood veneers: Submit sample sets of each Marlite Signature Select AA Grade wood veneer with finish choice.

(a) Ensure 6 x 6" sample shows full range of normal color and texture variations anticipated.

(b) Include samples of Classic Clear topcoat.

D. Manufacturer's recommended installation procedures.

1. Delivery, storage and handling recommendations.

2. Preparation and installation recommendations.

E. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.

F. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria, and physical requirements.

G. Manufacturer's Field Reports: Submit manufacturer's field reports within three (3) days of each manufacturer representative's site visit and inspection.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for

their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance: The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1. Inspect each package for damage and promptly contact Marline, Inc. directly to report damaged packages or missing components.

2. Store materials in manufacturer's unopened packaging until ready for installation.

a. Maintain temperature range of 60° to 80°F and humidity range of 35 to 55 % during storage, installation and product life cycle.

b. Maintain plastic or other protective wrap in place during on site handling until ready for installation.

c. Keep panels clean and do not stack panels after removal of protection.

3. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

1.07 FIELD CONDITIONS

A. Do not use wood or fiber board products in kitchens, rest rooms, or other high humidity areas.

B. Maintain environmental conditions (temperature, humidity and ventilation) within limits in accordance with manufacturer's written recommendations for optimum results.

1. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.08 MAINTENANCE

A. Spare parts and materials:

1. Comply with provisions of *Section 01 78 45, Spare Parts and Maintenance Materials*.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers:

1. Marlite Surface Systems

2. Or approved equivalent.

2.02 PERFORMANCE REQUIREMENTS

A. Burn Characteristics to ASTM E84, Class A.

1. Flame spread: 0-25.
2. Smoke Developed 0-450.

B. Burn Characteristics to ASTM E84, Class C.

1. Flame spread: 76-200.
2. Smoke Developed 0-450.

C Material and installation shall be compliant with International Building Code, 2021, NJ Edition, all other local, federal and other related codes.

2.03 DESCRIPTION

A. Clip-on 3/4 inch thick decorative wall panel system with large size, 4’x8’ or 4’x10’ wall panels with wood veneers. color shall be chosen from standard colors.

2.04 HARDWARE

A. Panel Trim:

1. Reveal:

    a. See drawings for horizontal and vertical reveal.

B. Hardware and Trim Material:

1. Aluminum - Heavy weight extruded aluminum 6063-T5 alloy and factory prefinished.

    a. Main rail and cross spline: As indicated on drawings.

    b. Concealed aluminum: Mill finished.

    c. Exposed aluminum: Satin anodized, color to be selected by *ARCHITECT/ENGINEER*.

2.05 PANELS

A. Panel Configuration: Face dimensions: As indicated.

1. Maximum of 48 inches along unsupported frame.

2. Panel thickness: 3/4 inches maximum.

B. Wood Fiber Substrate:

1. Medium density wood fiberboard, 3/4 inch, conforming to ANSI A208.2, industrial-grade MDF or other wood fiber substrates 75% minimum recycled wood waste and having no added formaldehyde.

C. Wood Veneer Panels: Select AA grade quality wood veneer laminated to wood fiber substrate and coated with furniture grade catalyzed finish as protective topcoat.

1. Edges: Square cut and finished.

2. Balancing Backer: Wood veneer measuring between 0.015 and 0.025 inches.

3. Veneer Face: 0.010 to 0.015 inches with catalyzed finish of approximately 0.003 inches.

4. Matching between panels: Manufacturer’s standard non-sequenced matching.

5. Species and Cut: As selected by *ARCHITECT* from manufacturer's standard range.

a. Grain direction: Vertical.

6. Finish: Classic Clear Topcoat.

7. Acceptable Material: Marlite MAP Wood Veneer Panels.

2.06 ACCESSORIES

A. Adhesives: Solvent based low VOC adhesive.

1. Acceptable Material: Marlite C-109 solvent based adhesive.

2.07 FABRICATION

A. Ensure framing panels, hardware and accessories are factory finished and ready to install except for field fabrication as required at work site and perimeter conditions.

1. Refinish field cut panel edges in accordance with manufacturer's instruction before installation.

2. Drill corners for cut-outs 1/8 inch radius minimum.

2.08 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design

and with the manufacturer's recommendations as approved by the *ENGINEER*.

1. Visually inspect substrate in presence of Architect.

2. Ensure substrate is smooth, sound, clean, dry and free of contaminants and other deleterious materials.

3. Ensure vapor barrier has been provided on exterior walls behind backing to prevent warping.

4. Ensure backing panels are smooth, solid, and flat and that drywall joints are taped and finished.

5. Ensure walls are primed before installation begins.

6. Ensure mechanical, electrical and building service or items affecting work of this section are placed and ready to receive this work.

7. Ensure stud spacing does not exceed 24 inches.

8. Inform Architect of unacceptable conditions immediately upon discovery.

9. Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Architect.

10. Starting installation of framed decorative panel system implies substrate conditions are acceptable for work of this section.

C. Ensure structural walls are finished and building is completely closed with walls thoroughly dry before starting installation.

D. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Conditioning: Allow panels to acclimate to balanced environment in installation location for 72 hours minimum before and during installation.

1. Maintain environmental conditions of 60° to 80° F and 35% to 55% humidity in installation location for 72 hours before and during installation.

B. Protect existing surfaces with drop cloths.

C. Except as indicated, before installing, examine panels and arrange to achieve best combination of color, pattern, texture and grain.

D. Ensure HVAC system is operable and installation area is balanced to normal operating conditions before proceeding with installation.

3.03 INSTALLATION

A. General: Install the work of this section in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

B. Install framed decorative panel system in accordance with manufacturer's written recommendations.

1. Do casework to Architectural Woodwork Institute standards [and in accordance with Section 06 41 00 - Architectural Wood Casework].

C. Install materials straight, plumb and level in accordance with manufacturer's written instructions.

1. Anchor units tightly and securely in place.

2. Cut sheets to meet existing supports.

D. Fasten supports and trim using #6 trim-head screws anchored into stud or other solid substrate at 16 inch centers.

1. Where screws do not hit studs, fasten with adhesive in accordance with manufacturer's written recommendations.

2. Pre-drill holes through members and fasten screw flush with flange on aluminum profile.

3. Where necessary countersink for screw head to seat flush with flange.

E. Avoid contamination of the panel faces with adhesives, solvents or cleaners during installation.

1. Clean up spills immediately.

F. Painting: Marred or abraded surfaces shall be cleaned and refinished in accordance with manufacturer's recommendations.

3.04 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Remove and dispose of all debris.

C. Collect recycle waste and dispose of in accordance with manufacturer's written recommendations and at appropriate recycling facilities.

3.05 TESTS

A. Upon completion of this portion of the work and prior to acceptance by the *OWNER*, make all required tests and adjustments for free and smooth operation.

B. Secure all approvals from agencies having jurisdiction.

3.06 START-UP

A. The equipment manufacturer shall provide the services of a trained qualified representative, for one (1) trip each with a minimum of one (1) day, excluding travel time for the purpose of inspecting the installation.

B. The representative shall prepare and submit a written report to both the *CONTRACTOR* and *ENGINEER* regarding the installation, including any conditions which might affect the manufacturer's guarantee. The equipment shall not be accepted by the *OWNER* until such time as this report has been received and accepted by the *ENGINEER*.

3.07 INSTRUCTIONS

A. The manufacturer's representative shall instruct the *OWNER'S* operating personnel, at a time designated by the *OWNER*, as to the proper method of operation and recommended maintenance procedures.

B. The scheduling of the instruction shall be at the convenience of the *OWNER* and may not coincide with the start-up inspection.

****END OF SECTION****

SECTION 09 90 00
(09900)
PAINTING
(GENERAL)

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Surface preparation and painting of interior walls, (concrete floors), ceilings, sills, molding, trim, shelving, doors, frames and windows, and appurtenances.

2. Surface preparation and painting of exterior doors, frames, windows, trim, and appurtenances.

3. Surface preparation and painting of all exposed new and existing piping, valves and fittings except non-ferrous metals and stainless steel. This shall include all piping that will be enclosed in insulation.

4. Surface preparation and painting of all equipment and machinery that is not factory painted, including foundations.

5. Surface preparation and painting of all structural steel, bar joists, metal deck, miscellaneous metal and supports.

7. Surface preparation and painting of all exterior exposed electrical cabinets, boxes, hangers, apparatus, etc. that are not factory painted.

8. Restore or repaint areas damaged.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 01 74 00: Cleaning and Restorations*

3. *Section 03 30 00: Concrete*

4. *Section 05 12 00: Structural Steelwork*

8. *Section 05 31 23: Steel Roof Decking*

9. *Section 05 50 00: Metal Fabrications*

10. *Section 06 20 00: Carpentry*

11. *Section 07 92 13: Sealants and Caulking*

14. *Section 26 05 00: Basic Electrical Requirements*

C. Payment:

1. Unless otherwise noted in the *PROPOSAL* Section, no separate payment shall be made for this item.

2. Include all costs for *PAINTING* in the prices bid for the various related items of work as designated in the *PROPOSAL*.

1.02 REFERENCE STANDARDS

A. Steel Structures Painting Council:

1.	SSPC-SP1	Solvent Cleaning
2.	SSPC-SP2	Hand Tool Cleaning
3.	SSPC-SP3	Power Tool Cleaning
4.	SSPC-SP5	White Metal Blast Cleaning
5.	SSPC-SP6	Commercial Blast Cleaning
6.	SSPC-SP7	Brush-Off Blast Cleaning
7.	SSPC-SP10	Near-White Blast Cleaning
8.	SSPC-SP11	Power Tool Cleaning to Bare Metal
9.	SSPC-SP12	High & Ultrahigh-Pressure Water Jetting
10.	SSPC-SP13	Surface Preparation of Concrete
11.	SSPC-TR3	Dehumidification & Temperature Control
12.	SSPC-Vis 1	Pictorial Surface Preparation Standards
13	SSPC-Vis 3	Visual Std. for Power and Hand tool Cleaned Steel
14.	SSPC-PA 1	Shop, Field and Maintenance Painting
15.	SSPC-PA2	Measurement of Dry Paint Thickness

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Manufacturer's literature:

1. Manufacturer’s descriptive literature to include color charts, and recommend method of application for paints and related materials.

2. Manufacturer’s standard and custom color charts and decks showing full range of colors available.

C. Upon completion of high performance coating application, provide certification from paint material supplier indicating that quantity of each coating material purchased was sufficient to properly coat all surfaces. Such certification shall list the square footage figure for all areas coated and the number of gallons of each material used as provided by *CONTRACTOR*.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Applicator qualifications:

1. Completion of minimum of five (5) equal applications for each coating system specified.

2. Provide listing of experience as outlined in *PROPOSAL*.

3. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

4. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

5. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

B. Labels: Include the following information on each paint material container label:

1. Manufacturer’s name.

2. Distinctive product name.

3. Manufacturer's stock number and lot number.

C. Product information:

1. Manufacturer shall include the following on paint material label, or submit on accompanying instruction sheet for *CONTRACTOR*'S use.

2. Submit detailed information as specified in AWWA D102, Section 4.

a. Mixing instructions

b. Percent solids

c. Spreading rate

d. Weight

e. Drying time

f. Pot life

g. Thinning instructions

h. Safety precautions

3. Provide Material Safety Data Sheets (MSDS) for all materials delivered to site.

D. Requirements of regulatory agencies:

1. Comply with all Local, State, and Federal safety regulations, laws and ordinances.

2. Federal:

a. Worker protection:

(1) 29 CFR 1910.94, Ventilation
(2) 29 CFR 1910.95(a-p), Occupational Noise Exposure
(3) 29 CFR 1910.97, Non-Ionizing Radiation
(4) 29 CFR 1910.134, Respiratory Protection Standard
(5) 29 CFR 1910.146, Permit-Required Confined Spaces

(6) 29 CFR 1926.20, General Safety and Health Provisions
(7) 29 CFR 1926.353, Protection in Welding, Cutting and Heating
(8) 29 CFR 1926.55, Gases, Vapors, Fumes, Dusts and Mists
(9) 29 CFR 1926.57, Ventilation
(10) 29 CFR 1926.59, Hazard Communication Program
(11) 29 USC 654, Section 5(a)(1) General Duty Clause of the 1970 OSH Act, which requires employers to provide safe work conditions for their employees.

b. Ambient air quality:

(1) 40 CFR 50.6, National Primary and Secondary Ambient Air Quality Standards for Particulate Matter.

c. Water quality:

(1) 40 CFR 122, Administered Permit Programs: The National Pollutant Discharge Elimination System
(2) 40 CFR, Parts 141, 142 and 143; Federal Safe Drinking Water Act

d. Hazardous waste:

(1) 40 CFR 261, Identification and Listing of Hazardous Waste
(2) 40 CFR 262, Standards Applicable to Generators of Hazardous Waste
(3) 40 CFR 263, Standards Applicable to Transporters of Hazardous Waste

3. State of New Jersey:

a. N.J.A.C. 7:10-1 et. seq.; New Jersey Safe Drinking Water Regulations.

b. N.J.A.C. 7:27-16; Misc. Metal Parts and Products Rule.

c. N.J.A.C. 7:27-23; Architectural Coatings Rule.

d. N.J.A.C. 8:59-5.1, et. seq.; New Jersey Worker and Community Right to Know Act.

4. All other Federal, State and local regulations applicable to the work.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection.*

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER.*

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER.*

E. Deliver sealed containers with labels legible and intact.

F. Storage of materials:

1. Store only acceptable project materials on project site.

2. Store in suitable location. Comply with manufacturer's storage recommendations.

3. Restrict storage to paint materials and related equipment.

4. Comply with health and fire regulations.

5. Storage of materials shall be subject to approval of *ENGINEER*.

6. All paint cans, opened and unopened, shall remain on job site for inspection by *ENGINEER*. Do not discard until directed to do so by *ENGINEER*.

1.06 JOB CONDITIONS

A. Sequencing, scheduling: Do not begin painting until environmental conditions meet the requirements of these Specifications.

B. Environmental requirements:

1. Do not blast when relative humidity exceeds 85 percent (85%), and/or surface temperature of steel is less than 5° F. above the dew point.

2. Comply with paint supplier's recommendations as to environmental conditions under which coatings and coating systems can be applied. The following shall be considered as general requirements, and shall not be exceeded unless recommended by paint supplier and approved by *ENGINEER*.

   a. Interior coating systems:

      (1) Do not apply when surrounding air temperature, as measured in shade, is below 50° F. and when temperature of surface to be painted is below 50° F.

      (2) Do not apply paint to wet or damp surfaces during periods of rain, snow, fog, or mist, or when relative humidity exceeds 85 percent. If dew or condensation is present, delay painting until mid-morning or as required to insure that surfaces to be painted are dry.

      (3) Do not apply paint when it is expected that air temperature in shade will drop below 50° F., or that relative humidity will exceed 85 percent within 18 hours after application of paint. Complete days painting to allow minimum of 6 hours drying time prior to time of day when condensation will occur.

   b. Exterior coating systems:

      (1) Same general environmental requirements as specified for interior coating system.

      (2) Do not apply paint when wind velocity exceeds 15 m.p.h.

C. Protection:

1. Cover or otherwise protect surfaces not being painted concurrently.

2. *CONTRACTOR* shall promptly remedy all paint damage to existing structures and other property at site or adjacent thereto not designated for painting under this Contract. See paragraph 9 of General Conditions, as amended by Supplementary Conditions.

D. Safety precautions:

1. Comply with all OSHA regulations.

2. Provide adequate air exhaust equipment to eject blast dust and solvent fumes from tank interiors or confined spaces; and to prevent accumulation of solvent fumes that will retard curing of the paint or create an explosion or fire hazard.

3. During blasting operations, provide nozzle men with air-supplied helmets and other persons exposed to blasting dust with filter-type respirators and safety goggles.

4. When applying coatings inside of tanks or confined spaces, all persons exposed to toxic vapors shall wear air-supplied masks.

5. Provide access facilities, ventilation, grounding, lighting, protective clothing; and handle paint and solvent as specified in AWWA D102, Section 7. Comply with paint supplier's safety precautions.

1.07 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including surface preparation, recoating, removal and reinstallation of equipment and re-start-up during the warranty period.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, character and quality of material, serviceability and other described essential characteristics.

B. Substitutions:

1. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2. No request for substitution will be considered that decreases the film thickness specified and/or number of coats to be applied; or that offers a change from the generic type of coating specified.

3. Submit additional information for substitutions as specified below:

   a. Certification that coating meets regulatory requirements.

   b. List at least five (5) equivalent applications where each coating material has been used and rendered satisfactory service.

C. Acceptable manufacturers:

1. Tnemec Company, Inc.
   Kansas City, MO
   816- 474-3400

2. Carboline Company
   St. Louis, MO
   314- 644-1000

3. Sherwin-Williams Company
   Malvern, PA
   Jim Criss – Cell: 609-577-4034

4. ICI Devoe Coatings
   Sykesville, MD
   410- 795-3234

5. Finnaren & Haley
   Conshohocken, PA
   800- 843-9800

6. Benjamin Moore & Co.
   Montvale, NJ
   201-573-9600

7. NSP Specialty Products
   Pinehurst, NC 28374
   800-248-8907
   910-235-0468

8. International Paint
   Union, NJ 07083

908-686-1300

9. Or equivalent.

2.02 MATERIALS

A. Paint:

1. Materials are specified in the Painting Schedule.

2. Use manufacturer's standard colors or custom colors as selected by the *ENGINEER* from the manufacturers full range of standard and custom colors.

B. Primers and undercoats: As specified in Painting Schedule or as recommended by paint manufacturer and approved by *ENGINEER*.

C. Sealer for interior woodwork: White pigmented Shellac or urethane wood sealer.

D. All coatings shall be in compliance with N.J.A.C. 7:27-23 and NJSA 7:27-16.

E. All coatings shall be lead free.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Inspection:

1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

2. Verify that the work of this section may be installed in accordance with all pertinent codes and regulations, the original design, and the referenced standards.

3. Verify that the specified coatings are compatible with the surface and service for which they are to be used.

4. Examine surfaces scheduled to receive paint for conditions that will adversely affect execution, permanence or quality of work and that cannot

be put into acceptable condition through preparatory work specified below. *CONTRACTOR* shall be solely responsible for providing a surface acceptable to the application of coatings utilizing the indicated cleaning methods as a minimum.

B. Discrepancies:

1. In the event of discrepancy, immediately notify the *ENGINEER*.

2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 PREPARATION

A. General:

1. Before painting, remove hardware, accessories, plates, lighting fixtures and similar items or provide ample protection of such items.

2. Upon completion of each space, replace above items.

3. Use only skilled mechanics for removing and replacing above items.

4. All welding, burning, etc., shall be completed prior to the blasting operation. All flux, spatter, slag or other laminations left from welding must be chipped or ground off. Rough welds and other sharp projections shall be ground smooth.

5. Clean surfaces shall be coated with the specified coating system during the same day as blasted and prior to sundown of that day.

6. Blasting media shall be fresh, with sharp angular surfaces to insure fast, positive cleaning action with a minimum of dust.

7. Blasting media shall be confined as closely as possible to the area being blasted. If necessary, shields of sheeting or other such barriers shall be erected to confine the media to the blast area. Rotating equipment near blasting operations shall have a tent placed over it to protect it from drifting, spent media.

8. Nameplates, valve stems, rotating equipment, etc., shall be protected from blasting and coating by suitable masking materials.

9. Dials, gauges, and indicators on operating equipment shall be covered with clear material so as to afford visual access.

B. Preparation of surfaces:

1. Wood:

a. Sandpaper to smooth and even surface, then dust off.

b. Touch up knots, pitch streaks, sap spots and similar blemishes with sealer before priming.

2. Wallboard and plaster shall be thoroughly cleaned of all dust, dirt and efflorescence by stiff broom or brush cleaning.

3. Block: Thoroughly clean of all dust, dirt, loose mortar and efflorescence by brushing down with stiff brooms or scraping tools, producing a clean surface for painting. All surface contaminants shall be removed.

4. Concrete:

a. Concrete shall be permitted to age at least 28 days prior to applying coating system.

b. The *CONTRACTOR* may elect to use a paintable curing compound to permit coating in seven (7) days.

c. All surface contaminants shall be removed and there shall be no evidence of laitance on the surface prior to painting. Hardeners and sealers shall be removed. Surface shall be acid etched or brush blasted.

d. Patch all bug holes, voids and cracks.

e. Surfaces to be used for immersion service shall not be “bagged”.

5. Iron and steel surfaces:

a. All sharp edges and welds shall be ground smooth to a rounded contour and all weld splatter shall be removed prior to blast cleaning.

b. Iron and steel shall be prepared in accordance with SSPC-SP6 unless otherwise specified and prime coated the same day whether shop primed or field painted.

c. Primed iron and steel shall be cleaned of all construction debris and hand tool cleaned in accordance with SSPC SP2 prior to touch-up and field painting.

d. Surface profile for blasted surfaces shall be between 20 and 30 percent of the total dry film thickness of the complete system.

e. Compressed air for blasting shall be clean, dry and oil free. Place oil and water separators in air hose as close as possible to blast cleaning equipment. Water shall be continuously bled from moisture traps.

f. After blasting, remove all dust and grit with vacuum cleaner or compressed air (clean and dry).

g. Coat blasted surfaces before they become contaminated with rust, oil, grease, dust or other foreign matter.

h. If blast cleaned surfaces become contaminated by rust, oil, grease, hand-prints or other foreign matter, solvent clean and reblast to original specifications to insure same degree of cleanliness.

i. Blasted surfaces shall be prime coated the same day.

j. Feather edges of sound paint during spot-blasting operations.

6. Galvanized steel

a. New Galvanized Metal: Remove grease, oil, dirt, soil, drawing compounds, and other contaminants by use of solvents, emulsions, cleaning compounds or steam cleaning per SSPC-SP1. If galvanized metal has not weathered for at least 6 months or if the metal has been treated with chromates or silicates, first Solvent Clean per SSPC-SP1 and apply a paint test patch (minimum area of 2 sq ft) and allow the paint to dry for at least one week before testing adhesion. If adhesion is unacceptable, Brush-Off Blast per SSPC-SP7 or NACE 4 to remove these treatments.

b. Old Galvanized Metal: If metal is covered with a white powder (white rust) and there is little or no rusting, solvent clean per SSPC-SP1.

7. Aluminum:

a. Remove all oil, grease, dirt, oxide and other foreign material by Solvent Cleaning SSPC-SP1.

b. Aluminum surfaces in contact with concrete shall be coated with a bituminous barrier coat prior to installation.

3.03 APPLICATION

A. Prior to painting, meet with *ENGINEER* to review all aspects of surface preparation and application.

1. Do not apply coatings until air temperature, surface temperature, relative humidity, and surface moisture content are within specified limitations.

2. Check temperature and humidity using pyrometers and hygrometers, or similar equipment.

B. Sequencing:

1. Sequence painting to allow coating of surfaces that may be inaccessible after fixtures, partitions, or other facilities are installed and so that minimum damage to finish coatings will result.

2. All structural steel shall be finish painted.

C. Prepare surfaces to be painted and apply all paint and other materials in accordance with paint manufacturer's recommendations unless otherwise specified as approved by the *ENGINEER*.

D. Each coat of paint shall be slightly darker than preceding coat unless otherwise directed. Undercoats shall be tinted similar to finish coats.

E. Surfaces to be painted shall be clean, dry, smooth and adequately protected from dampness.

1. Each coat of paint shall be well brushed on, worked out evenly and allowed to dry before a subsequent coat is applied.

2. Use rollers or airless spray except that sharp corners, inside angles, welds, and rivets shall be brushed and allowed to dry before remaining surfaces are rolled or sprayed.

3. Rate of application shall not exceed that recommended by paint manufacturer.

4. Keep brushes, rollers, and spraying equipment clean, dry, free from contamination. Use equipment suitable for the finish desired.

5. Comply with recommendation of product manufacturer for drying time between succeeding coats.

F. Mixing, thinning, pot life, application procedure, equipment, coverage, curing, recoating, storage, and number of coats shall be in accordance with coating manufacturer's instructions or these specifications, whichever are more stringent.

G. Avoid contamination of blasted surfaces and avoid between coat contamination. Surface contamination shall be removed before applying next coat.

H. Striping of Irregular Surfaces:

1. Stripe paint all edges, corners, crevices, rivets, bolts, welds, sharp edges and similar surface irregularities with the priming paint before the steel receives its first full prime coat of paint. The stripe coat shall be applied by brush or spray to thoroughly work the coating into or on the irregular surfaces and shall extend onto the surrounding steel a minimum of 1 in. in all directions.

2. The full prime coat can be applied first to protect the steel after blasting followed by the stripe coat after the prime coat has dried. Stripe coat shall be tinted to differentiate it from the prime coat.

3. The stripe coat can also be applied as part of the application of the prime coat unless prohibited by the coating manufacturer. If applied as part of the application process of the prime coat, the stripe coat shall be allowed to dry for a minimum of ten (10) minutes in order to allow *ENGINEER* to verify that the coat was applied. If a wet-on-wet stripe coat is prohibited by the coating manufacturer or brush or roller application of the full coat pulls the underlying stripe coat, the stripe coat shall be permitted dry according to the manufacturers' recommendations prior to the application of the full coat.

I. Spraying techniques that result in a uniform, wet pattern shall be used and dry spraying shall be avoided. Dry spray shall be removed prior to sound coating being applied.

J. Coated surfaces shall be allowed to cure prior to allowing traffic or other work to proceed that might damage coating.

K. No coating shall be applied over scale, oil, grit or other foreign material. All grit shall be removed by brush, airblast or vacuum type cleaner prior to applying coating system. Care shall be taken to assure that blast cleaned surfaces are not contaminated with foreign material prior to applying primer.

L. Regulators and gauges in good working order shall be provided on both air and material lines. Operating pressures in accordance with those required for the particular coating will be used.

M. Temperature of the surface to be painted shall not be less than 50° F (10° C) or greater than 120° F (49° C) unless approved otherwise by the *ENGINEER*.

N. The coating system shall not be applied closer than 6 inches to a non-blasted area. Any subsequent blasting operation shall not result in sand or grit particles being embedded in the paint film.

O. Spray guns must be held perpendicular to the surface being painted and handled and adjusted in such a manner that dry overspray is kept to a minimum.

P. The final dry film thickness of the applied coating system shall be within the range of thicknesses specified per coat, and the thicknesses of the totals of each coat for a coating system as specified in the "Coating Schedule".

Q. All spray equipment to be used for the application of a particular coating will be available for inspection by *ENGINEERs* representative before application is begun.

R. The air source must be sufficient to provide a continuous volume of 20 cfm air at each spray gun nozzle at 80 pounds per square inch pressure for applying coatings by conventional spray technique. When coatings are applied by airless spray, the input pressures to the pump shall be such that a uniform spray pattern is developed for application.

S. Drop cloths shall be used to protect all previously painted surfaces and all surfaces not to be coated.

T. All zinc rich primers shall be applied under continuous agitation.

U. Runs or sags shall be brushed out immediately or the coating shall be removed from the surface.

V. Finished work shall be uniform, of approved color, smooth and free from runs, sags, defective brushing, clogging, mud cracking or excessive flooding. Make edges of paint adjoining other materials or colors sharp and clean without overlapping.

W. At completion, touch up and restore finish where damaged and leave in good condition.

X. All methods of application shall be in accordance with paint manufacturer's recommendations as approved by *ENGINEER*.

3.04 CLEANING

A. Touch up and restore finish where damaged.

B. Remove spilled, splashed or splattered paint from all surfaces.

C. Do not mar surface finish of item being cleaned.

D. Refer to *Section 01 74 00, Cleaning and Restorations*.

3.05 FIELD QUALITY CONTROL

A. Tests by *CONTRACTOR*: Check wet film thickness steel surfaces during paint application using a Nordson Wet Film Gauge or similar approved instrument. Take 1 wet film thickness measurement for each 100 square feet of surface painted.

B. All surfaces, preparation, and paint applications are subject to inspection by the *ENGINEER* Representative.

C. Painted exterior and interior surfaces shall be rejected if any of the following defects are apparent to the *ENGINEER*.

1. Brush/roller marks, streaks, laps, runs, sags, drips, stippling, mud cracking, blistering, blushing, checking, cratering, flaking, orange peel, over spray, wrinkling, pinholes, hiding or shadowing by inefficient application methods, skipped or missed areas, and foreign materials in paint coatings.

2. Evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles.

3. Damage due to touching before paint is sufficiently dry or any other contributory cause.

4. Damage due to application on moist surfaces or caused by inadequate protection from the weather.

5. Damage and/or contamination of paint due to blown contaminants (dust, spray paint, etc.).

6. Insufficient film thickness.

7. Insufficient surface profile on blasted steel surfaces.

8. The final coat on any surface exhibits a lack of uniformity of color, sheen, texture, and hiding across full surface area.

D. Painted surfaces rejected by the *ENGINEER* shall be repaired or replaced at the Contractors expense.

1. Correct deficiencies in film thickness by application of additional coat(s) of paint.

2. Correct defective work or work not meeting specifications by removal and recoating.

3.06 INSPECTION PRIOR TO RELEASE OF MAINTENANCE BOND

A. General: Within two (2) years time from acceptance of work by *ENGINEER*, the surfaces coated under this Contract shall be inspected by representatives of *OWNER*, *ENGINEER* and *CONTRACTOR* to determine if any repair work is necessary.

B. Arrangements:

1. *OWNER* will establish date for the inspection and will notify *CONTRACTOR* at least thirty (30) days in advance.

2. *OWNER* will drain tank (if required). *CONTRACTOR* shall provide suitable interior lighting and ventilation for the tank inspection.

C. Remedial work:

1. Any location where coats of paint have peeled off, bubbled, or cracked and any location where rusting is evident shall be considered failure of paint system.

2. *CONTRACTOR* shall make repairs at all points where failures are observed by removing deteriorated coating, cleaning surface, and recoating with same paint system. If area of failure exceeds 25 percent of the area of a portion of a surface, then for that portion, remove and repaint the entire paint system.

3. For purposes of determining need for complete repainting of a tank, the outside roof, shell, floor, riser, and tank supporting structure consisting of columns, rods, struts, and other members; and inside roof, shell, floor and riser shall be considered separately.

D. Inspection Report: *OWNER* will have prepared, by an independent inspection agency, an inspection report covering the inspection describing the number and types of failures observed, the percentage of surface area where failure has occurred, and names of persons making the inspection. The report will include color photographs illustrating each type of failure.

E. All work relating to the inspection shall conform to the requirements of Paragraph 36 of General Conditions entitled, "Approval and Acceptance of Work".

3.07 PAINTING SCHEDULES

A. **GENERAL ENVIRONMENT – INTERIOR**:
(i.e. office and warehouse):

1. Concrete and masonry walls:

a. Surface preparation: SSPC-SP13/NACE6 or ICRI No. 310.2R, CSP3-5.

b. Sherwin Williams:
1 coat "Kem Cati-Coat HS" Epoxy Block Filler
2 coats "Pro Industrial Acrylic Coating – Semi-Gloss Finish.

c. PPG/Amercoat:
1 coat "Amerlock 400BF" Epoxy Block Filler
2 coats "Pitt-Tech DTM Acrylic Coating"

d. Carboline:
1 coat "Sanitile 500" Epoxy Block Filler
1 coat "Carbocrylic 3359" Acrylic Coating

e. Or equivalent

2. Wood surfaces:

a. Surface preparation: Sand bare wood to a fresh surface and following manufacturer instructions.

b. Sherwin Williams:
1 coat "Premium Wall & Wood Primer," B28W8111
2 coats: "Pro Industrial Acrylic Coating Semi-Gloss Finish.", B66-650 Series

c. Carboline:
1 coat "Sanitile 120" Primer/Sealer
1 coat "Carbocrylic 3359" Acrylic Coating

b. PPG/Americoat:
1 coat "Seal Grip Acrylic Primer Sealer"
2 coats "Manor Hall 70-101"

e. Or equivalent

3. Ferrous Metal:
(including metal doors, frames, trim, equipment and miscellaneous metal):

a. Surface preparation: SSPC-SP3, Power-Tool Cleaning.

b. Sherwin-Williams:
1 coat "DTM Acrylic Primer/Finish (2-5 mils DFT/coat) on bare metal
2 coats "Pro Industrial Acrylic Coating", B66-650 Series (2-5 mils DFT/coat) Semi-Gloss

c. Carboline:
1 coat "Carbocrylic 3359 DTMCC" Acrylic Primer (2-3 mils DFT)
1 coat "Carbocrylic 3359 DTMC" Acrylic Coating (2-3 mils DFT)

d. PPG/Americoat:
2 coats "Pitt-Tech DTM" Acrylic Coating

e. Or equivalent

4. Galvanized Ferrous Metal:

a. Surface Preparation SSPC-SP1, Solvent-Clean.

b. Sherwin Williams:
1 coat "Pro Industrial Pro-Cryl Universal Primer" (3-4.5 mils

DFT)
2 coats “Pro Industrial Acrylic Coating” Semi-Gloss Finish. B660650 Series” (2.5-4 mils DFT/coat)

c. Carboline:
1 coat “Galoseal WB” Priimer (1-2 mils DFT)
2 coats “Carbocrylic 3359 DTMC” Acrylic Coating (2-3 mils DFT)

d. PPG/Americoat:
1 coat “6-209 Epoxy Ester Primer”
2 coats “Pitt-Tech DTM Acrylic Primer”

e. Or equivalent.

5. Overhead Ferrous Metal:
(including steel bar joists, steel beams, steel deck):

a. Surface preparation: SSPC-SP3, Power Tool Cleaning

b. Sherwin Williams:
1 coat “Kem Bond HS” (2.0 – 5.0 mils)
2 coats “Dry Fall Flat White” (3.0 – 5.0 mils)

c. PPG/Americoat:
1 coat “6-209 Epoxy Ester Primer”
2 coats “Pitt-Tech DTM Acrylic Primer”

d. Carboline:
1 coat “Carbocrylic 3359 DTMC” Acrylic Primer (2-3 mils DFT)
1 coat “Carbocrylic 3359 DTMC” Acrylic Coating (2-3 mils DFT)

e. Or equivalent.

6. Overhead Galvanized Metal:
(including steel bar joists, steel beams, steel deck):

a. Surface preparation: SSPC-SP1, Solvent Clean

b. Sherwin Williams:
1 coat “ DTM Wash Primer”
2 coats “Dry Fall Flat White”

c. PPG/Americoat:
1 coat “6-209 Epoxy Ester Primer”

2 coats “Pitt-Tech DTM Acrylic Primer”

d. Carboline:
1 coat “Galoseal WB” Priimer (1-2 mils DFT)
2 coats “Carbocrylic 3359 DTMC” Acrylic Coating (2-3 mils DFT)

e. Or equivalent.

7. Wallboard and plaster:

a. Surface preparation: Provide Finish per Specification 09 21 16, Gypsum Wallboard and then follow manufacturer’s recommendations.

b. Sherwin Williams:
1 coat “ProMar 200 Zero VOC Latex Primer,” B28W2600
2 coats “ProMar 200 Zero VOC Latex,” Egg Shell Finish.

c. Carboline:
1 coat “Sanitile 120” Primer (1-2 mils DFT)
1 coat “Sanitile 150” Acrylic Coating (2-3 mils DFT)

d. Or equivalent

B. **PROCESS ENVIRONMENT - INTERIOR**:
(Non-Immersion)

1. Concrete and masonry walls:

a. Surface preparation: SSPC-SP13/NACE 6 or ICRI No. 310.2R, CSP 3-5.

b. Sherwin Williams:
1 coat “Kem Cati-Coat HS” Epoxy Block Filler
2 coats “Macropoxy 646 fast Cure Epoxy” (4-8 mils DFT/coat)

c. Carboline:
1 coat “Sanitile 500” Epoxy Block Filler
1 coat “Carboguard 890” Epoxy Coating (4-6 mils DFT)

d. PPG/Amercoat:
1 coat “Amerlock 400BF” Epoxy Block Filler
1 coat “Amercoat 385” Multi-Purpose Epoxy

e. Or equivalent

2. Wood surfaces (see General Environment – Interior):

3. Ferrous Metal: [Lighter Duty – One Component]
(including metal doors, frames, trim, equipment and miscellaneous metals, and structural steel):

a. Surface preparation: SSPC-SP3, Power-Tool Cleaning.

b. Sherwin-Williams:
1 coat "Kem Bond HS Universal Primer" (2.5-3.5 mils DFT)
2 coats "Industrial Enamel HS" (2-4 mils DFT/coat)

c. Carboline:
1 coat "Carbocoat 150 Universal Primer" (2-3 mils DFT)
2 coats "Carbocoat 8215 VOC" Alkyd (2-3 mils DFT)

d. PPG/Amercoat:
1 coat "Amercoat 185H Universal Primer" (2-3 mils DFT)
2 coats "Amercoat 5450" (1.5-2.5 mils DFT)

e. Or equivalent

4. Ferrous Metal: [Heavy Duty – Two Components]:

a. Surface preparation: SSPC-SP6, Commercial Blast.
First coat or shop coat must be specified epoxy below.

b. Sherwin-Williams:
2 coats "Macropoxy 646 – FC Epoxy" (5-10 mils DFT/coat)

c. Carboline:
2 coats "Carboguard 890" (6-10 mils total DFT/coat)

d. PPG/Amercoat:
2 coats "Amercoat 385" (4-6 mils DFT)

e. Or equivalent

5. Galvanized and Nonferrous Metal:

a. Surface Preparation SSPC-SP1, Solvent-Clean

b. Sherwin Williams:

1 coat “Pro-Cryl Universal Primer” (3-4.5 mils DFT)
2 coats “Industrial Enamel HS” (2-4 mils DFT/coat)

c. Carboline:
1 coat “Galoseal WB” (1 – 2 mils DFT)
1 coat “Carbocrylic 3359 DTMC” (2-3 mils DFT)

d. PPG/Amercoat:
1 coat “6-209 Epoxy Ester Primer” (2.0 mils DFT)
2 coats “Amercoat 5450” (1.5-2.5 mils DFT)

e. Or equivalent

6. Wallboard and plaster: (Same as for General Environment – Interior).

C. **EXTERIOR EXPOSURE**:
(Exposure to weather, freezing and/or ultraviolet) – [Lighter Duty]:

1. Ferrous metal: [Lighter Duty]
(including metal doors and trim, interior face of exterior doors, frame, exposed electrical equipment, and other miscellaneous metal):

a. Surface preparation: SSPC-SP3, Power-Tool Cleaning.

b. Sherwin-Williams:
2 coats “DTM Acrylic Primer/Finish” (2-5 mils DFT/coat)

c. Carboline:
1 coat “Carbocoat 8239” Primer (1-2 mils DFT)
1 coat “Carbocrylic 3359 DTMC” Acrylic Coating (2-3 mils DFT)

d. PPG/Amercoat:
2 coats “DTM Acrylic Primer/Finish” (2-5 mils DFT/coat)

e. Or equivalent

2. Ferrous Metal: [Heavy Duty – Above Grade]:
(including exterior surface of tanks – not Potable, Non-Immersion)

a. Surface preparation: Blast to SSPC-SP10, Near White. (First coat must be specified epoxy, see below.)

b. Sherwin-Williams:
1 coat “Macropoxy 646- FC Epoxy” (4-6 mils DFT)
2 coats “Hi-Solids Polyurethane” (3-5 mils DFT)

c. Carboline:
1 coat “Carboguard 890” (4-6 mils total DFT)
1 coat “Carbothane 133 Series” (3-5 mils DFT)

d. PPG/Amercoat:
1 coat “Amercoat 385” (4-12 mils DFT
1 coat “Amercoat 450H” (3-4 mils DFT)

e. Or equivalent

3. Galvanized (and Nonferrous) Metal:
(including metal doors and trim, interior face of exterior doors, frames, exposed electrical equipment, and other miscellaneous metal):

a. Surface Preparation SSPC-SP1, Solvent-Clean.

b. Sherwin Williams:
1 coat “Pro Industrial Pro-Cryl Universal Primer” (3-4.5 mils DFT)
2 coats “Pro Industrial Acrylic Coating” B66-650 Series (2.5-4 mils DFT/coat)

c. Carboline:
1 coat “Galoseal WB” (1 – 2 mils DFT)
2 coats “Carbocrylic 3359 DTMC” Acrylic Coating (2-3 mils DFT)

d. PPG/AmerCoat:
1 coat “6-209 Epoxy Ester Primer” (2.0 mils DFT)
2 coats “Pitt-Tech DTM Acrylic Finish” (2.0 mils DFT/coat)

e. Or equivalent

4. Masonry:

a. Surface preparation: SSPC-SP13/NACE-6, or ICRI No. 310.2R, CSP 3-5.

b. Sherwin Williams:
1 coat “Kem Cati-Coat HS” Epoxy Block Filler
2 coats “Macropoxy 646 Fast Cure Epoxy” (5-10 mils DFT/coat)

c. Carboline:
1 coat “Sanitile 500” Epoxy Block Filler

1 coat “Carboguard 890” Epoxy Coating (4-6 mils DFT)

d. PPG/Amercoat:
1 coat “Amerlock 400BF” Epoxy Block Filler
1 coat “Amercoat 385” Multi-Purpose Epoxy

e. Or equivalent

5. Wood:
(See Finish Schedule for Satin or Gloss):

a. Surface preparation: Caulk, clean and/or wash, scrape, sand and seal stains according to manufacturer’s requirements.

b. Sherwin Williams:
1 coat “Exterior Latex Wood Primer,” (B42W8041)(1.4 mils DFT)
2 coats "A100 Exterior Latex Satin," (A82 Series)(1.4 mils DFT/coat)

c. PPG/Americoat:
1 coat “Grip-Seal 100% Acrylic Primer/Sealer,” (1.5 mils DFT)
2 coats “Manor Hall 70-101 series” (1.5 mils DFT/coat)

d. Benjamin-Moore:
2 coats “Regal Select Exterior High Build” Low Luster (2.3 mils DFT/coat)

e. Carboline:
1 coat “Sanitile 120” Primer/Sealer (1-2 mils DFT)
1 coat “Carocrylic 3359” Acrylic Coating (2-3 mils DFT)

f. Or equivalent.

D. **PIPING**
(interior/exterior):

1. Ferrous metal:

a. Surface preparation: SSPC-SP2, Hand-tool.

b. Sherwin-Williams:
2 coats “DTM Acrylic Primer/Finish” (2-5 mils DFT/coat)

c. Carboline:
1 coat “Carbocoat 8239” Primer (2-3 mils DFT)

1 coat “Carbocrylic 3359” Acrylic Coating (2-3 mils DFT)

d. PPG/Amercoat:
2 coats “DTM Acrylic Primer/Finish” (2-5 mils DFT/coat)

e. Or equivalent

2. Galvanized and nonferrous metal:

a. Surface Preparation SSPC-SP1, Solvent-Clean.

b. Sherwin Williams:
1 coat “Pro Industrial Pro-Cryl Universal Primer” (3-4.5 mils DFT)
2 coats “Pro Industrial Acrylic Coating” B66-650 S/G Series (2.5-4 mils DFT/coat)

c. Carboline:
1 coat “Galoseal WB” (1 – 2 mils DFT)
2 coats “Carbocrylic 3359” Acrylic Coating (2-3 mils DFT)

d. PPG/AmerCoat:
1 coat “6-230 Epoxy Ester Primer” (2.0 mils DFT)
2 coats “Pitt-Tech DTM Acrylic Finish” (2-5 mils DFT/coat)

e. Or equivalent

3.08 COLOR AND FINISH SCHEDULE

A. Refer to finish schedule on Plans for locations of all painting work.

B. Colors shall be selected by the *ENGINEER* from the manufacturer's full range of standard and custom color selections.

****END OF SECTION****

SECTION 10 14 00
(10440)
SIGNAGE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Interior building signage

2. Room Names and Numbers

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 09 90 00: Painting (General)*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *SIGNAGE* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required to demonstrate compliance with the specified requirements.

C. Shop drawings:

1. Show fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, layout, reinforcement, accessories, and installation details.

2. Provide message list for each sign required, including large-scale details of wording, lettering and Braille layout.

3. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed for signs supported by or anchored to permanent construction.

D. Samples: Provide samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.

E. Manufacturers' recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall directed all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Regulatory requirements:

1. Comply with the requirements of N.J.A.C. 5:23-7 Barrier Free Subcode of the State of New Jersey and IBC 2021..

2. Comply with CABO/ANSI 117.1-98; "Accessible and Useable Buildings and Facilities."

D. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 PROJECT CONDITIONS

A. Field measurements:

1. Obtain field measurements prior to preparation of show drawings and fabrication to ensure proper fitting.

2. Show recorded measurements on final shop drawings.

B. All painting work shall be completed prior to start of this portion of the work.

1.06 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The Contractor and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

1.07 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers:

1. ANDCO Industries, Corp.

2. ASI Sign Systems

3. Best Manufacturing Company

4. Spanjer Brothers, Inc.

5. Or equivalent.

2.02 ROOM SIGNS - INTERIOR AND EXTERIOR

A. Engraved Signs: Laminated colored plastic; lettering engraved through face to expose core color:

1. Face Color: Color as selected.
2. Core Color: Black or as selected
3. Total Thickness: 1/8 inch.
4. Height: 3 inches
5. Edges: Beveled.
6. Character Font: Helvetica, Medium, Initial cap
7. Mounting: Adhesive

2.03 BUILDING SIGNS _ EXTERIOR (Wall Mounted)

A. Provide two signs one at each end of the building, as directed by owner.

B. Frames: Aluminum panel, ANDCO System 22 Series with radius corner, natural satin/Type C finish.

B. Frame mounting: Flat PWF-RC to building with aluminum sleeves, bolts in threaded studs with mastic.

C. Panels: .125" thick aluminum; mounted flush to panel; natural satin/Type C finish.

D. Letters: 1/4" thick aluminum, mounted flush to panel; natural satin/Type C finish. studs with mastic.

2.04 DIMENSIONAL LETTERS

A. Precision cut ½" thick architectural grade aluminum plate.

B. Letter height as shown; style to be selected by *ARCHITECT* from manufacturers standards.

C. Mounting: Drilled and tapped holes on back for mounting studs with aluminum stand-off sleeves, mastic.

D. Color of letters to be selected by *ARCHITECT*.

2.05 RAISED BRAILLE CHARACTERS AND PICTORIAL SYMBOL SIGNS

A. Machine-cut copy characters and pictorial symbols from matte-finish opaque acrylic sheet and chemically weld onto the acrylic sheet forming sign panel face. Produce precisely formed characters with square cut edges free from burrs and cut marks.

1. Panel material: Matte-finished opaque acrylic sheet.

2. Panel material: Matte-finished clear acrylic with opaque color coating subsurface applied.

3. Raised characters and symbols: Characters and symbols shall be raised 1/32 inch minimum. Raised characters and symbols shall be 5/8 inch high minimum, and 2-inch maximum (refer to character heights below). Raised characters and symbols shall be accompanied by Braille.

Character Heights

Height Above Floor/Ground	Minimum Character Height
More than 80-inches	3-inches
More than 60-inches but not more than 80-inches	2-inches
More than 48-inches but not more than 60-inches	1-inch

4. Braille: Braille shall be separated ½-inch minimum from the corresponding raised character or symbols. Braille shall be Grade II and shall conform to Specifications #800, National Library Service, Library of Congress.

2.06 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the Contractor subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General:

1. Install the work of this section in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

2. Locate sign units and accessories where indicated using mounting methods of type described and in compliance with the manufacturer's instructions.

3. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.

B. Wall mounted panel signs: Signage shall be located on the wall adjacent to the latch side of the door and shall be mounted 60-inches above the adjacent finish floor surface to the centerline of the sign. In locations having double doors, signs shall be mounted on the wall to the right of the doors, signs shall be mounted on the wall to the right of the right hand door. Where there is not wall space at the locations described above, signs shall be mounted on the nearest adjacent wall. Signs shall be fastened to wall surfaces using the methods indicated below:

1. Silicon-adhesive mounting: Use liquid silicone adhesive recommended by the sign manufacturer to attach sign units to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended by the sign manufacturers to hold the sign in place until the adhesive has fully cured.

2. Shim plate mounting: Provide 1/8-thick concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other mounting methods are not practicable. Attach the plate with

fasteners and anchors suitable for secure attachment to the substrate. Attach panel sign units to the plast using the method specified above.

3. Mechanical mounting: Provide tamper proof screws with anchors comparable with aluminum sign at exterior locations.

C. Dimensional letters and numbers:

1. Mount letters and numbers using standard fastening methods recommended by the manufacturer for letter form, type of mounting, wall construction, and condition of exposure indicated.

2. Provide heavy paper template to establish letter spacing and to locate holes for fasteners.

3. Flush mounting: Mount letters with backs in contact with the wall surface.

3.03 CLEANING

A. Clean exposed surface of all grease, dirt and other foreign materials.

B. Touch up all marred or abraded surfaces as specified herein.

****END OF SECTION****

SECTION 10 21 13
(10161)
PLASTIC TOILET PARTITIONS AND SCREENS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Toilet partitions and doors, urinal and entrance screens as shown.

2. All necessary anchoring, hardware and accessories.

B. Related work:

1. *Section 10 28 13: Toilet Room Accessories*

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Shop drawings showing precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provisions in construction to accommodate the work of this section.

D. Samples:

1. Submit color samples illustrating full range of colors available from manufacturer's standard and premium product lines.

E. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect materials of this section before, during, and after installation and to protect installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver materials to the job site and store in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturers' recommendations.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The manufacturer shall guarantee its plastic partitions and screens against breakage, corrosion, and delamination under normal conditions for 15 years from the date of installation. If materials are found to be defective during that period for reasons listed herein, the materials will be replaced free of charge.

C. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the Contract Maintenance Period.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers:

1. Scranton Products, Inc.
   Scranton, PA 18505
   Tel: 800-445-5148 (717) 343-7921.

2. Or equivalent.

D. Toilet partitions shall be floor mounted, overhead braced.

E. Fire Resistance: Partition materials shall comply with the following requirements when tested in accordance with the ASTM E 84, *Standard Test Method for Surface Burning Characteristics of Building Materials*:

1. Smoke Developed Index: Not to exceed 450.

2. Flame Spread Index: Not to exceed 75.

3. Material Fire Ratings:

a. National Fire Protection Association (NFPA): Class B.
b. International Code Council (ICC): Class B.

2.02 MATERIALS

A. Doors:

1. Doors shall be 58" high, 1" thick, single component construction, Solid Polymer.

B. Panels:

1. Toilet compartment Panels shall be 58" high, 1" thick, single component construction, Solid Polymer.

2. Shower compartment panels shall be 82" high, 1" thick, single component construction, Solid Polymer.

C. Pilasters:

1. Pilasters shall be 82" high, 1" thick, single component construction, fitted with an 11 gauge stainless steel footer for attachment to min. 3/8" floor studs and expansion shields.

2. Headrails shall be heavy duty aluminum extrusions, anodized with anti-grip configuration, and shall be fastened to the pilaster tops.

D. Hardware:

1. Hinges shall be fabricated from 11 gauge stainless steel, one piece leaf, for surface mounting. Hinge shall be equipped with one-piece 3/8" stainless steel pintle extending the full height of the hinge. Upper and lower hinge are to both be cam operated, with the one piece pintle.

2. Coat hook and bumper to be 14 gauge stainless steel, Sanymetal #7267.

3. Door strike and keeper shall be 14 gauge stainless steel, Sanymetal #7269/7270.

4. Door latch to be slide type, 14 gauge stainless steel. Sanymetal #7231.

5. Panel brackets to wall pilasters to be heavy duty aluminum, anodized and polished with three (3) brackets per connection:

6. Pilaster shoe 4" high stainless steel shoe, #4 finish.

7. Heatstrips in stainless steel shall be applied to the bottom edges of panels and doors to prevent burning.

E. Finish:

1. Panels, doors and pilasters shall be fabricated from Polymer resin that forms a single component section, waterproof and non-absorbent, with a self-lubricating surface.

F. Color:

1. Color shall extend throughout the entire thickness of all the components.

2. Colors shall be selected from the manufacturer's standard polymer colors.

2.03 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 INSPECTION

A. Inspect areas and conditions under which toilet partitions and related items are to be installed.

Existing metal partitions shall be dismounted, removed from premises and disposed of in an approved manner in an lawful place of the Contractor's choice.

B. Notify *ENGINEER* in writing if conditions are detrimental to completion of work.

C. Do not proceed with work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Erection of partitions, etc. shall be in accordance with the manufacturer's standard recommendations and the following:

1. All parts shall be erected in a substantial manner, straight, level and plumb.

2. No evidence of drilling, cutting or patching shall be visible in the finished work.

3. Clearance at vertical edges of doors shall be uniform top to bottom and shall not exceed 3/16".

4. Finished surfaces shall be cleaned after installation and left free of imperfections.

3.03 ADJUSTMENT AND CLEANING

A. Perform final adjustments to pilaster leveling devices and other operating parts of partition assembly just prior to final inspection.

B. Clean exposed surfaces of partition hardware and fittings in accordance with manufacturers instructions.

****END OF SECTION****

SECTION 10 28 13
(10800)
TOILET ROOM ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Toilet room accessories.

B. Related Work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 09 21 16: Gypsum Wallboard system*.

C. Payment:

1. Unless otherwise noted in the *Proposal* Section, no separate payment shall be made for this item.

2. Include all costs for *TOILET ROOM ACCESSORIES* in the prices bid for the various related items of work as designated in the *Proposal*.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection.*

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER.*

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER.*

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

1.06 MAINTENANCE MANUALS

A. Maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER*'s personnel.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers:

1. American Specialties, Inc.
   Yonkers, NY

2. Bobrick Wash Room Equipment, Inc.
   Clifton Park, NY

3. Bradley Corporation
   Menomoree Falls, WI

4. McKinney/Parker Products Co.
   Scranton, PA

5. Kohler Co.
   Kohler, Wisconsin,

6. Or equivalent.

2.02 PRODUCTS

A. Provide the following products by American Specialties, Inc. or equivalent in the quantities and locations shown on the drawings. All accessory items shall be stainless steel with satin finish.

1.	Paper Towel Dispenser	Bradley-Model 2495
2.	Waste Receptacle	Bobrick-B270
3.	Soap Dispenser	Bobrick-B2012
4.	Toilet Paper Dispenser	Bobrick- B 2892
6.	Mirror	Bobrick-Custom Size-B-290-66" x 30" Tempered glass -A with Fully Tempered Glass complying with ANSI Z97.1 and passing the testing requirements of CPSC 16 CFR 1201, Category I."
8.	Grab Bar	Bobrick-6806 x 42 and 6806 x 36
14.	Coat Rack	Bobrick B-9542
15.	Toilet Seat Cover Dispenser	Bobrick-B-4221

2.03 OTHER MATERIALS

A. Anchors and fasteners: Provide anchors and fasteners capable of developing a retaining force commensurate with the strength of the accessory to be mounted, and well suited for use with the supporting construction. Where exposed fasteners are permitted, provide oval head fasteners with finish matching the accessory.

B. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 COORDINATION

A. Throughout construction of substrate surface, use all means necessary to ensure proper and adequate provision for concealed support devices, and for finished openings, to receive the work of this section.

3.03 INSTALLATION

A. Install the work of this section in strict accordance with the manufacturers' recommendations as approved by the *ENGINEER*, anchoring all components plumb, level, square, and firmly into position for long life under hard use.

3.04 CLEANING

A. Clean exposed surface of all grease, dirt and other foreign materials.

B. Touch up all marred or abraded surfaces in accordance with manufacturer's directions.

****END OF SECTION****

SECTION 10 28 14
(10811)
ELECTRIC HAND DRYERS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Warm Air, self-contained electric hand dryers.

B. Related Work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 06 20 00: Carpentry*

3. *Division 26: Electrical*

C. Payment:

1. Unless otherwise noted in the *Proposal* Section, no separate payment shall be made for this item.

2. Include all costs for *ELECTRIC HAND DRYERS* in the prices bid for the various related items of work as designated in the *Proposal*.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required to demonstrate compliance with the specified requirements.

C. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection.*

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER.*

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in

strict accordance with the manufacturer's recommendations as approved by the *ENGINEER.*

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

1.06 MAINTENANCE MANUALS

A. Maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER*'s personnel.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers:

1. Excel Dryer Inc., which is located at:
   357 Chestnut St.
   P. O. Box 365
   East Longmeadow, MA 01028
   Tel: 413-525-4531
   Fax: 413-525-2853

2. Or equivalent.

2.02 ELECTRIC HAND DRYERS

A. Hand Dryer: Warm air, rapid drying electric hand dryer; Xlerator; surface mounted; entire dryer internally grounded.

1. Warranty Period: 5 years; limited warranty.

2. Controls: Automatic, activated by infrared optical sensor. Operates while hands are under blower. Shut-off within 2 seconds when hands removed, or in 35 seconds if hands not removed.

3. Cover: Stainless steel with brushed finish.

4. Air Intake: Inlet openings on bottom of cover.

5. Air Outlet: Delivers focused air stream at average hand position of 4 inches (102 mm) below air outlet.

6. Noise Reduction Nozzle: 1.1 noise reduction nozzle.

7. Wall Plate: Injection molded, rib reinforced plate with metal L brackets to attach cover, with ten 5/16 inch (8 mm) diameter holes for surface mounting to wall and three 7/8 inch (22 mm) diameter holes for electrical wiring; bottom hole suitable for surface conduit.

8. Nominal Size: 11-3/4 inches (298 mm) wide by 12-11/16 inches (322 mm) high by 6-11/16 inches (170 mm) deep. Weight: 16 pounds (7.3 kg).

9. Power Source: 220/240 volt, 6.5 amp, 60 Hz

10. Combination Motor and Blower: Series commutated, through-flow discharge, vacuum type; 5/8 HP, 20,000 RPM. Air flow rate: 16,000 linear feet per minute (81 meters per second) at air outlet, 14,000 linear feet per minute (71 meters per second) at average hand position of 4 inches (102 mm) below air outlet.

11. Heater: Nichrome wire element, mounted inside blower housing to be vandal proof.

12. Heater Safeguard: Automatic resetting thermostat to open when air flow is restricted and close when air flow is resumed.

13. Air Temperature: 135 degrees F (55 degrees C) measured at average hand position of 4 inches (102 mm) below air outlet. Air Heater Output: 900 watts.

14. All metal parts coated according to Underwriters Laboratories, Inc, requirements.

15. Mount dryers at heights indicated on Drawings.

2.03 OTHER MATERIALS

A. Anchors and fasteners: Provide anchors and fasteners capable of developing a retaining force commensurate with the strength of the accessory to be mounted, and well suited for use with the supporting construction. Where exposed fasteners are permitted, provide oval head fasteners with finish matching the accessory.

B. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 COORDINATION

A. Throughout construction of substrate surface, use all means necessary to ensure proper and adequate provision for concealed support devices, and for finished openings, to receive the work of this section.

3.03 INSTALLATION

A. Install the work of this section in strict accordance with the manufacturers' recommendations as approved by the *ENGINEER*, anchoring all components plumb, level, square, and firmly into position for long life under hard use.

3.04 CLEANING

A. Clean exposed surface of all grease, dirt and other foreign materials.

B. Touch up all marred or abraded surfaces in accordance with manufacturer's directions.

****END OF SECTION****

SECTION 10 44 00
(10520)
FIRE EXTINGUISHERS, CABINETS AND ACCESSORIES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Fire extinguishers, cabinets and accessories.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 09 90 00: Painting*

1.02 REFERENCES

A. National Fire Protection Association:

1. NFPA 10; Portable Fire Extinguishers

B. Uniform Fire Code of the State of New Jersey; N.J.A.C. 5:70

C. Uniform Construction Code of the State of New Jersey; N.J.A.C. 5:23

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required to demonstrate compliance with the specified requirements.

C. Shop drawings showing precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provision in concrete forming, reinforcement, and placement to accommodate the work of this section.

D. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions, will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

C. An extinguisher instruction manual shall be provided giving condensed instructions and cautions necessary to the installation, operation, inspection, and maintenance of the extinguisher(s). The manual shall refer to NFPA-10 as a source of detailed instruction.

PART 2 - PRODUCTS

2.01 GENERAL

A. Proprietary Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Manufacturers:

1. The products specified herein are as manufactured by Larsen's Manufacturing Company, Minneapolis, MN, (612) 571-1181, or equivalent.

2. Similar products by the following:

a. Larsen's Manufacturing Company
Minneapolis, MN (763) 571-1181

b. J. W. Moon, Inc.
4717 Stenton Avenue
Philadelphia, PA 19144 (215) 250-5656

c. J. L. Industries
Bloomington, MN (612) 835-6850

d. Muckle Manufacturing
Owatonna, MN (507) 451-7114

e. Watrous Inc.
Bensonville, IL (312) 766-8000

f. Walter Kidde
Wake Forest, NC (919) 556-6811

g. Or equivalent.

2.02 FIRE EXTINGUISHERS

A. Interior:

1. Larsen's Model No. MP10 or equivalent.

2. 10 lb. multi-purpose dry chemical, UL Rating of 4A-80BC

B. Exterior:

1. Larsen's Model No. MP20 or equivalent.

2. 20 lb. multi-purposed dry chemical, UL Rating of 20A-120BC.

2.03 FIRE EXTINGUISHER CABINET - INTERIOR

A. Recessed: Larsen's Model No. 2409-R2, or equivalent. Door shall be welded steel construction with semi-concealed hinge and full panel glass with "Larsen Loc" locking device. Cabinet trim shall be Style "L". Cabinet shall have a white baked enamel inside and white baked acrylic enamel outside.

B. Semi-recessed: Larsen's Model No. 2409-6R or equivalent and meeting all other requirements for recessed model.

C. Surface mounted: Larsen's Model No. 2409-SM or equivalent and meeting all other requirements for recessed model.

D. Finish painting is specified in *Section 09 90 00, Painting*.

E. When mounted in fire rated wall, cabinets shall be equipped with Larsen's flame shield option or equivalent, certified and listed by Warnock-Hersey for one and two hour wall construction.

2.04 FIRE EXTINGUISHER CABINET - EXTERIOR

A. Surface Mounted: Larsen's Model No. 2712-SM, or equivalent. Cabinet and trim shall be stainless steel. Door shall be welded stainless steel construction with semi-concealed hinge and full panel glass with "Larsen Loc" locking device. Cabinet shall have a white baked enamel inside and white baked acrylic enamel outside.

2.05 BRACKETS

A. Provide wall brackets for fire extinguishers shown without cabinet.

2.06 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General: Install the work of this section in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

B. Mounting:

1. Fire extinguishers shall be mounted in accordance with NFPA-10; Portable Fire Extinguishers.

2. Extinguishers having a gross weight not exceeding 40 lb (18.14 kg) shall be installed so that the top of the extinguisher is not more than 5.0 feet (1.53 m) above the floor. (NFPA 10:1.5.10)

3. Extinguishers having a gross weight greater than 40 lb (18.14 kg) (except wheeled types) shall be so installed that the top of the extinguisher is not more than 3½ feet (1.07 m) above the floor. (NFPA 10:1.5.10)

4. In no case shall the clearance between the bottom of the extinguisher and the floor be less than 4" (10.2 cm). (NFPA 10:1.5.10)

5. Extinguishers mounted in cabinets or wall recesses or set on shelves shall be placed in a manner such that the extinguisher operating instructions face outward. The location of such extinguishers shall be marked conspicuously. (NFPA 10:1.5.12)

C. Painting:

1. Finish paint cabinets in accordance with Section 09900.

2. Cabinet trim shall be given two (2) finish coats of enamel in accordance with Section 09900. Color, shade or tone to be approved by *ENGINEER*.

3. Marred or abraded surfaces shall be cleaned and refinished in accordance with the manufacturer's recommendations prior to finish painting.

3.03 FIELD QUALITY CONTROL

A. Tests:

1. Secure all approvals from agencies having jurisdiction.

2. Assure that all extinguishers have current inspection tags.

3.04 CLEANING

A. Clean exposed surface of all grease, dirt and other foreign materials.

B. Touch up all marred or abraded surfaces as specified herein.

****END OF SECTION****

SECTION 11 26 00
(11460)
KITCHEN UNIT

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Kitchen equipment, Appliances and accessories as indicated on drawing A9

2. Kitchen work tables

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 22 11 13: Facility Water Distribution*

3. *Section 22 13 13: Facility Sanitary Sewerage*

4. *Division 23: Facility Natural Gas Piping*

5. Division 26: Electrical

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for the *KITCHEN UNIT* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required to demonstrate compliance with the specified requirements.

C. Shop drawings showing precise dimensions of the work of this section, and all other data needed to ensure proper installation and operation of the work of this section.

D. Samples: Submit manufacturers standard and custom color selections for cabinet work, counter top and refrigerator trim.

E. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Regulatory requirements:

1. Kitchen units shall be listed by Underwriters Laboratories, Inc. (UL).

2. Electrical components shall be listed by Underwriters Laboratories, Inc. (UL).

3. Wood/laminate cabinets shall carry the Kitchen Cabinet Manufacturers Association (KCMA) certified cabinet seal, and meet or exceed the recommended minimum construction and performance standards as outlined in the American National Standards Institute (ANSI) ANSI/KCMA A161.1.

4. Refrigerators shall meet or exceed all Federal Department of Energy and/or applicable state energy consumption standards.

5. All equipment shall pass inspection of local code authority having jursidiction

D. Basis of acceptance: The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection.*

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER.*

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER.*

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The Contractor and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the Owner's personnel.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. The kitchen units described herein products manufactured by Dwyer Products Corp., Michigan City, IND (219-874-5236).

2.02 PRODUCTS

A. Commercial Kitchen appliances and equipment shall be:

1. Edward Don & Company-Mid Atlantic

2. Dwyer Products Corp.,

3. Or approved equivalent

2.03 APPLIANCES, KITCHEN UNITS, AND OTHER ITEMS

A. Refer to schedule indicated on Contract Drawing A9.

2.04 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the Contractor subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General: Install the work of this section in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

B. Painting: Marred or abraded surfaces shall be cleaned and refinished in accordance with manufacturer's recommendations.

3.03 CLEANING

A. Comply with provisions of *Section 01 74 00, Cleaning and Restorations*.

B. Clean exposed surface of all grease, dirt and other foreign materials.

C. Touch up all marred or abraded surfaces in accordance with manufacturer's directions.

3.04 TESTS

A. Upon completion of this portion of the work and prior to acceptance by the *OWNER*, where all required tests and adjustments for free and smooth operation.

B. Secure all approvals from agencies having jurisdiction.

****END OF SECTION****

SECTION 12 35 31

KITCHEN CABINETS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Kitchen cabinets, counter tops and hardware located in the Break Room.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 06 20 00: Carpentry*

3. *Section 09 65 00: Resilient Flooring*

5. *Section 09 90 00: Painting*

6. *Section 22 40 00: Plumbing Fixtures*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *KITCHEN CABINETS* located in the Break Room as shown on drawings in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Manufacturer’s product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data demonstrating compliance with the specified requirements.

3. Submit component dimensions, configurations, construction details, and joint details.

C. Shop Drawings: Indicate casework locations, scale plans, elevations, rough-in and anchor placement dimensions and tolerances, and clearances required.

D. Samples: Submit two samples, minimum size 3 x 6 inches of color of finish and two samples of each type of hardware.

F. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance: The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

PART 2 - PRODUCTS

2.01 GENERAL

A. Proprietary Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features,

general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable Manufacturers:

1. Aristokraft, Inc.

2. Kraftmaid Cabinetry Inc.

3. Mastercraft Industries, Inc.

4. Wood-Mode Fine Custom Cabinetry

5. Or equivalent.

2.02 COMPONENTS

A. Base Cabinet Construction:

1. Four furniture board corner braces.

2. ⅜" furniture board back.

3. ¾" x 1½" solid Birch face frame (3" center stile).

4. ¾" full-depth furniture board shelf.

5. ⅜" furniture board bottom.

6. 3/8" 5-ply, plywood sides.

7. 3/8" x 4" furniture board recessed toekick.

8. 3⅜" Recessed toekick of unfinished furniture board.

B. Wall Cabinet Construction:

1. 1/2" furniture board top.

2. 3/8" 5-ply, plywood sides.

3. 3/4" furniture board adjustable shelves

4. 3/4" x 1½" solid wood face frame.

5. 3/8" furniture board back.

6. 1/2" furniture board bottom.

C. Door Construction: Reveal overlay, 3/4" thick solid birch frame with a 3/16" recessed veneer center panel (front and back).

D. Drawer Construction:

1. Drawer Fronts: 3/4" thick Solid Birch.

2. Self-closing, epoxy-coated guides for smooth, quiet action. Rated at 100 lbs. capacity per drawer.

3. 3/4" thick all-wood drawer sides and back with a clear topcoat.

4. Adjustable undermount drawer guides with double rails for more stability.

5. 1/4" plywood laminated drawer bottom.

6. 21" deep drawer box with dovetail construction for base cabinets.

7. Drawer bottom fully captured for added strength and optimum load capacity.

E. Bolts, Nuts, Washers and Screws: Of size and type to suit application.

F. Concealed Joint Fasteners: Threaded steel.

2.03 HARDWARE COMPONENTS

A. Drawer and Door Pulls: Polished Chrome, plated, 1-5/16" diameter

B. Catches: Magnetic

C. Drawer Slides: Full Extension arms, steel and ball bearing construction, with "Smart stop."

D. Hinges: Concealed, 120º opening.

E. Door Bumpers: Resilient plastic with adhesive back, clear color, 5/16" diameter x 3/64".

F. Shelf Supports: Bright nickel-plated steel with ¼" pin, EPCO 520N, or equivalent.

2.04 COUNTERTOPS

A. Counter Top: Plastic laminate over particle board, square internal intersection to back splash.

B. Side Splash: Plastic laminate over particle board, square internal intersections to back splash and top surface.

C. High Pressure Decorative Laminate: NEMA LD 3, GP50 for horizontal surfaces, GP28 for vertical surfaces, CL20 for cabinet liner surfaces, BK20 for undecorated backing sheets, PF42 for post forming; color, pattern as selected by Architect and Owner from the manufacturer's standard color and texture, and with a matte surface texture.

D. Adhesive for High Pressure Decorative Laminates: FS A-A-1936 contact adhesive and as recommended by laminate manufacturer to suit application.

2.05 FABRICATION

A. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.

B. Fabricate corners and joints without gaps or inaccessible spaces or areas where dirt or moisture could accumulate.

C. Fabricate each unit rigid, not dependent on building structure or adjacent units for rigidity.

D. Form edges smooth. Form material for counter tops and shelves from continuous sheets.

E. Provide cutouts for plumbing fixtures and fittings.

F. When necessary to cut and fit on site, furnish materials with ample allowance for cutting. Furnish trim for scribing and site cutting.

2.06 SHOP FINISHING

A. Exposed To View Surfaces: Stain, seal, and varnish of color as selected.

B. Interior Surfaces: Maple Laminate, manufacturers standard clear finish.

2.07 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Verify adequacy of support framing.

D. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General: Install the work of this section in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

B. Install casework, components and accessories.

C. Use anchoring devices to suit conditions and substrate materials encountered.

D. Set casework items plumb and square, securely anchored to building structure.

E. Carefully scribe casework abutting other components, with maximum gaps of 1/32". Use filler strips; not additional overlay trim for this purpose.

F. Close ends of units, back splashes, shelves and bases.

G. Provide 4" high top set cove base at base cabinets as specified in *Section 09 65 00, Resilient Flooring*.

3.03 ADJUSTING

A. Adjust doors, drawers, hardware, fixtures, and other moving or operating parts to function smoothly.

3.04 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Clean casework, counters, shelves, and hardware.

C. Remove and dispose of all debris.

3.05 PROTECTION OF INSTALLED CONSTRUCTION

A. Do not permit finished casework to be exposed to continued construction activity.

****END OF SECTION****

SECTION 14 20 20

VERTICAL PLATFORM LIFTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Commercial vertical platform wheelchair lifts.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 03 30 00: Concrete*

3. *Section 06 20 00: Carpentry*

4 *Division 26: Electrical*

C. References:

1. American National Standards Institute (ANSI) B-29.2 - Chain Standards for Inverted Tooth (Silent) Chains and Sprockets

2. American Society of Mechanical Engineers (ASME) A17.1 - Safety Code for Elevators and Escalators

3. American Society of Mechanical Engineers (ASME) A18.1 - Safety Standard for Platform and Stairway Chair Lifts

4. CSA B44.1 - Elevator and Escalator Electrical Equipment

5. CSA B355 - Lifts for Persons with Physical Disabilities

6. CSA B613 - Private Residence Lifts for Persons with Physical Disabilities

7. U.S. Architectural & Transportation Barriers Compliance Board's Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)

8. ICC/ANSI A117.1 - Accessible and Usable Buildings and Facilities

9. NFPA 70 - National Electric Code

10. CSA - National Electric Code

D. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *VERTICAL PLATFORM LIFTS* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Requirements of Regulatory Agencies:

1. Fabricate and install work in compliance with applicable jurisdictional authorities.

2. Contract shall prepare drawings signed and sealed by a Professional Engineer licensed in the State of New Jersey, for platform/wheelchair lift, all related electrical work, all door/hardware and related items to be submitted to the code official for permitting.

3. File shop drawings and submissions with local authorities as the information is made available. Company pre-inspection and jurisdictional authority inspections and permits are to be made on timely basis as required.

D. Shop drawings showing precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provision in concrete forming,

reinforcement, and placement to accommodate the work of this section.

1. Provide a complete layout of lift equipment detailing dimensions and clearances as required.

E. Selection Samples: For each finish product specified requiring selection of color or finish, two complete sets of color charts representing manufacturer's full range of available colors and patterns.

F. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance: The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

C. Coverage - this warranty applies to the repair or replacement, at Manufacturer's option, of parts that fail due to defective material or workmanship. Manufacturer may, at its option, provide factory reconditioned parts. This warranty is provided to the Authorized Dealer on behalf of the final purchaser of the product and is not transferable. The Manufacturer's warranty does not cover labor charges for the removal, repair or replacement of warranty parts but such costs may be covered for a period of time by Authorized Dealer's warranty, which is provided to purchaser separately.

1. The manufacturer shall offer a 36-month limited warranty on parts from date of shipment.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers:

1. Savaria
   2 Walker Drive
   Brampton, ON, Canada L6T 5E1
   Tel: (800) 661-5112
   Tel: (905) 791-5555
   Fax: (905) 791-2222

2. Or equivalent

2.02 COMMERCIAL WHEELCHAIR LIFT

A. Hydraulic Vertical Platform Lifts:

1. Savaria Model 1158497 – Multilift

2. Or equivalent

B. Hydraulic Vertical Platform Lift: The lift described here, manufactured by Savaria Lifts Inc, is a vertical platform lift consisting of a hydraulic tower with a lifting platform. The platform is made to accommodate a wheelchair user or a person with impaired mobility.

C. Work described in this section includes providing equipment, incidental material and labor required for complete, operable roped hydraulic wheelchair lift installation. Lifts shall be erected, installed, adjusted, tested and placed in operation by lift system manufacturer, or manufacturer's authorized installer.

1. Lifts shall be in accordance:

   a. ASME A18.1 and ADAAG compliant (USA)
   b. ASME A18.1 and A117.1 compliant (USA)
   c. ASME 18.1 only (USA)

D. The following preparatory work to receive the lifts specified in this section is part of the work of other sections. Contractor shall coordinate with other disciplines to complete the work in a timely manner.

1. Permanent 120 VAC, 20 amp single phase power to operate lift to be provided from a lockable fused/cartridge type disconnect switch with auxiliary contacts for battery operation. Refer to drawings for permanent

power specifications and location of disconnects. Temporary power may be provided to expedite installation of lift.

2. Provide rough openings per lift contractor's shop drawings.

3. Provide substantial, level pit floor slab as indicated on the lift contractor's shop drawings.

E. Characteristics:

1. Rated Load: 750 lb (340 kg).

2. Rated Speed: 8’/min (0.04 m/s).

3. Car Dimensions:

a. 36 inches W by 48 inches D (914 mm by 1219 mm)

4. Levels Serviced:

a. Two (2)

5. Car Configuration:

a. Front/rear exit.

6. Travel: ±3 feet. Maximum of 14' in US.

7. Pit Depth:

a. 3" Standard

8. Installation Environment:

a. Interior (Interior install)

9. Powder Coat Finish:

a. Optional Color – from manufacturers color chart

10. Operation: constant pressure.

11. Power Supply: 120VAC, 20 amp, 60 Hz 1 phase circuit through a fuse disconnect with auxiliary contact on main power.

12. Drive System: 2:1 Roller chain hydraulic

13. Emergency Power:

    a. Battery operation in down direction – standard
    b. 24VDC battery raising and lowering

14. Controller: Relay logic based controller

15. Motor/Pump: 1 HP, 110/115 VAC

16. Manual Lowering: Hoistway at lower landing

F. Car Enclosure: Side Guards of platform shall have a steel frame with a powder coat finish and steel panel inserts to a minimum of 42 inches (1067 mm) high.

G. Gates:

1. First landing gate:

    a. Gate type:
        (1) 42" high platform gate with a concealed electro/mechanical interlock.
    b. Operation
        (1) Automatic - Surface mounted gate opener for platform gate.
    d. Gate Width
        (1) 36 inches (889 mm)

2. Upper landing gate:

    a. Gate type:
        (1) 42” high low profile aluminum gate with a concealed electro/mechanical interlock.
    b. Flush closing operation with hoistway side.
    c. Operation
        (1) Automatic - Surface mounted gate opener for low profile aluminum gate.
    d. Gate Width
        (1) 36 inches (889 mm)

H. Call Stations: Provide flush, surface or door frame mounted landing call/send stations.

1. Call stations will be:

a. Keyed (removable in on/off position)

I. Car Operation:

1. Car Operating Panel shall consist of constant pressure buttons, emergency stop/alarm button and an on/off key switch (when applicable).

2. Auxiliary lighting: The car shall be equipped with a battery operated light. The battery shall be the rechargeable type with an automatic recharging system.

J. Acme Screw Drive: The screw should have a diameter of 1 inch (25 mm) and a back-up nut shall be installed.

K. Stopping Device: All limit switches shall be located in a position to be inaccessible to unauthorized persons. They shall be located behind the mast wall and be accessible through removable panels.

L. Terminal Stopping Device: Normal terminal stopping devices shall be provided at top and bottom of runway to stop the car positively and automatically.

M. Guide Rails and Bracket: Guide rails and brackets shall be used to guide the platform and sling. Guide rails shall form part of the structural integrity of the unit and be integral to the mast enclosure, ensuring stability and minimum platform deflection when loaded.

N. Car Sling: Car sling shall be fabricated from steel tubing 42 inches high (1070 mm) with adequate bracing to support the platform and car enclosure. Roller guide shoes shall be mounted on the top and bottom of the car sling to engage the guide rails. Guide shoes to be roller type with 3 inches (76 mm) diameter wheels. Roller guide shoes shall be used for better ride quality and durability.

O. Wiring: All wiring and electrical connections shall comply with applicable codes. Insulated wiring shall have flame-retardant and moisture proof outer covering and shall be run in conduit, or electrical wire ways.

P. Pumping Unit and Cotnrol:

1. The pumping unit and control shall be enclosed in the tower. The controller and pump unit shall be pre-wired and tested prior to shipment. The controller is to be relay logic based operation for ease of maintenance and service. Pump unit shall incorporate the following features:

a. Adjustable pressure relief valve.

b. Manually operable down valve to lower lift in the event of an emergency. This valve shall be activated from outside of the hoistway through a keyed box.
c. Pressure gauge isolating valve, manually operable.
d. Gate valve to isolate cylinder from pump unit.
e. Electrical solenoid for down direction control.
f. Emergency Operation - A manual lowering device shall be located outside the hoistway in a lockable box positioned at a lower landing.

Q. Cylinder and Plunger:

1. The cylinder shall be constructed of steel pipe of sufficient thickness and suitable safety margin. The top of the cylinder shall be equipped with a cylinder head with an internal guide ring and self-adjusting packing.

2. The plunger shall be constructed of a steel shaft of proper diameter machined true and smooth. The plunger shall be provided with a stop electrically welded to the bottom to prevent the plunger from leaving the cylinder.

R. Roller Chains: Two No.50 roller chains with 5/8 inch (16 mm) pitch. Minimum breaking strength 6100 lb (2773 kg) each.

S. Leveling Device:

1. The lift shall be provided with an anti-creep device which will maintain the carriage level within 1/2 inch (12 mm) of each landing.

2. All limit switch and leveling device switches shall be located in a position to be inaccessible to unauthorized persons. They shall be located behind the mast wall and be accessible through removable panels.

T. Guide Yoke: The 2:1 guide yoke/sprocket assembly shall be supplied with idler sheaves, roller guide shoes, bearings and guards.

U. Terminal Stopping Devices: Normal terminal stopping devices shall be provided at top and bottom of runway to stop the car positively and automatically.

V. Guide Rails and Brackets: Steel 'C" guide rails and brackets shall be used to guide the platform and sling. Guide rails shall form part of the structural integrity of the unit and be integral to the mast enclosure, ensuring stability and minimum platform deflection when loaded.

W. Car Sling: Car sling shall be fabricated from steel tubing 44 inches (1116 mm)

high with adequate bracing to support the platform and car enclosure. Roller guide shoes shall be mounted on the top and bottom of the car sling to engage the guide rails. Guide shoes shall be roller type with 3 inches (76 mm) diameter wheels. Nylon guide shoes shall not be used for better ride quality and durability.

X. Wiring: All wiring and electrical connections shall comply with applicable codes. Insulated wiring shall have flame-retardant and moisture-proof outer covering and shall be run in conduit or electrical wire ways if located outside the unit enclosure. Quick disconnect harnesses shall be used when possible.

2.03 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

1. Do not begin installation until hoistway and machine room has been properly prepared.

2. Site dimensions shall be taken to verify that tolerances and clearances have been maintained and meet local regulations.

3. Substrate preparation shall be the responsibility of Contractor.

4. Clean surfaces thoroughly prior to installation.

5. Prepare surfaces using methods recommended by the manufacturer for achieving the best results for the substrate under the project conditions.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General: Install the work of this section in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1. Lift installation:

a. Install all the components of the lift system that are specified in this section to be provided, and that are required by jurisdictional authorities to license the lift.

b. Trained employees of the lift contractor shall perform all installation work of this section.

c. Adjust lift for proper operation and clean unit thoroughly.

d. Instruct users in operation procedures and Owner's maintenance person in trouble-shooting and maintenance procedures.

B. Painting: Marred or abraded surfaces shall be cleaned and refinished in accordance with manufacturer's recommendations.

3.03 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Remove and dispose of all debris.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

3.05 TESTS

A. Upon completion of this portion of the work and prior to acceptance by the *OWNER*, make all required tests and adjustments for free and smooth operation.

B. Secure all approvals from agencies having jurisdiction.

3.06 START-UP

A. The representative shall prepare and submit a written report to both the *CONTRACTOR* and *ENGINEER* regarding the installation, including any conditions which might affect the manufacturer's guarantee. The equipment shall not be accepted by the *OWNER* until such time as this report has been received and accepted by the *ENGINEER*.

3.07 INSTRUCTIONS

A. The manufacturer's representative shall instruct the *OWNER'S* operating personnel, at a time designated by the *OWNER*, as to the proper method of operation and recommended maintenance procedures.

B. The scheduling of the instruction shall be at the convenience of the *OWNER* and may not coincide with the start-up inspection.

****END OF SECTION****

SECTION 21 05 00

COMMON REQUIREMENTS FOR FIRE SUPPRESSION WORK

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Common mechanical requirements specifically applicable to Division 21 Sections, in addition to Division 1 – General Requirements.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for the work of this Section in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

1. Prepare and submit a Schedule of Submittals showing all submittals required by the Specification sections or the Drawings.

2. Prepare and submit to *ENGINEER* shop drawings, product data and samples required by the Specification sections.

3. Prepare and submit to the *ENGINEER,* engineering drawings and calculations for items indicated on the Plans or as otherwise required by the contract specifications.

B. For piping, sheet metal, sleeve layout, and reflected ceiling plan shop drawings, submit a sepia transparency. After this copy is notated and corrected by the *ENGINEER*, it will be returned. Then the required number of corrected prints will be prepared.

C. Shop drawings shall consist of manufacturer's certified scale drawings, cuts, or catalogs, including descriptive literature and complete certified characteristics of equipment, showing dimensions, capacity, code requirements, motor and drive testing, as indicated on the Drawings or Specifications.

D. Certified performance curves for all pumping and fan equipment shall be submitted for review.

E. All shop drawings showing routing of ductwork, piping and conduit shall not be less than ⅜" = 1' - 0" scale.

1.03 DEFINITIONS

A. "Piping" includes in addition to pipe; all fittings, valves, hangers, and other accessories related to such piping.

B. "Concealed" mean hidden from sight as in chases, furred spaces, shafts, hung ceilings, or embedded in construction.

C. "Exposed" means not "concealed" as defined above. Work in trenches, crawl spaces, and tunnels shall be considered "exposed" unless otherwise specifically noted.

D. Where any device or part of equipment is herein referred to in the singular number (such as "the pump"), such reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the Drawings.

1.04 CODES

A. N.J. Uniform Construction Code

B. NFPA National Fire Protection Association

C. ASME American Society of Mechanical Engineers

D. ANSI American National Standards Institute

E. ASTM American Society for Testing Materials

F. AWWA American Water Works Association

G. NEMA National Electrical Manufacturers Association

H. UL Underwriters' Laboratories

I. National Fire Protection Association (NFPA)

J. Local Water Company Rules and Regulations

K. National Electric Code

1.05 DRAWINGS

A. The Drawings are generally diagrammatic and are intended to convey the scope of work and indicate general arrangement of equipment; ducts, conduits, piping, and fixtures.

B. The locations of all items shown on the Drawings or called for in the Specifications that are not definitely fixed by dimensions are approximate only. The exact locations necessary to secure the best conditions and results must be determined at the project and shall have the approval of the *ENGINEER* before being installed. Do not scale Drawings.

C. Follow Drawings in laying out work and check Drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions at all points. Where headroom and space conditions appear inadequate, *ENGINEER* shall be notified before proceeding with installation.

D. If directed by the *ENGINEER*, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper

E. Piping or ductwork connected to equipment may require different size connection than indicated on the Drawings. The Contractor shall provide transition pieces as required at the equipment.

1.06 EQUIPMENT AND MATERIALS

A. Begin no fabrication or work that requires submittals until return of submittals with *ENGINEER'S* stamp and initials or signature indicating review and that no further submissions are required. Any manufacturing done, shipment made, workmanship performed, or work installed before the required shop drawings, product data, samples, engineering drawings, or engineering calculations are returned indicating that no further submissions are required will be at the sole expense and responsibility of the Contractor and subject to rejection.

B. The materials, workmanship, design, and arrangement of all work installed under the contract shall be subject to the approval of the *ENGINEER*.

1.07 RECORD DRAWINGS

A. During construction keep an accurate record of all deviations between the work as shown on the Drawings, and that which is actually installed.

B. Furnish Record Drawings in accordance with *Section 01 78 39, Project Record Documents*.

1.08 LAWS, ORDINANCES, PERMITS AND FEES

A. Give all necessary notices, obtain all permits and pay all governmental taxes, fees, and other costs in connection with the work; file all necessary plans, prepare all documents, and obtain all necessary approvals of all governmental departments having jurisdiction; obtain all required Certificates of Inspection for the work and deliver to the *ENGINEER* before request for acceptance and final payment for the work.

B. Include all work, without extra cost to the *OWNER*, any labor, materials, services, apparatus, drawings (in addition to Contract Drawings and Documents) in order to comply with all applicable laws, ordinances, rules and regulations whether or not shown on Drawings and/or specified.

C. All materials furnished and all work installed shall comply with the specifications and the requirements of the Uniform Construction Code of the State of New Jersey; requirements of local utility companies and governmental departments having jurisdiction.

1.09 ORGANIZATION OF WORK

A. The work called for under this Contract shall be carried on simultaneously with the work of other trades in a manner such as not to delay the overall progress of the work. Furnish promptly to other trades involved at the project, all information and measurements relating to the work that they may require. Cooperate with them in order to secure the harmony necessary in the interest of the project as a whole.

B. Keep a competent superintendent in charge of the work at all times.

C. Maintain a complete file of shop drawings at all times available to the Owner's representative.

D. Every facility shall be provided to permit observation of the work by the Owner's representative during the course of construction.

E. Where items of equipment and/or materials are indicated in the Specifications as being furnished by other trades for installation, assume responsibility for the unloading of such equipment and/or materials from the delivery trucks and for providing safe storage for same as required pending installation.

F. Where the work is to be installed in close proximity to work of other trades or where there is evidence that the work is to interfere with work of other trades, assist in working out space conditions to make a satisfactory adjustment.

G. Prepare composite working drawings and sections at a scale specified in *Section 01 31 13, Project Coordination.* Clearly show how the work is to be installed in relation to the work of other trades. If the installation is made before coordinating with other trades, make all necessary changes in the work without extra charge to the *OWNER*.

H. Attend coordination meetings under the supervision of the General Contractor and comply with the requirements of *Section 01 31 13, Project Coordination*.

1.10 PROTECTION OF WORK AND PROPERTY

A. Maintain and protect all equipment, materials and tools from loss or damage from all causes until final acceptance by the *OWNER*.

B. Assume responsibility for the protection of any finished work or other trades from damage or defacement by the operations and remedy any such injury or damages.

1.11 PIPE EXPANSION

A. All pipe connections shall be installed to allow for freedom of movement of the pipe during expansion and contraction. Proper anchors and guides shall be provided where necessary and/or when shown on the Drawings. Anchors and guides shall be subject to the review of the *ENGINEER*.

1.12 SCAFFOLDING, RIGGING, HOISTING

A. Provide all scaffolding, rigging, hoisting and services necessary for erection and delivery into the premises of all equipment and materials furnished under this section of the Specifications, and remove same from premises when no longer required.

B. In the event that supplementary bracing of the basic building structure is required to assure a secure rigging procedure and a secure route for the equipment being handled, assume full responsibility for such supplementary bracing.

1.13 BASES AND SUPPORTS

A. Provide all bases and supports not part of the building structure of required size, type and strength, as approved by the *ENGINEER*, for all equipment and materials. All equipment, bases and supports shall be adequately anchored to the building structure to prevent shifting of position under operating conditions.

B. Provide not les than six-inch high concrete bases for all pumps, refrigeration machines, compressors, and rotating machinery and elsewhere as specified. Bases shall extend six inches beyond machinery base in all directions with top edge chamfered. Provide ½" x 6" steel dowels into floors to anchor bases. Provide anchor bolts set in pipe sleeves two sizes larger than anchor bolts for securing machinery. After anchor bolts are aligned with equipment bases, fill sleeves with concrete.

1.14 SLEEVES, PIPE AND CONDUIT INSERTS AND ANCHOR BOLTS

A. Provide and assume responsibility for the location and maintenance in proper position of all sleeves, inserts, and anchor bolts required for the work. In the event that failure to do so requires cutting and patching of finished work, it shall be done without additional cost to the *OWNER*.

B. All pipes and conduits passing through masonry walls or partitions shall be provided with sleeves having an internal diameter larger than the outside diameter

of the pipe or insulation enclosing the pipe or conduit. Sleeves shall be Schedule 40 black steel pipe.

C. Sleeves through foundation walls shall be as shown on the drawings. Sleeves shall be set with ends flush with each face of wall. The space between sleeve and pipe shall be packed with oiled oakum to within 2" of each face of the wall. The remaining space shall be packed and made watertight with a waterproof compound.

D. Sleeves through concrete floors or interior masonry walls shall be as shown on the drawings. The open sleeve space shall be packed with non-combustible materials.

E. Pipe or conduit passing through exterior walks shall be wrapped with two layers of Type 15 unperforated roofing felt conforming to ASTM D226.

F. Inserts shall be preset concrete inserts with steel reinforced rods through the insert and both ends hooked over the reinforced mesh. Inserts shall be of individual type of malleable iron construction with accommodation for removable nuts and threaded rods up to ¾" diameter, permitting lateral adjustment, except as otherwise noted. Individual inserts shall be Grinnell Fig. 282 up to 5" pipe and conduit, Fig. 282, 6" and up to 8" pipe and conduit, Fig. 152 above 8" and up to 12" pipe and conduit. For figures 282 and 152, they shall come with an opening at the tip to allow reinforcing rods up to ½" diameter to be passed through the insert body. Rods shall extend a minimum of 4" on either side of the insert. Pipes larger than 12" shall be suspended from steel members only.

1.15 ESCUTCHEONS

A. Provide escutcheons on pipes wherever they pass through ceilings, walls, or partitions.

B. Interior Pipe Escutcheons: Chrome-plated, stamped, steel, hinged, split-ring escutcheon, with set screw. Inside diameter shall closely fit pipe outside diameter, or outside of pipe insulation where pipe in insulated. Outside diameter shall completely cover the opening in walls.

1. Manufacturers: Subject to compliance with requirements, provide escutcheon as manufactured by one of the following:

a. Chicago Specialty Manufacturing Company.
b. Tubular Brass Plumbing Products, Zurn Industries, Inc.

C. Exterior Pipe Escutcheons: Type 304 Stainless Steel. Inside diameter shall closely fit pipe outside diameter, or outside of pipe insulation where pipe is insulated. Outside diameter shall completely cover the opening in walls.

1.16 MANUFACTURER'S IDENTIFICATION

A. Manufacturer's nameplate, name or trademark, shall be permanently affixed to all equipment and material furnished under this Specification. Where such equipment is in a finished occupied space, the nameplate shall be in a concealed but accessible location. The nameplate of a Subcontractor or Distributor will not be acceptable.

1.17 EQUIPMENT NAMEPLATES

A. Provide for each item of equipment, including all control devices, pumps, fans, compressors, boilers, etc., a permanently attached nameplate made of black surface, white core laminated bakelite with incised letters. Pneumatic, electric and mechanically actuated gauges shall have a brief, but complete description of their function. Stating the air pressure or voltage range alone is not acceptable. Nameplates shall be a minimum of 3" long by 1 ½" wide and shall bear the equipment name and item number of ½" high white letters as designated in the equipment schedule. Mounting screws shall have chrome plated acorn headed screws.

1.18 DRIP PANS

A. Confirm the final location of all electrical equipment to be installed in the vicinity of piping. Plan and arrange all overhead piping no closer than two feet from a vertical line to electric switchboards, panelboards, or similar equipment.

B. Where the installation of piping does not comply with the requirements of foregoing paragraph, where feasible the piping shall be relocated.

C. Provide copper gutters as follows:

1. Provide a gutter of 16 ounce cold rolled copper under every pipe which is within 2'-0" of being vertically over any motor, electrical controllers, switchboards, panelboards, or the like.

2. Each gutter shall be soldered and made watertight, properly suspended; and carefully pitched to a convenient point for draining. Provide a ¾" drain, to nearest floor drain or slop sink.

3. In lieu of such separate gutters, a continuous protecting sheet of similar construction, adequately supported and braced, properly rimmed, pitched and drained, may be provided over any such motor, and extending 2'-0" in all directions beyond the motor, over which such piping has to run.

1.19 TOOLS

A. All special tools for proper operation and maintenance of the equipment shall be provided to the Owner's Representative at no additional cost to the *OWNER*.

1.20 QUIET OPERATION

A. All equipment and material shall operate under all conditions of load without any sound or vibration, which in the opinion of the *ENGINEER* is objectionable. Where sound or vibration conditions arise which are considered objectionable by the *ENGINEER*, eliminate same in a manner reviewed by the *ENGINEER*.

1.21 RUBBISH REMOVAL

A. Maintain project site and building interior free of all rubbish, rubble, waste material, packaging materials, etc. accumulating as a result of his work. Assume responsibility for the cleaning up of packaging removed from materials and equipment furnished by other trades for the installation. Note that final acceptance of the work is contingent upon the project being free of all excess and waste materials resulting from the work.

B. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

1.22 CLEANING PIPING, DUCTS AND EQUIPMENT

A. Clean all piping, ducts, and equipment of all foreign substances inside and out before being placed in operation.

B. If any part of a system should be stopped by foreign matter after being placed in operation, the system shall be disconnected, cleaned, and reconnected wherever necessary to locate and remove obstructions. Any work damaged in the course of

removing obstructions shall be repaired when the system is reconnected at no additional cost to the *OWNER*.

C. During construction, properly cap all pipes and equipment nozzles so as to prevent the entrance of sand, dirt, etc.

1.23 EXCAVATION AND BACKFILL

A. All excavation, trenching, backfilling and compaction required shall be in accordance with *Section 31 23 00: Excavating, Filling and Grading*.

B. Perform all excavation, trenching and backfilling necessary to construct and complete the utility and all its appurtenances. No tunneling will be allowed except by written consent of the *ENGINEER*. Care shall be taken to avoid undermining of all existing utilities, footings or foundations.

C. Locations and elevations of pipe lines, conduits, cables, etc., shown are not to be used as final for installation of work; however, they are to be followed as closely as possible, ground conditions permitting. Exact locations of grade shall be determined on job.

D. Under no circumstances, lay pipe or conduit or install appurtenances in water. Keep trenches free from water. Perform all necessary pumping as required to keep trenches free from water at no additional cost to the *OWNER*.

E. Where existing utilities are encountered, support, shore and protect said existing utilities and allow ample time for such measures as may be necessary for continuances of such services.

F. Notch under pipe bells to provide solid bearing for the entire body of pipe.

1.24 GRADING

A. All grading shall be in accordance with *Section 31 23 00: Excavating, Filling and Grading*.

B. Final grading shall be done under other sections of the Specifications.

1.25 PAINTING

A. Paint all piping as specified in *Section 09 90 00, Painting*.

B. All gauges, dials and rotating equipment shall be protected as specified.

C. Nameplates on all equipment shall be cleaned and left free of paint.

1.26 LUBRICATION

A. Properly lubricate all rotating equipment as soon as it is connected and before operation of the equipment is started. Any equipment damaged due to inadequate lubrication shall be replaced at no cost to the *OWNER*.

1.27 TESTS

A. All piping, wiring, and equipment shall be tested as specified under the various sections of the work. Labor, materials, instruments and power required for testing shall be furnished under the particular section of the Specifications.

B. Tests shall be performed to the satisfaction of the *ENGINEER*. The *ENGINEER* will be present at such test, when he deems necessary and such other parties as may have legal jurisdiction.

C. Pressure tests shall be applied to piping only before connection of equipment and installation of insulation. In no case shall piping, equipment, or accessories be subjected to pressure exceeding their rating.

D. All defective work shall be promptly repaired or replaced and the tests shall be repeated until the particular system and component parts thereof receive the review of the *ENGINEER*.

E. Any damages resulting from tests shall be repaired or replaced and the tests shall be repeated until the particular system and component parts thereof receive the approval of the *ENGINEER*.

F. The duration of tests shall be as determined by all authorities having jurisdiction, but in no case less than the time prescribed in each section of the Specifications.

G. Equipment and systems that normally operate during certain seasons of the year shall be tested during the appropriate season.

H. Tests shall be performed on individual equipment, systems, and their controls. Whenever the equipment or system under test is interrelated with and depends upon the operation of other equipment, systems and controls for proper operation,

functioning, and performance, the latter shall be operated simultaneously with the equipment or system being tested.

I. The electrical work shall include providing any assistance (such as removal of switchboard and panelboard trims and covers, pull and junction box covers, etc.) deemed necessary by the *ENGINEER* to check compliance with the Drawings and Specifications.

1.28 OPERATING INSTRUCTIONS

A. Provide Operation and Maintenance Data in accordance with *Section 01 78 23*.

B. The Manuals shall contain the following items:

1. Table of Contents (FIRE SUPPRESSION)
2. Introduction - Explanation of Manual and its use.
3. Description of Systems
4. Complete schematic drawings of all systems.
5. Functional and sequential description of all systems.
6. All posted instruction charts.
7. Maintenance - including complete trouble-shooting charts.
8. Listing of Manufacturers.
9. Manufacturer's Data (Where multiple model, type and size listings are included, clearly and conspicuously indicate those that are pertinent to this installation).
10. Description - Literature, drawings, illustrations, certified performance charts, technical data, etc.
11. Operation.
12. Parts List.
13. Names, addresses and telephone numbers of local recommended repair and service companies.
14. Guarantee data.
15. Model No. and Serial No. of all equipment.

1.29 TRAINING

A. Controls manufacturer shall provide at no extra cost to the end user, 24-hours minimum training through the first year warranty. Upon completion of this project, manufacturer shall train end user for a period of three (3) consecutive days, eight (8) hours each day.

1.30 OPERATION PRIOR TO COMPLETION

A. The *OWNER* may require operation of parts or all of the installation for the beneficial occupancy prior to final completion and acceptance of the building.

B. The operation shall not be construed to mean acceptance of the work by the *ENGINEER* for the *OWNER*. The *OWNER* will furnish supervisory personnel to direct operation of the entire system and the Contractor shall continue to assume this responsibility until final acceptance.

1.31 ELECTRIC MOTORS

A. Furnish, install and align all motors required for this equipment. Unless they are factory installed on the unit, all starters and associated wiring and safety switches for such motors shall be furnished and installed under Division 26.

B. All motors shall comply with *Section 23 05 13, Common Motor Requirements for HVAC Equipment*.

C. The speed, horsepower, type and other essential data for each motor, if not given under paragraphs describing the various motor driven apparatus, or in schedules on the drawings shall be obtained from the manufacturer of the respective apparatus and shall be submitted to the *ENGINEER* for his review. All 2-speed motors shall be single winding type.

D. Provide oversized motor junction box for 2 speed motors.

E. Direct connected motors shall be furnished without an adjustable base. All motors connected to driven equipment by belt shall be furnished with adjustable sliding bases, except fractional motors with slotted mounting holes.

F. All motor leads shall be permanently identified and supplied with connectors.

G. Motors shall have nameplates giving manufacturer's name, serial number, horsepower, speed, voltage, phase and current characteristics.

1.32 INDIVIDUAL MOTOR STARTERS

A. For single-phase motors ⅓ HP or smaller, starters shall be manual, 120 volts, single-pole or 240 volts, 2-pole with thermal overload protection and pilot light. Where interlocking or automatic control (other than for unit and cabinet heaters)

is required, starters shall be combination circuit breaker and magnetic starter with pilot light.

B. For 3-phase motors ½ through 20 HP, starters shall be full-voltage combination circuit breaker and magnetic across-the-line contractor, rated 208 volts, 3-pole. All magnetic starters shall have three thermal overloads.

C. Unless otherwise specified, motors 25 HP and over shall be furnished with combination circuit breaker and magnetic reduced voltage starter of the autotransformer closed transition type.

D. For motors requiring electric interlocks, or automatic control features, starters shall be equipped with the necessary auxiliary relays and contacts to provide the control features desired. Such starters shall be also provided with “hand-off-auto” pushbuttons mounted in cover. For 2-speed motors, provide “high-low-off-auto” 4-position selector switch. Furnish adjustable 20-second time delay between high and low speeds for motors 10 HP and above.

E. In addition to any auxiliary contacts required for interlocking purposes, each magnetic starter shall be equipped with one normally open auxiliary control circuit contact either for “sealing in” or as a spare for future use.

F. Indicating lights shall be transformer or series resistor type. There shall be one red light for each single speed motor to indicate when motor is running. For multiple speed motors one indicating light for each speed shall be provide.

G. The starter disconnecting means shall be circuit breakers. The external operating handle shall clearly indicate “ON” or “OFF” position of the switch and shall be interlocked with the door to require throwing the handle to the “OFF” position to open the door. The handle shall be arranged for locking both the door closed and the disconnect in the “OFF” position with up to 3 padlocks. Provide defeat device in cover to permit opening door in "ON" position.

H. Circuit breakers in combination starter units shall be of the magnetic trip type with an adjustable trip setting for selecting instantaneous trip points of fault protection (motor circuit protector). Field adjustment of the instantaneous trip shall be performed by the Electrical Contractor. Select the trip setting at approximately 10 times the motor nameplate full-load current. If the circuit breaker trips on starting, incrementally increase the settings. In no case shall the trip setting exceed 13 times the motor full-load current.

I. Overload heaters shall be furnished for all starters and shall be sized in range of 115 to 125% of full load current. The motor starters shall be shipped with the overload heaters inside the compartment but not installed. The Electrical

Contractor shall verify the ratings of the heater coils based on the motor nameplate data before installing the overloads. The Contractor supplying the starter shall replace any improperly selected heaters.

J. A transformer shall be supplied in each starter unit for 120 volt control voltage. Transformer capacity shall be adequate to supply the holding coil requirements plus the solenoids, e-p switches, relays and other devices required to be controlled from the starter. A fuse shall be supplied in one secondary terminal of the control transformer. The other terminal shall be grounded to the housing of the starter. Fuses shall be also provided in the transformer primary leads per the National Electrical Code.

K. All enclosures shall be NEMA Type I sheet steel with hinged cover for general purpose indoor application, unless otherwise indicated. Enclosures shall be arranged for equipment or wall mounting. Weatherproof NEMA Type 4 enclosures shall be provided for all outdoor starters.

L. Each starter shall be clearly identified by engraved nameplates after installation. The nameplates shall be bakelite black plates with ½" high white letters and shall be securely fastened to starter with mounting screws made of non-corrosive metals.

M. Stainless steel flush mounted starter and enclosures shall be provided for all starters located in kitchen and dishwasher areas.

N. All starters, except those furnished as an integral part of equipment and factory installed on the equipment, shall be of the same manufacturer.

O. Starters shall be as manufactured by General Electric, Square D, Cutler-Hammer, or Allen-Bradley.

P. Shop drawings shall be provided with dimensions, ratings, wiring diagrams and schedule of nameplates for approval prior to fabrication.

1.33 MOTOR CONTROLLERS

A. Motor controllers shall be defined as control devices such as pushbuttons, switches, etc. which are not mounted in starter cover, required for remote control of motors.

B. Unless otherwise noted, motor controllers shall be housed in NEMA Type 1 general purpose enclosures. Outdoor controllers shall be provided with

weatherproof NEMA Type 4 enclosures. Provide nameplate to indicate the motor with which they are associated.

C. The controllers to be installed in finished area shall be flush mounted.

D. The Electrical Contractor shall install and provide wiring for motor controllers. The Contractor providing the motor shall furnish the controllers.

E. Unless otherwise notes, pushbuttons shall be of the normal duty, spring return momentary type.

F. Selector switches and pushbuttons shall be equipped with nameplates indicating the function of each of their positions as noted in the list of electric motors and motor controls or shown on the drawings.

G. Pilot light shall be transformer or series resistor type for operation at 120 V.

H. Pilot lights shall be equipped with nameplates indicating the operating conditions they annunciate as noted in the list of electric motors and motor controls or shown on the drawings.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

****END OF SECTION****

SECTION 21 05 10

COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Expansion of the existing fire protection sprinkler system to cover area of the building as indicated on Contract Drawing FP-1.

2. Contractor to perform testing of the existing system and perform hydraulic calculations for the entire existing system and for the proposed expanded area.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 21 13 13: Wet Pipe Sprinkler System*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *COMMON WORK RESULTS FOR FIRE SUPPRESSION* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and

installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Shop drawings:

1. Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals.

2. Indicate installation, layout, weights, mounting and support details, and piping connections.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance: The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage:

1. Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use.

2. Furnish cast iron and steel valves with temporary protective coating.

3. Furnish temporary end caps and closures on piping and fittings. Maintain in place until installation.

4. Store in strict accordance with the manufacturer's recommendations.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

1.06 MAINTENANCE

A. Spare parts and materials:

1. Comply with provisions of *Section 01 78 45, Spare Parts and Maintenance Materials*.

2. Provide one spare set of sprinkler heads and installation wrench in a locked box.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand,

make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 VALVES

A. General:

1. Manufacturer's name and model, figure or drawing numbers as specified are for identification of type, quality and construction.

2. Provide valves of same manufacturer throughout where possible.

3. Provide valves with manufacturer's name and pressure rating clearly marked on outside of body.

4. Valves shall be rated for not less than 175 psig water working pressure, and in any event shall be compatible in working pressure to the pipe and fittings to which they are attached.

5. Valves shall be designed for the service for which they are installed.

B. Supervisory Switches:

1. Supervisory switches shall be UL listed, and FM approved for use in a fire protection system. Plug type switches are not acceptable in any cases for use in fire protection systems.

2. All valves that control water to automatic sprinkler heads shall be equipped with a supervisory switch with two (2) sets of SPDT 24vdc circuit contacts.

3. Provide tamper switches on all valves in the fire line.

C. Flow switches shall be field adjustable vane type with pneumatic retard and 175 psi working pressure. Units shall be suitable for installation by drilling pipe and securing with U-bolt furnished with the switch. Units shall be single pole double throw, suitable for 24-volt D.C. service with one normally open contact and one normally closed contact. Waterflow switches shall be adjusted so that the device

will transmit a waterflow alarm within 30 seconds of opening the inspector's test valve on the sprinkler system.

D. Gate Valves:

a. Acceptable Manufacturers:

a. Kennedy
b. Mueller
c. Clow
d. M & H
e. U. S. Pipe
f. Nibco
g. Watts
h. Or equivalent.

2. 2-inches and under: 175 psig, U.L. listed, FM approved; bronze body and trim, rising stem, hand wheel, solid wedge or disc, threaded ends or grooved ends.

3. Over 2-inches: 175 psig, U.L. listed, FM approved; iron body, bronze trim, rising stem pre-grooved for mounting tamper switch, hand wheel, OS&Y, solid rubber covered bronze or cast-iron wedge, flanged, screwed or grooved ends.

4. Buried gate valves 4" and larger: U.L. listed, FM approved, iron body, resilient seated, NRS, conforming to AWWA C509, mechanical joint, SS bolting.

E. Check Valves:

1. Acceptable Manufacturers:

a. Keystone
b. Stockham
c. Kennedy
d. Mueller
e. Or equivalent.

2. 2-inches and under: 175 psig, U.L. listed, FM approved; horizontal swing type, bronze body and disc, rubber seat, screwed or grooved ends.

3. Over 2-inches: 175 psig, U.L. listed, FM approved; Iron body, bronze trim, swing check with rubber disc, renewable disc and seat, flanged or grooved ends.

4. 4-inches and larger: 175 psig, U.L. listed, FM approved; bronze disc with stainless steel spring, resilient seal, flanged or grooved ends.

5. Provide bronze automatic ball drip where valve is subject to freezing.

F. Globe And Angle Valves:

1. Acceptable manufacturers:

a. Nibco
b. Potter-Roemer
c. Or equivalent.

2. 2-inches and under: 175 psig, U.L. listed, FM approved; Bronze body, bronze trim, rising stem and hand wheel, inside screw, renewable rubber disc, threaded ends, with back seating capacity, packable under pressure.

3. Over 2-inches: 175 psig, U.L. listed, FM approved; Iron body, bronze trim, rising stem, hand wheel, OS&Y, plug-type disc, flanged or grooved ends, renewable seat and disc.

G. Ball Drip Valve: Automatic type, bronze, stainless steel ball, threaded ends.

2.03 BACKFLOW PREVENTION DEVICES

A. Reduced Pressure Detector Fire Protection Assembly:

1. Acceptable Manufacturers:

a. Conbraco
b. Watts
c. Febco
d. Or equivalent

2. The backflow preventer shall be suitable for supply pressure up to 175 psig and water temperatures from 33 to 140°F.

3. The backflow preventer shall be UL listed and FM approved and meet the requirements of the National Standard Plumbing Code, AWWA C511 and

ASSE 1047.

4. The unit shall consist of two (2) mechanically independent spring-loaded poppet type check valves and a hydraulically dependent differential pressure relief valve set in an epoxy-coated (FDA Approved) ductile iron body. It shall include a resilient-seated OS&Y gate valve on each end of the body, and four (4) quarter-turn, full port, test cocks.

5. The by-pass line shall consist of a water meter, an approved reduced pressure principle assembly with two (2) shut-off ball valves and four (4) test cocks.

6. All parts shall be made of corrosion resistant materials.

7. The unit shall have removable bronze seats and replaceable discs.

2.04. PIPE

A. General:

1. All materials shall be UL Listed and FM Approved.

B. Acceptable Manufacturers:

1. Rolled groove and cut groove pipe fittings: Anvil Gruvlok, Central, Star, and Victaulic.

2. Screwed pipe fittings: Grinnell, Star, Stockham, Ward, or equivalent.

3. Underground pipe fittings: Clow, Tyler Pipe and Foundry, U.S. Pipe and Foundry, Griffin Pipe, Atlantic States Cast Iron Pipe Company, or equivalent.

4. Welded Fittings: Merit or equivalent.

5. Steel Piping: Allied Tube and Conduit, Wheatland Tube Company, or equivalent.

6. Ductile iron Piping: Clow, Tyler Pipe and Foundry, U.S. Pipe and Foundry, Griffin Pipe, Atlantic States Cast Iron Pipe Company, or equivalent.

C. Piping:

1. Piping and components shall be designed for 175 psig minimum working pressure, unless noted otherwise.

2. Piping on street side of backflow prevention device shall be pressure Class 350, ductile iron conforming to ANSI/AWWA C151/A21.51, cement mortar lined in accordance with ANSI/AWWA C104/A21.4. Buried piping shall have mechanical joints; above ground piping shall have flanged joints; both conforming to ANSI/AWWA C111/A21.11. Fittings shall conform to ANSI/AWWA C110/A21.10 and be Class 250.

3. Interior piping on system side of backflow prevention device shall be Schedule 40 and Schedule 10 only in accordance with NFPA Standard 13 for fire protection use. Schedule 40 and Schedule 10 piping shall comply with ASTM A795, A53 or ASTM A135.

4. Schedule 40 black steel pipe shall be joined by threaded joints in accordance with ANSI B2.1 or by welded joints in accordance with ANSI B31.10, ANSI B31.10a and ANSI B31.10b. At the Contractor's option, the piping may be joined by a U.L. listed and FM Global approved mechanical grooved coupling and fitting system. All grooves shall be roll grooved into the piping utilizing grooving equipment by the groove equipment manufacturer that is compatible with the design of the couplings, fittings, and gaskets.

5. Schedule 10, black steel, ASTM A135 sprinkler pipe shall be joined by welded joints in accordance with ANSI B31.10, ANSI B31.10a and ANSI B31.10b. At the Contractor's option, the piping may be joined by a U.L. listed and FM approved grooved mechanical couplings system. At the Contractor's option, the piping may be joined by a U.L. listed and FM approved mechanical grooved coupling system. All grooves shall be rolled into the piping utilizing equipment that is compatible with the design of the couplings, fittings, gaskets, etc.

6. All black steel pipe must be preoxidized with a suitable protective coating. Sprinkler piping that is exposed to the weather, or used in a corrosive atmosphere (where noted on drawings) shall be galvanized.

7. Schedule 10 threaded pipe is not acceptable.

8. Grooved piping is not allowed on supply side of detector check valve.

D. Fittings:

1. Where static pressures do not exceed 175 psig, screwed fittings shall be cast iron, Class 125, 175 psig rated working pressure, ANSI B16.4 or malleable iron, Class 150 psig, 300 psig rated working pressure, ANSI B16.3.
2. Provide fittings manufactured with outlets the same size as the piping to be installed in the fittings. Bushings are not acceptable unless a suitable fitting is not manufactured.

3. Threaded pipe couplings with continuous threads through the coupling are not acceptable.

4. One-half inch (½") extension couplings are not to be utilized at sprinkler head connections.

5. Where static pressures do not exceed 175 psig, flanged fittings shall be cast iron, Class 125, 175 psig working pressure, ANSI B16.1. Gaskets shall be full face of 1/8 inch minimum thickness red sheet rubber. Flange bolts shall be hexagon head machine bolts with heavy semi-finished hexagon head nuts, cadmium plated, having dimensions in accordance with ANSI B18.2.

6. Weld fittings shall be ANSI B16.9, ANSI B16.25, ASTM A234, ANSI B16.5, or ANSI B16.11 standard weight, steel fittings, rated for a minimum working pressure equal to or greater than the system working pressure to which they are to be installed.

7. Welded outlets shall be ASTM A53, U.L. listed and FM approved, 300 psig rated working pressure, with threads cut in accordance with ANSI B1.20.1.

8. Grooved couplings and fittings for the standpipe system, including standpipe horizontal feed mains, shall be ductile iron conforming to ASTM A536 or malleable iron conforming to ASTM A47, 300'psig minimum working pressure. Coupling gasket material shall be EPDM elastomeric. Grooved couplings and fittings shall be tested and listed by UL and FM. Grooved couplings and fittings shall be manufactured by the same manufacturer.

9. Grooved couplings for sprinkler systems may be ductile iron conforming to ASTM A536 or malleable iron conforming to ASTM A47, 175 psig minimum working pressure. Coupling gasket material shall be EPDM elastomeric. Grooved couplings shall be tested and listed by UL and FM. Grooved couplings and fittings shall be manufactured by the same manufacturer.

10. Push-on type fittings are not acceptable.

2.05 ACCESSORIES

A. Sleeve couplings:

1. Except as otherwise specified, all sleeve couplings for connecting ductile iron pipe shall be Smith-Blair 441 standard sleeve straight cast couplings as manufactured by Smith-Blair, Incorporated, or equivalent.

2. Couplings shall have ductile iron sleeves and flanges. Gaskets shall be of specially compounded natural rubber, and shall have a wedge type design and large cross sectional area. Bolts and nuts shall be stainless steel.

3. All necessary gaskets, followers, bolts and other appurtenances required for making up flexible joints shall be of the pattern and material recommended by the manufacturer for the conditions or service to be encountered.

B. Joint harness: Studs for harnessed joints shall conform to the requirements of ASTM A193, Grade B-7, or equivalent. Plate lugs shall conform to ASTM A283, Grade B, or ASTM A285, Grade C, or equivalent.

C. Thrust Blocks: Concrete for thrust blocks shall be Class B conforming to the requirements for Thrust Blocks in Subsection 903.03 and Table 903.03.06 of the Standard Specifications.

D. Tapping Sleeves:

1. Tapping Sleeves shall be of a full sleeve type capable of containing pressure within the full volume of the sleeve. Sleeve shall be mechanical joint suitable for use with Class AB or CD cast iron pipe or ductile iron pipe.

2. Sleeve shall be rated at 200 psi water working pressure through 12" size and 150 psi for sleeves 14" through 24".

3. All cast iron shall conform to ASTM-A-126, Class B. Castings shall be cleaned and sound without defects that will impair their service. No plugging or welding of such defects will be allowed, bolts, nuts, and gaskets shall be in accordance with mechanical joint requirements of AWWA C-111.

4. Tapping Sleeves shall be capable of withstanding their rated working pressure without leakage past the side gaskets and end gaskets of the sleeve. Sleeves shall be supplied with split end gaskets and two-piece glands. Side flange rubber gaskets shall butt against the rubber end gaskets affecting a totally watertight seal. Side and end bolts shall be of a T-Head design. The throat flange shall be so designed as to afford centering of the tapping valve to the sleeve. Tapping sleeve shall be equipped with a test plug.

5. Inside and outside of all tapping sleeves shall be coated in accordance with AWWA standards.

6. Sleeves shall be marked with name of manufacturer and size (run x branch).

2.06 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Ream ends of steel pipe to remove burrs. Make joints smooth and unobstructed inside. Remove any obstructions or debris inside piping, blowing it out with compressed air or otherwise cleaning it internally immediately prior to assembly.

B. Cap or cover open piping during erection to prevent entry of foreign objects.

3.03 INSTALLATION – VALVES

A. Provide valves where required and/or indicated on the drawings for the control, operation and maintenance of all fire suppression equipment and systems.

B. Install valves with stems upright or horizontal, not inverted.

C. Install manual drain valves at every low point of each piping system. Exact location of each drain valves shall be submitted to the Engineer for approval.

D. Drain and test connections for each sprinkler riser, including an angle valve, pressure gauge and inspector's test. Auxiliary drains shall be provided as required by NFPA 13.

E. In addition to the supervisory valve switches provided on each sprinkler system valve, the valves shall be locked or secured in the open position. All valve locks shall be keyed the same.

F. All buried valves shall be provided with valve boxes. No valve shall be set under roads, pavements or walks, except where so noted. The valve box shall not transmit shock or stress to the valve; with the valve box cover flush with the surface of the finished area.

3.04 INSTALLATION - INSPECTOR'S TEST CONNECTION

A. For each sprinkler system and for each waterflow alarm device, where multiple devices occur, furnish and install an inspector's test assembly. Pipe discharge from this assembly to suitable drain inside, outside, or as shown on drawings.

3.05 INSTALLATION - SUPERVISORY SWITCHES

A. Provide a supervisory switch on each shutoff valve in the fire protection piping system to indicate when valve is not fully open.

3.06 INSTALLATION - PIPING

A. Coordinate piping installation with mechanical and electrical piping and ductwork

drawings, as well as structural and architectural drawings.

B. Piping shall be installed such that there is no trapped piping. Auxiliary drain connections shall be installed per NFPA Standard 13 where trapped piping cannot be avoided.

C. Install a flanged connection, grooved connection or union on both sides of all equipment.

D. Piping shall be installed to maintain a clear space for the installation and relocation of lighting fixtures in suspended ceilings.

E. Nipples shall be the same material, composition and weight classification as the pipe with which they are installed. Close or running thread nipples shall not be used.

F. Horizontal piping shall be installed parallel to or at right angles to the column lines of the building. Vertical piping shall be installed plumb.

G. Piping in finished portions of the building, except in mechanical equipment rooms or where otherwise indicated on the drawings, shall be concealed to the maximum extent possible.

H. Install same type underground piping material specified for inside building to 5-feet outside of building.

I. Do not install piping within 3-feet in horizontal direction from electrical panels or equipment.

J. Grooved Connections:

1. Couplings, fittings, valves and pipe shall be assembled in accordance with latest published instructions of the manufacturer and local codes.

2. Pipe ends must be square cut and in accordance with manufacturer's standards. Pipe shall be checked to be certain it is free of indentations, projections, grooves, weld seams or roll marks on the exterior of the pipe over the entire gasket seating area to assure leak-tight seal. The contractor shall groove the piping with tools that are compatible with the grooved couplings, fittings, and gaskets.

3. Gaskets shall be of the central cavity pressure responsive design. Gasket style and grade shall be checked to be certain gasket supplied is suited for the intended service.

4. Thorough lubrication of the gasket exterior including the lips and/or pipe ends and housing exterior is essential to prevent pinching of the gasket. Lubricants shall be of type recommended by gasket manufacturer for intended use.

5. Grooved couplings and fittings shall be manufactured by the same manufacturer. Mixing of grooved couplings and fittings by different manufacturers or different designs of the same manufacturer is not acceptable.

6. Riser and main piping shall be installed with rigid couplings equal to Victaulic Style 07 grooved rigid coupling.

K. Screwed Connections:

1. Screw joints shall be made up with pipe joint compound suitable for use in a fire protection system.

2. Screw joints shall have threads cut to ANSI/ASME B1.20.1.

L. Central Drain Pipe:

1. Adjacent to each standpipe riser with sprinkler system control valve assemblies, install a central drain riser system with Schedule 40 or Schedule 10 black steel piping. The drain riser piping and fittings shall be rated for 175 psi minimum working pressure.

3.07 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Remove and dispose of all debris.

3.08 TESTS

A. Upon completion of this portion of the work and prior to acceptance by the *OWNER*, make all required tests and adjustments for free and smooth operation.

B. Secure all approvals from agencies having jurisdiction.

3.09 START-UP

A. The equipment manufacturer shall provide the services of a trained qualified representative, for one (1) trip each with a minimum of 6-hour day, excluding travel time for the purpose of inspecting the installation.

B. The representative shall prepare and submit a written report to both the *CONTRACTOR* and *ENGINEER* regarding the installation, including any conditions which might affect the manufacturer's guarantee. The equipment shall not be accepted by the *OWNER* until such time as this report has been received and accepted by the *ENGINEER*.

3.10 INSTRUCTIONS

A. The manufacturer's representative shall instruct the *OWNER'S* operating personnel, at a time designated by the *OWNER*, as to the proper method of operation and recommended maintenance procedures.

B. The scheduling of the instruction shall be at the convenience of the *OWNER* and may not coincide with the start-up inspection.

****END OF SECTION****

SECTION 21 05 29
(15141)
HANGERS AND SUPPORTS
FOR
FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Locate, layout, design, provide and install supports to adequately and safely support all non-buried piping and equipment.

2. Equipment bases and supports.

3. Sleeves and seals.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 03 30 00: Concrete*

3. *Section 05 50 00: Metal Fabrications*

4. *Section 07 84 00: Firestopping*

5. *Section 07 92 13: Sealants and Caulking*

6. *Section 09 90 00: Painting (General)*

7. *Section 21 13 13: Wet-Chemical Fire Extinguishing System*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for the work of this Section in the prices bid for the various related items of work listed in the Proposal.

1.02 REFERENCES

A. American Society of Mechanical Engineers:

1. ANSI/ASME B31 - Power Piping.

B. Manufacturer's Standardization Society of the Value and Fittings Industry:

1. MSS SP 58: Pipe Hangers and Supports-Materials, Design and Manufacture

2. MSS SP 69: Pipe Hangers and Supports - Selection and Application.

C. International Code Council, Inc.:

1. International Mechanical Code, as amended by the Uniform Construction Code of the State of New Jersey.

2. International Building Code (IBC), New Jersey Edition.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer’s product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Shop drawings:

1. For pipe 2” or less in diameter where the load per hanger or support does not exceed 50 lbs in a 5’ x 5’ area and the spacing does not exceed 10’:

a. Work shall conform to Chapter 8 of the National Standard Plumbing Code as amended by the Uniform Construction Code of the State of New Jersey.

b. Show precise dimensions of the work of this section and all other data needed to ensure proper and adequate provision in the work to accommodate the work of this section.

c. A three-dimensional isometric drawing of all piping showing the arrangement of each run, type of pipe material, wall thickness, contents, flow direction, equipment attachments, fittings and valves. The isometric drawing shall also locate and identify all supports. Supports shall be located from changes in piping direction, from floors, and from building column lines.

d. A complete set of details showing all physical attachments of the support framing to the building. This shall include:

(1) Where attaching to building framing, show weld sizes and configurations; number, diameter, spacing and materials of all bolts; size, length and arrangement of angles, plates or any other supplemental structural member.

(2) Where attaching to concrete or masonry structures using cast-in-place anchor bolts, show anchor bolt locations, diameters, material, plate washer sizes (if used), and projection and embedment lengths above and below the bearing face of concrete.

(3) Where anchor bolts are to be drilled in concrete, show anchor bolt locations, diameters, material, projection and embedment lengths above and below the bearing face of concrete, the anchor bolt manufacturer's model number and description along with the manufacturer's current allowable load tables with recommended installation, use and safety factor data.

(4) For all type of anchor bolts, provide base plate thickness and size and depth of grout to be provided.

g. Within fourteen (14) days after review of the support engineering drawings by the *ENGINEER* and before any of the materials of this section are delivered to the job site, submit complete erection drawings of the supports. Drawings for steel framing shall be done

in accordance with the AISC Manual of Steel Construction (ASD), Part 5, Section M1, entitled “Shop Drawings.”

h. All constructability problems and potential fouls must be resolved by the Contractor prior to the submittal of design information to the *ENGINEER*.

2. For all other piping

a. Show precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provision in the work to accommodate the work of this section.

b. A three-dimensional isometric drawing of all piping showing the arrangement of each run, type of pipe material, wall thickness, contents, flow direction, equipment attachments, fittings and valves. The isometric drawing shall also locate and identify all supports. Supports shall be located from changes in piping direction, from floors, and from building column lines.

c. A table identifying each and every support associated with each piping run. Each support shall be identified with a unique alphanumeric number and designated as to support type (i.e. vertical load support, lateral load support, etc.). The table shall also show for every support, each individual support load condition and each summed load combination as given in the Design Requirements section of this specification. All loads shall be clearly delineated for each support as to magnitude, direction and units.

d. A complete set of all load reactions imposed by the supports onto the building framing and any concrete or masonry structure including foundations, walls, and floor slabs. All loads shall be clearly delineated for each support as to magnitude, location, direction, elevation, point of application and units. Loads shall be those caused by the load conditions in the combinations described in the Design Requirements section of these specifications.

e. A complete set of engineering drawings and design calculations that fully substantiates that the supports and anchor bolts meet the requirements of these specifications and accepted engineering practices. Engineering drawings for steel framing shall be done in accordance with the AISC Manual of Steel Construction (ASD), Part 5, Section A7, entitled “Design Documents.”

f. A complete set of details showing all physical attachments of the support framing to the building. This shall include:

(1) Where attaching to building framing, show weld sizes and configurations; number, diameter, spacing and materials of all bolts; size, length and arrangement of angles, plates or any other supplemental structural member.

(2) Where attaching to concrete or masonry structures using cast-in-place anchor bolts, show anchor bolt locations, diameters, material, plate washer sizes (if used), and projection and embedment lengths above and below the bearing face of concrete.

(3) Where anchor bolts are to be drilled in concrete, show anchor bolt locations, diameters, material, projection and embedment lengths above and below the bearing face of concrete, the anchor bolt manufacturer's model number and description along with the manufacturer's current allowable load tables with recommended installation, use and safety factor data.

(4) For all type of anchor bolts, provide base plate thickness and size and depth of grout to be provided.

g. Within fourteen (14) days after review of the support engineering drawings and calculations by the *ENGINEER*, and before any of the materials of this section are delivered to the job site, submit complete erection drawings of the supports. Drawings for steel framing shall be done in accordance with the AISC Manual of Steel Construction (ASD), Part 5, Section M1, entitled "Shop Drawings."

h. All constructability problems and potential fouls must be resolved by the Contractor prior to the submittal of design information to the *ENGINEER*.

i. Engineering drawings and calculations shall be signed and sealed by a Professional Engineer registered in the State of New Jersey.

D. Manufacturer's recommended installation procedures.

E. Prior to construction, submit a copy of all required approved construction permits.

F. Submit a certificate signed by New Jersey registered surveyor certifying that the elevations and locations of supports are in conformance or nonconformance with the Contractor's drawings.

G. Submit a Record Plan.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance: The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

D. Supports shall be designed and installed in accordance with the more stringent of the referenced standards and these *Specifications*.

E. New Jersey licensed Land Surveyor shall be employed by Contractor to perform all construction layout and to certify support installations.

F. New Jersey licensed Professional Engineer shall be employed to perform all structural design.

1.05 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.06 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The Contractor and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

1.07 DESIGN REQUIREMENTS

A. General: Unless otherwise herein modified, all supports must be designed in accordance with the latest editions of the AISC Manual of Steel Construction, Allowable Stress Design, and the International Building Code. All designs must be coordinated and reviewed for constructability and potential fouls by the Contractor. Supports shall include all shapes, plates, hardware, components, anchor bolts, and fasteners required to support and transfer all design loads to the building in accordance with the specified design criteria. Where member and connection sizes have been shown, they shall be the minimum acceptable.

B. Arrangement:

1. All supports shall be arranged and constructed so as not to obstruct egress paths from the building, nor to impede maintenance access to equipment or operations of the facility. The clear height shall be not less than 7' - 0" above finished floor.

2. Support and anchorage components shall not breach the watertightness of the walls, mat foundation and/or structural floor slabs.

3. Unless otherwise approved by the *ENGINEER*, the installed location of all piping, ductwork, equipment, walkways and platforms shall comply with the dimensional requirements shown on the plans in regard to location, elevation, slope and arrangement.

C. Deflections:

1. The allowable deflection of all support framing members under all load combinations shall not exceed L/240, where L equals the member length, unless a more stringent limit is recommended by the equipment manufacturer.

2. Allowance shall be made for support deflections by avoiding inadvertent load transfer from the supports to the adjacent building.

D. Bracing: Bracing members shall have an L/r ratio of not more than 200, where L is the distance in inches between connections and r is the least radius of gyration of the bracing member. Where cross-bracing members are connected at their point of intersection, the L distance shall be taken as the distance in inches between connection at the point of intersection of the bracing members and the connections at the end of the members.

E. Friction from gravity loads shall not be considered adequate resistance to resultant piping forces.

F. Attachment to the main building structure:

1. All attachments of supports to the main building structure including its superstructure framing, roof, walls, floor slab or foundations shall be specifically approved by the *ENGINEER*. All attachments shall be reviewed individually by the *ENGINEER*. The general basis for acceptance shall be as specified herein.

2. Maximum reactions:

a. The maximum loads imposed by supports upon all other building's structural systems shall be individually reviewed by the *ENGINEER*.

3. Manner of attachment:

a. All connections to either main building framing steel, concrete structures, or masonry walls shall be “pinned” and shall offer no moment restraint. Cantilevers, braced framing or any connection arrangement that causes a couple or torsion in either main building framing steel, concrete structures, or masonry walls shall not be permitted unless specifically approved by the *ENGINEER*.

b. All support framing base plates attaching to concrete structures or masonry walls shall be installed upon a one inch (1") minimum thick bed of non-shrink grout.

c. Where support framing spans across an expansion joint in the main building framing steel, allowance shall be made for a movement of 4±" at one end of the support framing span. Where support framing spans across an expansion joint in a concrete structure or masonry wall, allowance shall be made for a movement of 2"± at one end of the support framing span.

H. Design Loads:

1. Dead Load (DL): This includes the weight of all piping, ductwork, supports, contents and insulation.

2. Pressure Load (PL): This includes the resultant forces, in all directions, caused by the pressure under both constant and variable conditions within the range of the pressure capacity for which the piping or ductwork was provided.

3. Thermal Load (TL): This includes the resultant forces, in all directions, caused by the temperature under both constant and variable conditions within the range of operating temperatures for which the piping or ductwork was provided.

4. Snow Load (SL): This load shall be applied of the entire horizontal projection of all exterior piping, ductwork and supports. Snow loads must be developed in accordance with the 2021 International Building Code with the factors applicable to the building to which the equipment, piping and ductwork attaches. As a minimum, snow loads shall be based on a uniformly distributed downward pressure of 30 psf.

5. Wind Load (WL): This load shall be applied to the entire vertical projection of all exterior piping, ductwork and supports. Wind loads must be developed in accordance with the 2021 International Building Code

with the factors applicable to the building to which the equipment, piping and ductwork attaches. As a minimum, wind loads shall be based on a uniformly distributed lateral pressure of 30 psf.

6. Earthquake Load (EQ): This load shall be applied to all piping, ductwork and supports. Earthquake loads must be developed in accordance with the 2021 International Building Code with the factors applicable to the building for which the piping and ductwork attaches. As a minimum, earthquake loads shall be based upon a seismic shear of 15% of the dead load as previously described.

I. Load Combinations: Support framing shall be designed to safely withstand the stated design loads as they occur in the following combinations:

1. DL

2. DL + PL + TL

3. DL + WL

4. DL + PL + TL + WL

5. DL + SL

6. DL + PL + TL + SL

7. DL + PL + TL + SL + WL

8. DL + EQ

9. DL + PL + TL + EQ

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 STEEL

A. Structural Steel: ASTM A36 or A992.

B. Structural Tubing: ASTM A500, Grade B.

C. Structural Tubing: ASTM A501.

D. Steel Pipe: ASTM A53, Grade B.

E. Bolts & Nuts: ASTM A307, A325 or A490.

2.03 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes ½ to 1½ Inch: Carbon steel, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2 to 4 Inches and Cold Pipe Sizes 6 Inches and Over: Carbon steel, adjustable, clevis.

C. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron roll, double hanger.

D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods; cast iron roll and stand for hot pipe sizes 6 inches and over.

E. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

F. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp; adjustable steel yoke and cast iron roll for hot pipe sizes 6 inches and over.

G. Vertical Support: Steel riser clamp.

H. Floor Support for Pipe Sizes to 4 Inches and All Cold Pipe Sizes: Cast iron adjustable pipe saddle, lock nut nipple, floor flange, and concrete pier or steel support.

I. Floor Support for Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

J. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

K. Shield for Insulated Piping 2 Inches and Smaller: 18 gage galvanized steel shield over insulation in 180 degree segments, minimum 12 inches long at pipe support.

L. Shield for Insulated Piping 2½ Inches and Larger (Except Cold Water Piping): Pipe covering protective saddles.

M. Shields for Insulated Cold Water Piping 2½ Inches and Larger: Hard block non-conducting saddles in 90 degree segments, 12 inch minimum length, block thickness same as insulation thickness.

N. Shields for Vertical Copper Pipe Risers: Sheet lead.

2.04 HANGER RODS

A. Steel Hanger Rods: Threaded both ends, threaded one end, or continuous threaded.

2.05 INSERTS

A. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.06 ANCHOR BOLTS

A. Stainless steel in accordance with *Section 05 50 00, Metal Fabrications*.

2.07 FLASHING

A. Metal Flashing: 26 gage galvanized steel.

B. Lead Flashing: Five (5) lb/sq ft sheet lead for waterproofing; one (1) lb/sq ft sheet lead for soundproofing.

C. Flexible Flashing: Compatible with roofing.

D. Caps: Steel, 22 gage minimum; 16 gage at fire resistant elements.

2.08 SLEEVES

A. Sleeves for Pipes Through Non-fire Rated Floors: Form with 18 gage galvanized steel.

B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Form with steel pipe or galvanized steel.

C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Prefabricated fire rated sleeves including seals, UL listed.

F. Fire Stopping Insulation: As specified in *Section 07 84 00, Firestopping*.

G. Caulk: As specified in *Section 07 92 13, Sealants and Caulking*.

2.09 FABRICATION

A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

B. Design hangers without disengagement of supported pipe.

C. Provide copper plated hangers and supports for copper piping.

2.10 CONCRETE EQUIPMENT BASES

A. Comply with *Section 03 30 00, Concrete*.

2.11 FINISH

A. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

2.12 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their

respective kinds, and as selected by the Contractor subject to the approval of the *ENGINEER*.

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PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Inserts:

1. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

2. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over four inches (4").

3. Where concrete slabs form finished ceiling, provide inserts to be flush with slab surface.

4. Where inserts are omitted, drill through concrete slab from below and provide thru-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

B. Hangers and support location:

1. Unless otherwise located on the *Contract Drawings*, the Contractor is responsible, subject to the *ENGINEER'S* review, for locating and arranging pipe supports in a manner that would safely support the piping, would not create access/egress obstructions and would not overstress the piping/ductwork system, the support structure, any building structural members, or attached equipment when subjected to the Design Loads in

the combinations specified. However, the following is the minimum criteria for support placement.

a. Dead load supports for horizontal piping runs:

Pipe Size And Material	Horizontal Distance Between Dead Load Supports On A Horizontal Run
Ductile Iron Pipe (Pressure Class 150 or thicker)	
3"	12'-0"
4" to 6"	14'-0"
8" to 12"	19'-0"
14" to 16"	20'-0"
18" to 24"	20'-0"
Steel Pipe (Schedule 40 or thicker)	
½" to 1¼"	6'-0"
1½" to 2"	12'-0"
2½" to 3"	12'-0"
4" to 6"	12'-0"
8" to 12"	12'-0"
14" to 16"	20'-0"
18" to 24"	20'-0"
PVC (Schedule 40 or thicker)	
All Sizes	4'-0"
Cast Iron (Standard Wall or thicker)	
All Sizes, 5' Lengths	5'-0"
All Sizes, 10' Lengths	10'-0"

b. Lateral load supports for vertical piping runs:

Pipe Size And Material	Vertical Distance Between Lateral Load Supports on a Vertical Run

Ductile Iron Pipe (Pressure Class 150 or thicker) 3" to 24"	15'-0"
Steel Pipe (Schedule 40 or thicker)	
½" to 1¼"	10'-0"
1½" to 24"	15'-0"
PVC (Schedule 40 or thicker)	
All Sizes	10'-0"
Cast Iron (Standard Wall or thicker)	
All Sizes, All Lengths	15'-0"

c. Install supports to provide minimum of ½ inch space between finished covering and adjacent work.

d. Place dead load and lateral support within 12" of each horizontal elbow or joint.

e. Place axial support within 12" of each elbow.

f. Place lateral support within 12" of each vertical elbow.

g. Use hangers with 1½" minimum vertical adjustment.

h. Support vertical and lateral loads from vertical piping at every floor and change of direction. Support vertical cast iron pipe at each floor at hub.

i. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers to support dead loads.

j. Support riser piping independently of connected horizontal piping.

k. For Concentrated Loads: Install additional hangers or supports, spaced as required, at locations where concentrated loads such as

in-line pumps, valves, fittings or accessories occur, to support the concentrated loads.

C. Equipment bases and supports:

1. Provide equipment bases of concrete type specified herein.

2. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

3. Construct support of steel members or steel pipe and fittings. Brace and fasten with flanges bolted to structure.

4. Provide rigid anchors for pipes after vibration isolation components are installed.

D. Flashing:

1. Provide flexible flashing and metal counter flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

2. Flash vent and soil pipes projecting 3 inches minimum above finished roof surface with lead worked one inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and calk, metal counter flash and seal.

3. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 x 36 inch sheet size. Fasten flashing to drain clamp device.

4. Seal floor drains water tight to adjacent materials.

5. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms, installed in accordance with manufacturer's instructions for sound control.

6. Provide curbs for mechanical roof installations twelve inch (12") minimum height above roofing surface. Flexible sheet flash and counter flash with sheet metal; seal water tight.

E. Sleeves:

1. Set sleeves in position in formwork. Provide reinforcing around sleeves.

2. Extend sleeves through floors one inch (1") above finished floor level. Caulk sleeves full depth and provide floor plate.

3. Where piping penetrates non-fire rated floor, ceiling, or wall, close off space between pipe or duct and adjacent work with stuffing insulation and calk air tight. Provide close fitting metal collar or escutcheon covers at both sides of penetration. Close penetrations of fire rated assemblies in accordance with *Section 07 84 00, Firestopping*

4. Install stainless steel escutcheons at finished surfaces.

3.03 FIELD QUALITY CONTROL

A. Tests:

1. Upon completion of this portion of the work and prior to acceptance by the *OWNER*, make all required tests and adjustments for free and smooth operation.

2. Secure all approvals from agencies having jurisdiction.

3.04 CLEANING

A. Clean exposed surface of all grease, dirt and other foreign materials.

B. Touch up all marred or abraded surfaces in accordance with manufacturer's directions.

****END OF SECTION****

SECTION 21 05 53

IDENTIFICATION OF FIRE SUPPRESSION
PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Nameplates, tags, stencils, pipe markers, labels and lockout devices.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 09 90 00: Painting*.

C. Payment:

1. Unless otherwise noted in the *Proposal* Section, no separate payment shall be made for this item.

2. Include all costs for *IDENTIFICATION OF FIRE SUPPRESSION PIPING AND EQUIPMENT* in the prices bid for the various related items of work as designated in the *Proposal*.

1.02 REFERENCES

A. ANSI/ASME A13.1 - Scheme for the Identification of Piping Systems.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer’s product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Submit list of wording, symbols, letter size, and color-coding for identification.

D. Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

E. Submit manufacturer’s installation procedures.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

D. Regulatory requirements:

1. NJAC 8:59-5.1, et. seq., New Jersey Worker and Community Right to Know Act.

1.05 PRODUCT DELIVERY, STORAGE AND DELIVERY

A. Comply with provisions of *Section 01 66 00, Storage and Protection.*

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER.*

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER.*

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers

1. W.H. Brady.
2. Seton Name Plate Company
3. Or equivalent

2.02 MATERIALS

A. Color: Unless specified otherwise, comply with ANSI/ASME A13.1.

B. Plastic nameplates: Laminated three-layer plastic with engraved black letters on light contrasting background color.

C. Plastic tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1½ inch diameter.

D. Metal tags: Brass with stamped letters; tag size minimum 1½ inch diameter with smooth edges.

E. Stencils: With clean-cut symbols and letters of following size:

OUTSIDE DIAMETER OF INSULATION OR PIPE	LENGTH OF COLOR FIELD	SIZE OF LETTERS
¾" - 1¼"	8"	½"
1½" - 2"	8"	¾"
2½" - 6"	12"	1¼"
8" - 10"	24"	2½"
Over 10"	32"	3½"
Ductwork and Equipment	--- ----------	2½"

F. Stencil paint: Semi-gloss enamel, colors and lettering size conforming to ANSI/ASME A13.1.

G. Plastic pipe markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and fluid being conveyed.

H. Plastic tape pipe markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

I. Underground plastic pipe markers: Bright colored continuously printed plastic ribbon tape of not less than 6 inch wide by 4 mil thick, manufactured for direct burial service.

2.03 LOCKOUT DEVICES

A. Lockout Hasps:

1. Anodized aluminum hasp with erasable label surface; size minimum 7¼ x 3 inches.

B. Valve Lockout Devices:

1. Steel device preventing access to valve operator, accepting lock shackle.

2.04 HYDRAULIC DESIGN INFORMATION SIGN

A. Acceptable manufacturers:

1. Grinnell
2. Viking
3. Reliable.
4. Or equivalent

B. Description:

1. Permanently marked weatherproof metal or rigid plastic sign lithographed with white letters on red background and red letters in white spaces.

2. Sign shall include the following:

a. Location of the design area or areas.

b. Discharge densities over the design area or areas.

c. Required flow and residual pressure demand at the base of riser.

d. Occupancy classification or commodity classification and maximum permitted storage height and configuration.

2.05 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with *Section 09 90 00* for stencil painting.

3.03 INSTALLATION

A. Plastic nameplates: Install with corrosive-resistant mechanical fasteners, or adhesive.

B. Plastic or Metal tags: Install with corrosive-resistant chain.

C. Stencil painting: Apply in accordance with Manufacturers directions.

D. Plastic pipe markers: Install in accordance with manufacturer's instructions.

E. Plastic tape pipe markers: Install complete around pipe in accordance with manufacturer's instructions.

F. Underground plastic pipe markers: Install 6 to 8 inches below finished grade, directly above buried pipe.

G. Controls: Identify control panels and major control components outside panels with plastic nameplates.

H. Valves: Identify all valves in main and branch piping with brass tags.

I. Piping:

1. Identify piping, concealed or exposed, with plastic pipe markers and labels. Tags may be used on small diameter piping. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping.

2. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and "T", at each side of penetration of structure or enclosure, and at each obstruction.

J. Hydraulic design information sign: Install with brass chain and "S" hooks around each valve supplying the corresponding hydraulically designed area.

3.04 COLORS

A. Identify services as follows:

1. Valve handles – Safety Red

2. Fire Suppression Piping – White letters on Safety Red

3.05 VALVE CHART AND SCHEDULE

A. Install valve charts contained in 8½" x 11" aluminum frames with clear plexiglass window inside the entrance of any room with control valves. Charts shall indicate valve numbers, location and purpose along with manufacturers name and model number.

****END OF SECTION****

SECTION 21 13 13

WET-PIPE FIRE SPRINKLER SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. The work includes expansion of the existing wet-pipe sprinkler system as indicated on Contract Drawing FP-1. The work also includes system design, installation, and certification. The Contractor shall perform testing of the existing system and hydraulic calculations for the entire existing system and proposed expanded area.

2. The Contract Drawings DO NOT show complete system layout; only mains, branches, risers and typical sprinkler head arrangements are shown. Provide additional branches, fittings, components, etc. as necessary to meet intent of Contract Documents and all applicable NFPA Standards.

3. Sprinkler system shall be supported and seismically supported in accordance with NFPA 13 and the International Building Code, 2021.

B. Related Work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 21 05 10: Common Work Results for Fire Suppression Systems*

3. *Section 21 05 29: Hangers and Supports for Fire Suppression Piping and Equipment*

4. *Section 26 05 03: Equipment Wiring Systems*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *WET-PIPE FIRE SPRINKLER SYSTEM* in the prices bid for the various related items of work as designated in the Proposal.

1.02 DESIGN REQUIREMENTS

A. System shall provide coverage for building areas shown on drawings.

B. Provide hydraulically designed system to meet the occupancy requirements shown and in accordance with NFPA 13.

C. Piping layout shown on Contract Drawings is intended to show general layout, areas to be covered and basic requirements. Prepare detailed working drawings of piping for review and approval by proper authorities before any work is performed.

D. Any revision to layouts shown on Contract Drawings shall be reviewed with *ENGINEER* prior to submittal to insurance rating authority and other authorities.

E. Determine volume and pressure of incoming water supply from water flow test data.

F. Interface system with building fire and smoke alarm system.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Valves

3. Sprinkler heads

4. Switches

5. Hose valve test head assembly

6. Test connections

7. Drains

8. Accessories

9. Wet-pipe and valve assembly

10. Sprinkler piping and head arrangements.

C. Submit complete system layout drawings including hydraulic calculations for review. Layout drawings shall show detailed pipe layout, hangers and supports, sprinklers and accessories including controls and location of alarms. Layout drawings and hydraulic calculations shall be signed and sealed by a Professional Engineer licensed in the State of New Jersey. Obtain approval of system layout from Owner's insurance carrier and local Fire Marshal before submittal to *ENGINEER*.

D. Furnish written certificate of inspection to *ENGINEER* advising that materials and installation are in full accordance with manufacturer's procedures and recommendations and operate properly and safely.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Installer shall be certified in accordance with N.J.A.C. 5:74 and shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

1.07 MAINTENANCE

A. Spare parts and materials:

1. Comply with provisions of *Section 01 78 45, Spare Parts and Maintenance Materials*.

2. Furnish extra sprinklers under provisions of NFPA 13.

3. Furnish suitable wrenches for each sprinkler type.

4. Furnish metal storage cabinet located adjacent to alarm valve.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Fire protection system components shall be UL listed and FM approved for fire protection service.

2.02 SPRINKLER HEADS

A. Acceptable Manufacturers:

1. Ansul Incorporated
2. Grinnell Corp.
3. Reliable Sprinkler Corp.
4. Tyco
5. Or equivalent.

B. Suspended Ceiling Type:

1. Type: Recessed pendant type with matching screw on escutcheon plate.

2. Finish: Chrome plated.

3. Escutcheon Plate Finish: Chrome plated.

4. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

C. Exposed Area Type:

1. Type: Standard upright type with guard.

2. Finish: Chrome plated.

3. Fusible Link: Fusible-solder link type temperature rated for specific area hazard.

D. Side wall Type:

1. Type: Recessed horizontal side wall type with matching screw on escutcheon plate and guard.

2. Finish: Chrome plated.

3. Escutcheon Plate Finish: Chrome plated.

4. Fusible Link: Fusible-solder link type temperature rated for specific area hazard.

E. Guards: Finish to match sprinkler finish

F. In areas where heads are subject to cold-soldering or physical damage, provide combination watershed and sprinkler guard assembly over head. Guards shall be installed on heads where located in elevator shafts, under lower rakes of stairways and when heads are 7'-0" or less above finished floor, electrical and mechanical rooms.

G. Wire Guards:

1. Upright - Reliable AC3
Grinnel #F774 Chrome

2. Pendent - Reliable AC4
Grinnel #F774 Chrome

2.03 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm with pressure retard chamber and variable pressure trim; with test and drain valve.

B. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125-volt AC.

2.04 STOCK HEAD AND CABINETS

A. Replacement heads and cabinet shall be provided in accordance with NFPA.

2.05 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Install in accordance with NFPA 13.

B. Coordinate installation with work on Fire Alarm System. Connections to building fire alarm system shall be part of work.

C. Install buried shut-off valves in valve box. Furnish post indicator.

D. Place pipe runs to minimize obstruction to other work.

E. Install piping in concealed spaces above finished ceilings.

F. Center sprinklers in two directions in ceiling tile and install piping offsets, dependent upon spacing and coordination with ceiling elements.

G. Install guards on sprinklers as indicated on Drawings.

3.03 TESTING

A. Hydrostatically test entire system.

1. Require test be witnessed by Fire Marshall and Authority having jurisdiction.

B. Verify signal devices are installed and connected to fire alarm system.

C. Test shall include:

1. Testing of valves, equipment and accessories for proper operation.

2. Setting and adjusting of pressure switches and controls.

3. Submit written certification of acceptance of all tests in accordance with NFPA-13.

3.04 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Remove and dispose of all debris.

C. Flush entire piping system of foreign matter.

****END OF SECTION****

SECTION 21 23 00

WET-CHEMICAL FIRE EXTINGUISHING SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Furnishing and installing of a pre-engineered, stored-pressure wet chemical solution extinguishing system.

2. The kitchen hood, fire suppression system, gas-fired make up air unit and kitchen hood exhaust fan shall all be provided by a single manufacturer.

   a. CaptiveAire or approved equivalent.

B. Related Work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 21 05 10: Common Work Results for Fire Suppression*

3. *Section 21 05 29: Hangers and Supports for Fire Suppression Piping and Equipment*

4. *Section 23 34 17: Kitchen Hood Exhaust Fans*

5. *Section 23 38 13: Commercial Kitchen Hoods*

6. *Section 23 74 23: Packaged Outdoor Heating Only Makeup Air Unit*

7. *Section 26 05 03: Equipment Wiring Systems*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *WET-CHEMICAL FIRE EXTINGUISHING SYSTEM* in the prices bid for the various related items of work as designated in the Proposal.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Exhaust Hoods

3. Cylinders and Valve Assemblies

4. Distribution Nozzles

5. Distribution System

6. Suppression System

7. Electrical Component

8. Accessories

C. Furnish written certificate of inspection to *ENGINEER* advising that materials and installation are in full accordance with manufacturer's procedures and recommendations, and operate properly and safely.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Installer shall be shall be certified in accordance with N.J.A.C. 5:74 and shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

D. The TANK Fire Suppression System is ETL Listed in accordance with ANSI/UL/ULC 300, ULCORD-C 1254.6

E. Microprocessor-based control board shall be ETL Listed to UL Standard 864 and ULC-S527-11.

F. TANK Fire Suppression System intended for installation and for use in accordance with the National Fire Protection Association Standards:

1. Wet Chemical Extinguishing Systems, NFPA 17A

2. National Electrical Code, NFPA 70

3. National Fire Alarm & Signaling Code, NFPA 72

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The Contractor and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Fire protection system components shall be UL listed and FM approved for fire protection service.

D. The Fire Suppression System shall be TANK manufactured by Captive Aire, or approved equivalent.

2.02 COMPONENTS

A. Exhaust hood fire system components to be factory installed.

B. Cylinder and Valve Assembly

1. The cylinders shall have a tin-nickel alloy plated brass valve with pressure gauge.

2. Wet chemical agent shall be contained in one or more stored pressure DOT/TC rated steel cylinder and valve assemblies.

3. Each cylinder is factory-filled with liquid fire suppressant and pressurized to 200 PSIG at 70°F.

4. Maximum cylinder flow points = 20.

C. Distribution Nozzles

1. Nozzles shall be located to protect the exhaust ducts, plenums, and all cooking appliances requiring protection.

2. All nozzles shall be equipped with a metal blow off cap. The cap prevents contamination from entering the pipe network and is designed to pop-off upon system discharge, allowing agent to flow to the protected hazard area.

3. All nozzles shall incorporate a stamped part number to easily identify nozzle type.

D. Distribution System

1. The distribution system shall consist of Copper, Schedule 40 black iron, chrome-plated or stainless-steel pipe and fittings. All exposed piping and fittings must be chrome-plated or stainless steel.

2. Fittings shall be minimum class 150. Galvanized fittings shall not be used.

E. Suppression System

1. The system control equipment shall be capable of all functions associated with automatically and manually discharging the wet chemical agent from all cylinder and valve assemblies, including automatic shutdown of the heat source or fuel and electrical power to all protected areas upon system discharge.

2. Liquid Fire Suppressant shall be Aqueous Potassium Carbonate (APC).

3. All mechanical components of the actuator kit shall be enclosed.

4. The actuator kit shall be capable of automatic or manual activation means.

5. Supervisory Pressure Switch added to monitor operating system pressure.

6. For manual activation, an electrically operated manual release shall be used to actuate the system manually.

7. For automatic activation, the system will be activated by a Firestat (heat) detector.

F. Electrical

1. Electrical Division to provide shunt trip breakers at main power panel, or disconnects, as designated by the Electrical Engineer; interconnection provided at hood control panel for the signal to shut down all electricity in and under the exhaust hood. Shunt trips/disconnects to accomplish shut off of electricity in the event of fire system activation by others.

2. Printed circuit board with microprocessor-based controller that provides all the necessary monitoring, timing, and supervision functions required for the reliable operation of the fire system.

3. Independent supervised loops incorporate redundancy and fault detection.

4. Real-time cloud-based monitoring connection provided with system by ownership.

5. Primary power supply, with battery backup for power loss.

6. All wiring must be in accordance to NFPA 70 and the Authority Having Jurisdiction (AHJ).

7. Electric gas valve provided for equipment below exhaust hood. Coordinate size and installation with Plumbing Division.

8. All wiring is to be in accordance with the applicable manufacturer's instructions for the fire alarm control panel, gas shut-off valve, manual reset relay, and Contractor supplied shut-off devices.

2.03 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the Contractor subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 APPLICATION

A. Wet chemical-based fire suppression system for use in commercial kitchens. It can be mounted in the integral cabinet located at the end of the hood or offered as a wall mount package.

3.03 INSTALLATION

A. As part of this item, provide wall mounted type K handheld portable fire extinguisher, placard, and mounting bracket as required in the immediate vicinity of each cooking area, per NFPA-96 and NFPA-10. Additional fire extinguishers as required in the kitchen area are to be specified by the Architect and provided by the General Contractor.

B. Install in accordance with manufacturer's instructions, drawings, written specifications, manufacturer's installation manual, and all applicable building codes.

C. Six-month and twelve-month inspections, servicing, and replacement of components as per NFPA 96 to be provided by the General Contractor or *OWNER*.

3.04 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Remove and dispose of all debris.

3.05 DEMONSTRATION

A. The manufacturer's representative shall instruct the *OWNER'S* operating personnel, at a time designated by the *OWNER*, as to the proper method of operation and recommended maintenance procedures.

B. The scheduling of the instruction shall be at the convenience of the *OWNER* and may not coincide with the start-up inspection.

****END OF SECTION****

SECTION 22 05 00
(15010)

COMMON REQUIREMENTS FOR PLUMBING WORK

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Common mechanical requirements specifically applicable to Division 22 Sections, in addition to Division 1 – General Requirements.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for the work of this Section in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

1. Prepare and submit a Schedule of Submittals showing all submittals required by the Specification sections or the Drawings.

2. Prepare and submit to *ENGINEER* shop drawings, product data and samples required by the Specification sections.

3. Prepare and submit to the *ENGINEER,* engineering drawings and calculations for items indicated on the Plans or as otherwise required by the contract specifications.

B. For piping, sheet metal, sleeve layout, and reflected ceiling plan shop drawings, submit an electronic copy of coordinated drawings. After the copy is notated and corrected by the *ENGINEER*, it will be returned. Then the required number of corrected prints will be prepared.

C. Shop drawings shall consist of manufacturer's certified scale drawings, cuts, or catalogs, including descriptive literature and complete certified characteristics of equipment, showing dimensions, capacity, code requirements, motor and drive testing, as indicated on the Drawings or Specifications.

D. Certified performance curves for all pumping and fan equipment shall be submitted for review.

E. All shop drawings showing routing of ductwork, piping and conduit shall not be less than ⅜" = 1' - 0" scale.

1.03 DEFINITIONS

A. "Piping" includes in addition to pipe; all fittings, valves, hangers, and other accessories related to such piping.

B. "Concealed" mean hidden from sight as in chases, furred spaces, shafts, hung ceilings, or embedded in construction.

C. "Exposed" means not "concealed" as defined above. Work in trenches, crawl spaces, and tunnels shall be considered "exposed" unless otherwise specifically noted.

D. Where any device or part of equipment is herein referred to in the singular number (such as "the pump"), such reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the Drawings.

1.04 CODES

A. N.J. Uniform Construction Code

B. ASME American Society of Mechanical Engineers

C. ANSI American National Standards Institute

D. ASTM American Society for Testing Materials

E. AWWA American Water Works Association

F. NEMA National Electrical Manufacturers Association

G. UL Underwriters' Laboratories

H. Local Water Company Rules and Regulations

I. National Electric Code

J. National Standard Plumbing Code

1.05 DRAWINGS

A. The Drawings are generally diagrammatic and are intended to convey the scope of work and indicate general arrangement of equipment; ducts, conduits, piping, and fixtures.

B. The locations of all items shown on the Drawings or called for in the Specifications that are not definitely fixed by dimensions are approximate only. The exact locations necessary to secure the best conditions and results must be determined at the project and shall have the approval of the *ENGINEER* before being installed. Do not scale Drawings.

C. Follow Drawings in laying out work and check Drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions at all points. Where headroom and space conditions appear inadequate, *ENGINEER* shall be notified before proceeding with installation.

D. If directed by the *ENGINEER*, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper

E. Piping or ductwork connected to equipment may require different size connection than indicated on the Drawings. The Contractor shall provide transition pieces as required at the equipment.

1.06 EQUIPMENT AND MATERIALS

A. Begin no fabrication or work that requires submittals until return of submittals with *ENGINEER'S* stamp and initials or signature indicating review and that no further submissions are required. Any manufacturing done, shipment made, workmanship performed, or work installed before the required shop drawings, product data, samples, engineering drawings, or engineering calculations are returned indicating that no further submissions are required will be at the sole expense and responsibility of the *CONTRACTOR* and subject to rejection.

B. The materials, workmanship, design, and arrangement of all work installed under the contract shall be subject to the approval of the *ENGINEER*.

1.07 RECORD DRAWINGS

A. During construction keep an accurate record of all deviations between the work as shown on the Drawings, and that which is actually installed.

B. Furnish Record Drawings in accordance with *Section 01 78 39, Project Record Documents*.

1.08 LAWS, ORDINANCES, PERMITS AND FEES

A. Give all necessary notices, obtain all permits and pay all governmental taxes, fees, and other costs in connection with the work; file all necessary plans, prepare all documents, and obtain all necessary approvals of all governmental departments having jurisdiction; obtain all required Certificates of Inspection for the work and deliver to the *ENGINEER* before request for acceptance and final payment for the work.

B. Include all work, without extra cost to the *OWNER*, any labor, materials, services, apparatus, drawings (in addition to Contract Drawings and Documents) in order to comply with all applicable laws, ordinances, rules and regulations whether or not shown on Drawings and/or specified.

C. All materials furnished and all work installed shall comply with the specifications and the requirements of the Uniform Construction Code of the State of New Jersey; requirements of local utility companies and governmental departments having jurisdiction.

1.09 ORGANIZATION OF WORK

A. The work called for under this Contract shall be carried on simultaneously with the work of other trades in a manner such as not to delay the overall progress of the work. Furnish promptly to other trades involved at the project, all information and measurements relating to the work that they may require. Cooperate with them in order to secure the harmony necessary in the interest of the project as a whole.

B. Keep a competent superintendent in charge of the work at all times.

C. Maintain a complete file of shop drawings at all times available to the Owner's representative.

D. Every facility shall be provided to permit observation of the work by the Owner's representative during the course of construction.

E. Where items of equipment and/or materials are indicated in the Specifications as being furnished by other trades for installation, assume responsibility for the unloading of such equipment and/or materials from the delivery trucks and for providing safe storage for same as required pending installation.

F. Where the work is to be installed in close proximity to work of other trades or where there is evidence that the work is to interfere with work of other trades, assist in working out space conditions to make a satisfactory adjustment.

G. Prepare composite working drawings and sections at a scale specified in *Section 01 31 13, Project Coordination.* Clearly show how the work is to be installed in relation to the work of other trades. If the installation is made before coordinating with other trades, make all necessary changes in the work without extra charge to the *OWNER*.

H. Attend coordination meetings under the supervision of the General Contractor and comply with the requirements of *Section 01 31 13, Project Coordination*.

1.10 PROTECTION OF WORK AND PROPERTY

A. Maintain and protect all equipment, materials and tools from loss or damage from all causes until final acceptance by the *OWNER*.

B. Assume responsibility for the protection of any finished work or other trades from damage or defacement by the operations and remedy any such injury or damages.

1.11 PIPE EXPANSION

A. All pipe connections shall be installed to allow for freedom of movement of the pipe during expansion and contraction. Proper anchors and guides shall be provided where necessary and/or when shown on the Drawings. Anchors and guides shall be subject to the review of the *ENGINEER*.

1.12 SCAFFOLDING, RIGGING, HOISTING

A. Provide all scaffolding, rigging, hoisting and services necessary for erection and delivery into the premises of all equipment and materials furnished under this section of the Specifications, and remove same from premises when no longer required.

B. In the event that supplementary bracing of the basic building structure is required to assure a secure rigging procedure and a secure route for the equipment being handled, assume full responsibility for such supplementary bracing.

1.13 BASES AND SUPPORTS

A. Provide all bases and supports not part of the building structure of required size, type and strength, as approved by the *ENGINEER*, for all equipment and materials. All equipment, bases and supports shall be adequately anchored to the building structure to prevent shifting of position under operating conditions.

B. Provide not les than six-inch high concrete bases for all pumps, refrigeration machines, compressors, and rotating machinery and elsewhere as specified. Bases shall extend six inches beyond machinery base in all directions with top edge chamfered. Provide ½" x 6" steel dowels into floors to anchor bases. Provide anchor bolts set in pipe sleeves two sizes larger than anchor bolts for securing machinery. After anchor bolts are aligned with equipment bases, fill sleeves with concrete.

1.14 SLEEVES, PIPE AND CONDUIT INSERTS AND ANCHOR BOLTS

A. Provide and assume responsibility for the location and maintenance in proper position of all sleeves, inserts, and anchor bolts required for the work. In the event that failure to do so requires cutting and patching of finished work, it shall be done without additional cost to the *OWNER*.

B. All pipes and conduits passing through masonry walls or partitions shall be provided with sleeves having an internal diameter larger than the outside diameter

of the pipe or insulation enclosing the pipe or conduit. Sleeves shall be Schedule 40 black steel pipe.

C. Sleeves through foundation walls shall be as shown on the drawings. Sleeves shall be set with ends flush with each face of wall. The space between sleeve and pipe shall be packed with oiled oakum to within 2" of each face of the wall. The remaining space shall be packed and made watertight with a waterproof compound.

D. Sleeves through concrete floors or interior masonry walls shall be as shown on the drawings. The open sleeve space shall be packed with non-combustible materials.

E. Inserts shall be preset concrete inserts with steel reinforced rods through the insert and both ends hooked over the reinforced mesh. Inserts shall be of individual type of malleable iron construction with accommodation for removable nuts and threaded rods up to ¾" diameter, permitting lateral adjustment, except as otherwise noted. Individual inserts shall be Grinnell Fig. 282 up to 5" pipe and conduit, Fig. 282, 6" and up to 8" pipe and conduit, Fig. 152 above 8" and up to 12" pipe and conduit. For figures 282 and 152, they shall come with an opening at the tip to allow reinforcing rods up to ½" diameter to be passed through the insert body. Rods shall extend a minimum of 4" on either side of the insert. Pipes larger than 12" shall be suspended from steel members only.

1.15 ESCUTCHEONS

A. Provide escutcheons on pipes wherever they pass through ceilings, walls, or partitions.

B. Interior Pipe Escutcheons: Chrome-plated, stamped, steel, hinged, split-ring escutcheon, with set screw. Inside diameter shall closely fit pipe outside diameter, or outside of pipe insulation where pipe in insulated. Outside diameter shall completely cover the opening in walls.

1. Manufacturers: Subject to compliance with requirements, provide escutcheon as manufactured by one of the following:

a. Chicago Specialty Manufacturing Company.
b. Tubular Brass Plumbing Products, Zurn Industries, Inc.

C. Exterior Pipe Escutcheons: Type 304 Stainless Steel. Inside diameter shall closely fit pipe outside diameter, or outside of pipe insulation where pipe is insulated. Outside diameter shall completely cover the opening in walls.

1.16 MANUFACTURER'S IDENTIFICATION

A. Manufacturer's nameplate, name or trademark, shall be permanently affixed to all equipment and material furnished under this Specification. Where such equipment is in a finished occupied space, the nameplate shall be in a concealed but accessible location. The nameplate of a Subcontractor or Distributor will not be acceptable.

1.17 EQUIPMENT NAMEPLATES

A. Provide for each item of equipment, including all control devices, pumps, fans, compressors, boilers, etc., a permanently attached nameplate made of black surface, white core laminated bakelite with incised letters. Pneumatic, electric and mechanically actuated gauges shall have a brief, but complete description of their function. Stating the air pressure or voltage range alone is not acceptable. Nameplates shall be a minimum of 3" long by 1 ½" wide and shall bear the equipment name and item number of ½" high white letters as designated in the equipment schedule. Mounting screws shall have chrome plated acorn headed screws.

1.18 DRIP PANS

A. Confirm the final location of all electrical equipment to be installed in the vicinity of piping. Plan and arrange all overhead piping no closer than two feet from a vertical line to electric switchboards, panelboards, or similar equipment.

B. Where the installation of piping does not comply with the requirements of foregoing paragraph, where feasible the piping shall be relocated.

C. Provide copper gutters as follows:

1. Provide a gutter of 16 ounce cold rolled copper under every pipe which is within 2' - 0" of being vertically over any motor, electrical controllers, switchboards, panelboards, or the like.

2. Each gutter shall be soldered and made watertight, properly suspended; and carefully pitched to a convenient point for draining. Provide a ¾" drain, to nearest floor drain or slop sink.

3. In lieu of such separate gutters, a continuous protecting sheet of similar construction, adequately supported and braced, properly rimmed, pitched

and drained, may be provided over any such motor, and extending 2' - 0" in all directions beyond the motor, over which such piping has to run.

1.19 TOOLS

A. All special tools for proper operation and maintenance of the equipment shall be provided to the Owner's Representative at no additional cost to the *OWNER*.

1.20 QUIET OPERATION

A. All equipment and material shall operate under all conditions of load without any sound or vibration, which in the opinion of the *ENGINEER* is objectionable. Where sound or vibration conditions arise which are considered objectionable by the *ENGINEER*, eliminate same in a manner reviewed by the *ENGINEER*.

1.21 RUBBISH REMOVAL

A. Maintain project site and building interior free of all rubbish, rubble, waste material, packaging materials, etc. accumulating as a result of his work. Assume responsibility for the cleaning up of packaging removed from materials and equipment furnished by other trades for the installation. Note that final acceptance of the work is contingent upon the project being free of all excess and waste materials resulting from the work.

B. Comply with requirements of *Section 01 74 00, Cleaning and Restorations.*

1.22 CLEANING PIPING, DUCTS AND EQUIPMENT

A. Clean all piping, ducts, and equipment of all foreign substances inside and out before being placed in operation.

B. If any part of a system should be stopped by foreign matter after being placed in operation, the system shall be disconnected, cleaned, and reconnected wherever necessary to locate and remove obstructions. Any work damaged in the course of removing obstructions shall be repaired when the system is reconnected at no additional cost to the *OWNER*.

C. During construction, properly cap all pipes and equipment nozzles so as to prevent the entrance of sand, dirt, etc.

1.23 EXCAVATION AND BACKFILL

A. All excavation, trenching, backfilling and compaction required shall be in accordance with *Section 31 23 00: Excavating, Filling and Grading*.

B. Perform all excavation, trenching and backfilling necessary to construct and complete the utility and all its appurtenances. No tunneling will be allowed except by written consent of the *ENGINEER*. Care shall be taken to avoid undermining of all existing utilities, footings or foundations.

C. Locations and elevations of pipe lines, conduits, cables, etc., shown are not to be used as final for installation of work; however, they are to be followed as closely as possible, ground conditions permitting. Exact locations of grade shall be determined on job.

D. Under no circumstances, lay pipe or conduit or install appurtenances in water. Keep trenches free from water. Perform all necessary pumping as required to keep trenches free from water at no additional cost to the *OWNER*.

E. Where existing utilities are encountered, support, shore and protect said existing utilities and allow ample time for such measures as may be necessary for continuances of such services.

F. Notch under pipe bells to provide solid bearing for the entire body of pipe.

1.24 GRADING

A. All grading shall be in accordance with *Section 31 23 00: Excavating, Filling and Grading*.

B. Final grading shall be done under other sections of the Specifications.

1.25 PAINTING

A. Paint all piping as specified in *Section 09 90 00, Painting*.

B. All gauges, dials and rotating equipment shall be protected as specified.

C. Nameplates on all equipment shall be cleaned and left free of paint.

1.26 LUBRICATION

A. Properly lubricate all rotating equipment as soon as it is connected and before operation of the equipment is started. Any equipment damaged due to inadequate lubrication shall be replaced at no cost to the *OWNER*.

1.27 TESTS

A. All piping, wiring, and equipment shall be tested as specified under the various sections of the work. Labor, materials, instruments and power required for testing shall be furnished under the particular section of the Specifications.

B. Tests shall be performed to the satisfaction of the *ENGINEER*. The *ENGINEER* will be present at such test, when he deems necessary and such other parties as may have legal jurisdiction.

C. Pressure tests shall be applied to piping only before connection of equipment and installation of insulation. In no case shall piping, equipment, or accessories be subjected to pressure exceeding their rating.

D. All defective work shall be promptly repaired or replaced and the tests shall be repeated until the particular system and component parts thereof receive the review of the *ENGINEER*.

E. Any damages resulting from tests shall be repaired or replaced and the tests shall be repeated until the particular system and component parts thereof receive the approval of the *ENGINEER*.

F. The duration of tests shall be as determined by all authorities having jurisdiction, but in no case less than the time prescribed in each section of the Specifications.

G. Equipment and systems that normally operate during certain seasons of the year shall be tested during the appropriate season.

H. Tests shall be performed on individual equipment, systems, and their controls. Whenever the equipment or system under test is interrelated with and depends upon the operation of other equipment, systems and controls for proper operation, functioning, and performance, the latter shall be operated simultaneously with the equipment or system being tested.

I. The electrical work shall include providing any assistance (such as removal of switchboard and panelboard trims and covers, pull and junction box covers, etc.)

deemed necessary by the *ENGINEER* to check compliance with the Drawings and Specifications.

1.28 OPERATING INSTRUCTIONS

A. Provide Operation and Maintenance Data in accordance with *Section 01 78 23*.

B. The Manuals shall contain the following items:

1. Table of Contents (PLUMBING)
2. Introduction - Explanation of Manual and its use.
3. Description of Systems
4. Complete schematic drawings of all systems.
5. Functional and sequential description of all systems.
6. All posted instruction charts.
7. Maintenance.
8. Listing of Manufacturers.
9. Manufacturer's Data (Where multiple model, type and size listings are included, clearly and conspicuously indicate those that are pertinent to this installation).
10. Description - Literature, drawings, illustrations, certified performance charts, technical data, etc.
11. Operation.
12. Maintenance - including complete trouble-shooting charts.
13. Parts List.
14. Names, addresses and telephone numbers of local recommended repair and service companies.
15. Guarantee data.
16. Model No. and Serial No. of all equipment.

1.29 TRAINING

A. Controls manufacturer shall provide at no extra cost to the end user, 24-hours minimum training through the first year warranty. Upon completion of this project, manufacturer shall train end user for a period of three (3) consecutive days, eight (8) hours each day.

1.30 OPERATION PRIOR TO COMPLETION

A. The *OWNER* may require operation of parts or all of the installation for the beneficial occupancy prior to final completion and acceptance of the building.

B. The operation shall not be construed to mean acceptance of the work by the *ENGINEER* for the *OWNER*. The *OWNER* will furnish supervisory personnel to direct operation of the entire system and the Contractor shall continue to assume this responsibility until final acceptance.

1.31 ELECTRIC MOTORS

A. Furnish, install and align all motors required for this equipment. Unless they are factory installed on the unit, all starters and associated wiring and safety switches for such motors shall be furnished and installed under Division 26.

B. All motors shall comply with *Section 23 05 13, Common Motor Requirements for HVAC Equipment*.

C. The speed, horsepower, type and other essential data for each motor, if not given under paragraphs describing the various motor driven apparatus, or in schedules on the drawings shall be obtained from the manufacturer of the respective apparatus and shall be submitted to the *ENGINEER* for his review. All 2-speed motors shall be single winding type.

D. Provide oversized motor junction box for 2 speed motors.

E. Direct connected motors shall be furnished without an adjustable base. All motors connected to driven equipment by belt shall be furnished with adjustable sliding bases, except fractional motors with slotted mounting holes.

F. All motor leads shall be permanently identified and supplied with connectors.

G. Motors shall have nameplates giving manufacturer's name, serial number, horsepower, speed, voltage, phase and current characteristics.

1.32 INDIVIDUAL MOTOR STARTERS

A. For single-phase motors ⅓ HP or smaller, starters shall be manual, 120 volts, single-pole or 240 volts, 2-pole with thermal overload protection and pilot light. Where interlocking or automatic control (other than for unit and cabinet heaters) is required, starters shall be combination circuit breaker and magnetic starter with pilot light.

B. For 3-phase motors ½ through 20 HP, starters shall be full-voltage combination circuit breaker and magnetic across-the-line contractor, rated 208 volts, 3-pole. All magnetic starters shall have three thermal overloads.

C. Unless otherwise specified, motors 25 HP and over shall be furnished with combination circuit breaker and magnetic reduced voltage starter of the autotransformer closed transition type.

D. For motors requiring electric interlocks, or automatic control features, starters shall be equipped with the necessary auxiliary relays and contacts to provide the control features desired. Such starters shall be also provided with “hand-off-auto” pushbuttons mounted in cover. For 2-speed motors, provide “high-low-off-auto” 4-position selector switch. Furnish adjustable 20-second time delay between high and low speeds for motors 10 HP and above.

E. In addition to any auxiliary contacts required for interlocking purposes, each magnetic starter shall be equipped with one normally open auxiliary control circuit contact either for “sealing in” or as a spare for future use.

F. Indicating lights shall be transformer or series resistor type. There shall be one red light for each single speed motor to indicate when motor is running. For multiple speed motors one indicating light for each speed shall be provide.

G. The starter disconnecting means shall be circuit breakers. The external operating handle shall clearly indicate “ON” or “OFF” position of the switch and shall be interlocked with the door to require throwing the handle to the “OFF” position to open the door. The handle shall be arranged for locking both the door closed and the disconnect in the “OFF” position with up to 3 padlocks. Provide defeat device in cover to permit opening door in "ON" position.

H. Circuit breakers in combination starter units shall be of the magnetic trip type with an adjustable trip setting for selecting instantaneous trip points of fault protection (motor circuit protector). Field adjustment of the instantaneous trip shall be performed by the Electrical Contractor. Select the trip setting at approximately 10 times the motor nameplate full-load current. If the circuit breaker trips on starting, incrementally increase the settings. In no case shall the trip setting exceed 13 times the motor full-load current.

I. Overload heaters shall be furnished for all starters and shall be sized in range of 115 to 125% of full load current. The motor starters shall be shipped with the overload heaters inside the compartment but not installed. The Electrical Contractor shall verify the ratings of the heater coils based on the motor nameplate data before installing the overloads. The Contractor supplying the starter shall replace any improperly selected heaters.

J. A transformer shall be supplied in each starter unit for 120 volt control voltage. Transformer capacity shall be adequate to supply the holding coil requirements plus the solenoids, e-p switches, relays and other devices required to be controlled from the starter. A fuse shall be supplied in one secondary terminal of the control transformer. The other terminal shall be grounded to the housing of the starter. Fuses shall be also provided in the transformer primary leads per the National Electrical Code.

K. All enclosures shall be NEMA Type I sheet steel with hinged cover for general purpose indoor application, unless otherwise indicated. Enclosures shall be arranged for equipment or wall mounting. Weatherproof NEMA Type 4 enclosures shall be provided for all outdoor starters.

L. Each starter shall be clearly identified by engraved nameplates after installation. The nameplates shall be bakelite black plates with 1/2" high white letters and shall be securely fastened to starter with mounting screws made of non-corrosive metals.

M. Stainless steel flush mounted starter and enclosures shall be provided for all starters located in kitchen and dishwasher areas.

N. All starters, except those furnished as an integral part of equipment and factory installed on the equipment, shall be of the same manufacturer.

O. Starters shall be as manufactured by General Electric, Square D, Cutler-Hammer, or Allen-Bradley.

P. Shop drawings shall be provided with dimensions, ratings, wiring diagrams and schedule of nameplates for approval prior to fabrication.

1.33 MOTOR CONTROLLERS

A. Motor controllers shall be defined as control devices such as pushbuttons, switches, etc. which are not mounted in starter cover, required for remote control of motors.

B. Unless otherwise noted, motor controllers shall be housed in NEMA Type 1 general purpose enclosures. Outdoor controllers shall be provided with weatherproof NEMA Type 4 enclosures. Provide nameplate to indicate the motor with which they are associated.

C. The controllers to be installed in finished area shall be flush mounted.

D. The Electrical Contractor shall install and provide wiring for motor controllers. The contractor providing the motor shall furnish the controllers.

E. Unless otherwise noted, pushbuttons shall be of the normal duty, spring return momentary type.

F. Selector switches and pushbuttons shall be equipped with nameplates indicating the function of each of their positions as noted in the list of electric motors and motor controls or shown on the drawings.

G. Pilot light shall be transformer or series resistor type for operation at 120 V.

H. Pilot lights shall be equipped with nameplates indicating the operating conditions they annunciate as noted in the list of electric motors and motor controls or shown on the drawings.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

****END OF SECTION****

SECTION 22 05 29
(15141)
HANGERS AND SUPPORTS
FOR
PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Locate, layout, design, provide and install supports to adequately and safely support all non-buried piping and equipment.

2. Equipment bases and supports.

3. Sleeves and seals.

4. Flashing and sealing of equipment and pipe stacks.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 03 30 00: Concrete*

3. *Section 05 50 00: Metal Fabrications*

4. *Section 07 84 00: Firestopping*

5. *Section 07 92 13: Sealants and Caulking*

6. *Section 09 90 00: Painting (General)*

7. *Section 22 11 13: Facility Water Distribution*

8. *Section 22 05 48: Vibration and Seismic Controls for Plumbing Piping and Equipment*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for the work of this Section in the prices bid for the various related items of work listed in the Proposal.

1.02 REFERENCES

A. American Society of Mechanical Engineers:

1. ANSI/ASME B31 - Power Piping.

B. Manufacturer's Standardization Society of the Value and Fittings Industry:

1. MSS SP 58: Pipe Hangers and Supports-Materials, Design and Manufacture

2. MSS SP 69: Pipe Hangers and Supports - Selection and Application.

C. International Code Council, Inc.:

1. International Mechanical Code, as amended by the Uniform Construction Code of the State of New Jersey.

2. International Building Code (IBC), New Jersey Edition.

D. Plumbing - Heating - Cooling Contractors – National Association

1. National Standard Plumbing Code, as amended by the Uniform Construction Code of the State of New Jersey.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Shop drawings:

1. For pipe 2" or less in diameter where the load per hanger or support does not exceed 50 lbs in a 5' x 5' area and the spacing does not exceed 10':

a. Work shall conform to Chapter 8 of the National Standard Plumbing Code as amended by the Uniform Construction Code of the State of New Jersey.

b. Show precise dimensions of the work of this section and all other data needed to ensure proper and adequate provision in the work to accommodate the work of this section.

c. A three-dimensional isometric drawing of all piping showing the arrangement of each run, type of pipe material, wall thickness, contents, flow direction, equipment attachments, fittings and valves. The isometric drawing shall also locate and identify all supports. Supports shall be located from changes in piping direction, from floors, and from building column lines.

d. A complete set of details showing all physical attachments of the support framing to the building. This shall include:

(1) Where attaching to building framing, show weld sizes and configurations; number, diameter, spacing and materials of all bolts; size, length and arrangement of angles, plates or any other supplemental structural member.

(2) Where attaching to concrete or masonry structures using cast-in-place anchor bolts, show anchor bolt locations, diameters, material, plate washer sizes (if used), and projection and embedment lengths above and below the bearing face of concrete.

(3) Where anchor bolts are to be drilled in concrete, show anchor bolt locations, diameters, material, projection and embedment lengths above and below the bearing face of concrete, the anchor bolt manufacturer’s model number and description along with the manufacturer’s current allowable load tables with recommended installation, use and safety factor data.

(4) For all type of anchor bolts, provide base plate thickness and size and depth of grout to be provided.

g. Within fourteen (14) days after review of the support engineering drawings by the *ENGINEER* and before any of the materials of this section are delivered to the job site, submit complete erection drawings of the supports. Drawings for steel framing shall be done in accordance with the AISC Manual of Steel Construction (ASD), Part 5, Section M1, entitled "Shop Drawings."

h. All constructability problems and potential fouls must be resolved by the Contractor prior to the submittal of design information to the *ENGINEER*.

2. For all other piping:

a. Show precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provision in the work to accommodate the work of this section.

b. A three-dimensional isometric drawing of all piping showing the arrangement of each run, type of pipe material, wall thickness, contents, flow direction, equipment attachments, fittings and valves. The isometric drawing shall also locate and identify all supports. Supports shall be located from changes in piping direction, from floors, and from building column lines.

c. A table identifying each and every support associated with each piping run. Each support shall be identified with a unique alphanumeric number and designated as to support type (i.e. vertical load support, lateral load support, etc.). The table shall also show for every support, each individual support load condition and each summed load combination as given in the Design Requirements section of this specification. All loads shall be clearly delineated for each support as to magnitude, direction and units.

d. A complete set of all load reactions imposed by the supports onto the building framing and any concrete or masonry structure including foundations, walls, and floor slabs. All loads shall be clearly delineated for each support as to magnitude, location, direction, elevation, point of application and units. Loads shall be those caused by the load conditions in the combinations described in the Design Requirements section of these specifications.

e. A complete set of engineering drawings and design calculations that fully substantiates that the supports and anchor bolts meet the requirements of these specifications and accepted engineering practices. Engineering drawings for steel framing shall be done in accordance with the AISC Manual of Steel Construction (ASD), Part 5, Section A7, entitled "Design Documents."

f. A complete set of details showing all physical attachments of the support framing to the building. This shall include:

(1) Where attaching to building framing, show weld sizes and configurations; number, diameter, spacing and materials of all bolts; size, length and arrangement of angles, plates or any other supplemental structural member.

(2) Where attaching to concrete or masonry structures using cast-in-place anchor bolts, show anchor bolt locations, diameters, material, plate washer sizes (if used), and projection and embedment lengths above and below the bearing face of concrete.

(3) Where anchor bolts are to be drilled in concrete, show anchor bolt locations, diameters, material, projection and embedment lengths above and below the bearing face of concrete, the anchor bolt manufacturer's model number and description along with the manufacturer's current allowable load tables with recommended installation, use and safety factor data.

(4) For all type of anchor bolts, provide base plate thickness and size and depth of grout to be provided.

g. Within fourteen (14) days after review of the support engineering drawings and calculations by the *ENGINEER*, and before any of the materials of this section are delivered to the job site, submit complete erection drawings of the supports. Drawings for steel framing shall be done in accordance with the AISC Manual of Steel Construction (ASD), Part 5, Section M1, entitled "Shop Drawings."

h. All constructability problems and potential fouls must be resolved by the Contractor prior to the submittal of design information to the *ENGINEER*.

i. Engineering drawings and calculations shall be signed and sealed by a Professional Engineer registered in the State of New Jersey.

D. Manufacturer's recommended installation procedures.

E. Prior to construction, submit a copy of all required approved construction permits.

F. Submit a certificate signed by New Jersey registered surveyor certifying that the elevations and locations of supports are in conformance or nonconformance with the Contractor's drawings.

G. Submit a Record Plan.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance: The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

D. Supports shall be designed and installed in accordance with the more stringent of the referenced standards and these *Specifications*.

E. New Jersey licensed Land Surveyor shall be employed by Contractor to perform all construction layout and to certify support installations.

F. New Jersey licensed Professional Engineer shall be employed to perform all structural design.

1.05 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.06 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer’s warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

1.07 DESIGN REQUIREMENTS

A. General: Unless otherwise herein modified, all supports must be designed in accordance with the latest editions of the AISC Manual of Steel Construction, Allowable Stress Design, and the International Building Code. All designs must be coordinated and reviewed for constructability and potential fouls by the Contractor. Supports shall include all shapes, plates, hardware, components, anchor bolts, and fasteners required to support and transfer all design loads to the building in accordance with the specified design criteria. Where member and connection sizes have been shown, they shall be the minimum acceptable.

B. Arrangement:

1. All supports shall be arranged and constructed so as not to obstruct egress paths from the building, nor to impede maintenance access to equipment or operations of the facility. The clear height shall be not less than 7' - 0" above finished floor.

2. Support and anchorage components shall not breach the water tightness of the walls, mat foundation and/or structural floor slabs.

3. Unless otherwise approved by the *ENGINEER*, the installed location of all piping, ductwork, equipment, walkways and platforms shall comply with the dimensional requirements shown on the plans in regard to location, elevation, slope and arrangement.

C. Deflections:

1. The allowable deflection of all support framing members under all load combinations shall not exceed L/240, where L equals the member length, unless a more stringent limit is recommended by the equipment manufacturer.

2. Allowance shall be made for support deflections by avoiding inadvertent load transfer from the supports to the adjacent building.

D. Bracing: Bracing members shall have an L/r ratio of not more than 200, where L is the distance in inches between connections and r is the least radius of gyration of the bracing member. Where cross-bracing members are connected at their point of intersection, the L distance shall be taken as the distance in inches between connection at the point of intersection of the bracing members and the connections at the end of the members.

E. Friction from gravity loads shall not be considered adequate resistance to resultant piping forces.

F. Attachment to the main building structure:

1. All attachments of supports to the main building structure including its superstructure framing, roof, walls, floor slab or foundations shall be specifically approved by the *ENGINEER*. All attachments shall be reviewed individually by the *ENGINEER*. The general basis for acceptance shall be as specified herein.

2. Maximum reactions:

a. The maximum loads imposed by supports upon all other building's structural systems shall be individually reviewed by the *ENGINEER*.

3. Manner of attachment:

a. All connections to either main building framing steel, concrete structures, or masonry walls shall be "pinned" and shall offer no moment restraint. Cantilevers, braced framing or any connection arrangement that causes a couple or torsion in either main building framing steel, concrete structures, or masonry walls shall not be permitted unless specifically approved by the *ENGINEER*.

b. All support framing base plates attaching to concrete structures or masonry walls shall be installed upon a one inch (1") minimum thick bed of non-shrink grout.

c. Where support framing spans across an expansion joint in the main building framing steel, allowance shall be made for a movement of 4±" at one end of the support framing span. Where support framing spans across an expansion joint in a concrete structure or masonry wall, allowance shall be made for a movement of 2"± at one end of the support framing span.

H. Design Loads:

1. Dead Load (DL): This includes the weight of all piping, ductwork, supports, contents and insulation.

2. Pressure Load (PL): This includes the resultant forces, in all directions, caused by the pressure under both constant and variable conditions within the range of the pressure capacity for which the piping or ductwork was provided.

3. Thermal Load (TL): This includes the resultant forces, in all directions, caused by the temperature under both constant and variable conditions within the range of operating temperatures for which the piping or ductwork was provided.

4. Snow Load (SL): This load shall be applied of the entire horizontal projection of all exterior piping, ductwork and supports. Snow loads must be developed in accordance with the 2000 International Building Code

with the factors applicable to the building to which the equipment, piping and ductwork attaches. As a minimum, snow loads shall be based on a uniformly distributed downward pressure of 30 psf.

5. Wind Load (WL): This load shall be applied to the entire vertical projection of all exterior piping, ductwork and supports. Wind loads must be developed in accordance with the 2006 International Building Code with the factors applicable to the building to which the equipment, piping and ductwork attaches. As a minimum, wind loads shall be based on a uniformly distributed lateral pressure of 30 psf.

6. Earthquake Load (EQ): This load shall be applied to all piping, ductwork and supports. Earthquake loads must be developed in accordance with the 2006 International Building Code with the factors applicable to the building for which the piping and ductwork attaches. As a minimum, earthquake loads shall be based upon a seismic shear of 15% of the dead load as previously described.

I. Load Combinations: Support framing shall be designed to safely withstand the stated design loads as they occur in the following combinations:

1. DL

2. DL + PL + TL

3. DL + WL

4. DL + PL + TL + WL

5. DL + SL

6. DL + PL + TL + SL

7. DL + PL + TL + SL + WL

8. DL + EQ

9. DL + PL + TL + EQ

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 STEEL

A. Structural Steel: ASTM A36 or A992.

B. Structural Tubing: ASTM A500, Grade B.

C. Structural Tubing: ASTM A501.

D. Steel Pipe: ASTM A53, Grade B.

E. Bolts & Nuts: ASTM A307, A325 or A490.

2.03 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes ½ to 1½ Inch: Carbon steel, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2 to 4 Inches and Cold Pipe Sizes 6 Inches and Over: Carbon steel, adjustable, clevis.

C. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron roll, double hanger.

D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods; cast iron roll and stand for hot pipe sizes 6 inches and over.

E. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

F. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp; adjustable steel yoke and cast iron roll for hot pipe sizes 6 inches and over.

G. Vertical Support: Steel riser clamp.

H. Floor Support for Pipe Sizes to 4 Inches and All Cold Pipe Sizes: Cast iron adjustable pipe saddle, lock nut nipple, floor flange, and concrete pier or steel support.

I. Floor Support for Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.

J. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

K. Shield for Insulated Piping 2 Inches and Smaller: 18 gage galvanized steel shield over insulation in 180 degree segments, minimum 12 inches long at pipe support.

L. Shield for Insulated Piping 2½ Inches and Larger (Except Cold Water Piping): Pipe covering protective saddles.

M. Shields for Insulated Cold Water Piping 2½ Inches and Larger: Hard block non-conducting saddles in 90 degree segments, 12 inch minimum length, block thickness same as insulation thickness.

N. Shields for Vertical Copper Pipe Risers: Sheet lead.

2.04 HANGER RODS

A. Steel Hanger Rods: Threaded both ends, threaded one end, or continuous threaded.

2.05 INSERTS

A. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.06 ANCHOR BOLTS

A. Stainless steel in accordance with *Section 05 50 00, Metal Fabrications*.

2.07 FLASHING

A. Metal Flashing: 26 gage galvanized steel.

B. Lead Flashing: Five (5) lb/sq ft sheet lead for waterproofing; one (1) lb/sq ft sheet lead for soundproofing.

C. Flexible Flashing: Compatible with roofing.

D. Caps: Steel, 22 gage minimum; 16 gage at fire resistant elements.

2.08 SLEEVES

A. Sleeves for Pipes through Non-fire Rated Floors: Form with 18 gage galvanized steel.

B. Sleeves for Pipes through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Form with steel pipe or galvanized steel.

C. Sleeves for Pipes through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Prefabricated fire rated sleeves including seals, UL listed.

F. Caulk: As specified in *Section 07 92 13, Sealants and Caulking*.

2.09 FABRICATION

A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

B. Design hangers without disengagement of supported pipe.

C. Provide copper plated hangers and supports for copper piping.

2.10 CONCRETE EQUIPMENT BASES

A. Comply with *Section 03 30 00, Concrete*.

2.11 FINISH

A. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

2.12 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Inserts:

1. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

2. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over four inches (4").

3. Where concrete slabs form finished ceiling, provide inserts to be flush with slab surface.

4. Where inserts are omitted, drill through concrete slab from below and provide thru-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

B. Hangers and support location:

1. Unless otherwise located on the *Contract Drawings*, the Contractor is responsible, subject to the *ENGINEER'S* review, for locating and arranging pipe supports in a manner that would safely support the piping, would not create access/egress obstructions and would not overstress the piping/ductwork system, the support structure, any building structural members, or attached equipment when subjected to the Design Loads in the combinations specified. However, the following is the minimum criteria for support placement.

a. Dead load supports for horizontal piping runs:

Pipe Size And Material	Horizontal Distance Between Dead Load Supports On A Horizontal Run
Ductile Iron Pipe (Pressure Class 150 or thicker)	
3"	12'-0"
4" to 6"	14'-0"
8" to 12"	19'-0"
14" to 16"	20'-0"
18" to 24"	20'-0"
Steel Pipe (Schedule 40 or thicker)	
½" to 1¼"	6'-0"
1½" to 2"	12'-0"
2½" to 3"	12'-0"
4" to 6"	12'-0"
8" to 12"	12'-0"
14" to 16"	20'-0"
18" to 24"	20'-0"
PVC (Schedule 40 or thicker)	
All Sizes	4'-0"

Copper (Type L or thicker)	
Pipe	12'-0"
Tube, ≤ 1¼"	6'-0"
Tube, ≥ 1½"	10'-0"
Cast Iron (Standard Wall or thicker)	
All Sizes, 5' Lengths	5'-0"
All Sizes, 10' Lengths	10'-0"

b. Lateral load supports for vertical piping runs:

Pipe Size And Material	Vertical Distance Between Lateral Load Supports on a Vertical Run
Ductile Iron Pipe (Pressure Class 150 or thicker)	
3" to 24"	15'-0"
Steel Pipe (Schedule 40 or thicker)	
½" to 1¼"	10'-0"
1½" to 24"	15'-0"
PVC (Schedule 40 or thicker)	
All Sizes	10'-0"
Copper (Type L or thicker)	
Pipe and Tube	10'-0"
Cast Iron (Standard Wall or thicker)	
All Sizes, All Lengths	15'-0"

c. Install supports to provide minimum of ½ inch space between finished covering and adjacent work.

d. Place dead load and lateral support within 12" of each horizontal elbow or joint.

e. Place axial support within 12" of each elbow.

f. Place lateral support within 12" of each vertical elbow.

g. Use hangers with 1½" minimum vertical adjustment.

h. Support vertical and lateral loads from vertical piping at every floor and change of direction. Support vertical cast iron pipe at each floor at hub.

i. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers to support dead loads.

j. Support riser piping independently of connected horizontal piping.

k. For Concentrated Loads: Install additional hangers or supports, spaced as required, at locations where concentrated loads such as in-line pumps, valves, fittings or accessories occur, to support the concentrated loads.

C. Equipment bases and supports:

1. Provide equipment bases of concrete type specified herein.

2. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

3. Construct support of steel members or steel pipe and fittings. Brace and fasten with flanges bolted to structure.

4. Provide rigid anchors for pipes after vibration isolation components are installed.

D. Flashing:

1. Provide flexible flashing and metal counter flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

2. Flash vent and soil pipes projecting 3 inches minimum above finished roof surface with lead worked one inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and calk, metal counter flash and seal.

3. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 x 36 inch sheet size. Fasten flashing to drain clamp device.

4. Seal floor drains water tight to adjacent materials.

5. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms, installed in accordance with manufacturer's instructions for sound control.

6. Provide curbs for mechanical roof installations twelve inch (12") minimum height above roofing surface. Flexible sheet flash and counter flash with sheet metal; seal water tight.

E. Sleeves:

1. Set sleeves in position in formwork. Provide reinforcing around sleeves.

2. Extend sleeves through floors one inch (1") above finished floor level. Caulk sleeves full depth and provide floor plate.

3. Where piping penetrates non-fire rated floor, ceiling, or wall, close off space between pipe or duct and adjacent work with stuffing insulation and calk air tight. Provide close fitting metal collar or escutcheon covers at both sides of penetration. Close penetrations of fire rated assemblies in accordance with *Section 07 84 00, Firestopping*

4. Install stainless steel escutcheons at finished surfaces.

3.03 FIELD QUALITY CONTROL

A. Tests:

1. Upon completion of this portion of the work and prior to acceptance by the *OWNER*, make all required tests and adjustments for free and smooth operation.

2. Secure all approvals from agencies having jurisdiction.

3.04 CLEANING

A. Clean exposed surface of all grease, dirt and other foreign materials.

B. Touch up all marred or abraded surfaces in accordance with manufacturer's directions.

****END OF SECTION****

SECTION 22 07 19
(15260)
PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Piping insulation.

2. Jackets and accessories.

3. Heat trace and insulate all piping in locations subject to freezing and where indicated to a minimum depth of 3' - 6" below proposed finished grade.

4. Insulate all hot water piping.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 09 90 00: Painting*

3. *Division 22: Plumbing*

4. *Division 26: Electrical*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for the *PIPING INSULATION* in the prices bid for the various related items of work as designated in the Proposal.

1.02 REFERENCES

A. ASTM C195 - Mineral Fiber Thermal Insulation Cement.

B. ASTM C547 - Mineral Fiber Preformed Pipe Insulation.

C. ASTM C552 - Cellular Glass Block and Pipe Thermal Insulation.

D. ASTM B209 - Aluminum and Aluminum-alloy Sheet and Plate.

E. ASTM E84 - Surface Burning Characteristics of Building Materials.

1.03 SUBMITTALS

A. Comply with provisions of *Section01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Shop drawings showing precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provision in concrete forming, reinforcement, and placement to accommodate the work of this section.

D. Manufacturer's recommended installation procedures.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

4. Applicator: Company specializing in piping insulation application with three years minimum experience.

5. Materials: Flame spread smoke developed rating of 25/50 in accordance with ASTM E84.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

PART 2 PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 INSULATION

A. Interior: Glass fiber insulation; ANSI/ASTM C547, 'k' value of 0.24 at 75 degrees F at 24 degrees C), noncombustible.

B. Exterior and underground: Cellular glass; ANSI/ASTM C552; maximum water vapor transmission rating of 0.1 perms; 'k' value of 0.40 at 75 degrees F.

2.03 JACKETS

A. Interior applications:

1. Vapor barrier jackets: Kraft reinforced foil vapor barrier with self-sealing adhesive joints.

2. PVC jackets: One-piece, premolded type.

B. Exterior applications and Engine Generator Exhaust:

1. Aluminum jackets: ASTM B209; 0.040 inch thick; stucco finish.

2. Stainless steel jackets: Type 316 stainless steel; 0.016 inch thick; smooth finish.

C. Underground applications:

1. PITTWRAP® CW PLUS jacketing as supplied by Pittsburgh Corning Corporation.

2. Or equal.

2.04 ACCESSORIES

A. Insulation bands: ¾ inch wide, 0.015 inch thick stainless steel or 0.007 inch thick aluminum.

B. Metal jacket bands: ⅜ inch wide; 0.015 inch thick aluminum or 0.010 inch thick stainless steel. Bands shall match jacket.

C. Insulating cement: ANSI/ASTM C195; hydraulic setting mineral wool.

D. Finishing cement: ASTM C449.

E. Adhesives: Compatible with insulation.

F. Sealant: PITTSEAL® 444N sealant by Pittsburgh Corning Corporation.

G. Or equal.

2.05 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Install materials after piping has been tested and approved.

3.03 INSTALLATION

A. General:

1. Install materials in accordance with manufacturer's instructions.

2. Prior to installing insulation, paint all piping in accordance with *Section 09 90 00, Painting.*

3. Continue insulation with vapor barrier through penetrations.

4. In exposed piping, locate insulation and cover seams in least visible locations.

5. On insulated piping with vapor barrier, insulate fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

6. On insulated piping without vapor barrier and piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation at such locations.

7. Provide an insert, not less than 6 inches (150 mm) long, of same thickness and contour as adjoining insulation, between support shield and piping, but under the finish jacket, on piping 2 inches (50 mm) diameter or larger, to prevent insulation from sagging at support points. Inserts shall be cork

or other heavy density insulating material suitable for the planned temperature range. Factory fabricated inserts may be used.

8. Neatly finish insulation at supports, protrusions, and interruptions.

B. Buried piping:

1. All insulated piping shall rest in a six inch (6") layer of compacted sand. Excavation shall be kept free of standing water during insulation and jacketing application.

2. Insulation shall be applied to the piping with butt joints staggered and tightly butted. Longitudinal and butt joints may be left dry. All joints shall be tightly fitted to eliminate voids by refitting or replacing sections of insulation. Each section of insulation shall be held in place by two wraps of strapping tape with a 50% overlap per wrap. For double-layer applications, the second layer of insulation shall be applied in a manner similar to the first, with all joints staggered between layers.

3. Jacketing applications:

a. Apply the jacketing in strict accordance with the manufacturers directions. Seal all overlaps and butt strips as required. Seal to ensure that ground water cannot penetrate the jacket system.

b. Uncoated, exposed insulation left at day's end shall be sealed with PITTSEAL® 444N sealant to prevent bulk water entry.

c. All completed work shall be backfilled as soon as possible to prevent damage to the insulation system.

4. Backfilling: Sand backfill shall be placed within 6" of the insulated pipe and shall be free of rocks, debris or stones greater than 1/4" (6mm) diameter. Care shall be taken not to damage the jacketing during backfilling. Backfill shall be placed in 6" lifts, tamping each lift, until a depth of one foot (300mm) over the insulated pipe is reached. The remainder of the trench shall be backfilled as specified elsewhere.

C. Jackets:

1. Indoor, concealed applications: Insulated pipes conveying fluids above ambient temperature shall have standard jackets, with or without vapor barrier, factory-applied or field-applied. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. PVC jackets may be used.

2. Indoor, exposed applications:

a. For pipe exposed in mechanical equipment rooms or in finished spaces, insulate as for concealed applications. Finish with all service jacket; size for finish painting. Do not use PVC jackets.

3. Exterior applications:

a. Provide vapor barrier jackets. Cover with aluminum or stainless steel jacket with seams located on bottom side of horizontal piping. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement.

b. All exterior above grade piping shall have an outer jacket that shall extend to two feet below grade.

4. Buried piping: All below grade piping shall have "PITTWRAP CW" plus jacketing as specified herein.

3.04 INSULATION THICKNESS

A. Unless otherwise indicated or specified, insulation thickness shall be determined by the installer in accordance with ASHRAE 90A-1 and the Energy Code of the State of New Jersey.

B. Submit calculations showing effective economic thickness of insulation to *ENGINEER* for approval prior to fabrication.

3.05 CLEANING

A. Clean exposed surface of all grease, dirt and other foreign materials.

B. Touch up all marred or abraded surfaces in accordance with manufacturer's directions.

****END OF SECTION****

SECTION 22 11 13
(15410)
FACILITY WATER DISTRIBUTION

PART 1- GENERAL

1.01 DESCRIPTION

A. Work included:

1. Potable water piping within the building and on-site.
2. Unions and flanges.
3. Valves.
4. Water pressure reducing valves.
5. Hose bibs.
6. Water hammer arrestors.

B. Related Work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 03 30 00: Concrete*.

3. *Section 09 90 00: Painting*

4. *Section 22 05 29: Hangers and Supports for Plumbing Piping and Equipment*

5. *Section 31 23 00: Excavating, Filling and Grading*

C. Payment:

1. Unless otherwise noted on the *Bid Form*, no separate payment shall be made for this item.

2. Include all costs for *FACILITY WATER DISTRIBUTION* in the prices bid for the various related items of work as designated on the *Bid Form*.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Product Data:

1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturer's catalog information.

2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.

3. Hangers and Supports: Submit manufacturers catalog information including load capacity.

4. Domestic Water Specialties: Submit manufacturers catalog information, component sizes, rough-in requirements, service sizes, and finishes.

5. Pumps: Submit pump type, capacity, certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Submit installation instructions for pumps, valves and accessories.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

4. Comply with requirements of local Gas Company.

5. Welders certification: In accordance with ANSI/AWS D1.1.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection:

1. Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

2. Provide temporary protective coating on cast iron and steel valves.

3. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

4. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNERS* personnel.

PART 2 – PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Ductile Iron Pipe: AWWA C151, Pressure Class 150, cement-lined.

1. Fittings: AWWA C110, ductile iron, standard thickness.

2. Joints: AWWA C111, rubber gasket with rods.

3. Jackets: Jackets: Pipe and fittings installed below ground shall be polyethylene encased in accordance with AWWA C105, Method A or B. Flat sheets shall not be used except for fittings. All polyethylene encasement materials shall be factory marked or color-coded to indicate pipeline contents; blue for potable water, green for sewer and wastewater, and lavender for recycled water. Provide 10 mil polyethylene tape for sealing.

2.03 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tubing: ASTM B88, Type L, hard drawn.

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.

2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F.

2.04 UNIONS AND FLANGES

A. Unions for Pipe 2 inches and Smaller:

1. Copper Piping: Class 150, bronze unions with soldered joints.

2. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

B. Flanges for Pipe 2½ inches and Larger:

1. Copper Piping: Class 150, slip-on bronze flanges.

2. Gaskets: 1/16-inch thick preformed neoprene gaskets.

C. PVC Pipe Materials: For connections to equipment and valves with threaded connections, furnish solvent-weld socket to screwed joint adapters and unions, or ASTM D2464, Schedule 80, threaded, PVC pipe.

2.05 GATE VALVES

A. Acceptable Manufacturers:

1. Crane Valve, North America
2. Hammond Valve
3. Milwaukee Valve Company
4. NIBCO, Inc.
5. Stockham Valves & Fittings
6. Or equivalent.

B. 2-inches and Smaller: MSS SP 80, Class 125, bronze body, bronze trim, threaded bonnet, non-rising stem, hand-wheel, inside screw, solid wedge disc, alloy seat rings, solder or threaded ends.

C. 2½-inches and Larger: MSS SP 70, Class 125, cast iron body, bronze trim, bolted bonnet, non-rising stem, hand-wheel, solid wedge disc with bronze seat rings, flanged ends. Furnish chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

2.06 GLOBE VALVES

A. Acceptable Manufacturers:

1. Crane Valve, North America
2. Hammond Valve
3. Milwaukee Valve Company
4. NIBCO, Inc.
5. Stockham Valves & Fittings
6. Or equivalent.

B. 2-inches and Smaller: MSS SP 80, Class 125, bronze body, bronze trim, threaded bonnet, hand wheel, Buna-N composition disc, solder or threaded ends.

C. 2½-inches and Larger: MSS SP 85, Class 125, cast iron body, bronze trim, hand wheel, outside screw and yoke, flanged ends. Furnish chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

2.07 BALL VALVES

A. Acceptable Manufacturers:

1. Crane Valve, North America
2. Hammond Valve
3. Milwaukee Valve Company
4. NIBCO, Inc.
5. Stockham Valves & Fittings
6. Or equivalent.

B. 2-inches and Smaller: MSS SP 110, Class 150, bronze, two piece body, type 316 stainless steel ball, full port, teflon seats, blow-out proof stem, solder or threaded ends with union, lever handle with balancing stops.

2.08 CHECK VALVES

A. Horizontal Swing Check Valves:

1. Acceptable Manufacturers:

    a. Crane Valve, North America
    b. Hammond Valve
    c. Milwaukee Valve Company
    d. NIBCO, Inc.
    e. Stockham Valves & Fittings
    f. Or equivalent.

2. 2-inches and Smaller: MSS SP 80, Class 150, bronze body and cap, bronze seat, Buna-N disc, solder or threaded ends.

3. 2½-inches and Larger: MSS SP 71, Class 125, cast iron body, bolted cap, bronze or cast iron disc, renewable disc seal and seat, flanged ends.

B. Spring Loaded Check Valves:

1. Acceptable Manufacturers:

    a. Crane Valve, North America
    b. Hammond Valve
    c. Milwaukee Valve Company
    d. NIBCO, Inc.
    e. Stockham Valves & Fittings
    f. Or equivalent.

2. 2-inches and Smaller: MSS SP 80, Class 250, bronze body, in-line spring lift check, silent closing, Buna-N disc, integral seat, solder or threaded ends.

3. 2½-inches and Larger: MSS SP 71, Class 125, wafer style, cast iron body, bronze seat, center guided bronze disc, stainless steel spring and screws, flanged ends.

2.09 WATER PRESSURE REDUCING VALVES

A. Acceptable Manufacturers:

1. Watts Regulator Co (Model # LF223S)

2. Apollo Valve (Model # PRH_Y)

3. Or equivalent

B. 2-inches and Smaller: ASSE 1003 and MSS SP 80, bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, stainless steel in-line strainer, double union ends.

C. 2-inches and Larger: ASSE 1003 and MSS SP 85, cast iron body, bronze fitted, elastomeric diaphragm and seat disc, stainless steel in-line strainer, flanged.

2.10 PIPE HANGERS AND SUPPORTS

A. Comply with the requirements of *Section 22 05 29, Hangers and Supports for Plumbing Piping and Equipment*

2.11 PRESSURE GAGES

A. Acceptable Manufacturers:

1. Wika
2. Crosby
3. Or equivalent.

B. Gage: ASME B40.1, with bourdon tube, rotary brass movement, brass socket, front calibration adjustment, black scale on white background.

C. Case: Fiberglass reinforced polypropylene.

D. Bourdon Tube: Type 316 stainless steel.

E. Dial Size: 4 inch diameter.

F. Mid-Scale Accuracy: ½ percent.

G. Scale:Psi.

2.12 PRESSURE SENSORS AND GAUGE ISOLATORS

A. Pressure Sensing Gauge Isolators:

1. Flanged conforming to ANSI B16.1, 125 lb. drilling or screwed end with standard NPT threaded ends as required.

2. Face to face dimensions of flanged sensors shall conform to MSS-SP67.

3. Inside diameter of the sensor shall be the same as the mating pipe with a full, through, uninterrupted flow and no crevices.

4. Sensing ring shall measure pressure for full 360° circumference.

5. Body and flanges shall be of carbon steel.

6. Sensing sleeve shall be of Buna-N.

7. Sensing fluid shall be mineral oil or food grade silicone.

8. Pressure gages of the size indicated shall be provided with the sensors and assembly shall be factory assembled and tested. Provide isolation valve between sensor and gauge.

2.13 HYDRANTS

A. Wall Hydrants:

1. Acceptable Manufacturers:

a. Zurn
b. Watts
c. J. R. Smith
d. Or equivalent.

2. Wall Hydrant: ASSE 1019; non-freeze, self-draining type with chrome plated wall plate hose thread spout, hand wheel and integral vacuum breaker.

2.14 HOSE BIBS

A. Interior: Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, chrome plated where exposed with hand wheel, integral vacuum breaker in conformance with ASSE 1011.

2.15 WATER HAMMER ARRESTORS

A. ASSE 1010; stainless steel construction, sized in accordance with PDI WH-201.

B. Pre-charged suitable for operation in temperature range 34 to 250 degrees F and maximum 150 psi working pressure.

2.16 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed with installation until conditions are satisfactory.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs.
B. Remove scale and dirt, on inside and outside, before assembly.

3.03 INSTALLATION - METERS

A. Install positive displacement meters in accordance with AWWA M6, with isolating valves on inlet and outlet. Provide full line size bypass with globe valve for liquid service meters.

3.04 INSTALLATION - THERMOMETERS AND GAGES

A. Install one pressure gage for each pump, locate taps before strainers and on suction and discharge of pump; pipe to gage.

B. Install pressure gage 24" downstream of Pressure Reducing Valve. Gage shall read from 0 to 150psi.

C. Install gage taps in piping.

D. Install pressure gages with pulsation dampers. Provide ball valve to isolate each gage.

E. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2½ inches for installation of thermometer sockets. Allow clearance from insulation.

F. Provide instruments with scale ranges selected according to service with largest appropriate scale.

G. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

H. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

3.05 INSTALLATION - HANGERS AND SUPPORTS

A. Install hangers and supports in accordance with *Section 22 05 29, Hangers and Supports for Plumbing Piping and Equipment*.

3.06 INSTALLATION - BURIED PIPING SYSTEMS

A. Verify connection to existing piping system size, location, and invert are as indicated on Drawings.

B. Establish elevations of buried piping with not less than 4-feet of cover.

C. Establish minimum separation of potable water piping from sanitary sewer piping in accordance with code.

D. Remove scale and dirt on inside of piping before assembly.

E. Excavate pipe trench in accordance with *Section 31 23 00, Excavating, Filling and Grading*.

F. Install pipe to elevations as indicated on Drawings.

G. Place bedding material at trench bottom to provide uniform bedding for piping, level bedding materials in one continuous layer and compact as specified in *Section 31 23 00, Excavating, Filling and Grading*.

H. Install pipe on prepared bedding.

I. Route pipe in straight line.

J. Install pipe to allow for expansion and contraction without stressing pipe or joints.

K. Install shutoff drain valves at locations indicated on Drawings in accordance with this Section.

L. Install plastic ribbon tape continuous over pipe buried 6 inches below finish grade; coordinate with *Section 31 23 00, Excavating, Filling and Grading*.

M. Install trace wire or metallic ribbon continuous, buried 6 inches below finish grade, above pipeline; coordinate with *Section 31 23 00, Excavating, Filling and Grading*.

N. Pipe Cover and Backfilling:

1. Backfill trench in accordance with *Section 31 23 00, Excavating, Filling and Grading*.

2. Maintain optimum moisture content of fill material to attain required compaction density.

3.07 INSTALLATION - ABOVE GROUND PIPING

A. Install non-conducting dielectric connections wherever jointing dissimilar metals.

B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

C. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.

D. Group piping whenever practical at common elevations.

E. Slope piping and arrange systems to drain at low points.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

H. Provide access where valves and fittings are not accessible.

I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

J. Provide support for utility meters in accordance with requirements of utility companies.

K. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to *Section 09 90 00, Painting*.

L. Install domestic water piping in accordance with ASME B31.9.

M. Sleeve pipes passing through partitions, walls and floors. Refer to *Section 22 05 29, Hangers and Supports for Plumbing Piping and Equipment*.

N. Install unions downstream of valves and at equipment or apparatus connections.

O. Install valves with stems upright or horizontal, not inverted.

P. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

Q. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

R. Install butterfly valves for throttling, bypass, or manual flow control services.

S. Provide lug end butterfly valves adjacent to equipment when functioning to isolate equipment.

T. Provide spring loaded check valves on discharge of water pumps.

U. Provide flow controls in water circulating systems as indicated on Drawings.

V. Install potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibs.

W. Pipe relief from valves, back-flow preventers and drains to nearest floor drain.

X. Test backflow preventers in accordance with the national Standard Plumbing Code.

Y. Install water hammer arrestors complete with accessible isolation valve on hot

and cold water supply piping to lavatories.

Z. Install Work in accordance with the Uniform Construction Code of New Jersey and the National Standard Plumbing code.

3.08 INSTALLATION - SERVICE CONNECTIONS

A. Provide new water service complete with reduced pressure backflow preventer. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Caulk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall. Provide 18 gage galvanized sheet metal sleeve around service main to 6-inch above floor and 6 feet minimum below grade. Size for minimum of 2 inches of loose batt insulation stuffing.

3.09 FIELD QUALITY CONTROL

A. Test domestic water piping system in accordance with the National Standard Plumbing Code.

3.10 CLEANING

A. Disinfect water distribution system in accordance with the National Standard Plumbing code.

B. Clean exposed surface of all grease, dirt and other foreign materials.

C. Touch up all marred or abraded surfaces in accordance with manufacturer's directions.

END OF SECTION

SECTION 22 13 13

FACILITY SANITARY SEWERAGE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Sanitary sewer piping within the building and on-site from the public sewer main.
2. Unions and flanges.
3. Pipe hangers and supports.
4. Floor drains.
5. Floor sink.
5. Cleanouts.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 22 05 29: Hangers and Supports for Plumbing Piping*

3. *Section 22 07 19: Plumbing Piping Insulation*

4. *Section 22 40 00: Plumbing Fixtures*

5. *Section 31 23 00: Excavating, Filling and Grading*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate measurement or payment shall be made for this item.

2. Include all costs for the work of this Section in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrates compliance with the specified requirements.

C. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. Manufacturer's standard performance guarantees or warranties that extend beyond a one-year period shall be provided. Standard performance guarantee or warranty shall contain an agreement to repair or replace damaged materials or equipment that fails within the maintenance period.

C. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by, the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 SANITARY SEWER PIPING, BURIED BEYOND 5 FEET OF BUILDING

A. Cast iron pipe: ASTM A74, service weight Fittings: Cast iron. Joints: ASTM C564, neoprene gasketing system.

B. PVC pipe: ASTM D3034, SDR 35; Fittings: PVC; Joints: ASTM F477, elastomeric gaskets.

C. PVC pipe and fittings: ASTM D2665. Fittings: PVC. Joints: ASTM D2855, solvent weld.

2.03 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast iron pipe: ASTM A74 service weight. Fittings: Cast iron. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.

B. Copper tubing: ASTM B306, DWV. Fittings: ANSI/ASME B16.3, cast bronze, or ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B32, solder.

C. PVC pipe and fittings: ASTM D2665. Fittings: PVC. Joints: ASTM D2855, solvent weld.

2.04 SANITARY SEWER PIPING, ABOVE GRADE AND WITHIN BUILDINGS

A. Cast iron pipe: ASTM A74, service weight. Fittings: Cast iron. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.

B. Cast iron pipe: CISPI 301, hubless, service weight. Fittings: Cast iron. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

C. Copper pipe: ASTM B306, DWV. Fittings: ANSI/ASME B16.3, cast bronze, or ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B32, solder.

D. PVC pipe and fittings: ASTM D2665. Fittings: PVC. Joints: ASTM D2855, solvent weld.

E. PVC pipe and fittings: ASTM F1866, Schedule 40 Drainage and DWV fabricated fittings.

2.05 UNIONS AND FLANGES

A. Unions for Pipe 2 inches and Smaller:

1. Copper Piping: Class 150, bronze unions with [soldered] [brazed joints].
2. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, and water impervious isolation barrier.
3. PVC Piping: PVC.
4. CPVC Piping: CPVC.

B. Flanges for Pipe 2½ inches and Larger:

1. Copper Piping: Class 150, slip-on bronze flanges.
2. PVC Piping: PVC flanges.
3. CPVC Piping: CPVC flanges.
4. Gaskets: 1/16 inch thick preformed neoprene gaskets.

C. PVC Pipe Materials: For connections to equipment and valves with threaded connections, furnish solvent-weld socket to screwed joint adapters and unions.

2.06 FLOOR DRAINS

A. Acceptable manufacturers:

1. Wade
2. Josam
3. J. R. Smith
4. Zurn
5. Watts

6. Or equivalent.

B. General:

1. The free open area of strainers shall be at least 2/3 of the cross-sectional area of the nominal drain outlet size unless a larger size is specified.

2. All floor drains shall be provided with deep seal traps with cleanouts (4" minimum).

2.07 FLOOR SINKS

A. Acceptable manufacturers:

1. Wade
2. Jay R. Smith
3. Zurn
4. Josam
5. Watts
6. Or equivalent.

B. General:

1. The free open area of strainers shall be at least 2/3 of the cross-sectional area of the nominal drain outlet size unless a larger size is specified.

2. All floor sinks shall be provided with deep seal traps with cleanouts (4" minimum).

C. FS-1: Galvanized cast iron flanged 8" deep receptor with acid resistant coated interior, flashing clamp, nickel-bronze rim and secured grate, dome bottom strainer, 6X 12" rectangular top; J. R. Smith 3121 Series or equivalent.

2.08 OTHER MATERIALS

A. Plastic marking tape shall be of plastic material with integral wires, foil backing or other means to enable detection by a metal detector when the tape is buried up to 3' deep. The tape shall have the words “SANITARY SEWER LINE BELOW” in contrasting letters repeated continuously. The tape shall be of a type specifically manufactured for marking and locating underground utilities. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion.

B. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.03 INSTALATION – HANGERS AND SUPPORTS

A. Comply with requirements of *Section 22 05 29, Hangers and Supports for Plumbing Piping and Equipment*.

3.04 INSTALLATION – BURIED PIPE

A. Excavation and backfill shall comply with requirements of *Section 31 23 00, Excavating, Filling and Grading*.

B. Verify connection size, location, and invert are as indicated on Drawings.

C. Route pipe in straight line.

B. Install plastic marking tape 6 inches below finish grade and continuously over top of buried pipeline. Coordinate with *Section 31 23 00, Excavating, Filling and Grading*.

3.05 INSTALLATION - ABOVE GROUND PIPING

A. Establish invert elevations, slopes for drainage to comply with the National Standard Plumbing Code. Maintain gradients.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Provide clearance at cleanout for snaking drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install floor cleanouts at elevation to accommodate finished floor.

E. Install non-conducting dielectric connections wherever jointing dissimilar metals.

F. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

G. Install piping to maintain headroom. Group piping to conserve space.

H. Group piping whenever practical at common elevations.

I. Support cast iron drainage piping at every joint.

J. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

K. Provide clearance in hangers and from structure and other equipment for installation of insulation.

L. Provide access where valves and fittings are not accessible. Coordinate size and location of doors.

M. Install piping penetrating roofed areas to maintain integrity of roof assembly.

N. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

O. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to *Section 09 90 00, Painting*.

P. Install bell and spigot pipe with bell end upstream.

Q. Sleeve pipes passing through partitions, walls and floors. Refer to *Section 22 05 29*.

****END OF SECTION****

SECTION 22 13 23

SANITARY WASTE INTERCEPTORS

PART 1 - GENERAL

1.01 SUMMARY

A. Work included:

1. Grease trap.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 03 30 00: Concrete*

3. *Section 22 05 29: Hangers and Supports for Plumbing Piping*

4. *Section 22 13 13: Facility Sanitary Sewerage*

5. *Section 22 40 00: Plumbing Fixtures*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for the *PLUMBING SPECIALTIES* in the prices bid for the various related items of work as designated in the Proposal.

1.02 REFERENCES

A. ANSI/ASSE 1011 - Hose Connection Vacuum Breakers.

B. ANSI/ASSE 1019 - Wall Hydrants, Frost Proof Automatic Draining Anti-Backflow Types.

C. ANSI A112.21.1 - Floor Drains.

D. ANSI A112.26.1 - Water Hammer Arresters.

E. PDI WH-201 Water Hammer Arresters.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Shop drawings showing precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provision in concrete forming, reinforcement, and placement to accommodate the work of this section.

D. Manufacturer's recommended installation procedures.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.05 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.06 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

1.07 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

PART 2 - PRODUCTS

2.01 GENERAL

A. Proprietary Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 GREASE TRAP

A. Provide one (1) Thermaco Big Dipper Model No. W-350-IS, or equivalent; bright finish type 304 stainless steel exterior, rotationally molded polyethylene interior automatic self-cleaning grease and oil recovery separator(s) for floor mounted installation, rated at 35 gallons per minute peak flow, 85 pounds of grease capacity and including as an integral part of the unit, one (1) rotating gear hydrophobic wheel assembly for automatic grease/oil removal, an integral flow control device, self-regulating enclosed electric immersion heater, a vessel vent, an integral gas trap, an integral programmable 24-hour multi-event time control, a field reversible motor location, a field reversible grease/oil sump outlet, quick release stainless steel lid clamps, a gasketed and fully removable 304 stainless steel lid, a lift-our strainer basket access, an internal stainless steel strainer basket for collection of coarse solids, and a separate grease and oil collection container. Electric assembly shall be tested to comply with pertinent sections of the Standards for Safety ANSI/UL 73 and/or ANSI/UL 1004. Electric motor equipped with overload protection. Two (2) no-hub connectors for plumbing connection shall be provided. Operation shall be for 115VAC, 60 Hz, 1173 Watts.

B. Provide a Thermco Horizontal Air Gap assembly with a 2" outlet, flow controls and Model HAG-BA-3 stainless steel baskets for a 3-compartment sink.

C. Provide and install all parts as required for installation of sanitary drain from dishwasher and three compartment sink.

2.03 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their

respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Coordinate cutting or forming of floor construction to receive drains to required invert elevations.

3.03 INSTALLATION

A. General:

1. Install the work of this section in strict accordance with the manufacturer's recommendations.

2. Location of all specialties shall be verified prior to installation. Coordinate as necessary to assure proper location.

3.04 FIELD QUALITY CONTROL

A. Upon completion of this portion of the work and prior to acceptance by the *OWNER*, make all required tests and adjustments for free and smooth operation.

B. Secure all approvals from agencies having jurisdiction.

3.05 CLEANING

A. Clean exposed surface of all grease, dirt and other foreign materials.

B. Touch up all marred or abraded surfaces in accordance with manufacturer's directions.

3.06 DEMONSTRATION

A. The manufacturer's representative shall instruct the *OWNER'S* operating personnel, at a time designated by the *OWNER*, as to the proper method of operation and recommended maintenance procedures.

B. The scheduling of the instruction shall be at the convenience of the *OWNER* and may not coincide with the start-up inspection.

****END OF SECTION****

SECTION 22 34 00

FUEL-FIRED DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Water heater.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 22 05 29: Hangers and Supports for Plumbing Piping and Equipments*

C. Payment:

1. Unless otherwise noted on the Bid Form, no separate payment shall be made for this item.

2. Include all costs for the work of this section in the prices bid for the various related items of work as designated on the Bid Form.

1.02 REFERENCES

A. ANSI/ASME Section 8D - Pressure Vessels.

B. ANSI/NFPA 54 - National Fuel Gas Code.

C. ANSI/NFPA 70 - National Electrical Code.

D. ANSI Z21.10.1 - Gas Water Heaters Vol. I Storage Water Heaters with Input Ratings of 75,000 Btu per Hour or Less.

E. ANSI Z21.10.3 - Gas Water Heaters - Vol. III Storage, with Input Ratings Above 75,000 Btu per Hour, Circulating and Instantaneous Water Heaters.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Manufacturer's recommended installation procedures.

D. Include dimension drawings of water heaters indicating components and connections to other equipment and piping.

E. Include heat exchanger dimensions, size of tappings, and performance data.

F. Include dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.05 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

E. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.06 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

C. Provide manufacturer's warranty under provisions of *Section 01 78 36, Guarantees*.

D. Warranty:

1. Commercial gas-fired water heater: Provide three-year coverage of water storage tank and 1 year warranty on all other parts of water heater.

2. Tankless water heater:

a. Provide five year limited heat exchanger warranty for a no charge replacement unit in the event of a covered failure of the heat exchanger.

b. Warrant all other parts against defects in materials and workmanship for a period of five years from date of original installation.

1.07 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

C. Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

PART 2 PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 TANKLESS GAS-FIRED WATER HEATER

A. Acceptable manufacturers:

1. Bradford White, Model # TG-199I-N

2. Or equivalent.

B. The water heater shall have a minimum gas input of 15,000 to 199,000 BTUH and a minimum flow rate of 3.3 GPM at 100º F (C) temperature rise. It shall be design certified by CSA International (formerly AGA/CGA). The heater shall have a flame rod sensor to indicate flame failure, boiling protection (203º F lockout thermistor and combustion fan rpm check. The entire installation shall be in compliance with state and local codes and ordinances.

C. Outgoing water temperature is monitored by a built-in sensor. Burner and combustion blower modulate between minimum and maximum input to maintain setpoint temperature. If the temperature of the water exceeds 6 degrees above the set point temperature the burner will shut down. The burner will ignite once outgoing water temperature falls below the set point.

D. Provide manufacturers standard vent kit.

2.03 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Water heater:

1. Install water heaters in accordance with manufacturer's instructions and to NFPA requirements.

2. Coordinate with plumbing piping and related fuel piping, gas venting and electrical work to achieve operating system.

B. Venting:

1. The exit termination shall not be less than 7 ft. above grade when located adjacent to public walkways.

2. The vent shall terminate at least 3 ft. above any forced air inlet located within 10 ft. (3m).

3. The vent shall terminate at least 4 ft. below, 4 ft. horizontally from, or 1 ft. above any door, window or gravity air inlet into the building.

4. The vent termination point shall not be installed closer than 3 ft. from an inside corner of an L-shaped structure.

5. The vent termination should not be mounted directly above, or within 3 ft. horizontally from an oil tank vent or gas meter.

6. The bottom of the vent terminal shall be located at least 1 ft. above finished grade or above maximum expected snow level.

3.03 FIELD QUALITY CONTROL

A. Upon completion of this portion of the work and prior to acceptance by the *OWNER*, make all required tests and adjustments for free and smooth operation.

B. Secure all approvals from agencies having jurisdiction.

3.04 CLEANING

A. Clean exposed surface of all grease, dirt and other foreign materials.

B. Touch up all marred or abraded surfaces in accordance with manufacturer's directions.

****END OF SECTION****

SECTION 22 40 00
(15440)
PLUMBING FIXTURES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Refer to plumbing and equipment schedules on architectural and plumbing drawings.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 07 92 13: Sealants and Caulking*

3. *Section 10 28 13: Toilet Room Accessories*

4. *Section 22 05 29: Hangers and Supports for Plumbing Piping*

5. *Section 22 11 13: Facility Sanitary Sewerage*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for the *PLUMBING FIXTURES* in the prices bid for the various related items of work as designated in the Proposal.

1.02 REFERENCES

A. ANSI A112.6.1 - Supports for Off-the-Floor Plumbing Fixtures for Public Use.

B. ANSI A112.18.1 - Finished and Rough Brass Plumbing Fixture Fittings.

C. ANSI A112.19.1 - Enameled Cast Iron Plumbing Fixtures.

D. ANSI A112.19.2 - Vitreous China Plumbing Fixtures.

E. ANSI A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use).

F. ANSI A112.19.4 - Porcelain Enameled Formed Steel Plumbing Fixtures.

G. ANSI A112.19.5 - Trim for Water-Closet Bowls, Tanks, and Urinals.

H. ANSI Z358.1 - Emergency Eye Wash and Shower Equipment.

I. ARI 1010 - Drinking Fountains and Self-Contained Mechanically Refrigerated Drinking Water Coolers.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

3. Include fixtures, sizes, utility sizes, trim, and finishes.

C. Manufacturer's recommended installation procedures.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for

their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

C. Provide five (5) year manufacturer's warranty on all fixtures and trim.

D. Provide extended warranty on water cooler and include coverage of refrigeration system for a period of not less than five (5) years.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

C. Include fixture trim exploded view and replacement parts lists.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers:

1. Fixtures:

    a. American Standard
    b. Elkay
    c. Kohler
    d. Or equivalent.

2. Fixture trim:

    a. Chicago Faucet
    b. T & S Brass
    c. American Standard
    d. Or equivalent.

3. Flush valves:

    a. Sloan
    b. Or equivalent.

4. Water closet seats:

    a. Olsonsite
    b. Church
    c. American Standard
    d. Or equivalent.

5. Fixture carriers:

    a. J. R Smith
    b. Wade
    c. Or equivalent.

6. Mixing valves (pressure balanced):

    a. American Standard
    b. Kohler

c. Elkay
d. Chicago Faucet
e. Or equivalent.

D. Fixtures: Provide fixtures by same manufacturer for each product specified throughout.

E. Trim: Provide trim by same manufacturer for each product specified throughout.

2.02 WATER CLOSET

A. Refer to Plumbing Fixture's Schedule.

2.03 LAVATORY

A. Refer to Plumbing Fixture's Schedule.

2.04 OTHER MATERIALS

A. Undersink pipe insulation:

1. Undersink P-trap, supplies and stops shall be covered with antimicrobial undersink protecting pipe covers secured with reusable fasteners. Angle stops shall have locking access cover.

2. Insulation shall be "Lav Guard" by Truebro, Inc., Ellington, CT, or approved equivalent.

B. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

D. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

E. Verify adjacent construction is ready to receive rough-in work of this Section.

3.02 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.

C. Install components level and plumb

D. Install and secure fixtures in place with wall supports and/or wall carriers as required and bolts.

E. Seal fixtures to wall and floor surfaces with sealant as specified in *Section 07 92 13*, color to match fixture.

F. Mount fixtures to the heights required by the Uniform Construction Code of the State of New Jersey and the National Standard Plumbing Code.

G. Insulate exposed undersink plumbing in accordance with ANSI A117.1.

3.03 ADJUSTING AND CLEANING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

B. At completion clean plumbing fixtures and equipment.

C. Solidly attach water closets to floor with lag screws. Lead flashing is not intended to hold fixture in place.

3.04 FIXTURE ROUGH-IN SCHEDULE

A. Rough-in fixture piping connections in accordance with requirements of the Uniform Construction Code of the State of New Jersey and the National Standard Plumbing Code.

****END OF SECTION****

SECTION 23 01 30

HVAC AIR-DISTRIBUTION SYSTEM CLEANING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Mechanical cleaning and decontamination of all interior porous and non-porous ductwork, fans, coils, and other components of air conveyance systems (ACS). The air conveyance system includes but is not limited to: supply ducts, return air ducts, outside air ducts, exhaust air ducts, fan coil units, turning vanes, extractors, dampers, diffusers, grilles, registers, and all other internal components common to the airstream as applicable for RTU-19, FCU-11A, FCU-11B, FCU-11C, FCU-9, FCU-16 and EF-30.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 23 05 93: Testing and Balancing For HVAC*

3. *Section 23 31 13: Sheet Metal Ductwork*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for the *HVAC AIR-DISTRIBUTION SYSTEM CLEANING* in the prices bid for the various related items of work as designated in the Proposal.

1.02 REFERENCES

A. National Air Duct Cleaners Association:

1. ACR 2021: Assessment, Cleaning and Restoration of HVAC Systems.

B. North American Insulation Manufacturers Association:

1. Understanding Microbial Contamination in HVAC Systems.

2. Glass Fiber Air Transmission Systems: Cleaning Fibrous Glass or Lined Sheet Metal Ducts.

1.03 DEFINITIONS

A. The HVAC system includes any interior surface of the facility's air distribution system for conditioned spaces and/or occupied zones. This includes the entire heating, air-conditioning and ventilation system from the points where the air enters the system to the points where the air is discharged from the system. The return air grilles, return air ducts to the air handling unit (AHU), humidifiers and dehumidifiers, supply air ducts, fans, fan housing, fan blades, air wash systems, spray eliminators, turning vanes, filters, filter housings, reheat coils, and supply diffusers are all considered part of the HVAC system. The HVAC system may also include other components such as dedicated exhaust and ventilation components and make-up air systems.

B. Debris: Any solid materials, including particulate substances, in the HVAC system not intended to be present.

C. Mechanical Cleaning: Physical removal of debris and other foreign matter from HVAC system surfaces.

D. Non-Porous HVAC system Surface: Any surface of the HVAC system in contact with the air stream that cannot be penetrated by either solutions or air. This would exclude materials such as wood, fiberboard, thermal insulation, and concrete.

E. Visibly Clean: Determined by internal visual inspection, that all portions or components of the HVAC system are both (1) free of any debris and (2) in the cleaners' professional judgment, capable of cleaning verification.

F. Visual Inspection: Examination of the cleaned components of the HVAC system to evaluate the effectiveness of the cleaning process using the human eye or another optical instrument.

1.04 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. List of equipment to be used.

2. Product description and MSDS sheets for cleaners, biocides and encapsulates.

3. Access doors.

C. Manufacturer Certificates: Signed by manufacturers certifying that products comply with requirements.

D. Qualification Data: For Air System Cleaning Specialist (ASCS)

E. Field quality control test reports.

1.05 QUALITY ASSURANCE

A. Air System Cleaning Specialist

1. Certification: Employ an ASCS certified by NADCA on a full-time basis.

2. Supervisor Qualifications: Certified as an ASCS by NADCA.

3. Equipment, Materials and Labor: Have equipment, materials and labor required to perform specified services.

B. Comply with current published standards of NADCA.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine systems to determine appropriate methods, tools, and equipment required for performance of the work.

B. Prepare a written report listing conditions detrimental to performance of the work.

C. Proceed with work only after unsatisfactory conditions have been corrected.

D. Contractor is not responsible for problems resulting from prior inappropriate or careless cleaning techniques of others.

3.02 CLEANING

A. Engage a qualified ASCS to clean the following systems:

1. Supply system.
2. Return system.
3. Exhaust system.
4. Relief air system.

B. Perform cleaning before air balancing or mark position of dampers and air-directional mechanical devices before cleaning.

C. Use duct-mounted access doors, as required, for physical and mechanical entry and for inspection.

1. Install additional duct-mounting access doors to comply with duct cleaning standards. Comply with specified requirements in Section 23 31 13 for additional duct-mounting access doors.

2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection. Replace damaged and deteriorated flexible ducts with the same material.

3. Disconnect and reconnect flexible connectors as needed for cleaning and inspection. Replace damaged and deteriorated flexible connectors. Comply with requirements in *Section 23 31 13, Sheet Metal Ductwork* for flexible connectors.

4. Reseal rigid-fiberglass-duct systems according to NAIMA recommended practices.

5. Replace damaged fusible links on fire and smoke dampers. Replacement fusible links shall be of the same rating as those being replaced. Comply with requirements in *Section 23 31 13, Sheet Metal Ductwork* for fusible links.

6. Remove and reinstall ceiling components to gain access for duct cleaning. Clean ceiling components after they have been removed and replaced.

D. Mark position of dampers and air-directional mechanical devices before cleaning and restore to their marked position on completion.

E. Particulate Collection and Odor Control:

1. Where the Particulate Collection Equipment is exhausting inside the building, HEPA filtration with 99.97% collection efficiency for 0.3-micron size (or greater) particles shall be used. When the Particulate Collection Equipment is exhausting outside the building, Mechanical Cleaning operations shall be undertaken only with Particulate Collection Equipment in place, including adequate filtration to contain Debris removed from the HVAC system. When the Particulate Collection Equipment is exhausting outside the building, precautions shall be taken to locate the equipment down wind and away from all air intakes and other points of entry into the building.

2. Controlling Odors: Measures shall be employed to control odors and/or mist vapors during the cleaning process.

F. Component Cleaning: Cleaning methods shall be employed such that all HVAC system components must be Visibly Clean as defined in applicable standards (see NADCA Standards). Upon completion, all components must be returned to those settings recorded just prior to cleaning operations.

G. Air-Volume Control Devices: Dampers and any air-directional mechanical devices inside the HVAC system must have their position marked prior to cleaning and, upon completion, must be restored to their marked position.

H. Ceiling sections (tile) may be removed and reinstalled to gain access to HVAC systems during the cleaning process.

I. Air distribution devices (registers, grilles & diffusers): Clean all air distribution devices.

J. Air handling units, fan coil units, blowers and exhaust fans: The contractor shall insure that supply, return, and exhaust fans and blowers are thoroughly cleaned. Areas to be cleaned include blowers, fan housings, plenums (except ceiling supply and return plenums), scrolls, blades, or vanes, shafts, baffles, dampers and drive assemblies. All visible surface contamination deposits shall be removed in accordance with NADCA Standards.

1. Clean all air handling units (AHU) internal surfaces, components and condensate collectors and drains.

2. Assure that a suitable operative drainage system is in place prior to beginning wash down procedures.

3. Clean all coils and related components, including evaporator fins.

I. Duct Systems:

1. Create service openings in the system as necessary in order to accommodate cleaning of otherwise inaccessible areas.

2. Mechanically clean all duct systems to remove all visible contaminants, such that the systems are capable of passing Cleaning Verification Tests (see NADCA Standards).

3.03 MECHANICAL CLEANING METHODOLOGY

A. Source Removal Cleaning Methods: The HVAC system shall be cleaned using Source Removal mechanical cleaning methods designed to extract contaminants from within the HVAC system and safely remove contaminants from the facility. It is the contractor's responsibility to select Source Removal methods that will render the HVAC system Visibly Clean and capable of passing cleaning verification methods and other specified tests, in accordance with all general requirements. No cleaning method, or combination of methods, shall be used which could potentially damage components of the HVAC system or negatively alter the integrity of the system.

1. All methods used shall incorporate the use of vacuum collection devices that are operated continuously during cleaning. A vacuum device shall be connected to the downstream end of the section being cleaned through a predetermined opening. The vacuum collection device must be of sufficient power to render all areas being cleaned under negative pressure, such that containment of debris and the protection of the indoor environment are assured.

2. All vacuum devices exhausting air inside the building shall be equipped with HEPA filters (minimum efficiency), including hand-held vacuums and wet vacuums.

3. All vacuum devices exhausting air outside the facility shall be equipped with Particulate Collection including adequate filtration to contain debris removed from the HVAC system. Such devices shall exhaust in a manner that will not allow contaminants to re-enter the facility. Release of debris outdoors must not violate any outdoor environmental standards, codes or regulations.

4. All methods require mechanical agitation devices to dislodge debris adhered to interior HVAC system surfaces, such that debris may be safely conveyed to vacuum collection devices. Acceptable methods will include those, which will not potentially damage the integrity of the ductwork, nor damage porous surface materials such as liners inside the ductwork or system components.

B. Methods of Cleaning Fibrous Glass Insulated Components:

1. Fibrous glass thermal or acoustical insulation elements present in any equipment or ductwork shall be thoroughly cleaned with HEPA vacuuming equipment, while the HVAC system is under constant negative pressure, and not permitted to get wet in accordance with applicable NADCA and NAIMA standards and recommendations.

2. Cleaning methods used shall not cause damage to fibrous glass components and will render the system capable of passing Cleaning Verification Tests.

C. Damaged Fibrous Glass Material:

1. Evidence of damage: If there is any evidence of damage, deterioration, delaminating, friable material, mold or fungus growth, or moisture such that fibrous glass materials cannot be restored by cleaning or resurfacing with an acceptable insulation repair coating, they shall be identified for replacement.

2. Replacement: When requested or specified, Contractor must be capable of remediating exposed damaged insulation in air handlers and/or ductwork requiring replacement.

3. Replacement material: In the event fiberglass materials must be replaced, all materials shall conform to applicable industry codes and standards, including those of UL and SMACNA.

4. Replacement of damaged insulation is **not** covered by this specification.

D. Cleaning of coils

1. Any cleaning method may be used which will render the Coil Visibly Clean and capable of passing Coil Cleaning Verification (see applicable NADCA Standards). Coil drain pans shall be subject to Non-Porous Surfaces Cleaning Verification. The drain for the condensate drain pan shall be operational. Cleaning methods shall not cause any appreciable damage to, displacement of, inhibit heat transfer, or erosion of the coil surface or fins, and shall conform to coil manufacturer recommendations when available. Coils shall be thoroughly rinsed with clean water to remove any latent residues.

E. Antimicrobial Agents and Coatings

1. Antimicrobial agents shall only be applied if active fungal growth is reasonably suspected, or where unacceptable levels of fungal contamination have been verified through testing.

2. Application of any antimicrobial agents used to control the growth of fungal or bacteriological contaminants shall be performed after the removal of surface deposits and debris.

3. When used, antimicrobial treatments and coatings shall be applied in strict accordance with the manufacturer's written recommendations and EPA registration listing.

4. Antimicrobial coatings shall be applied according to the manufacturer's written instructions. Coatings shall be sprayed directly onto interior ductwork surfaces, rather than "fogged" downstream onto surfaces.

3.03 CONNECTIONS

A. Reconnect ducts to fans and air-handling units with existing flexible connectors after cleaning ducts and flexible connectors. Replace existing damaged and deteriorated flexible connectors.

B. For fans developing static pressures of 5-inch wg and higher, cover replacement flexible connectors with loaded vinyl sheet held in place with metal straps.

C. Reconnect terminal units to supply ducts with existing flexible ducts or replace damaged and deteriorated existing flexible ducts with maximum 24-inch lengths of new flexible duct.

D. Reconnect diffusers or light troffer boots to low-pressure ducts with existing flexible ducts or replace damaged and deteriorated existing flexible ducts with maximum 8 feet lengths of flexible duct clamped or strapped in place.

E. Reconnect existing and new flexible ducts to metal ducts with draw bands.

3.04 CLEANLINESS VERIFICATION

A. General: Verification of HVAC System cleanliness will be determined after mechanical cleaning and before the application of any treatment or introduction of any treatment-related substance to the HVAC system, including biocidal agents and coatings.

B. Visual Inspection: The HVAC system shall be inspected visually to ensure that no visible contaminants are present.

1. If no contaminants are evident through visual inspection, the HVAC system shall be considered clean; however, the OWNER reserves the right to further verify system cleanliness through Surface Comparison Testing or the NADCA vacuum test specified in the NADCA standards.

2. If visible contaminants are evident through visual inspection, those portions of the system where contaminants are visible shall be re-cleaned and subjected to re-inspection for cleanliness.

3. NADCA vacuum test analysis should be performed by a qualified third party experienced in testing of this nature.

C. Verification of Coil Cleaning:

1. Cleaning must restore the coil pressure drop to within 10 percent of the pressure drop measured when the coil was first installed. If the original pressure drop is not known, the coil will be considered clean only if the coil is free of foreign matter and chemical residue, based on a thorough visual inspection.

3.05 POST-PROJECT REPORT

A. At the conclusion of the project, the Contractor shall provide a report to the *OWNER* indicating the following:

1. Success of the cleaning project, as verified through visual inspection and/or gravimetric analysis.

2. Areas of the system found to be damaged and/or in need of repair.

****END OF SECTION****

SECTION 23 05 00
(15010)
COMMON REQUIREMENTS FOR HVAC WORK

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Common mechanical requirements specifically applicable to Division 23 Sections, in addition to Division 1 – General Requirements.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for the work of this Section in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

1. Prepare and submit a Schedule of Submittals showing all submittals required by the Specification sections or the Drawings.

2. Prepare and submit to *ENGINEER* shop drawings, product data and samples required by the Specification sections.

3. Prepare and submit to the *ENGINEER,* engineering drawings and calculations for items indicated on the Plans or as otherwise required by the contract specifications.

B. For piping, sheet metal, sleeve layout, and reflected ceiling plan shop drawings, submit an electronic copy of coordinated drawing. After this copy is notated and corrected by the *ENGINEER*, it will be returned. Then the required number of corrected prints will be prepared.

C. Shop drawings shall consist of manufacturer's certified scale drawings, cuts, or catalogs, including descriptive literature and complete certified characteristics of equipment, showing dimensions, capacity, code requirements, motor and drive testing, as indicated on the Drawings or Specifications.

D. Certified performance curves for all pumping and fan equipment shall be submitted for review.

E. All shop drawings showing routing of ductwork, piping and conduit shall not be less than ⅜" = 1' - 0" scale.

1.03 DEFINITIONS

A. "Piping" includes in addition to pipe; all fittings, valves, hangers, and other accessories related to such piping.

B. "Concealed" mean hidden from sight as in chases, furred spaces, shafts, hung ceilings, or embedded in construction.

C. "Exposed" means not "concealed" as defined above. Work in trenches, crawl spaces, and tunnels shall be considered "exposed" unless otherwise specifically noted.

D. Where any device or part of equipment is herein referred to in the singular number (such as "the pump"), such reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the Drawings.

E. "HVAC" means Heating, Ventilating and Air Conditioning.

1.04 CODES

A. N.J. Uniform Construction Code

B. International Building Code – New Jersey Edition

C. International Fuel Gas Code

D. International Mechanical Code

E. International Energy Conservation Code

F. ASME American Society of Mechanical Engineers

G. National Standard Plumbing Code

H. ANSI American National Standards Institute

I. ASTM American Society for Testing Materials

J. AWWA American Water Works Association

K. IBR Institute of Boiler and Radiator Manufacturers

L. NEMA National Electrical Manufacturers Association

M. ASHRAE American Society of Heating, Refrigeration and Air Conditioning Engineers

N. SMACNA Sheet Metal and Air Conditioning Contractors National Association, Inc.

O. ARI Air Conditioning and Refrigeration Institute

P. UL Underwriters' Laboratories

Q. AMCA Air Moving and Conditioning Association

R. ADC Air Diffusion Council

S. NEBB National Environmental Balance Bureau

T. National Fire Protection Association (NFPA)

U. Local Water Company Rules and Regulations

V. NFPA-90A Air Conditioning and Ventilation Systems

W. National Electric Code

1.05 DRAWINGS

A. The Drawings are generally diagrammatic and are intended to convey the scope of work and indicate general arrangement of equipment; ducts, conduits, piping, and fixtures.

B. The locations of all items shown on the Drawings or called for in the Specifications that are not definitely fixed by dimensions are approximate only. The exact locations necessary to secure the best conditions and results must be determined at the project and shall have the approval of the *ENGINEER* before being installed. Do not scale Drawings.

C. Follow Drawings in laying out work and check Drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions at all points. Where headroom and space conditions appear inadequate, *ENGINEER* shall be notified before proceeding with installation.

D. If directed by the *ENGINEER*, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper

E. Piping or ductwork connected to equipment may require different size connection than indicated on the Drawings. The Contractor shall provide transition pieces as required at the equipment.

1.06 EQUIPMENT AND MATERIALS

A. Begin no fabrication or work that requires submittals until return of submittals with *ENGINEER'S* stamp and initials or signature indicating review and that no further submissions are required. Any manufacturing done, shipment made, workmanship performed, or work installed before the required shop drawings, product data, samples, engineering drawings, or engineering calculations are returned indicating that no further submissions are required will be at the sole expense and responsibility of the *CONTRACTOR* and subject to rejection.

B. The materials, workmanship, design, and arrangement of all work installed under the contract shall be subject to the approval of the *ENGINEER*.

1.07 RECORD DRAWINGS

A. During construction keep an accurate record of all deviations between the work as shown on the Drawings, and that which is actually installed.

B. Furnish Record Drawings in accordance with *Section 01 78 39, Project Record Documents*.

1.08 LAWS, ORDINANCES, PERMITS AND FEES

A. Give all necessary notices, obtain all permits and pay all governmental taxes, fees, and other costs in connection with the work; file all necessary plans, prepare all documents, and obtain all necessary approvals of all governmental departments having jurisdiction; obtain all required Certificates of Inspection for the work and deliver to the *ENGINEER* before request for acceptance and final payment for the work.

B. Include all work, without extra cost to the *OWNER*, any labor, materials, services, apparatus, drawings (in addition to Contract Drawings and Documents) in order to comply with all applicable laws, ordinances, rules and regulations whether or not shown on Drawings and/or specified.

C. All materials furnished and all work installed shall comply with the specifications and the requirements of the Uniform Construction Code of the State of New Jersey; requirements of local utility companies and governmental departments having jurisdiction.

1.09 ORGANIZATION OF WORK

A. The work called for under this Contract shall be carried on simultaneously with the work of other trades in a manner such as not to delay the overall progress of the work. Furnish promptly to other trades involved at the project, all information and measurements relating to the work that they may require. Cooperate with them in order to secure the harmony necessary in the interest of the project as a whole.

B. Keep a competent superintendent in charge of the work at all times.

C. Maintain a complete file of shop drawings at all times available to the Owner's representative.

D. Every facility shall be provided to permit observation of the work by the Owner's representative during the course of construction.

E. Where items of equipment and/or materials are indicated in the Specifications as being furnished by other trades for installation, assume responsibility for the

unloading of such equipment and/or materials from the delivery trucks and for providing safe storage for same as required pending installation.

F. Where the work is to be installed in close proximity to work of other trades or where there is evidence that the work is to interfere with work of other trades, assist in working out space conditions to make a satisfactory adjustment.

G. Prepare composite working drawings and sections at a scale specified in *Section 01 31 13, Project Coordination.* Clearly show how the work is to be installed in relation to the work of other trades. If the installation is made before coordinating with other trades, make all necessary changes in the work without extra charge to the *OWNER*.

H. Attend coordination meetings under the supervision of the General Contractor and comply with the requirements of *Section 01 31 13, Project Coordination*.

1.10 PROTECTION OF WORK AND PROPERTY

A. Maintain and protect all equipment, materials and tools from loss or damage from all causes until final acceptance by the *OWNER*.

B. Assume responsibility for the protection of any finished work or other trades from damage or defacement by the operations and remedy any such injury or damages.

1.11 PIPE EXPANSION

A. All pipe connections shall be installed to allow for freedom of movement of the pipe during expansion and contraction. Proper anchors and guides shall be provided where necessary and/or when shown on the Drawings. Anchors and guides shall be subject to the review of the *ENGINEER*.

1.12 SCAFFOLDING, RIGGING, HOISTING

A. Provide all scaffolding, rigging, hoisting and services necessary for erection and delivery into the premises of all equipment and materials furnished under this section of the Specifications, and remove same from premises when no longer required.

B. In the event that supplementary bracing of the basic building structure is required to assure a secure rigging procedure and a secure route for the equipment being handled, assume full responsibility for such supplementary bracing.

1.13 BASES AND SUPPORTS

A. Provide all bases and supports not part of the building structure of required size, type and strength, as approved by the *ENGINEER*, for all equipment and materials. All equipment, bases and supports shall be adequately anchored to the building structure to prevent shifting of position under operating conditions.

B. Provide not les than six-inch high concrete bases for all pumps, refrigeration machines, compressors, and rotating machinery and elsewhere as specified. Bases shall extend six inches beyond machinery base in all directions with top edge chamfered. Provide ½" x 6" steel dowels into floors to anchor bases. Provide anchor bolts set in pipe sleeves two sizes larger than anchor bolts for securing machinery. After anchor bolts are aligned with equipment bases, fill sleeves with concrete.

1.14 SLEEVES, PIPE AND CONDUIT INSERTS AND ANCHOR BOLTS

A. Provide and assume responsibility for the location and maintenance in proper position of all sleeves, inserts, and anchor bolts required for the work. In the event that failure to do so requires cutting and patching of finished work, it shall be done without additional cost to the *OWNER*.

B. All pipes and conduits passing through masonry walls or partitions shall be provided with sleeves having an internal diameter larger than the outside diameter of the pipe or insulation enclosing the pipe or conduit. Sleeves shall be Schedule 40 black steel pipe.

C. Sleeves through foundation walls shall be as shown on the drawings. Sleeves shall be set with ends flush with each face of wall. The space between sleeve and pipe shall be packed with oiled oakum to within 2" of each face of the wall. The remaining space shall be packed and made watertight with a waterproof compound.

D. Sleeves through concrete floors or interior masonry walls shall be as shown on the drawings. The open sleeve space shall be packed with non-combustible materials.

E. Pipe or conduit passing through exterior walks shall be wrapped with two layers of Type 15 unperforated roofing felt conforming to ASTM D226.

F. Inserts shall be preset concrete inserts with steel reinforced rods through the insert and both ends hooked over the reinforced mesh. Inserts shall be of individual type

of malleable iron construction with accommodation for removable nuts and threaded rods up to ¾" diameter, permitting lateral adjustment, except as otherwise noted. Individual inserts shall be Grinnell Fig. 282 up to 5" pipe and conduit, Fig. 282, 6" and up to 8" pipe and conduit, Fig. 152 above 8" and up to 12" pipe and conduit. For figures 282 and 152, they shall come with an opening at the tip to allow reinforcing rods up to ½" diameter to be passed through the insert body. Rods shall extend a minimum of 4" on either side of the insert. Pipes larger than 12" shall be suspended from steel members only.

1.15 ESCUTCHEONS

A. Provide escutcheons on pipes wherever they pass through ceilings, walls, or partitions.

B. Interior Pipe Escutcheons: Chrome-plated, stamped, steel, hinged, split-ring escutcheon, with set screw. Inside diameter shall closely fit pipe outside diameter, or outside of pipe insulation where pipe in insulated. Outside diameter shall completely cover the opening in walls.

1. Manufacturers: Subject to compliance with requirements, provide escutcheon as manufactured by one of the following:

a. Chicago Specialty Manufacturing Company.
b. Tubular Brass Plumbing Products, Zurn Industries, Inc.

C. Exterior Pipe Escutcheons: Type 304 Stainless Steel. Inside diameter shall closely fit pipe outside diameter, or outside of pipe insulation where pipe is insulated. Outside diameter shall completely cover the opening in walls.

1.16 MANUFACTURER'S IDENTIFICATION

A. Manufacturer's nameplate, name or trademark, shall be permanently affixed to all equipment and material furnished under this Specification. Where such equipment is in a finished occupied space, the nameplate shall be in a concealed but accessible location. The nameplate of a Subcontractor or Distributor will not be acceptable.

1.17 EQUIPMENT NAMEPLATES

A. Provide for each item of equipment, including all control devices, pumps, fans, compressors, boilers, etc., a permanently attached nameplate made of black

surface, white core laminated bakelite with incised letters. Pneumatic, electric and mechanically actuated gauges shall have a brief, but complete description of their function. Stating the air pressure or voltage range alone is not acceptable. Nameplates shall be a minimum of 3" long by 1 ½" wide and shall bear the equipment name and item number of ½" high white letters as designated in the equipment schedule. Mounting screws shall have chrome plated acorn headed screws.

1.18 DRIP PANS

A. Confirm the final location of all electrical equipment to be installed in the vicinity of piping. Plan and arrange all overhead piping no closer than two feet from a vertical line to electric switchboards, panelboards, or similar equipment.

B. Where the installation of piping does not comply with the requirements of foregoing paragraph, where feasible the piping shall be relocated.

C. Provide copper gutters as follows:

1. Provide a gutter of 16 ounce cold rolled copper under every pipe which is within 2' - 0" of being vertically over any motor, electrical controllers, switchboards, panelboards, or the like.

2. Each gutter shall be soldered and made watertight, properly suspended; and carefully pitched to a convenient point for draining. Provide a ¾" drain, to nearest floor drain or slop sink.

3. In lieu of such separate gutters, a continuous protecting sheet of similar construction, adequately supported and braced, properly rimmed, pitched and drained, may be provided over any such motor, and extending 2' - 0" in all directions beyond the motor, over which such piping has to run.

1.19 TOOLS

A. All special tools for proper operation and maintenance of the equipment shall be provided to the Owner's Representative at no additional cost to the *OWNER*.

1.20 QUIET OPERATION

A. All equipment and material shall operate under all conditions of load without any sound or vibration, which in the opinion of the *ENGINEER* is objectionable.

Where sound or vibration conditions arise which are considered objectionable by the *ENGINEER*, eliminate same in a manner reviewed by the *ENGINEER*.

1.21 RUBBISH REMOVAL

A. Maintain project site and building interior free of all rubbish, rubble, waste material, packaging materials, etc. accumulating as a result of his work. Assume responsibility for the cleaning up of packaging removed from materials and equipment furnished by other trades for the installation. Note that final acceptance of the work is contingent upon the project being free of all excess and waste materials resulting from the work.

B. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

1.22 CLEANING PIPING, DUCTS AND EQUIPMENT

A. Clean all piping, ducts, and equipment of all foreign substances inside and out before being placed in operation.

B. If any part of a system should be stopped by foreign matter after being placed in operation, the system shall be disconnected, cleaned, and reconnected wherever necessary to locate and remove obstructions. Any work damaged in the course of removing obstructions shall be repaired when the system is reconnected at no additional cost to the *OWNER*.

C. During construction, properly cap all pipes and equipment nozzles so as to prevent the entrance of sand, dirt, etc.

1.23 EXCAVATION AND BACKFILL

A. All excavation, trenching, backfilling and compaction required shall be in accordance with *Section 31 23 00, Excavating, Filling and Grading*.

B. Perform all excavation, trenching and backfilling necessary to construct and complete the utility and all its appurtenances. No tunneling will be allowed except by written consent of the *ENGINEER*. Care shall be taken to avoid undermining of all existing utilities, footings or foundations.

C. Locations and elevations of pipe lines, conduits, cables, etc., shown are not to be used as final for installation of work; however, they are to be followed as closely

as possible, ground conditions permitting. Exact locations of grade shall be determined on job.

D. Under no circumstances, lay pipe or conduit or install appurtenances in water. Keep trenches free from water. Perform all necessary pumping as required to keep trenches free from water at no additional cost to the *OWNER*.

E. Where existing utilities are encountered, support, shore and protect said existing utilities and allow ample time for such measures as may be necessary for continuances of such services.

F. Notch under pipe bells to provide solid bearing for the entire body of pipe.

1.24 GRADING

A. All grading shall be in accordance with *Section 31 23 00, Excavating, Filling and Grading*.

B. Final grading shall be done under other sections of the Specifications.

1.25 PAINTING

A. Paint all piping as specified in *Section 09 90 00, Painting*.

B. All gauges, dials and rotating equipment shall be protected as specified.

C. Nameplates on all equipment shall be cleaned and left free of paint.

1.26 LUBRICATION

A. Properly lubricate all rotating equipment as soon as it is connected and before operation of the equipment is started. Any equipment damaged due to inadequate lubrication shall be replaced at no cost to the *OWNER*.

1.27 TESTS

A. All piping, wiring, and equipment shall be tested as specified under the various sections of the work. Labor, materials, instruments and power required for testing shall be furnished under the particular section of the Specifications.

B. Tests shall be performed to the satisfaction of the *ENGINEER*. The *ENGINEER* will be present at such test, when he deems necessary and such other parties as may have legal jurisdiction.

C. Pressure tests shall be applied to piping only before connection of equipment and installation of insulation. In no case shall piping, equipment, or accessories be subjected to pressure exceeding their rating.

D. All defective work shall be promptly repaired or replaced and the tests shall be repeated until the particular system and component parts thereof receive the review of the *ENGINEER*.

E. Any damages resulting from tests shall be repaired or replaced and the tests shall be repeated until the particular system and component parts thereof receive the approval of the *ENGINEER*.

F. The duration of tests shall be as determined by all authorities having jurisdiction, but in no case less than the time prescribed in each section of the Specifications.

G. Equipment and systems that normally operate during certain seasons of the year shall be tested during the appropriate season.

H. Tests shall be performed on individual equipment, systems, and their controls. Whenever the equipment or system under test is interrelated with and depends upon the operation of other equipment, systems and controls for proper operation, functioning, and performance, the latter shall be operated simultaneously with the equipment or system being tested.

I. The electrical work shall include providing any assistance (such as removal of switchboard and panelboard trims and covers, pull and junction box covers, etc.) deemed necessary by the *ENGINEER* to check compliance with the Drawings and Specifications.

1.28 OPERATING INSTRUCTIONS

A. Provide Operation and Maintenance Data in accordance with *Section 01 78 23*.

B. The Manuals shall contain the following items:

1. Table of Contents (HVAC)
2. Introduction - Explanation of Manual and its use.
3. Description of Systems
4. Complete schematic drawings of all systems.

5. Functional and sequential description of all systems.
6. Relationship of system where applicable to the
7. Supervisory data system.
8. Systems Operation.
9. Start-up procedures.
10. Shut-down procedures.
11. Reset and adjustment and balancing procedures.
12. Seasonal operation.
13. All posted instruction charts.
14. Maintenance.
15. Cleaning and replacement - lines, components, filters, strainers, ducts, fans, etc.
16. Lubrication.
17. Charging and filling.
18. Purging and draining.
19. Systems trouble shooting charts.
20. Instruments checking and calibration.
21. Procedures for checking out functions with remote (Supervisory Data Console) indication and control.
22. Recommended list of spare parts.
23. Listing of Manufacturers.
24. Manufacturer's Data (Where multiple model, type and size listings are included, clearly and conspicuously indicate those that are pertinent to this installation).
25. Description - Literature, drawings, illustrations, certified performance charts, technical data, etc.
26. Operation.
27. Maintenance - including complete trouble-shooting charts.
28. Parts List.
29. Names, addresses and telephone numbers of local recommended repair and service companies.
30. Guarantee data.
31. Model No. and Serial No. of all equipment.

1.29 TRAINING

A. Controls manufacturer shall provide at no extra cost to the end user, 24-hours minimum training through the first year warranty. Upon completion of this project, manufacturer shall train end user for a period of three (3) consecutive days, eight (8) hours each day.

1.30 OPERATION PRIOR TO COMPLETION

A. The *OWNER* may require operation of parts or all of the installation for the beneficial occupancy prior to final completion and acceptance of the building.

B. The operation shall not be construed to mean acceptance of the work by the *ENGINEER* for the *OWNER*. The *OWNER* will furnish supervisory personnel to direct operation of the entire system and the Contractor shall continue to assume this responsibility until final acceptance.

1.31 ELECTRIC MOTORS

A. Furnish, install and align all motors required for this equipment. Unless they are factory installed on the unit, all starters and associated wiring and safety switches for such motors shall be furnished and installed under Division 26.

B. All motors shall comply with *Section 23 05 13, Common Motor Requirements for HVAC Equipment*.

C. The speed, horsepower, type and other essential data for each motor, if not given under paragraphs describing the various motor driven apparatus, or in schedules on the drawings shall be obtained from the manufacturer of the respective apparatus and shall be submitted to the *ENGINEER* for his review. All 2-speed motors shall be single winding type.

D. Provide oversized motor junction box for 2 speed motors.

E. Direct connected motors shall be furnished without an adjustable base. All motors connected to driven equipment by belt shall be furnished with adjustable sliding bases, except fractional motors with slotted mounting holes.

F. All motor leads shall be permanently identified and supplied with connectors.

G. Motors shall have nameplates giving manufacturer's name, serial number, horsepower, speed, voltage, phase and current characteristics.

1.32 INDIVIDUAL MOTOR STARTERS

A. For single-phase motors ⅓ HP or smaller, starters shall be manual, 120 volts, single-pole or 240 volts, 2-pole with thermal overload protection and pilot light. Where interlocking or automatic control (other than for unit and cabinet heaters) is required, starters shall be combination circuit breaker and magnetic starter with pilot light.

B. For 3-phase motors ½ through 20 HP, starters shall be full-voltage combination circuit breaker and magnetic across-the-line contractor, rated 208 volts, 3-pole. All magnetic starters shall have three thermal overloads.

C. Unless otherwise specified, motors 25 HP and over shall be furnished with combination circuit breaker and magnetic reduced voltage starter of the autotransformer closed transition type.

D. For motors requiring electric interlocks, or automatic control features, starters shall be equipped with the necessary auxiliary relays and contacts to provide the control features desired. Such starters shall be also provided with “hand-off-auto” pushbuttons mounted in cover. For 2-speed motors, provide “high-low-off-auto” 4-position selector switch. Furnish adjustable 20-second time delay between high and low speeds for motors 10 HP and above.

E. In addition to any auxiliary contacts required for interlocking purposes, each magnetic starter shall be equipped with one normally open auxiliary control circuit contact either for “sealing in” or as a spare for future use.

F. Indicating lights shall be transformer or series resistor type. There shall be one red light for each single speed motor to indicate when motor is running. For multiple speed motors one indicating light for each speed shall be provide.

G. The starter disconnecting means shall be circuit breakers. The external operating handle shall clearly indicate “ON” or “OFF” position of the switch and shall be interlocked with the door to require throwing the handle to the “OFF” position to open the door. The handle shall be arranged for locking both the door closed and the disconnect in the “OFF” position with up to 3 padlocks. Provide defeat device in cover to permit opening door in "ON" position.

H. Circuit breakers in combination starter units shall be of the magnetic trip type with an adjustable trip setting for selecting instantaneous trip points of fault protection (motor circuit protector). Field adjustment of the instantaneous trip shall be performed by the Electrical Contractor. Select the trip setting at approximately 10 times the motor nameplate full-load current. If the circuit breaker trips on starting, incrementally increase the settings. In no case shall the trip setting exceed 13 times the motor full-load current.

I. Overload heaters shall be furnished for all starters and shall be sized in range of 115 to 125% of full load current. The motor starters shall be shipped with the overload heaters inside the compartment but not installed. The Electrical Contractor shall verify the ratings of the heater coils based on the motor

nameplate data before installing the overloads. The Contractor supplying the starter shall replace any improperly selected heaters.

J. A transformer shall be supplied in each starter unit for 120 volt control voltage. Transformer capacity shall be adequate to supply the holding coil requirements plus the solenoids, e-p switches, relays and other devices required to be controlled from the starter. A fuse shall be supplied in one secondary terminal of the control transformer. The other terminal shall be grounded to the housing of the starter. Fuses shall be also provided in the transformer primary leads per the National Electrical Code.

K. All enclosures shall be NEMA Type I sheet steel with hinged cover for general purpose indoor application, unless otherwise indicated. Enclosures shall be arranged for equipment or wall mounting. Weatherproof NEMA Type 4 enclosures shall be provided for all outdoor starters.

L. Each starter shall be clearly identified by engraved nameplates after installation. The nameplates shall be bakelite black plates with ½" high white letters and shall be securely fastened to starter with mounting screws made of non-corrosive metals.

M. Stainless steel flush mounted starter and enclosures shall be provided for all starters located in kitchen and dishwasher areas.

N. All starters, except those furnished as an integral part of equipment and factory installed on the equipment, shall be of the same manufacturer.

O. Starters shall be as manufactured by General Electric, Square D, Cutler-Hammer, or Allen-Bradley.

P. Shop drawings shall be provided with dimensions, ratings, wiring diagrams and schedule of nameplates for approval prior to fabrication.

1.33 MOTOR CONTROLLERS

A. Motor controllers shall be defined as control devices such as pushbuttons, switches, etc. which are not mounted in starter cover, required for remote control of motors.

B. Unless otherwise noted, motor controllers shall be housed in NEMA Type 1 general purpose enclosures. Outdoor controllers shall be provided with weatherproof NEMA Type 4 enclosures. Provide nameplate to indicate the motor with which they are associated.

C. The controllers to be installed in finished area shall be flush mounted.

D. The Electrical Contractor shall install and provide wiring for motor controllers. The contractor providing the motor shall furnish the controllers.

E. Unless otherwise notes, pushbuttons shall be of the normal duty, spring return momentary type.

F. Selector switches and pushbuttons shall be equipped with nameplates indicating the function of each of their positions as noted in the list of electric motors and motor controls or shown on the drawings.

G. Pilot light shall be transformer or series resistor type for operation at 120 V.

H. Pilot lights shall be equipped with nameplates indicating the operating conditions they annunciate as noted in the list of electric motors and motor controls or shown on the drawings.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

****END OF SECTION****

SECTION 23 05 03

HVAC PIPING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Heating water piping
2. Refrigerant piping
3. Equipment drains and over flows
4. Unions and flanges.
5. Valves

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 07 84 00: Fire Stopping*

3. *Section 08 31 13: Access Doors and Frames*

4. *Section 23 05 29: Hangers and Supports for HVAC Piping and Equipment*

5. *Section 23 05 53: Identification of HVAC Piping and Equipment*

6. *Section 23 05 93: Testing and Balancing For HVAC*

7. *Section 23 07 19: HVAC Piping Insulation*

C. References:

1. American Society of Mechanical Engineers:

a. ASME B31.1 - Power Piping.

b. ASME B31.5 - Refrigeration Piping.

c. ASME B31.9 - Building Services Piping.

d. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.

D. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for the *HVAC PIPING* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified, provide compatible system components and joints. Use non-conducting dielectric connections whenever jointing dissimilar metals in open systems.

B. Provide flanges, union, and coupling at locations requiring servicing. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.

C. Provide pipe hangers and supports in accordance with ASME B31.1, ASME B31.9, ASTM F708, MSS SP 58, MSS SP 69, and MSS SP 89.

D. Use gate, ball, or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.

E. Use globe valves for throttling, bypass, or manual flow control services.

F. Use spring loaded check valves on discharge of hot water pumps.

G. Use butterfly valves in heating water systems interchangeably with gate and globe valves.

H. Use lug end butterfly valves to isolate equipment.

I. Use ¾-inch ball valves with cap for blow downs at strainers.

J. Use ¾-inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment. Pipe to nearest floor drain.

K. Flexible connectors: Use at or near pumps, motor driven equipment where piping configuration does not absorb vibration.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Product Data:

1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturer's catalog information.

2. Valves: Submit manufacturer's catalog information with valve data and ratings for each service.

3. Hangers and supports: Submit manufacturer's catalog information including load capacity.

C. Shop Drawings: Indicate layout of piping systems, including equipment, critical dimensions, and sizes. Submit shop drawings sealed by registered professional Engineer.

D. Design Data: Indicate pipe sizes. Indicate pipe-sizing methods. Indicate calculations used. Submit sizing methods, calculations sealed by registered professional engineer.

E. Manufacturer's Installation Instructions: Submit installation instructions for pumps, valves and accessories.

F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

G. Welder's Certificate: Include welders' certifications of compliance with AWS D1.1.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

4. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

5. Comply with requirements of local Gas Company.

6. Welder's certification: In accordance with ANSI/AWS D1.1.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.05 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection:

1. Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

2. Provide temporary protective coating on cast iron and steel valves.

3. Furnish temporary end caps and closures on piping and fittings. Maintain in place until installation.

4. Protect piping from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.06 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

1.07 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 HEATING WATER PIPING, ABOVE GROUND

A. Steel Pipe: ASTM A53/A53M, Schedule 40, 0.375 inch wall for sizes 12 inch and larger, black.

1. Fittings: ASME B16.3, cast iron, forged steel welding type.

2. Joints: Threaded for pipe 2 inch and smaller; welded for pipe 2 ½" inches and larger.

3. Thread-o-Lets and Nipples: Schedule 80.

4. At Contractor's option, grooved mechanical-joint fittings and couplings may be used – except at valve connections.

B. Copper Tubing [at Contractor's option for pipe sizes 2" and smaller]: ASTM B88, Type L, hard drawn.

1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.

2. Tee connections consisting of mechanically extracted collars with notched and dimpled branch tube will not be allowed.

3. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F.

2.03 REFIGERANT PIPING

A. All refrigerant piping shall be ACR, Draw Temper (hard) copper, manufactured in accordance with ASTM B280. The composition of the solder depends on the location in the system:

1. For pipe runs and joints (copper to copper), Staz Silv or Silfos, a solder composition with 15% silver (BCUP S) shall be used.

2. Where dissimilar metals are joined, such as copper to brass or copper to steel, Staz Silv or "easy flow", a solder composition with 45% silver (BAg 1) shall be used.

3. Where auxiliary components, such as expansion valves are involved, Staz brite (soft solder) with tin and 4% silver shall be used so parts can be readily changed as needed.

B. When soldering, a nitrogen bleed shall be used to keep pipe and fitting from being oxidized.

C. Fittings and flanged unions shall be cast brass or wrought copper refrigeration type fittings.

2.04 EQUIPMENT DRAINS AND OVERFLOWS

A. Steel Pipe: ASTM A53/A53M Schedule 40, galvanized.

1. Fittings: ASME B16.3, malleable iron or ASME B16.4, cast iron.

2. Joints: Threaded for pipe 2 inch and smaller; flanged for pipe 2½- inches and larger.

B. Copper Tubing: ASTM B88, Type L, hard drawn.

1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.

2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F.

2.05 UNIONS AND FLANGES

A. Unions for Pipe 2 inches and Smaller:

1. Ferrous Piping: Class 150, malleable iron, threaded.
2. Copper Piping: Bronze unions with soldered joints.

B. Flanges for Pipe 2½ inches and Larger:

1. Ferrous Piping: Class 150, forged steel, slip-on flanges.
2. Copper Piping: Class 150, slip-on bronze flanges.
3. Gaskets: 1/16 inch thick preformed neoprene gaskets.

2.06 BALL VALVES

A. Acceptable Manufacturers:

1. Crane Valve, North America
2. Hammond Valve
3. Milwaukee Valve Company
4. NIBCO, Inc.
5. Stockham Valves & Fittings
6. Or equivalent

B. 2 inches and Smaller: MSS SP 110, 600 psi WOG, two piece bronze body, chrome plated brass ball or type 316 stainless steel, full port, teflon seats, blow-out proof stem, threaded ends with lever handle.

2.07 GLOBE VALVES

A. Acceptable Manufacturers:

1. Crane Valve, North America
2. Hammond Valve
3. Milwaukee Valve Company
4. NIBCO, Inc.
5. Stockham Valves & Fittings
6. Or equivalent

B. 2 inches and Smaller: MSS SP 80, Class 150, bronze body, bronze trim, union bonnet, hand wheel, Buna-N or Teflon composition disc, threaded ends.

C. 2-½ inches and Larger: MSS SP 85, Class 125, cast iron body, bronze trim, hand wheel, outside screw and yoke, flanged ends. Furnish chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

2.08 BUTTERFLY VALVES

A. Acceptable Manufacturers:

1. Crane Valve, North America
2. Hammond Valve Model
3. Milwaukee Valve Company
4. NIBCO, Inc.
5. Stockham Valves & Fittings
6. Or equivalent.

B. 2-½ inches and Larger: MSS SP 67, Class 150.

1. Body: Cast or ductile iron, lug ends, stainless steel stem, extended neck.

2. Disc: Aluminum bronze or stainless steel.

3. Seat: Resilient replaceable EPDM.

4. Handle and Operator: 10 position lever handle for 6" and smaller. Hand-wheel and gear drive for 8" and larger. Furnish gear operators for valves 8 inches and larger, and chain-wheel operators for valves mounted over 8 feet above floor.

2.09 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

D. Verify field measurements prior to fabrication.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.03 INSTALLATION

A. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

B. Install piping to maintain headroom without interfering with use of space or taking more space than necessary.

C. Group piping whenever practical at common elevations.

D. Sleeve pipe passing through partitions, walls and floors.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

G. Provide access where valves and fittings are not accessible. Coordinate size and location of access doors with *Section 08 31 13, Access Doors*.

H. Install non-conducting dielectric connections wherever jointing dissimilar metals.

I. Establish invert elevations, slopes for drainage to ⅛ inch per foot minimum. Maintain gradients.

J. Slope piping and arrange systems to drain at low points.

K. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

L. Install piping penetrating roofed areas to maintain integrity of roof assembly.

M. Insulate piping in accordance with *Section 23 07 19, HVAC Piping Insulation*.

N. Install pipe identification in accordance with *Section 23 05 53*.

O. Install refrigerant piping in accordance with ASME B31.5.

P. Arrange refrigeration piping to return oil to compressor. Provide traps and loops in piping, and where necessary provide double risers. Slope horizontal piping 0.40 percent in direction of flow

Q. Flood refrigerant piping system with nitrogen when brazing

R. Follow ASHRAE 15 procedures for charging and purging of systems and for disposal of refrigerant

3.04 VALVE APPLICATIONS

A. Install shutoff and drain valves at locations indicated on Drawings in accordance with this Section.

B. Install ball, butterfly or gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.

C. Install globe valves for throttling, bypass, or manual flow control services.

D. Install spring loaded check valves on discharge of water pumps.

E. Install lug end butterfly valves adjacent to equipment when functioning to isolate equipment.

F. Install ball, butterfly and gate valves in heating water systems for shut-off service.

G. Install butterfly valves in heating water systems interchangeably with gate and globe valves.

H. Install ball and butterfly valves in heating water systems for throttling service.

3.05 FIELD QUALITY CONTROL

A. Tests:

1. Upon completion of this portion of the work and prior to acceptance by the *OWNER*, make all required tests and adjustments for free and smooth operation.

2. Secure all approvals from agencies having jurisdiction.

B. Refrigeration System Tests:

1. Test refrigeration system in accordance with ASME B31.5.

2. Pressure test refrigeration system with dry nitrogen to 200 psig (1470 kPa). Perform final tests at 27 inches (92 kPa) vacuum and 200 psig (1470) kPa) using electronic leak detector. After completion of leak testing (and repairing any leaks) vacuum shall be applied to the system and connected to both low and high sides of system.

3. Refrigeration systems shall be thoroughly dehydrated and evacuated before charging with refrigerant. Systems shall be evacuated with a vacuum pump to an absolute pressure of not less than 500 microns mercury. Dryer cartridges shall be replaced until all water has been removed.

3.06 CLEANING

A. Disinfect water distribution system in accordance with National Standard Plumbing Code.

B. Clean exposed surface of all grease, dirt and other foreign materials.

C. Touch up all marred or abraded surfaces in accordance with manufacturer's directions.

****END OF SECTION****

SECTION 23 05 13

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Single- and three-phase motors for application on equipment provided under other sections.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 26 05 26: Grounding and Bonding for Electrical Systems*.

3. *Section 26 05 53: Identification for Electrical Systems*.

1.02 REFERENCES

A. American Bearing Manufacturers Association:

1. ABMA 9 - Load Ratings and Fatigue Life for Ball Bearings.

B. National Electrical Manufacturers Association:

1. NEMA MG 1 - Motors and Generators.

C. International Electrical Testing Association:

1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

D. International Code Council, Inc.:

1. International Mechanical Code, as amended by the Uniform Construction Code of the State of New Jersey.

2. International Building Code (IBC), New Jersey Edition.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Product Data: Submit catalog data for each motor furnished loose. Indicate nameplate data, standard compliance, electrical ratings and characteristics, and physical dimensions, weights, mechanical performance data, and support points.

2. Test Reports: Indicate procedures and results for specified factory and field testing and inspection.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

D. Supports shall be designed and installed in accordance with the more stringent of the referenced standards and these *Specifications*.

E. New Jersey licensed Land Surveyor shall be employed by Contractor to perform all construction layout and to certify support installations.

F. New Jersey licensed Professional Engineer shall be employed to perform all structural design.

1.05 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 20, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.06 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded

as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 REQUIREMENTS FOR MOTORS FURNISHED WITH EQUIPMENT

A. Acceptable Manufacturers:

1. Cooper Industries Inc.
2. Eaton Corp.
3. General Electric Co.
4. Or equivalent

B. Motors 3/4 hp and Larger: Three-phase motor as specified below.

C. Motors Smaller Than ¾ hp: Single-phase motor as specified below, except motors less than 250 watts or ¼ hp may be equipment manufacturer's standard.

D. Three-Phase Motors: NEMA MG 1, Design B, energy-efficient squirrel-cage induction motor, with windings to accomplish starting methods and number of speeds as indicated on Drawings.

1. Voltage: 208/230 or 460 volts, three phase, 60 Hz, as shown on equipment schedules.

2. Service Factor: As indicated on Drawings.

3. Enclosure: Meet conditions of installation unless specific enclosure is indicated on Drawings.

4. Design for continuous operation in 40 degrees C environment, with temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.

5. Insulation System: NEMA Class F.

6. Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.

7. Thermistor System (Motor Frame Sizes 254T and Larger): Three PTC thermistors embedded in motor windings and epoxy encapsulated solid state control relay with wiring to terminal box.

8. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum ABMA 9, L-10 life of 200,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.

9. Sound Power Levels: Conform to NEMA MG 1.

E. Single Phase Motors:

1. Permanent split-capacitor type where available, otherwise use split-phase start/capacitor run or capacitor start/capacitor run motor.

2. Voltage: 115 or 230 volts, single phase, 60 Hz, as indicated on equipment schedules.

F. Wiring Terminations: Furnish terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated.

2.03 SOURCE QUALITY CONTROL

A. Test motors in accordance with NEMA MG 1, including winding resistance, no-load speed and current, locked rotor current, insulation high-potential test, and mechanical alignment tests.

2.04 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 EXISTING WORK

A. Disconnect and remove abandoned motors

B. Maintain access to existing motors and other installations remaining active and requiring access. Modify installation or provide access panel.

C. Clean and repair existing motors to remain or are to be reinstalled.

3.03 INSTALLATION

A. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

B. Install engraved plastic nameplates in accordance with *Section 26 05 53*.

C. Ground and bond motors in accordance with *Section 26 05 26*.

3.04 FIELD QUALITY CONTROL

A. Tests:

1. Upon completion of this portion of the work and prior to acceptance by the *OWNER*, make all required tests and adjustments for free and smooth operation.

2. Secure all approvals from agencies having jurisdiction.

3.05 CLEANING

A. Clean exposed surface of all grease, dirt and other foreign materials.

B. Touch up all marred or abraded surfaces in accordance with manufacturer's directions.

****END OF SECTION**

SECTION 23 05 16

EXPANSION FITTINGS AND LOOPS
FOR
HVAC PIPING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Flexible pipe connections.

2. Expansion joints and compensators.

3. Pipe loops, offsets, and swing joints.

4. Pipe alignment guides

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 23 05 29: Hangers and Supports for HVAC Piping and Equipment*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for the *EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING* in the prices bid for the various related items of work as designated in the Proposal.

1.02 REFERENCES

A. American Society of Mechanical Engineers:

1. ASME B31.1 - Power Piping.

2. ASME B31.5 - Refrigeration Piping.

3. ASME B31.9 - Building Services Piping.

4. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.

B. American Welding Society:

1. AWS D1.1 - Structural Welding Code - Steel.

1.03 DESIGN CRITERIA

A. Provide structural work and equipment required for expansion and contraction of piping. Verify anchors, guides, and expansion joints provide and adequately protect system.

B. Expansion Compensation Design Criteria:

1. Installation Temperature: 50 degrees F.

2. Hot Water Heating System Temperature: 210 degrees F.

3. Safety Factor: 30 percent.

1.04 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot (meter) and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.

2. Expansion Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation.

C. Shop drawings:

1. Indicate layout of piping systems, including flexible connectors, expansion joints, expansion compensators, loops, offsets and swing joints.

2. Submit shop drawings sealed by a registered professional engineer.

D. Design Data: Indicate criteria and show calculations. Submit calculations sealed by a registered professional engineer.

E. Manufacturer's Installation Instructions: Submit special procedures.

F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

G. Welders' Certificate: Include welders' certification of compliance with [ASME Section IX. AWS D1.1.

1.05 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.
2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.06 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.07 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

1.08 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded

as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 FLEXIBLE PIPE CONNECTIONS

A. Steel Piping:

1. Inner Hose: Stainless Steel.

2. Exterior Sleeve: Double braided stainless steel.

3. Pressure Rating: 200 psig WOG and 250 degrees F.

4. Joint: As specified for pipe joints.

5. Size: Use pipe-sized units.

6. Maximum offset: 3/4 inch to 1 inch on each side of installed center line.

B. Copper Piping:

1. Inner Hose: Bronze.

2. Exterior Sleeve: Braided bronze.

3. Pressure Rating: 200 psig WOG and 250 degrees F.

4. Joint: As specified for pipe joints.

5. Size: Use pipe sized units.

6. Maximum offset: 3/4 inch to 1 inch on each side of installed center line.

2.03 EXPANSION JOINTS

A. Stainless Steel Bellows Type:

1. Pressure Rating: 200 psig WOG and 250 degrees F.

2. Maximum Compression: 1¾ inch.

3. Maximum Extension: 1/4 inch.

4. Joint: As specified for pipe joints.

5. Size: Use pipe sized units.

6. Application: Steel piping 3 inch and smaller.

B. External Ring Controlled Stainless Steel Bellows Type:

1. Pressure Rating: 200 psig WOG and 250 degrees F.

2. Maximum Compression: 15/16 inch.

3. Maximum Extension: 5/16 inch.

4. Maximum Offset: 1/8 inch.

5. Joint: Flanged.

6. Size: Use pipe sized units.

7. Accessories: Internal flow liner.

8. Application: Steel piping 3 inch and larger.

2.04 ACCESSORIES

A. Pipe Alignment Guides: Two piece welded steel with enamel paint, bolted, with spider to fit standard pipe, frame with four mounting holes, clearance for minimum 1 inch thick insulation, minimum 3 inch travel.

2.05 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

D. Examine piping layout and notify *ARCHITECT/ENGINEER* of additional anchors or expansion joints required to adequately protect system.

E. Provide inspection services by flexible pipe manufacturer's representative for final installing and certify installation is in accordance with manufacturer's recommendations and connectors are performing satisfactorily.

3.02 INSTALLATION

A. General: Install the work of this section in strict accordance with the manufacturer's recommendations.

B. Install Work in accordance with [ASME B31.1] [ASME B31.5] [ASME B31.9].

C. Install flexible pipe connectors on pipes connected to equipment supported by vibration isolation. Refer to Section 23 05 48. Provide line size flexible connectors.

D. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other end. Install in horizontal plane unless indicated otherwise.

E. Rigidly anchor pipe to building structure. Provide pipe guides to direct movement only along axis of pipe. Erect piping so strain and weight is not on cast connections or apparatus.

F. Provide support and anchors for controlling expansion and contraction of piping.

G. Provide loops, pipe offsets, and swing joints, or expansion joints, where required, as indicated on Drawings. Refer to Section 23 05 29 for pipe hanger installation requirements.

H. Provide expansion loops as indicated on Drawings.

3.03 FIELD QUALITY CONTROL

A. Tests:

1. Upon completion of this portion of the work and prior to acceptance by the *OWNER*, make all required tests and adjustments for free and smooth operation.

2. Secure all approvals from agencies having jurisdiction.

3.05 CLEANING

A. Clean exposed surface of all grease, dirt and other foreign materials.

B. Touch up all marred or abraded surfaces in accordance with manufacturer's directions.

****END OF SECTION****

SECTION 23 05 29

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Design, layout, and provide and install supports to adequately and safely support all HVAC piping, ductwork and equipment.

2. Equipment bases and supports.

3. Sleeves and seals.

4. Flashing and sealing of equipment.

5. Engineering drawings and calculations for hangers and supports signed and sealed by a Professional Engineer registered in the State of New Jersey.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 03 30 00: Concrete*

3. *Section 07 84 00: Firestopping*

4. *Section 07 92 13: Sealants and Caulking*

5. *Section 09 90 00: Painting (General)*

C. Payment:

1. Unless otherwise noted in the *Proposal* Section, no separate payment shall be made for this item.

2. Include all costs for *HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT* in the prices bid for the various related items of work as designated in the *Proposal*.

1.02 REFERENCES

A. American Society of Mechanical Engineers:

1. ANSI/ASME B31.1 - Power Piping.

2. ASME B31.5 - Refrigeration Piping.

3. ASME B31.9 - Building Services Piping.

B. Manufacturer's Standardization Society of the Value and Fittings Industry:

1. MSS SP 58: Pipe Hangers and Supports-Materials, Design and Manufacture, Selection, Application, and Installation.

C. International Code Council, Inc.:

1. International Mechanical Code, 2021 as amended by the Uniform Construction Code of the State of New Jersey.

2. International Building Code (IBC), 2021, New Jersey Edition.

D. Plumbing - Heating - Cooling Contractors – National Association:

1. National Standard Plumbing Code, 2021.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Shop drawings:

1. For pipe 2" or less in diameter where the load per hanger or support does not exceed 50 lbs in a 5' x 5' area and the spacing does not exceed 10':

a. Work shall conform to Chapter 8 of the National Standard Plumbing Code as amended by the Uniform Construction Code of the State of New Jersey.

b. Show precise dimensions of the work of this section and all other data needed to ensure proper and adequate provision in the work to accommodate the work of this section.

c. A three-dimensional isometric drawing of all piping showing the arrangement of each run, type of pipe material, wall thickness, contents, flow direction, equipment attachments, fittings and valves. The isometric drawing shall also locate and identify all supports. Supports shall be located from changes in piping direction, from floors, and from building column lines.

d. A complete set of details showing all physical attachments of the support framing to the building. This shall include:

(1) Where attaching to building framing, show weld sizes and configurations; number, diameter, spacing and materials of all bolts; size, length and arrangement of angles, plates or any other supplemental structural member.

(2) Where attaching to concrete or masonry structures using cast-in-place anchor bolts, show anchor bolt locations, diameters, material, plate washer sizes (if used), and projection and embedment lengths above and below the bearing face of concrete.

(3) Where anchor bolts are to be drilled in concrete, show anchor bolt locations, diameters, material, projection and embedment lengths above and below the bearing face of concrete, the anchor bolt manufacturer’s model number and description along with the manufacturer’s current allowable load tables with recommended installation, use and safety factor data.

(4) For all type of anchor bolts, provide base plate thickness and size and depth of grout to be provided.

e. Within fourteen (14) days after review of the support engineering drawings by the *ENGINEER* and before any of the materials of this section are delivered to the job site, submit complete erection drawings of the supports. Drawings for steel framing shall be done in accordance with the AISC Manual of Steel Construction (AISC 303) (ASD), Section 4, entitled "Approval Documents."

f. All constructability problems and potential fouls must be resolved by the Contractor prior to the submittal of design information to the *ENGINEER*.

2. For all other piping:

a. Show precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provision in the work to accommodate the work of this section.

b. A three-dimensional isometric drawing of all piping showing the arrangement of each run, type of pipe material, wall thickness, contents, flow direction, equipment attachments, fittings and valves. The isometric drawing shall also locate and identify all supports. Supports shall be located from changes in piping direction, from floors, and from building column lines.

c. A table identifying each and every support associated with each piping run. Each support shall be identified with a unique alphanumeric number and designated as to support type (i.e. vertical load support, lateral load support, etc.). The table shall also show for every support, each individual support load condition and each summed load combination as given in the Design Requirements section of this specification. All loads shall be clearly delineated for each support as to magnitude, direction and units.

d. A complete set of all load reactions imposed by the supports onto the building framing and any concrete or masonry structure including foundations, walls, and floor slabs. All loads shall be clearly delineated for each support as to magnitude, location, direction, elevation, point of application and units. Loads shall be those caused by the load conditions in the combinations described in the Design Requirements section of these specifications.

e. A complete set of engineering drawings and design calculations that fully substantiates that the supports and anchor bolts meet the

requirements of these specifications and accepted engineering practices. Engineering drawings for steel framing shall be done in accordance with the AISC Manual of Steel Construction (AISC 303) (ASD), Section 3, entitled "Approval Documents."

f. A complete set of details showing all physical attachments of the support framing to the building. This shall include:

(1) Where attaching to building framing, show weld sizes and configurations; number, diameter, spacing and materials of all bolts; size, length and arrangement of angles, plates or any other supplemental structural member.

(2) Where attaching to concrete or masonry structures using cast-in-place anchor bolts, show anchor bolt locations, diameters, material, plate washer sizes (if used), and projection and embedment lengths above and below the bearing face of concrete.

(3) Where anchor bolts are to be drilled in concrete, show anchor bolt locations, diameters, material, projection and embedment lengths above and below the bearing face of concrete, the anchor bolt manufacturer's model number and description along with the manufacturer's current allowable load tables with recommended installation, use and safety factor data.

(4) For all type of anchor bolts, provide base plate thickness and size and depth of grout to be provided.

g. Within fourteen (14) days after review of the support engineering drawings and calculations by the *ENGINEER*, and before any of the materials of this section are delivered to the job site, submit complete erection drawings of the supports. Drawings for steel framing shall be done in accordance with the AISC Manual of Steel Construction (AISC 303) (ASD), Section 4, entitled "Approval Documents."

h. All constructability problems and potential fouls must be resolved by the Contractor prior to the submittal of design information to the *ENGINEER*.

i. Engineering drawings and calculations shall be signed and sealed by a Professional Engineer registered in the State of New Jersey.

D. Manufacturer's recommended installation procedures.

E. Prior to construction, submit a copy of all required approved construction permits.

F. Submit a certificate signed by New Jersey registered surveyor certifying that the elevations and locations of supports are in conformance or nonconformance with the Contractor’s drawings.

G. Submit a Record Plan.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ARCHITECT/ ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ARCHITECT/ ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer’s installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

D. Supports shall be designed and installed in accordance with the more stringent of the referenced standards and these *Specifications*.

E. New Jersey licensed Land Surveyor shall be employed by Contractor to perform all construction layout and to certify support installations.

F. New Jersey licensed Professional Engineer shall be employed to perform all structural design.

1.05 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 20, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ARCHITECT/ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ARCHITECT/ENGINEER*.

1.06 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

1.07 DESIGN REQUIREMENTS

A. General: Unless otherwise herein modified, all supports must be designed in accordance with the latest editions of the AISC Manual of Steel Construction, Allowable Stress Design, and the International Building Code. All designs must be coordinated and reviewed for constructability and potential fouls by the Contractor. Supports shall include all shapes, plates, hardware, components, anchor bolts, and fasteners required to support and transfer all design loads to the building in accordance with the specified design criteria. Where member and connection sizes have been shown, they shall be the minimum acceptable.

B. Arrangement:

1. All supports shall be arranged and constructed so as not to obstruct egress paths from the building, nor to impede maintenance access to equipment or operations of the facility. Heights of piping equipment and ducting shall be similar to the existing systems, except the clear height shall be not less than 7' - 0" above finished floor or where dimensions or elevations are shown on the *Contract Drawings*.

2. Support and anchorage components shall not breach the watertightness of the walls, mat foundation and/or structural floor slabs.

3. Unless otherwise approved by the *ARCHITECT/ENGINEER*, the installed location of all piping, ductwork, equipment, walkways and platforms shall comply with the dimensional requirements shown on the plans in regard to location, elevation, slope and arrangement.

C. Deflections:

1. The allowable deflection of all support framing members under all load combinations shall not exceed L/240, where L equals the member length, unless a more stringent limit is recommended by the equipment manufacturer.

2. Allowance shall be made for support deflections by avoiding inadvertent load transfer from the supports to the adjacent building.

D. Bracing: Bracing members shall have an L/r ratio of not more than 200, where L is the distance in inches between connections and r is the least radius of gyration of the bracing member. Where cross-bracing members are connected at their point of intersection, the L distance shall be taken as the distance in inches between connection at the point of intersection of the bracing members and the connections at the end of the members.

E. Friction from gravity loads shall not be considered adequate resistance to resultant piping forces.

F. Fire protection systems shall meet the requirements of NFPA-13 and NFPA-14 for the building seismic requirements.

G. Attachment to the main building structure:

1. All attachments of supports to the main building structure including its superstructure framing, roof, walls, floor slab or foundations shall be

specifically approved by the *ARCHITECT/ENGINEER*. All attachments shall be reviewed individually by the *ARCHITECT/ENGINEER*. The general basis for acceptance shall be as specified herein.

2. Maximum reactions:

   a. The maximum loads imposed by supports upon all other building's structural systems shall be individually reviewed by the *ARCHITECT/ENGINEER*.

3. Manner of attachment:

   a. All connections to either main building framing steel, concrete structures, or masonry walls shall be "pinned" and shall offer no moment restraint. Cantilevers, braced framing or any connection arrangement that causes a couple or torsion in either main building framing steel, concrete structures, or masonry walls shall not be permitted unless specifically approved by the *ARCHITECT/ ENGINEER*.

   b. All support framing base plates attaching to concrete structures or masonry walls shall be installed upon a one-inch (1") minimum thick bed of non-shrink grout.

   c. Where support framing spans across an expansion joint in the main building framing steel, allowance shall be made for a movement of 4±" at one end of the support framing span. Where support framing spans across an expansion joint in a concrete structure or masonry wall, allowance shall be made for a movement of 2"± at one end of the support framing span.

H. Design Loads:

1. Dead Load (DL): This includes the weight of all piping, ductwork, supports, contents and insulation.

2. Pressure Load (PL): This includes the resultant forces, in all directions, caused by the pressure under both constant and variable conditions within the range of the pressure capacity for which the piping or ductwork was provided.

3. Thermal Load (TL): This includes the resultant forces, in all directions, caused by the temperature under both constant and variable conditions

within the range of operating temperatures for which the piping or ductwork was provided.

4. Snow Load (SL): This load shall be applied of the entire horizontal projection of all exterior piping, ductwork and supports. Snow loads must be developed in accordance with the International Building Code with the factors applicable to the building to which the equipment, piping and ductwork attaches. As a minimum, snow loads shall be based on a uniformly distributed downward pressure of 30 psf.

5. Wind Load (WL): This load shall be applied to the entire vertical projection of all exterior piping, ductwork and supports. Wind loads must be developed in accordance with the International Building Code with the factors applicable to the building to which the equipment, piping and ductwork attaches. As a minimum, wind loads shall be based on a uniformly distributed lateral pressure of 30 psf.

6. Earthquake Load (EQ): This load shall be applied to all piping, ductwork and supports. Earthquake loads must be developed in accordance with the International Building Code with the factors applicable to the building for which the piping and ductwork attaches. As a minimum, earthquake loads shall be based upon a seismic shear of 15% of the dead load as previously described.

I. Load Combinations: Support framing shall be designed to safely withstand the stated design loads as they occur in the following combinations:

1. DL

2. DL + PL + TL

3. DL + WL

4. DL + PL + TL + WL

5. DL + SL

6. DL + PL + TL + SL

7. DL + PL + TL + SL + WL

8. DL + EQ

9. DL + PL + TL + EQ

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ARCHITECT/ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 STEEL

A. Structural Steel: ASTM A36 or A992.

B. Structural Tubing: ASTM A500, Grade B.

C. Structural Tubing: ASTM A501.

D. Steel Pipe: ASTM A53, Grade B.

E. Bolts & Nuts: ASTM A307, A325 or A490.

2.03 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes ½ to 1½ Inch: Carbon steel, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2 to 4 Inches and Cold Pipe Sizes 6 Inches and Over: Carbon steel, adjustable, clevis.

C. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

D. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp; adjustable steel yoke and cast iron roll for hot pipe sizes 6 inches and over.

E. Vertical Support: Steel riser clamp.

F. Floor Support for Pipe Sizes to 4 Inches and All Cold Pipe Sizes: Cast iron adjustable pipe saddle, lock nut nipple, floor flange, and concrete pier or steel support.

G. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

H. Shield for Insulated Piping 2 Inches and Smaller: 18 gage galvanized steel shield over insulation in 180 degree segments, minimum 12-inches long at pipe support.

I. Shield for Insulated Piping 2½ Inches and Larger (Except Cold Water Piping): Pipe covering protective saddles.

J. Shields for Insulated Cold Water Piping 2½ Inches and Larger: Hard block non-conducting saddles in 90 degree segments, 12-inch minimum length, block thickness same as insulation thickness.

K. Shields for Vertical Copper Pipe Risers: Sheet lead.

2.04 HANGER RODS

A. Steel Hanger Rods: Threaded both ends, threaded one end, or continuous threaded.

2.05 INSERTS

A. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.06 ANCHOR BOLTS

A. Stainless steel in accordance with *Section 05 50 00, Metal Fabrications*.

2.07 FLASHING

A. Metal Flashing: 26 gage galvanized steel.

B. Lead Flashing: Five (5) lb/sq ft sheet lead for waterproofing; one (1) lb/sq ft sheet lead for soundproofing.

C. Flexible Flashing: Compatible with roofing.

D. Caps: Steel, 22 gage minimum; 16 gage at fire resistant elements.

2.08 SLEEVES

A. Sleeves for Pipes Through Non-fire Rated Floors: Form with 18 gage galvanized steel.

B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Form with steel pipe or galvanized steel.

C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Prefabricated fire rated sleeves including seals, UL listed.

F. Fire Stopping Insulation: As specified in *Section 07 84 00, Firestopping*.

G. Caulk: As specified in *Section 07 92 13, Sealants and Caulking*.

2.09 FABRICATION

A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

B. Design hangers without disengagement of supported pipe.

C. Provide copper plated hangers and supports for copper piping.

2.10 CONCRETE EQUIPMENT BASES

A. Comply with *Section 03 30 00, Concrete.*

2.11 FINISH

A. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

2.12 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ARCHITECT/ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ARCHITECT/ ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Inserts:

1. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

2. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over four inches (4").

3. Where concrete slabs form finished ceiling, provide inserts to be flush with slab surface.

4. Where inserts are omitted, drill through concrete slab from below and provide thru-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

B. Hangers and support location:

1. Unless otherwise located on the *Contract Drawings*, the Contractor is responsible, subject to the *ENGINEER'S* review, for locating and

arranging pipe/ductwork supports in a manner that would safely support the piping/ductwork, would not create access/egress obstructions and would not overstress the piping/ductwork system, the support structure, any building structural members, or attached equipment when subjected to the Design Loads in the combinations specified. However, the following is a minimum criteria for support placement.

a. Dead load supports for horizontal piping runs:

Pipe Size And Material	Horizontal Distance Between Dead Load Supports On A Horizontal Run
Steel Pipe (Schedule 40 or thicker)	
½" to 1¼"	6'-0"
1½" to 2"	12'-0"
2½" to 3"	12'-0"
4" to 6"	12'-0"
8" to 12"	12'-0"
14" to 16"	20'-0"
18" to 24"	20'-0"
PVC (Schedule 40 or thicker)	
All Sizes	4'-0"
Copper (Type L or thicker)	
Pipe	12'-0"
Tube, ≤ 1¼"	6'-0"
Tube, ≥ 1½"	10'-0"
Cast Iron (Standard Wall or thicker)	
All Sizes, 5' Lengths	5'-0"
All Sizes, 10' Lengths	10'-0"

b. Lateral load supports for vertical piping runs:

Pipe Size And Material	Vertical Distance Between Lateral Load Supports on a Vertical Run
Steel Pipe (Schedule 40 or thicker)	
½" to 1¼"	10'-0"
1½" to 24"	15'-0"
PVC (Schedule 40 or thicker)	
All Sizes	10'-0"
Copper (Type L or thicker)	
Pipe and Tube	10'-0"
Cast Iron (Standard Wall or thicker)	
All Sizes, All Lengths	15'-0"

c. Install supports to provide minimum of ½ inch space between finished covering and adjacent work.

d. Place dead load and lateral support within 12" of each horizontal elbow or joint.

e. Place axial support within 12" of each elbow.

f. Place lateral support within 12" of each vertical elbow.

g. Use hangers with 1½" minimum vertical adjustment.

h. Support vertical and lateral loads from vertical piping at every floor and change of direction. Support vertical cast iron pipe at each floor at hub.

i. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers to support dead loads.

j. Support riser piping independently of connected horizontal piping.

k. For Concentrated Loads: Install additional hangers or supports, spaced as required, at locations where concentrated loads such as in-line pumps, valves, fittings or accessories occur, to support the concentrated loads.

C. Equipment bases and supports:

1. Provide equipment bases of concrete type specified herein.

2. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

3. Construct support of steel members or steel pipe and fittings. Brace and fasten with flanges bolted to structure.

4. Provide rigid anchors for pipes after vibration isolation components are installed.

D. Flashing:

1. Provide flexible flashing and metal counter flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

2. Flash vent and soil pipes projecting 3 inches minimum above finished roof surface with lead worked one-inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and calk, metal counter flash and seal.

3. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 x 36 inch sheet size. Fasten flashing to drain clamp device.

4. Seal floor drains watertight to adjacent materials.

5. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms, installed in accordance with manufacturer's instructions for sound control.

6. Provide curbs for mechanical roof installations twelve-inch (12") minimum height above roofing surface. Flexible sheet flash and counter flash with sheet metal; seal watertight.

E. Sleeves:

1. Set sleeves in position in form work. Provide reinforcing around sleeves.

2. Extend sleeves through floors one inch (1") above finished floor level. Caulk sleeves full depth and provide floor plate.

3. Where piping or ductwork penetrates non-fire rated floor, ceiling, or wall, close off space between pipe or duct and adjacent work with stuffing insulation and calk airtight. Provide close fitting metal collar or escutcheon covers at both sides of penetration. Close penetrations of fire rated assemblies in accordance with *Section 07 84 00, Firestopping*

4. Install stainless steel escutcheons at finished surfaces.

3.03 FIELD QUALITY CONTROL

A. Tests:

1. Upon completion of this portion of the work and prior to acceptance by the *OWNER*, make all required tests and adjustments for free and smooth operation.

2. Secure all approvals from agencies having jurisdiction.

3.04 CLEANING

A. Clean exposed surface of all grease, dirt and other foreign materials.

B. Touch up all marred or abraded surfaces in accordance with manufacturer's directions.

****END OF SECTION****

SECTION 23 05 53
(15190)
IDENTIFICATION OF HVAC
PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Nameplates, tags, stencils, pipe markers, labels and lockout devices.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 09 90 00: Painting*.

C. Payment:

1. Unless otherwise noted in the *Proposal* Section, no separate payment shall be made for this item.

2. Include all costs for *IDENTIFICATION OF HVAC PIPING AND EQUIPMENT* in the prices bid for the various related items of work as designated in the *Proposal*.

1.02 REFERENCES

A. ANSI/ASME A13.1 - Scheme for the Identification of Piping Systems.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer’s product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required to demonstrate compliance with the specified requirements.

C. Submit list of wording, symbols, letter size, and color coding for mechanical identification.

D. Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

E. Submit manufacturer’s installation procedures.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

D. Regulatory requirements:

1. NJAC 8:59-5.1, et. seq., New Jersey Worker and Community Right to Know Act.

1.05 PRODUCT DELIVERY, STORAGE AND DELIVERY

A. Comply with provisions of *Section 01 66 00, Storage and Protection.*

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER.*

D. Delivery and Storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER.*

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 MATERIALS

A. Color: Unless specified otherwise, conform with ANSI/ASME A13.1.

B. Plastic nameplates: Laminated three-layer plastic with engraved black letters on light contrasting background color.

C. Plastic tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1½ inch (38 mm) diameter.

D. Metal tags: Brass with stamped letters; tag size minimum 1½ inch (38 mm) diameter with smooth edges.

E. Stencils: With clean cut symbols and letters of following size:

OUTSIDE DIAMETER OF INSULATION OR PIPE	LENGTH OF COLOR FIELD	SIZE OF LETTERS
¾" - 1¼" (20-30 mm)	8" (200 mm)	½" (15 mm)
1½" - 2" (40-50 mm)	8" (200 mm)	¾" (20 mm)
2½" - 6" (56-150 mm)	12" (300 mm)	1¼" (30 mm)
8" - 10" (200-250 mm)	24" (600 mm)	2½" (65 mm)
Over 10" (250 mm)	32" (800 mm)	3½" (90 mm)
Ductwork and Equipment	--- ----------	2½" (65 mm)

F. Stencil paint: In accordance with *Section 09 90 00*, semi-gloss enamel, colors and lettering size conforming to ANSI/ASME A13.1.

G. Plastic pipe markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and fluid being conveyed.

H. Plastic tape pipe markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

2.03 LOCKOUT DEVICES

A. Lockout Hasps:

1. Reinforced nylon hasp with erasable label surface; size minimum 7¼ x 3 inches.

B. Valve Lockout Devices:

1. Nylon device preventing access to valve operator, accepting lock shackle.

2.04 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with *Section 09 90 00* for stencil painting.

3.03 INSTALLATION

A. Plastic nameplates: Install with corrosive-resistant mechanical fasteners, or adhesive.

B. Plastic or Metal tags: Install with corrosive-resistant chain.

C. Stencil painting: Apply in accordance with *Section 09 90 00*.

D. Plastic pipe markers: Install in accordance with manufacturer's instructions.

E. Plastic tape pipe markers: Install complete around pipe in accordance with manufacturer's instructions.

F. Equipment: Identify all equipment provided including air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic

nameplates. Small devices, such as in-line pumps, may be identified with plastic or metal tags.

G. Controls: Identify control panels and major control components outside panels with plastic nameplates.

H. Valves: Identify all valves in main and branch piping with brass tags.

I. Piping:

1. Identify piping, concealed or exposed, with plastic pipe markers and labels. Tags may be used on small diameter piping. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping.

2. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and "T", at each side of penetration of structure or enclosure, and at each obstruction.

3.04 COLORS

A. Identify services as follows:

1. Valve handles - Red

2. Fire dampers – White on Safety Red

B. Identify equipment as follows:

1. Supports - Yellow

2. Shaft, pulley, gears, guards - Orange

3. Safety equipment - Green & White

C. Colors indicated shall be high gloss.

3.05 VALVE CHART AND SCHEDULE

A. Install valve charts contained in 8½" x 11" aluminum frames with clear plexiglass window inside the entrance of any room with control valves. Charts shall indicate valve numbers, location and purpose along with manufacturers name and model number.

****END OF SECTION****

SECTION 23 05 93
(15991)
TESTING AND BALANCING FOR HVAC

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Work included:

1. All piping and equipment shall be tested. Labor including standby electrician, materials, instruments and power required for testing shall be furnished unless otherwise indicated under the particular section of the Specifications.

2. Tests shall be performed in the presence of and to the satisfaction of the *ENGINEER* and such other parties as may have legal jurisdiction.

3. In no case shall piping, equipment, or accessories be subjected to pressure exceeding their ratings.

4. All defective work shall be promptly repaired or replaced and the tests shall be repeated until the particular system and component parts thereof receive the approval of the *ENGINEER*.

5. Any damage resulting from tests to any and all trades shall be repaired and damaged materials replaced, all to the satisfaction of the *ENGINEER*.

6. The duration of tests shall be as determined by all authorities having jurisdiction, but in no case less than the time prescribed below.

7. Equipment and systems which normally operate during certain seasons of the year shall be tested during the appropriate season. Tests shall be performed on individual equipment, systems, and their controls. Whenever the equipment or system under test is inter-related and depends upon the operation of other equipment, systems and controls for proper operation, functioning and performance, the latter shall be operated simultaneously with the equipment or system being tested.

8. All fans and duct systems shall be completely balanced by the adjustment of sheaves, dampers, registers and other volume and diverting control devices, to obtain the air quantities indicated on the design drawings. Replace sheaves if required to meet design conditions.

9. All pumps and piping systems shall be completely balanced by the adjustment of plug cocks, globe valves or other control devices, to obtain flow quantities indicated on the design drawings.

B. Related work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *TESTING AND BALANCING* in the prices bid for the various related items of work as designated in the Proposal.

1.02 QUALITY ASSURANCE

A. Prior to installation of the mechanical systems, engage the services of an independent air and water balancing firm that shall be subject to the approval of the *ENGINEER*. The firm shall have no affiliation with a mechanical contracting or sheet metal company. Balancing and testing company shall be a member of the Associated Air Balance Council. The balancing firm shall have at least one member of its full-time staff who is a licensed professional *ENGINEER* who shall supervise the balancing work. Prior to balancing, a list of instruments to be used shall be submitted to the *ARCHITECT*. All instruments shall be calibrated within six months before tests.

B. In accordance with NJAC 5:23-2.23i, a test and balance report for mechanically ventilated Class I and II buildings of Use Groups B and E shall be prepared and submitted by a licensed professional engineer or by a test and balance professional certified by the Associated Air Balance Council or the National Environmental Balancing Bureau. The signed report shall include:

1. Minimum quantity of outdoor air required by code;

2. Minimum quantity of outdoor air specified in the design;

3. Actual measured outdoor cubic feet/minute (CFM) or a derived quantity, if actual measurement is not possible; and

4. Actual measured total CFM.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 78 39, Project Record Documents.*

B. Submit all test and balancing reports as described hereinafter.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.01 FIELD TEST OF PIPING

A. During construction properly cap or plug all lines to prevent the entrance of sand, dirt, etc. The system of piping shall be blown through wherever necessary after completion (for the purpose of removing grit, dirt, sand, etc., from all equipment and piping), for as long a time as is required to thoroughly clean the apparatus.

B. Use anti-freeze solution for piping to be tested in winter.

C. All piping shall be tested as hereinafter specified. Tests shall be made after erection and before covering is applied or piping painted or concealed and as sections of mains and groups of risers are completed. The extent of the work completed before pressure tests are made shall be determined by the *ENGINEER*.

D. All piping, unless otherwise specified, shall be tested to a hydrostatic pressure at least 1½ times the maximum designed working pressure (but not less than 50 lbs. per square inch) for a sufficiently long time to detect all leaks and defects; and after testing shall be made tight in the most approved manner. Tests shall be repeated once after leaks and defects have been repaired. When automatic control valves and similar devices are incapable of withstanding test pressures applied to piping, such devices shall be removed, or otherwise protected during tests. After approval of such tests, devices shall be installed and tested with operating medium to operating pressures. The following shall be tested for four consecutive hours and approved tight. Leaks shall be remedied by replacing defective work.

Item Hydrostatic Field Test	
Overflow ad drain	50 psi
Cold water (domestic)	100 psi
Hot water heating	100 psi

E. Leaks appearing during the various pressure tests shall be corrected by replacing all defective materials or welds and subsequent tests shall be made until the piping is found perfect. Caulking of screwed joints or pending of welds is prohibited. Wherever it is necessary to cut out a weld and the ends of the pipe cannot be conveniently brought together, a short piece of pipe shall be fitted in and welded as approved by the *ENGINEER*.

F. Provide all other tests required by the Building Department, Fire Department and all other authorities having jurisdiction.

3.02 TEST OF REFRIGERATION PIPING

A. Refrigeration piping shall be tested in accordance with the recommendations of the refrigeration equipment manufacturer and in the following sequence for a period of 24 hours:

High side	Nitrogen at 300 psi
Low side	Nitrogen at 150 psi
Entire system	Freon at 5 psi

B. No visible leaks, losses in pressure or increase in vacuum shall occur during test period.

3.03 RUNNING TEST OF PIPING SYSTEMS

A. When directed, any section of the work, after it has been completed and otherwise satisfactorily tested, shall be put in actual operation and operated for a period of two (2) days of 24 hours each, during which time any defects which may appear shall be remedied and any adjustment which may be necessary shall be made.

B. During the time of the tests, repack all valves, make all adjustments and otherwise put the apparatus in perfect condition for operation, and instruct the *OWNER's* representative in the use and management of the apparatus.

3.04 EQUIPMENT TEST

A. Demonstrate that all equipment and apparatus fulfill the requirements of the Specifications and that all equipment shall be operated and tested for rated capacities and specified characteristics. Voltage and amperage readings shall be taken on all electric motors.

3.05 TEST PREPARATION AND PROCEDURE

A. On initial startup, prior to any tests, check the rotation and running amperage of all fan and pump motors to prevent damage to equipment by overload.

B. Final balancing must be done with all systems completely installed and operating, and after the automatic temperature controls have had their final adjustment.

C. New, clean filters must be installed in all supply systems prior to balancing.

D. All water systems shall be completely filled and vented, and all strainers cleaned prior to balancing. Inspect expansion tanks for proper water level and operating of makeup water valves.

E. All main supply air ducts shall be traversed, using a pitot tube and manometer. The manometer shall be calibrated to read two significant figures in all velocity pressure ranges.

1. A main duct is defined as either of the following:

a. A duct serving five or more outlets.

b. A duct serving two or more branch ducts.

c. A duct serving a reheat coil.

d. A zone duct from a multi-zone unit.

e. A duct emanating from a fan discharge or plenum and terminating at one or more outlets.

2. The intent of this operation is to measure by traverse the total air quantity supplied by the fan and to verify the distribution of air to zones.

F. Submit data in support of all supply fan deliveries by the following four methods:

1. By summation of the air quantity readings at all outlets.

2. By duct traverse of main supply ducts.

3. By a rotating vane traverse across a filter or coil bank.

4. By plotting RPM and static pressure readings on the fan curve. Air density corrections must be indicated.

G. For exhaust fans, summation and duct traversing shall be sufficient.

H. Inspect all fan scrolls and remove objects or debris. Inspect all coils and remove debris or obstructions. Verify that all fire dampers are open.

I. The supply air systems shall be completely balanced prior to the final balancing of the water systems.

J. Upon completion of all air and water balancing, all duct dampers, plug valves and other throttling devices shall be marked in the final adjusted position.

3.06 AIR BALANCE

A. Record the following design requirements for all fans and fan motors from the approved shop drawings.

1. Air quantities - CFM

2. Approximate fan speed - RPM

3. Fan static pressure (total or external) - inches of water

4. Maximum tip speed - FPM

5. Outlet velocity - FPM

6. Fan brake horsepower

7. Motor horsepower

8. Volts, phases, cycles and amps at design conditions.

B. Record the following data from all fans and fan motors installed at the project:

1. Manufacturer, model and size

2. Motor horsepower, service factor and RPM

3. Volts, phases, cycles and full load amps

4. Motor starter and heaters size

5. Equipment location

C. All fans and duct systems shall be completely balanced by the adjustment of sheaves, dampers, registers and other volume and diverting control devices, to obtain the air quantities indicated on the Drawings. All final adjusted air quantities shall be within 10% of the design requirements. Replace sheaves if required to meet design conditions.

D. Record the following test data for all fans and motors installed at the project at final balanced conditions:

1. Fan speed RPM

2. Fan static pressure (external and total) inches of water

3. Static pressure drop across all filters, dampers, coils and other items in the supply fan casings

4. Motor operating amps

5. Actual voltage

6. Fan CFM

7. Calculated brake horsepower

E. Submit single line diagrams of all duct systems indicating all terminal outlets identified by number. Data sheets shall list all such outlets denoted by the same numbers, including the outlets' size, "K" factor, location, CFM and jet velocity.

1. Submit this data for all supply, return and exhaust air systems.

3.07 WATER BALANCE

A. Record the following design requirements for all pumps and pump motors from the approved shop drawings:

1. Water quantity - GPM

2. Total head - feet of water

3. Pump speed - RPM

4. Impeller size

5. NPSH (if required)

6. Motor horsepower

7. Volts, phases, cycles and amps at design conditions

B. Record the following data from all pumps motors installed at the project:

1. Manufacturer, model and size

2. Impeller size

3. Motor horsepower, service factor and RPM

4. Volts, phases, cycles and full load amps

5. Motor starter and heaters size

6. Equipment location

C. All pumps and piping systems shall be completely balanced by the adjustment of plug cocks, globe valves or other control devices, to obtain the flow quantities indicated on the Drawings. Balancing shall be done with all controls set for full flow through coils. All automatic throttling valves shall be in the full-open position. All automatic three-way valves shall have the bypass port closed.

D. Record the following test data for all pumps and pump motors installed at the project:

1. Pump speed - RPM

2. Total head at shut-off or dead-end discharge - feet of water. (Plot this value on pump curve as a verification of impeller size.)

3. Suction, discharge and total head at final adjusted flow - feet of water.

E. Balance the water flow through all coils, convertors, cabinet heaters, heat exchangers, unit heaters, etc., in accordance with design requirements.

F. For all venturi type, pitot tube, or other flow measuring devices, record the pipe size, manufacturer and size of device, and the direct reading or the differential pressure, and calculated final flow.

G. Upon completion of the water balance, reconcile the total heat transfer through all coils by recording the entering and leaving water temperatures and the entering and leaving air dry bulb and wet bulb temperatures.

H. Upon completion of balancing adjust all differential bypasses and three-way valve bypasses for the same pressure drop or full bypass on full flow.

****END OF SECTION****

SECTION 23 07 13
(15290)
DUCTWORK INSULATION

PART 1 GENERAL

1.01 DESCRIPTION

A. Work included:

1. Ductwork insulation.

2. Insulation jackets.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 09 90 00: Painting*

3. *Section 23 31 13: Sheet Metal Ductwork*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for the *DUCTWORK INSULATION* in the prices proposed for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required to demonstrate compliance with the specified requirements.

3. Include product description, list of materials and thickness for each service, and locations.

4. Submit calculations showing effective economic thickness to *ENGINEER* for approval prior to fabrication.

C. Shop drawings showing precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provision in concrete forming, reinforcement, and placement to accommodate the work of this section.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions, as approved by the *ENGINEER*, will provide the basis for acceptance or rejection of the work performed under this section.

D. Applicator: Company specializing in ductwork insulation application with three years minimum experience.

1.05 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

PART 2 PRODUCTS

2.01 GENERAL

A. Proprietary Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers:

1. Knauf
2. Johns Manville
3. Or equivalent.

2.02 SHEET METAL MATERIALS

A. Comply with SMACNA's *HVAC Duct Construction Standards – Metal and Flexible* for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Lock-forming quality; ASTM A653/A 653M coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.

C. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized sheet metal ducts.

D. Tie Rods: Galvanized steel, ¼" minimum diameter for 36-inch length or less; ⅜" minimum diameter for lengths longer than 36 inches.

2.03 DUCT LINER

A. General: Comply with NFPA 90A or NFPA 90B and NAIMA's *Fibrous Glass Duct Liner Standard*.

B. Materials: ASTM C1071 with coated surface exposed to airstream to prevent erosion of glass fibers.

1.	Thickness:	1" ductwork; 2" plenums
2.	Duct-Velocity:	Suitable for duct velocity up to 4000 FPM
3.	Thermal Conductivity (k-Value):	0.26 at 75°F mean temperature
4.	Fire-Hazard Classification:	Maximum flame-spread rating of 25 and smoke-developed rating of 50, when tested according to ASTM C411.
5.	Mechanical Fasteners:	Galvanized steel, suitable for welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in duct.

a. Tensile Strength: Infefinitely sustain a 50 lb. tensile, dead-load test perpendicular to duct wall.

b. Fastener Pin Length: As required for thickness of insulation and without projecting more the 1/8 inch into airstream.

C. Dust liner to resist fungal and bacterial growth when subjected to ASTM G41 and G22 test methods.

2.04 SEALANT MATERIALS

A. Joint and Seam Sealants – General: The term “sealant” is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.

1. Joint and Seam Tape: 2" wide; glass-fiber fabric reinforced

2. Tape Sealing System: Woven-fiber tape impregnated with a gypsum mineral compound and a modified acrylic/silicone activator to react exothermically with tape to form a hard, durable, airtight seal.

3. Joint and Seam Sealant: One-part, non-sag, solvent-release-curing, polymerized Butyl sealant, formulated with a minimum of 75 percent solids.

4. Flanged Joint Mastics: One part, acid-curing, silicone, elastomeric joint sealant, complying with ASTM C920, Type S, Grade NS, Class 25, Use O.

2.05 DUCTWORK INSULATION

A. TYPE D-1: ASTM C1290, Type III, flexible glass fiber, commercial grade with factory applied reinforced aluminum foil jacket meeting ASTM C1136, Type II.

1. Thermal Conductivity: 0.30 at 75 degrees F.

2. Maximum Operating Temperature: 250 degrees F.

3. Density: 1.5 pound per cubic foot.

B. GLASS FIBER, RIGID, DUCT INSULATION:

1. Insulation: ASTM C612 Mineral Fiber Block and Board Insulation, Type IA

a. Operating Temperature: 450 degrees F (232 degrees C).
b. Density: 3.0 lb/cu ft (48 kg/cu m).
c. ‘K’ ('ksi') factor: 0.23 at 75 degrees F (0.033 at 24 degrees C).

2. Vapor Retarder Jacket:

a. Kraft paper with glass fiber yarn and bonded to aluminized film.
b. Moisture vapor transmission: ASTM E96; 0.04 perm.
c. Secure with pressure sensitive tape and/or outward clinch expanding staples and vapor barrier mastic.

2.06 DUCTWORK INSULATION JACKETS

A. Aluminum Duct Jacket:

1. ASTM B209; ASTM B209M.

B. Vapor Retarder Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film 0.0032 inch.

2. Moisture vapor transmission: ASTM E96; 0.02perm.

3. Secure with pressure sensitive tape.

2.07 DUCTWORK INSULATION ACCESSORIES

A. Vapor Retarder Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber-based adhesive.

B. Vapor Retarder Lap Adhesive: Compatible with insulation.

C. Adhesive: Waterproof, ASTM E162 fire-retardant type.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

E. Lagging Adhesive: Fire resistive to NFPA 255.

F. Adhesives: Compatible with insulation.

2.08 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Install materials after ductwork has been tested and approved.

B. Clean surfaces for adhesives.

3.03 INSTALLATION

A. Duct dimensions indicated on Drawings are finished inside dimensions.

B. Insulated ductwork conveying air below ambient temperature:

1. Provide insulation with vapor retarder jackets.

2. Finish with tape and vapor retarder jacket.

3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.

4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

C. Insulated ductwork conveying air above ambient temperature:

1. Provide with or without standard vapor retarder jacket.

2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

D. External Glass Fiber Duct Insulation:

1. Secure insulation with vapor retarder with wires and seal jacket joints with vapor retarder adhesive or tape to match jacket.

2. Secure insulation without vapor retarder with staples, tape, or wires.

3. Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift ductwork off trapeze hangers and insert spacers.

4. Seal vapor retarder penetrations by mechanical fasteners with vapor retarder adhesive.

5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

E. Duct Liner:

1. Adhere insulation with adhesive for 100 percent coverage.

2. Secure insulation with mechanical liner fasteners. Comply with SMACNA Standards for spacing.

3. Seal and smooth joints. Seal and coat transverse joints.

4. Seal liner surface penetrations with adhesive.

5. Cut insulation for tight overlapped corner joints. Support top pieces of liner at edges with side pieces.

F. Ducts Exterior to Building:

1. Install insulation according to external duct insulation paragraph above.

2. Provide external insulation with vapor retarder jacket. Cover with outdoor jacket finished with caulked aluminum jacket with seams located on bottom side of horizontal duct section.

3. Finish with mineral fiber outdoor duct jacket, aluminum duct jacket, and membrane duct jacket.

4. Caulk seams at flanges and joints. Located major longitudinal seams on bottom side of horizontal duct sections.

5. Prepare duct insulation for finish painting. Refer to Section 09 90 00,

3.04 DUCTWORK INSULATION SCHEDULE

	DUCTWORK INSULATION		
Service	Field – Applied Jacket	Insulation Type	INSULATION THICKNESS
New Supply air, Return air, Outside air, exhaust air ductwork above ceiling	Vapor Retarded Jacket	Flexible Glass Fiber	1.5” (1.5 #/ cu.ft.)
New Supply air and Return air, ductwork 10’ linearly from Roof top units above ceiling or any unconditioned space like chases, etc.		Elastomeric cellular foam (Duct Liner)	2”
New Supply air ductwork, Return air ductwork, duct transitions and duct connections into new Fan coil units (FCUs) and cabinet unit heaters (CUHs)	Vapor Retarded Jacket	Flexible Glass Fiber	1.5” (1.5 #/ cu.ft.)
New Exhaust Air Ductwork Downstream of backdraft damper	Vapor Retarded Jacket	Flexible Glass Fiber	2” (1.5 #/ cu.ft.)

Notes: All ductwork insulation meet the requirements of ASHRAE Standard 90.1 at a minimum. The above table is shown for reference only and not all ductwork types are referenced in table. The contractor shall modify above insulation types as required to meet the ASHRAE Standard 90.1 and as required best for field installation.

3.05 INSULATION THICKNESS

A. Insulation thickness shall be determined by the installer in accordance with ASHRAE 90A-1 and the Energy Code of the State of New Jersey.

B. Provide additional insulation and/or vapor retarders as required to limit vapor transmission and condensation.

3.06 CLEANING

A. Clean exposed surface of all grease, dirt and other foreign materials.

B. Touch up all marred or abraded surfaces in accordance with manufacturer's directions.

****END OF SECTION****

SECTION 23 07 19

HVAC PIPING INSULATION

PART 1 GENERAL

1.01 DESCRIPTION

A. Work included:

1. Piping insulation: Insulate all new hot water piping, refrigerant liquid, suction lines, and condensate drain lines.

2. Insulation jackets.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 07 84 00: Firestopping*

3. *Section 09 90 00: Painting: Painting Insulation Jackets*

4. *Section 23 05 53: Identification of HVAC Piping and Equipment*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for the *HVAC PIPING INSULATION* in the prices bid for the various related items of work as designated in the Proposal.

1.02 REFERENCES

A. ANSI/ASTM C553 - Mineral Fiber Blanket and Felt Insulation.

B. ASTM E84 - Surface Burning Characteristics of Building Materials.

C. NFPA 255 - Surface Burning Characteristics of Building Materials.

D. UL 723 - Surface Burning Characteristics of Building Materials.

E. ASHRAE 90A-1 - Energy Conservation in New Building Design.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

3. Include product description, list of materials and thickness for each service, and locations.

4. Submit calculations showing effective economic thickness to *ENGINEER* for approval prior to fabrication.

C. Shop drawings showing precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provision in concrete forming, reinforcement, and placement to accommodate the work of this section.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

D. Applicator: Company specializing in mechanical piping insulation application with three years minimum experience.

1.05 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. All insulation materials shall be UL listed; flame spread smoke developed rating of 25/50 in accordance with ASTM E84.

D. Acceptable manufacturers:

1. Knauf
2. Johns Manville
3. Owens Corning
4. Approved equivalent

2.02 PIPE INSULATION

A. Interior: ASTM C547, molded glass fiber pipe insulation.

1. Thermal Conductivity: 0.23 at 75 degrees.
2. Operating Temperature Range: 0 to 850 degrees F.
3. Vapor Barrier Jacket: ASTM C1136, Type I, factory applied reinforced foil kraft with self-sealing adhesive joints.
4. Jacket Temperature Limit: minus 20 to 150 degrees F.

B. Interior: ASTM C612; semi-rigid, fibrous glass board noncombustible, end grain adhered to jacket.

1. Thermal Conductivity: 0.27 at 75 degrees F.
2. Operating Temperature Range: 0 to 650 degrees F.
3. Vapor Barrier Jacket: ASTM C1136, Type II, factory applied reinforced foil kraft with self-sealing adhesive joints.
4. Jacket Temperature Limit: minus 20 to 150 degrees F.

C. Exterior: ASTM C534; Type I, flexible, closed cell elastomeric insulation, tubular.

1. Thermal Conductivity: 0.30 at 75 degrees F.
2. Maximum Service Temperature: 300 degrees F.
3. Operating Temperature Range: Range: Minus 58 to 300 degrees F.
4. Jacket Temperature Limit: minus 20 to 150 degrees F.

2.03 INSULATION JACKETS

A. Vapor Retarder Jacket:

1. ASTM C921, white Kraft paper with glass fiber yarn, bonded to aluminized film.

2. Moisture vapor transmission: ASTM E96; 0.02 perm-inches.

B. Aluminum Pipe Jacket:

1. ASTM B209.
2. Thickness: 0.016 inch thick sheet.
3. Finish: Smooth.
4. Joining: Longitudinal slip joints and 2 inch laps.
5. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
6. Metal Jacket Bands: ⅜ inch wide; 0.015 inch thick aluminum.

C. PVC Plastic Pipe Jacket:

1. Product Description: ASTM D1784, one piece molded type fitting covers and sheet material, off-white color.
2. Thickness: 15 mil.
3. Connections: Pressure sensitive color matching vinyl tape.

2.04 ACCESSORIES

A. Piping 1½ inches diameter and smaller: Galvanized steel insulation protection shield. MSS SP-69, Type 40. Length: Based on pipe size and insulation thickness.

B. Piping 2 inches diameter and larger: Wood insulation saddle, hard maple. Inserts length: not less than 6 inches long, matching thickness and contour of adjoining insulation.

C. Closed Cell Elastomeric Insulation Pipe Hanger: Polyurethane insert with aluminum single piece construction with self-adhesive closure. Thickness to match pipe insulation.

D. Adhesives: Compatible with insulation.

2.05 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Install materials after ductwork has been tested and approved.

B. Clean surfaces for adhesives.

3.03 INSTALLATION

A. Piping Exposed to View in Finished Spaces: Locate insulation and cover seams in least visible locations.

B. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions. Refer to *Section 07 84 00, Firestopping* for penetrations of assemblies with fire resistance rating greater than one hour.

C. Hot Piping Systems Less than 140 degrees F:

1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.

2. Insulate fittings, joints, and valve with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

3. Do not insulate unions and flanges at equipment, but bevel and seal ends of insulation at such locations.

D. Hot Piping Systems greater than 140 degrees F:

1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.

2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

3. Insulate flanges and unions at equipment.

E. Piping Systems Conveying Fluids Below Ambient Temperature:

1. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, [pump bodies,] and expansion joints.

2. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.

3. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor retarder adhesive or PVC fitting covers.

F. Inserts and Shields:

1. Piping 1½ inches Diameter and Smaller: Install [galvanized] steel shield between pipe hanger and insulation.

2. Piping 2 inches Diameter and Larger: Install insert between support shield and piping and under finish jacket.

a. Insert Configuration: Minimum 6 inches long, of thickness and contour matching adjoining insulation; may be factory fabricated.

b. Insert Material: Compression resistant insulating material suitable for planned temperature range and service.

3. Piping Supported by Roller Type Pipe Hangers: Install [galvanized] steel shield between roller and inserts.

G. Insulation Terminating Points:

1. Coil Branch Piping 1 inch and Smaller: Terminate hot water piping at union upstream of the coil control valve.

2. Chilled Water Coil Branch Piping: Insulate chilled water piping and associated components up to coil connection.

3. Condensate Piping: Insulate entire piping system and components to prevent condensation.

H. High Temperature Pipe Insulation:

1. Install in multiple layers to meet thickness schedules.

2. Attach each layer with bands. Secure first layer with bands before installing next layer.

3. Stagger joints between layers.

4. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

I. Closed Cell Elastomeric Insulation:

1. Push insulation on to piping.

2. Miter joints at elbows.

3. Seal seams and butt joints with manufacturer's recommended adhesive.

4. When application requires multiple layers, apply with joints staggered.

5. Insulate fittings and valves with insulation of like material and thickness as adjacent pipe.

J. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces: Finish with PVC jacket and fitting covers.

K. Piping Exterior to Building: Provide vapor retarder jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor retarder cement. Cover with aluminum jacket with seams located at 3 or 9 o'clock position on side of horizontal piping with overlap facing down to shed water or on bottom side of horizontal piping.

3.04 PIPING INSULATION SCHEDULE

Service	**PIPING SYSTEM**						
	Field - Applied Jacket	Insulation Type	INSULATION THICKNESS ACCORDING TO PIPE SIZE				
			≤ 3/4"	1" thru 1-1/4"	1-1/2" thru 3"	4" thru 6"	≥ 8"
Heating Hot Water (141°-200°F) – Reheat (HWS/HWR)	P.V.C exposed within 8' A.F.F – all areas.	Glass Fiber	1-1/2"	1-1/2"	2"	2"	2"
Cooling Coil Condensate Drain	P.V.C. exposed within 8' A.F.F – all areas.	Elastomeric Cellular Foam	½"	½"	½"		
All piping at pipe supports		Calcium Silicate Inserts	Same as adjoining pipe	Same as adjoining pipe	Same as adjoining pipe	Same as adjoining pipe	Same as adjoining pipe

	REFRIGERANT PIPING SYSTEM						
			INSULATION THICKNESS ACCORDING TO PIPE SIZE				
Service	Field - Applied Jacket	Insulation Type	1" & LESS	1 1/4"-2"	2 1/2"-4"	5"-6"	8" & Larger.
Refrigerant Suction, Liquid	Aluminum jacket & Vapor retarded jacket (out-side bldg.); PVC (exposed with- in 8' A.F.F. – all areas)	Cellular Foam	3/4"	3/4"	3/4"		
Cooling Coil Condensate		Cellular Foam	3/4"	3/4"	3/4"		

3.05 CLEANING

A. Clean exposed surface of all grease, dirt and other foreign materials.

B. Touch up all marred or abraded surfaces in accordance with manufacturer's directions.

****END OF SECTION****

SECTION 23 09 23

DIRECT-DIGITAL CONTROL BUILDING
AUTOMATION SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. General Scope of work:

a. Retain existing JACE 8000 controller and existing BMS front end. Provide expansion license as required to integrate new HVAC equipment.
b. Provide new zone level DDC controls for new HVAC equipment provided under this project scope
c. Integrate all new and modified HVAC equipment listed below into the existing Trane BMS.
d. Provide monitoring of spaces and equipment as indicated on Drawings
e. Provide all required BACnet interfaces, DDC controllers, sensors, actuators, relays, control wiring, programming, graphics, alarms, trending, and associated accessories
f. Provide electric/electronic actuation for all new and existing equipment (as part of this project) to be provided with DDC controls
g. Update system graphics with building addition and additional BAS system information indicated to reflect work of this project

2. Integrate the following HVAC equipment into existing Trane BMS system:

a. Existing Carrier RTU-19, along with the new VVT zone damper system, associated CO2 sensors for Demand control ventilation
b. New VAV Roof top unit RTU-20, associated VAV boxes and CO2 sensors for Demand control ventilation.
c. New hot water radiators and convectors - FTR-145, FTR-153, FTR-168, HC-, HC-2, associated control valves and actuators
d. New Hot water Cabinet Unit Heaters – CUH-1,2 and associated control valves and actuators.
e. New Minisplit heat pump system – MSHP-2, MSE-2.

f. Provide new controls for existing FCUs being relocated and integrate them- FCU-9,11A,11B,11C,16. Integrate the centralized controller associated with VRF system in Senior center.
g. New VRF system – FCU-17,18 and ACCU-4
h. New DOAS-1, associated VAV terminal unit – VAV-1,2 and control dampers EACD-1,2.
i. New Kitchen exhaust fan KEF-1 and Make up air unit MAU-1.

3. The BMS scope of work shall not be limited to the equipment specifically listed above. Equipment quantities and tags are provided for reference only. The BMS contractor shall review the contract drawings, record drawings, equipment schedules, sequences of operation, and existing BMS to verify final equipment quantities and control requirements, and shall provide all controls work required to integrate all existing and new HVAC equipment into the existing Trane BMS for complete and proper system operation

4. All space thermostats and local controllers shall permit occupants to adjust the heating and cooling setpoints by ±2 deg. F (adj.) from the setpoints established by the BMS. Local adjustments shall not override BMS-established limits or unoccupied setpoints

5. The BMS contractor and mechanical contractor shall coordinate with each other and with the respective equipment manufacturers to provide non-proprietary controls and all required interfaces for integration into the existing Trane BMS.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 23 36 16: Variable Air Volume Terminal Units (Single)*

3. *Section 23 73 13: Indoor Air Handling Units*

4. *Section 23 82 00: Terminal Heating and Cooling Units*

5. *Division 26: Electrical*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *DIRECT DIGITAL CONTROL BUILDING AUTOMATION SYSTEM* in the prices bid for the various related items of work as designated in the Proposal.

1.02 DESCRIPTION

A. General: The existing JACE 8000 controller, Trane BMS front end, operator interface, system database, and existing BMS network shall remain. Extend the existing system as required to integrate the new and modified HVAC equipment included in this project. Provide expansion licenses, field controllers, communication devices, programming, graphics, alarms, trends, and associated accessories required for a complete installation

B. The system shall directly (or via BACnet integration) control HVAC equipment as specified in Sequence of Operations on HVAC drawings. Each zone controller shall provide occupied and unoccupied modes of operation by individual zone. Furnish energy conservation features such as optimal start and stop, night setback, request-based logic, and demand level adjustment of setpoints as specified in the sequence.

C. Provide for future system expansion to include lighting control systems.

D. System shall use the BACnet protocol for communication to the operator workstation or web server and for communication between control modules. I/O points, schedules, setpoints, trends, and alarms specified on the drawings shall be BACnet objects.

E. Any exposed control wiring shall be in conduit.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Shop drawings showing precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provision in concrete forming, reinforcement, and placement to accommodate the work of this section.

D. Manufacturer’s recommended installation procedures.

E. Product Submittal Requirements: Meet requirements of *Division 1* on Shop Drawings, Product Data, and Samples. When manufacturer's cutsheets apply to a product series rather than a specific product, clearly indicate applicable data by highlighting or by other means. Clearly reference covered specification and drawing on each submittal. General catalogs shall not be accepted as cutsheets to fulfill submittal requirements. Select and show submittal quantities appropriate to scope of work. Submittal approval does not relieve Contractor of responsibility to supply sufficient quantities to complete work. Submittals shall be prepared using information in approved submittals for all new and existing HVAC equipment. Provide submittals for:

1. Retain submittals for project field controllers, sensors, actuators, dampers, valves, wiring, points, network architecture, graphics, and sequences. Provide airflow-measuring-station and operator-interface equipment submittals only when specifically shown or furnished. Submit expansion-license information for the existing JACE 8000.

2. Direct Digital Control System Hardware

    a. Complete bill of materials indicating quantity, manufacturer, model number, and relevant technical data of equipment to be used.
    b. Manufacturer's description and technical data such as performance curves, product specifications, and installation and maintenance instructions for items listed below and for relevant items not listed below:
        1) Direct digital controllers (controller panels)
        2) Transducers and transmitters
        3) Sensors (include accuracy data)
        4) Actuators
        5) Dampers
        6) Valves
        7) Relay and Switches
        8) Control Panels
        9) Power Supplies
        10) Wiring

c. Wiring diagrams and layouts for each control panel. Show termination numbers.
d. System graphic samples specific to the systems used on this project.
e. Floor plan schematic diagrams indicating field sensor and controller locations.
f. Riser diagrams showing control network layout, communication protocol, and wire types.
g. Damper schedule including damper tag, height and width, free area and control signal.
h. Valve schedule including valve tag, line size, valve body size, valve coefficient, design and actual pressure drop, selected actuator and control signal.
i. Control system drawings tile sheet.
j. List of I/O points.
k. Control system schematics.
l. BACnet communication architectural schematic.
m. Sequence of operation.

3. Submit product data and licensing information for the existing JACE 8000 expansion license and any new software modules required for this project. New central processing units, web servers, workstations, monitors, keyboards, or operating-system software are not required

4. Controlled Systems

   a. Riser diagrams showing control network layout, communication protocol, and wire types.
   b. Schematic diagram of each controlled system. Label control points with point names. Graphically show locations of control elements.
   c. Schematic wiring diagram of each controlled system. Label control elements and terminals. Where a control element is also shown on control system schematic, use the same name.
   d. Instrumentation list (Bill of Materials) for each controlled system. List each control system element in a table. Show element name, type of device, manufacturer, model number, and product data sheet number.
   e. Complete description of control system operation including sequences of operation. Include and reference schematic diagram of controlled system. List I/O points, software points and indicate alarmed and trended points.

5. Description of process, report formats, and checklists to be used in *Section 23 09 23* Article 3.16 (Control System Demonstration and Acceptance).

6. BACnet Protocol Implementation Conformance Statement (PICS) for each submitted type of controller and operator interface.

F. Schedules

1. Schedule of work provided within one month of contract award, indicating:

   a. Intended sequence of work items
   b. Start date of each work item
   c. Duration of each work item
   d. Planned delivery dates for ordered material and equipment and expected lead times
   e. Milestones indicating possible restraints on work by other trades or situations

2. Monthly written status reports indicating work completed and revisions to expected delivery dates. Include updated schedule of work.

F. Project Record Documents. Submit three copies of record (as-built) documents upon completion of installation for approval prior to final completion. Submittal shall consist of:

1. Project Record Drawings. As-built versions of submittal shop drawings provided as AutoCAD files (file format: .DWG, .DXF, .VSD, or comparable).

2. Testing and Commissioning Reports

3. Operation and Maintenance (O&M) Manual. Printed, electronic, or online help documentation of the following:

   a. As-built versions of submittal product data.
   b. Names, addresses, and telephone numbers of installing contractors and service representatives for equipment and control systems.
   c. Operator's manual with procedures for operating control systems: logging on and off, handling alarms, producing point reports, trending data, overriding computer control, and changing setpoints and variables.
   d. Programming manual or set of manuals with description of programming language and syntax, of statements for algorithms and calculations used, of point database creation and modification, of program creation and modification, and of editor use.

e. Engineering, installation, and maintenance manual or set of manuals that explains how to design and install new points, panels, and other hardware; how to perform preventive maintenance and calibration; how to debug hardware problems; and how to repair or replace hardware.
f. Documentation of programs created using custom programming language including setpoints, tuning parameters, and object database. Electronic copies of programs shall meet this requirement if control logic, setpoints, tuning parameters, and objects can be viewed using furnished programming tools.
g. Archive graphic files, programs, and database on magnetic or optical media.
h. List of recommended spare parts with part numbers and suppliers.
i. Complete original-issue documentation, installation, and maintenance information for furnished third-party hardware including computer equipment and sensors.
j. Complete original-issue copies of furnished software, including operating systems, custom programming language, operator workstation or web server software, and graphics software.
k. Licenses, guarantees, and warranty documents for equipment and systems.
l. Recommended preventive maintenance procedures for system components, including schedule of tasks such as inspection, cleaning, and calibration; time between tasks; and task descriptions.

4. The entire Operation and Maintenance Manual shall be furnished on Compact Disc media in Portable Document Format (PDF) that is both indexed and searchable and include the following for the BMS provided:

a. Table of Contents
b. As-built system record drawings. Computer Aided Drawings (CAD) record drawings shall represent the as-built condition of the system and incorporate all information supplied with the approved submittal.
c. Manufacturer' product data sheets or catalog pages for all products including software.
d. System Operator's manuals.
e. Archive copy of all site-specific databases and sequences.
f. BMS network diagrams.
g. Interfaces to all third-party products and work by other trades.
h. The Operation and Maintenance Manual USB drive shall be self-contained and include all necessary software required to access the

product data sheets. A logically organized table of contents shall provide the ability to display, zoom and search all documents.

G. Training Materials: Provide course outline and materials for each class at least six weeks before first class. Training shall be furnished by a system technician who is fully knowledgeable of the specific installation details of the project. This orientation shall, at a minimum, consist of a review of the project as-built drawings, the BMS software layout and naming conventions, and a walk through of the facility to identify panel and device locations. Training shall cover both the existing BMS system and the new systems and equipment integrated under this project. Provide a total of 8 to 16 hours of *OWNER* training.

1.04 CODES AND STANDARDS

A. Work, materials, and equipment shall comply with the most restrictive of local, state, and federal authorities' codes and ordinances or these plans and specifications. As a minimum, the installation shall comply with current editions in effect 30 days prior to receipt of bids of the following codes:

1. National Electric Code (NEC)

2. International Building Code (IBC)

   a. Section 719 Ducts and Air Transfer Openings
   b. Section 907 Fire Alarm and Detection Systems
   c. Section 909 Smoke Control Systems
   d. Chapter 28 Mechanical

3. International Mechanical Code (IMC)

1.05 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Installer and manufacturer qualifications:

1. Installer shall have an established working relationship with Control System manufacturer.

2. Installer shall have successfully completed Control System manufacturer's control system training. Upon request, installer shall present record of completed training including course outlines.

C. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

D. Basis of acceptance: The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.06 SYSTEM PERFORMANCE

A. Performance Standards. System shall conform to the following minimum standards over network connections. Systems shall be tested using manufacturer's recommended hardware and software for operator workstation (server and browser for web-based systems).

1. Graphic Display. A graphic with 20 dynamic points shall display with current data within 10 sec.

2. Graphic Refresh. A graphic with 20 dynamic points shall update with current data within 8 sec. and shall automatically refresh every 15 sec.

3. Configuration and Tuning Screens. Screens used for configuring, calibrating, or tuning points, PID loops, and similar control logic shall automatically refresh within 6 sec.

4. Object Command. Devices shall react to command of a binary object within 2 sec. Devices shall begin reacting to command of an analog object within 2 sec.

5. Alarm Response Time. An object that goes into alarm shall be annunciated at the workstation within 15 sec.

6. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 sec. Select execution times consistent with the mechanical process under control.

7. Performance. Programmable controllers shall be able to completely execute DDC PID control loops at a frequency adjustable down to once per sec. Select execution times consistent with the mechanical process under control.

8. Multiple Alarm Annunciation. Each workstation on the network shall receive alarms within 5 sec of other workstations.

9. Reporting Accuracy. System shall report values with minimum end-to-end accuracy listed in Table 1.

10. Control Stability and Accuracy. Control loops shall maintain measured variable at setpoint within tolerances listed in Table 2.

Table 1
Reporting Accuracy

Measured Variable	Reported Accuracy
Space Temperature	±0.5ºC (±1ºF)
Ducted Air	±0.5ºC (±1ºF)
Outside Air	±1.0ºC (±2ºF)
Dew Point	±1.5ºC (±3ºF)
Water Temperature	±0.5ºC (±1ºF)
Delta-T	±0.15ºC (±0.25ºF)
Relative Humidity	±5% RH
Water Flow	±2% of full scale
Airflow (terminal)	±10% of full scale (see Note 1)
Airflow (measuring stations)	±5% of full scale
Airflow (pressurized spaces)	±3% of full scale
Air Pressure (ducts)	±25 Pa (±0.1 in. w.g.)
Air Pressure (space)	±3 Pa (±0.01 in. w.g.)
Water Pressure	±2% of full scale (see Note 2)
Electrical (A, V, W, Power Factor)	±1% of reading (see Note 3)
Carbon Monoxide (CO)	±5% of reading

Carbon Dioxide (CO_2)	±50 ppm

Note 1: Accuracy applies to 10% - 100% of scale
Note 2: For both absolute and differential pressure
Note 3: Not including utility-supplied meters

Table 2
Control Stability and Accuracy

Controlled Variable	Control Accuracy	Range of Medium
Air Pressure	±50 Pa (±0.2 in. w.g.) ±3 Pa (±0.01 in. w.g.)	0-1.5 kPa (0-6 in. w.g.) -25 to 25 Pa (-0.1 to 0.1 in. w.g.)
Airflow	±10% of full scale	
Space Temperature	±1.0ºC (±2.0ºF)	
Duct Temperature	±1.5ºC (±3ºF)	
Humidity	±5% RH	
Fluid Pressure	±10 kPa (±1.5 psi) ±250 Pa (±1.0 in. w.g.)	MPa (1-150 psi) 0-12.5 kPa (0-50 in. w.g.) differential

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.08 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

C. Warrant work as follows:

1. Warrant labor and materials for specified control system free from defects for a period of 24 months after final acceptance. Control system failures during warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to *OWNER*. Respond during normal business hours within 24 hours of *OWNER*'s warranty service request.

2. Work shall have a single warranty date, even if *OWNER* receives beneficial use due to early system start-up.

3. If *ENGINEER* determines that equipment and systems operate satisfactorily at the end of final start-up, testing, and commissioning phase, *ENGINEER* will certify in writing that control system operation has been tested and accepted in accordance with the terms of this specification. Date of acceptance shall begin warranty period.

4. Provide updates to operator workstation or web server software, project-specific software, graphic software, database software, and firmware that resolve Contractor-identified software deficiencies at no charge during warranty period. If available, *OWNER* can purchase in-warranty service agreement to receive upgrades for functional enhancements associated with above-mentioned items. Do not install updates or upgrades without *OWNER*'s written authorization.

5. Maintain an adequate supply of materials within 100 miles of the Project site such that replacement of key parts and labor support, including programming, Warranty work shall be done during BMS Contractor's normal business hours.

6. Exception: Contractor shall not be required to warrant reused devices except those that have been rebuilt or repaired. Installation labor and materials shall be warranted. Demonstrate operable condition of reused devices at time of *ENGINEER*'s acceptance.

1.09 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

1.10 OWNERSHIP OF PROPRIETARY MATERIAL

A. Project-specific software and documentation shall become *OWNER*'s property. This includes, but is not limited to:

1. Graphics

2. Record drawings

3. Database

4. Application programming code

5. Documentation

6. Software licensures

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers:

1. Niagara N4

2. Approved equal offering non-proprietary BMS.

D. Acceptable BMS Subcontractors:

1. Trane

2. Approved equivalent.

2.02 PRODUCTS

A. Use new products the manufacturer is currently manufacturing and selling for use in new installations. Do not use this installation as a product test site unless explicitly approved in writing by *OWNER*. Spare parts shall be available for at least five years after completion of this contract.

B. The Building Management System (BMS) shall use an open architecture and fully support a multi-vendor environment. To accomplish this effectively, the BMS shall support open communication protocol standards and integrate a wide variety of third-party devises and applications. The system shall be designed for use on the Internet or intranets using off the shelf, industry standard technology compatible with other *OWNER* provided networks. Provide new BACnet field controllers, I/O modules, sensors, actuators, communication devices, expansion licenses, and associated components required to extend the existing JACE 8000 and Trane BMS. Do not provide a new network automation engine or operator interface unless the Contractor demonstrates insufficient existing capacity and obtains prior approval from the *OWNER* and *ENGINEER*

C. The system shall be modular in nature and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, controllers and operator devices while re-using existing controls equipment.

D. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution.

1. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.

2. The System shall maintain all settings and overrides through a system reboot. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution.

2.03 COMMUNICATION

A. Control products, communication media, connectors, repeaters, hubs, and routers shall comprise a BACnet internetwork. Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135, BACnet.

B. Install new wiring and network devices as required to provide a complete and workable control network.

C. Each controller shall have a communication port for temporary connection to a laptop computer or other operator interface. Connection shall support memory downloads and other commissioning and troubleshooting operations.

D. Internetwork operator interface and value passing shall be transparent to internetwork architecture.

1. An operator interface connected to a controller shall allow the operator to interface with each internetwork controller as if directly connected. Controller information such as data, status, and control algorithms shall be viewable and editable from each internetwork controller.

2. Inputs, outputs, and control variables used to integrate control strategies across multiple controllers shall be readable by each controller on the internetwork. Program and test all cross-controller links required to execute necessary control strategies. An authorized operator shall be able to edit cross-controller links by typing a standard object address or by using a point-and-click interface.

E. Controllers with real-time clocks shall use the BACnet Time Synchronization service. System shall automatically synchronize system clocks daily from an operator-designated controller via the internetwork. If applicable, system shall automatically adjust for daylight saving and standard time.

F. Verify available licensed point, device, and network capacity of the existing JACE 8000. Provide expansion licensing and additional BACnet field controllers or network devices as required for the work of this project

2.04 OPERATOR INTERFACE

A. Operator Interface. Existing Distech Niagara N4 operator interface shall be expanded to support new devices. Updated floorplan graphics and unit-specific graphics shall be provided.

B. Communication. Web server or workstation and controllers shall communicate using BACnet protocol. Web server or workstation and control network backbone shall communicate using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing as specified in ANSI/ASHRAE 135, BACnet Annex J.

C. Hardware. Each workstation or web server shall consist of the following:

1. Hardware Base. Industry-standard hardware shall meet or exceed DDC system manufacturer's recommended specifications and shall meet Industry-standard response times. Hard disk shall have sufficient memory to store system software, one year of data for trended points specified herein, and a system database at least twice the size of the existing database at system acceptance. Configure computers and network connections if multiple computers are required to meet specified memory and performance.

D. Operator Functions. Operator interface shall allow each authorized operator to execute the following functions as a minimum:

1. Log In and Log Out. System shall require user name and password to log in to operator interface.

2. Point-and-click Navigation. Operator interface shall be graphically based and shall allow operators to access graphics for equipment and geographic areas using point-and-click navigation.

3. View and Adjust Equipment Properties. Operators shall be able to view controlled equipment status and to adjust operating parameters such as setpoints, PID gains, on and off controls, and sensor calibration.

4. View and Adjust Operating Schedules. Operators shall be able to view scheduled operating hours of each schedulable piece of equipment on a weekly or monthly calendar-based graphical schedule display, to select and adjust each schedule and time period, and to simultaneously schedule related equipment. System shall clearly show exception schedules and holidays on the schedule display.

5. View and Respond to Alarms. Operators shall be able to view a list of currently active system alarms, to acknowledge each alarm, and to clear (delete) unneeded alarms.

6. View and Configure Trends. Operators shall be able to view a trend graph of each trended point and to edit graph configuration to display a specific

time period or data range. Operator shall be able to create custom trend graphs to display on the same page data from multiple trended points.

7. View and Configure Reports. Operators shall be able to run preconfigured reports, to view report results, and to customize report configuration to show data of interest.
8. Manage Control System Hardware. Operators shall be able to view controller status, to restart (reboot) each controller, and to download new control software to each controller.

9. Manage Operator Access. Typically, only a few operators are authorized to manage operator access. Authorized operators shall be able to view a list of operators with system access and of functions they can perform while logged in. Operators shall be able to add operators, to delete operators, and to edit operator function authorization. Operator shall be able to authorize each operator function separately.

E. System Software.

1. Operating System. Web server shall have an industry-standard professional-grade operating system. Acceptable systems include Microsoft Windows 10 or latest.

2. System Graphics. Operator interface shall be graphically based and shall include at least one graphic per piece of equipment or occupied zone, graphics for each chilled water and hot water system, and graphics that summarize conditions on each floor of each building included in this contract. Indicate thermal comfort on floor plan summary graphics using dynamic colors to represent zone temperature relative to zone setpoint.

    a. Functionality. Graphics shall allow operator to monitor system status, to view a summary of the most important data for each controlled zone or piece of equipment, to use point-and-click navigation between zones or equipment, and to edit setpoints and other specified parameters.
    b. Animation. Graphics shall be able to animate by displaying different image files for changed object status.
    c. Alarm Indication. Indicate areas or equipment in an alarm condition using color or other visual indicator.
    d. Format. Graphics shall be saved in an industry-standard format such as BMP, JPEG, PNG, or GIF. Web-based system graphics shall be viewable on browsers compatible with World Wide Web Consortium browser standards. Web graphic format shall require no plug-in (such as HTML and JavaScript) or shall only require

widely available no-cost plug-ins (such as Active-X and Adobe Flash).

e. Software License Agreement

(1) The *OWNER* shall agree to the manufacturer's standard software and firmware licensing agreement as a condition of this contract. Such license shall grant use of all programs and application software to *OWNER* as defined by the manufacturer's license agreement, but shall protect manufacturer's rights to disclosure of trade secrets contained within such software.

(2) The *OWNER* shall be the named license holder of all software associated with any and all incremental work on the project(s). In addition, the *OWNER* shall receive ownership of all job specific configuration documentation, data files, and application-level software developed for the project. This shall include all custom, job specific software code and documentation for all configuration and programming.

(3) Software licensing shall have the freedom to individually manage authorized parties and independent parties.

(4) The software licensing shall have no restrictions on which brand of server software or System Programming tools can interact with the system.

F. System Tools. System shall provide the following functionality to authorized operators as an integral part of the operator interface or as stand-alone software programs. If furnished as part of the interface, the tool shall be available from each workstation or web browser interface. If furnished as a stand-alone program, software shall be installable on standard PCs with no limit on the number of copies that can be installed under the system license.

1. Automatic System Database Configuration. Each workstation or web server shall store on its hard disk a copy of the current system database, including controller firmware and software. Stored database shall be automatically updated with each system configuration or controller firmware or software change.

2. Controller Memory Download. Operators shall be able to download memory from the system database to each controller.

3. System Configuration. Operators shall be able to configure the system.

4. Online Help. Context-sensitive online help for each tool shall assist operators in operating and editing the system.

5. Security. System shall require a user name and password to view, edit, add, or delete data.

    a. Operator Access. Each user name and password combination shall define accessible viewing, editing, adding, and deleting functions in each system application, editor, and object.
    b. Automatic Log Out. Automatically log out each operator if no keyboard or mouse activity is detected. Operators shall be able to adjust automatic log out delay.
    c. Encrypted Security Data. Store system security data including operator passwords in an encrypted format. System shall not display operator passwords.

6. System Diagnostics. System shall automatically monitor controller and I/O point operation. System shall annunciate controller failure and I/O point locking (manual overriding to a fixed value).

7. Alarm Processing. System input and status objects shall be configurable to alarm on departing from and on returning to normal state. Operator shall be able to enable or disable each alarm and to configure alarm limits, alarm limit differentials, alarm states, and alarm reactions for each system object. Configure and enable alarm points as specified in Sequence of Operations on drawings. Alarms shall be BACnet alarm objects and shall use BACnet alarm services.

8. Alarm Messages. Alarm messages shall use an English language descriptor without acronyms or mnemonics to describe alarm source, location, and nature.

9. Alarm Reactions. Operator shall be able to configure (by object) actions workstation or web server shall initiate on receipt of each alarm. As a minimum, workstation or web server shall be able to log, print, start programs, display messages, send e-mail, send page, and audibly annunciate.

10. Alarm Maintenance. Operators shall be able to view system alarms and changes of state chronologically, to acknowledge and delete alarms, and to archive closed alarms to the workstation or web server hard disk from each workstation or web browser interface.

11. Trend Configuration. Operator shall be able to configure trend sample or change of value (COV) interval, start time, and stop time for each system data object and shall be able to retrieve data for use in spreadsheets and standard database programs. Controller shall sample and store trend data and shall be able to archive data to the hard disk. Trends shall be BACnet trend objects.

12. Object and Property Status and Control. Operator shall be able to view, and to edit if applicable, the status of each system object and property by menu, on graphics, or through custom programs.

13. Reports and Logs. Operator shall be able to select, to modify, to create, and to print reports and logs. Operator shall be able to store report data in a format accessible by standard spreadsheet and word processing programs.

14. Standard Reports. Furnish the following standard system reports:

    a. Objects. System objects and current values filtered by object type, by status (in alarm, locked, normal), by equipment, by geographic location, or by combination of filter criteria.
    b. Alarm Summary. Current alarms and closed alarms. System shall retain closed alarms for an adjustable period.
    c. Logs. System shall log the following to a database or text file and shall retain data for an adjustable period:

        1) Alarm History.
        2) Trend Data. Operator shall be able to select trends to be logged.
        3) Operator Activity. At a minimum, system shall log operator log in and log out, control parameter changes, schedule changes, and alarm acknowledgment and deletion. System shall date and time stamp logged activity.

15. Custom Reports. Operator shall be able to create custom reports that retrieve data, including archived trend data, from the system, that analyze data using common algebraic calculations, and that present results in tabular or graphical format. Reports shall be launched from the operator interface.

16. Graphics Generation. Graphically based tools and documentation shall allow Operator to edit system graphics, to create graphics, and to integrate graphics into the system. Operator shall be able to add analog and binary

values, dynamic text, static text, and animation files to a background graphic using a mouse.

17. Graphics Library. Complete library of standard HVAC equipment graphics shall include equipment such as chillers, boilers, air handlers, terminals, fan coils, and unit ventilators. Library shall include standard symbols for other equipment including fans, pumps, coils, valves, piping, dampers, and ductwork. Library graphic file format shall be compatible with graphics generation tools.

18. Custom Application Programming. Operator shall be able to create, edit, debug, and download custom programs. System shall be fully operable while custom programs are edited, compiled, and downloaded. Programming language shall have the following features:

    a. Language. Language shall be graphically based or English language oriented. If graphically based, language shall use function blocks arranged in a logic diagram that clearly shows control logic flow. Function blocks shall directly provide functions listed below, and operators shall be able to create custom or compound function blocks. If English language oriented, language shall be based on the syntax of BASIC, FORTRAN, C, or PASCAL, and shall allow for free-form programming that is not column-oriented or "fill-in-the-blanks."
    b. Programming Environment. Tool shall provide a full-screen, cursor-and-mouse-driven programming environment that incorporates word processing features such as cut and paste. Operators shall be able to insert, add, modify, and delete custom programming code, and to copy blocks of code to a file library for reuse in other control programs.
    c. Independent Program Modules. Operator shall be able to develop independently executing program modules that can disable, enable and exchange data with other program modules.
    d. Debugging and Simulation. Operator shall be able to step through the program observing intermediate values and results. Operator shall be able to adjust input variables to simulate actual operating conditions. Operator shall be able to adjust each step's time increment to observe operation of delays, integrators, and other time-sensitive control logic. Debugger shall provide error messages for syntax and for execution errors.
    e. Conditional Statements. Operator shall be able to program conditional logic using compound Boolean (AND, OR, and NOT) and relational (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.

f. Mathematical Functions. Language shall support floating-point addition, subtraction, multiplication, division, and square root operations, as well as absolute value calculation and programmatic selection of minimum and maximum values from a list of values.

g. Variables: Operator shall be able to use variable values in program conditional statements and mathematical functions.

1) Time Variables. Operator shall be able to use predefined variables to represent time of day, day of the week, month of the year, and date. Other predefined variables or simple control logic shall provide elapsed time in seconds, minutes, hours, and days. Operator shall be able to start, stop, and reset elapsed time variables using the program language.

2) System Variables. Operator shall be able to use predefined variables to represent status and results of Controller Software and shall be able to enable, disable, and change setpoints of Controller Software as described in Controller Software section.

G. Portable Operator's Terminal. Provide all necessary software to configure a laptop computer for use as a Portable Operator's Terminal. Operator shall be able to connect configured Terminal to the system network or directly to each controller for programming, setting up, and troubleshooting.

H. Retain the existing Distech Niagara BMS by Trane operator interface and JACE 8000. Provide only the expansion licenses, database modifications, updated floor-plan and equipment graphics, navigation, schedules, alarms, trends, setpoints, and programming required for the project additions. No new web server, workstation, operating system, wireless/PDA interface, or portable operator terminal is required unless specifically approved.

2.05 CONTROLLER SOFTWARE

A. Building and energy management application software shall reside and operate in system controllers. Applications shall be editable through operator workstation, web browser interface, or engineering workstation.

B. System Security. See Paragraph 2.03.F.5 (Security) and Paragraph 2.03.F.15.c (Operator Activity).

C. Scheduling. See Paragraph 2.03.D.4 (View and Adjust Operating Schedules). System shall provide the following schedule options as a minimum:

1. Weekly. Provide separate schedules for each day of the week. Each schedule shall be able to include up to 5 occupied periods (5 start-stop pairs or 10 events).

2. Exception. Operator shall be able to designate an exception schedule for each of the next 365 days. After an exception schedule has executed, system shall discard and replace exception schedule with standard schedule for that day of the week.

3. Holiday. Operator shall be able to define 24 special or holiday schedules of varying length on a scheduling calendar that repeats each year.

D. System Coordination. Operator shall be able to group related equipment based on function and location and to use these groups for scheduling and other applications.

E. Binary and Analog Alarms. See Paragraph 2.03.F.7 (Alarm Processing).

F. Alarm Reporting. See Paragraph 2.03.F.9 (Alarm Reactions).

G. Remote Communication. System shall automatically contact operator workstation or server on receipt of critical alarms. If no network connection is available, system shall use a modem connection.

H. Maintenance Management. System shall generate maintenance alarms when equipment exceeds adjustable runtime, equipment starts, or performance limits. Configure and enable maintenance alarms as required.

I. Application software shall sequence only the HVAC equipment and systems indicated in the project drawings and sequences of operation

J. PID Control. System shall provide direct- and reverse-acting PID (proportional-integral-derivative) algorithms. Each algorithm shall have anti-windup and selectable controlled variable, setpoint, and PID gains. Each algorithm shall calculate a time-varying analog value that can be used to position an output or to stage a series of outputs.

K. Staggered Start. System shall stagger controlled equipment restart after power outage. Operator shall be able to adjust equipment restart order and time delay between equipment restarts.

L. Anti-Short Cycling. Binary output objects shall be protected from short cycling by means of adjustable minimum on-time and off-time settings.

M. On and Off Control with Differential. System shall provide direct- and reverse-acting on and off algorithms with adjustable differential to cycle a binary output based on a controlled variable and setpoint.

N. Runtime Totalization. System shall provide an algorithm that can totalize runtime for each binary input and output. Operator shall be able to enable runtime alarm based on exceeded adjustable runtime limit. Configure and enable runtime totalization and alarms as required.

2.06 CONTROLLERS

A. General. Provide Building Controllers (BC), Advanced Application Controllers (AAC), Application Specific Controllers (ASC), Smart Actuators (SA), and Smart Sensors (SS) as required to achieve performance specified in *Section 23 09 23* Article 1.9 (System Performance). Every device in the system which executes control logic and directly controls HVAC equipment must conform to a standard BACnet Device profile as specified in ANSI/ASHRAE 135, BACnet Annex L. Unless otherwise specified, hardwired actuators and sensors may be used in lieu of BACnet Smart Actuators and Smart Sensors.

B. BACnet.

1. Building Controllers (BCs). Each BC shall conform to BACnet Building Controller (B-BC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-BC in the BACnet Testing Laboratories (BTL) Product Listing.

2. Advanced Application Controllers (AACs). Each AAC shall conform to BACnet Advanced Application Controller (B-AAC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-AAC in the BACnet Testing Laboratories (BTL) Product Listing.

3. Application Specific Controllers (ASCs). Each ASC shall conform to BACnet Application Specific Controller (B-ASC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-ASC in the BACnet Testing Laboratories (BTL) Product Listing.

4. Smart Actuators (SAs). Each SA shall conform to BACnet Smart Actuator (B-SA) device profile as specified in ANSI/ASHRAE 135, BACnet Annex

L and shall be listed as a certified B-SA in the BACnet Testing Laboratories (BTL) Product Listing.

5. Smart Sensors (SSs). Each SS shall conform to BACnet Smart Sensor (B-SS) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-SS in the BACnet Testing Laboratories (BTL) Product Listing.

6. BACnet Communication.

   a. Each BC shall reside on or be connected to a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing.
   b. BACnet routing shall be performed by BCs or other BACnet device routers as necessary to connect BCs to networks of AACs and ASCs.
   c. Each AAC shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
   d. Each ASC shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
   e. Each SA shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
   f. Each SS shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using ARCNET or MS/TP Data Link/Physical layer protocol.

C. Communication.

1. Service Port. Each controller shall provide a service communication port for connection to a Portable Operator's Terminal. Connection shall be extended to space temperature sensor ports where shown on drawings.

2. Signal Management. BC and ASC operating systems shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and to allow for central monitoring and alarms.

3. Data Sharing. Each BC and AAC shall share data as required with each networked BC and AAC.

4. Stand-Alone Operation. Each piece of equipment specified in drawings and Scope of Work shall be controlled by a single controller to provide stand-alone control in the event of communication failure. All I/O points specified for a piece of equipment shall be integral to its controller. Provide stable and reliable stand-alone control using default values or other method for values normally read over the network.

D. Environment. Controller hardware shall be suitable for anticipated ambient conditions.

1. Controllers used outdoors or in wet ambient conditions shall be mounted in waterproof enclosures and shall be rated for operation at -29°C to 60°C (-20°F to 140°F).

2. Controllers used in conditioned space shall be mounted in dust-protective enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).

E. Keypad. Provide a local keypad and display for each BC and AAC. Operator shall be able to use keypad to view and edit data. Keypad and display shall require password to prevent unauthorized use. If the manufacturer does not normally provide a keypad and display for each BC and AAC, provide the software and any interface cabling needed to use a laptop computer as a Portable Operator's Terminal for the system.

F. Real-Time Clock. Controllers that perform scheduling shall have a real-time clock.

G. Serviceability.

1. Controllers shall have diagnostic LEDs for power, communication, and processor.

2. Wires shall be connected to a field-removable modular terminal strip or to a termination card connected by a ribbon cable.

3. Each BC and AAC shall continually check its processor and memory circuit status and shall generate an alarm on abnormal operation. System shall continuously check controller network and generate alarm for each controller that fails to respond.

H. Memory.

1. Controller memory shall support operating system, database, and programming requirements.

2. Each BC and AAC shall retain BIOS and application programming for at least 72 hours in the event of power loss.

3. Each ASC and SA shall use nonvolatile memory and shall retain BIOS and application programming in the event of power loss. System shall automatically download dynamic control parameters following power loss.

I. Immunity to Power and Noise. Controllers shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m (3 ft).

J. Transformer. ASC power supply shall be fused or current limiting and shall be rated at a minimum of 125% of ASC power consumption.

K. Each BC and AAC shall employ a finite state control engine to eliminate unnecessary conflicts between control functions at crossover points in their operational sequences. Suppliers using non-state based DDC shall provide separate control strategy diagrams for all controlled functions in their submittals.

L. Controllers shall be factory programmed with a continuous adaptive tuning algorithm that senses changes in the physical environment and continually adjusts loop tuning parameters appropriately. Controllers that require manual tuning of loops or perform automatic tuning on command only shall not be acceptable.

2.07 INPUT AND OUTPUT INTERFACE

A. General. Hard-wire input and output points to BCs, AACs, ASCs, or SAs.

B. Protection. Shorting an input or output point to itself, to another point, or to ground shall cause no controller damage. Input or output point contact with up to 24 V for any duration shall cause no controller damage.

C. Binary Inputs. Binary inputs shall monitor the on and off signal from a remote device. Binary inputs shall provide a wetting current of at least 12 mA and shall be protected against contact bounce and noise. Binary inputs shall sense dry contact closure without application of power external to the controller.

D. Pulse Accumulation Inputs. Pulse accumulation inputs shall conform to binary input requirements and shall accumulate up to 10 pulses per second.

E. Analog Inputs. Analog inputs shall monitor low-voltage (0-10 Vdc), current (4-20 mA), or resistance (thermistor or RTD) signals. Analog inputs shall be compatible with and field configurable to commonly available sensing devices.

F. Binary Outputs. Binary outputs shall send an on-or-off signal for on and off control. Building Controller binary outputs shall have three-position (on-off-auto) override switches and status lights. Outputs shall be selectable for normally open or normally closed operation.

G. Analog Outputs. Analog outputs shall send a modulating 0-10 Vdc or 4-20 mA signal as required to properly control output devices. Each Building Controller analog output shall have a two-position (auto-manual) switch, a manually adjustable potentiometer, and status lights. Analog outputs shall not drift more than 0.4% of range annually.

H. Universal Inputs and Outputs. Inputs and outputs that can be designated as either binary or analog in software shall conform to the provisions of this section that are appropriate for their designated use.

2.08 POWER SUPPLIES AND LINE FILTERING

A. Power Supplies. Control transformers shall be UL listed. Furnish Class 2 current-limiting type or furnish over-current protection in primary and secondary circuits for Class 2 service in accordance with NEC requirements. Limit connected loads to 80% of rated capacity.

1. DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100-microsecond response time for 50% load changes. Unit shall have built-in over-voltage and over-current protection and shall be able to withstand 150% current overload for at least three seconds without trip-out or failure.

    a. Unit shall operate between 0°C and 50°C (32°F and 120°F). EM/RF shall meet FCC Class B and VDE 0871 for Class B and MILSTD 810C for shock and vibration.
    b. Line voltage units shall be UL recognized and CSA listed.

B. Power Line Filtering.

1. Provide internal or external transient voltage and surge suppression for workstations and controllers. Surge protection shall have:

a. Dielectric strength of 1000 V minimum
b. Response time of 10 nanoseconds or less
c. Transverse mode noise attenuation of 65 dB or greater
d. Common mode noise attenuation of 150 dB or greater at 40-100 Hz

2.09 AUXILIARY CONTROL DEVICES

A. Motorized Control Dampers.

1. Type. Control dampers shall have linear flow characteristics and shall be parallel- or opposed-blade type as specified below or as scheduled on drawings.

   a. Outdoor and return air mixing dampers and face-and-bypass dampers shall be parallel-blade and shall direct airstreams toward each other.
   b. Other modulating dampers shall be opposed-blade.
   c. Two-position shutoff dampers shall be parallel- or opposed-blade with blade and side seals arranged for normally open or closed operation as required.

2. Frame. Damper frames shall be 13 gauge galvanized steel channel or 1/8" extruded aluminum with reinforced corner bracing.

3. Blades. Damper blades shall not exceed 8" width or 48" in length. Blades shall be suitable for medium velocity 2000 fpm performance. Blades shall be not less than 16 gauge.

4. Shaft Bearings. Damper shaft bearings shall be as recommended by manufacturer for application, oil impregnated sintered bronze, or better.

5. Seals. Blade edges and frame top and bottom shall have replaceable seals of butyl rubber or neoprene. Side seals shall be spring-loaded stainless steel. Blade seals shall leak no more than 10 cfm per ft^2 at 1000 Pa (4 in. w.g.) differential pressure. Blades shall be airfoil type suitable for wide-open face velocity of 1500 fpm.

6. Sections. Damper sections shall not exceed 48" - 60". Each section shall have at least one damper actuator.

7. Linkages. Dampers shall have exposed linkages.

B. Electric Damper and valve Actuators.

1. Stall Protection. Mechanical or electronic stall protection shall prevent actuator damage throughout the actuator's rotation.

2. Spring-return Mechanism. Actuators used for power-failure and safety applications shall have an internal mechanical spring-return mechanism or an uninterruptible power supply (UPS).

3. Signal and Range. Proportional actuators shall accept a 0-10 Vdc or a 0-20 mA control signal and shall have a 2-10 Vdc or 4-20 mA operating range.

4. Wiring. 24 Vac and 24 Vdc actuators shall operate on Class 2 wiring.

5. Manual Positioning. Operators shall be able to manually position each actuator when the actuator is not powered. Non-spring-return actuators shall have an external manual gear release. Spring-return actuators with more than 7 N·m (60 in.-lb) torque capacity shall have a manual crank.

C. Control Valves

1. General. Select body and trim materials in accordance with manufacturer's recommendations for design conditions and service shown.

2. Type. Provide two- or three-way control valves for two-position or modulating service as shown.

3. Water Valves.

a. Valves providing two-position service shall be quick opening. Two-way valves shall have replaceable disc or ball.

b. Close-off (Differential) Pressure Rating. Valve actuator and trim shall provide the following minimum close-off pressure ratings.

1) Two-way: 150% of total system (pump) head.
2) Three-way: 300% of pressure differential between ports A and B at design flow or 100% of total system (pump) head.

c. Ports. Valves providing modulating service shall have equal percentage ports.

d. Sizing.

1) Two-position service: line size.
2) Two-way modulating service: select pressure drop equal to the greatest of twice the pressure drop through heat exchanger (load), 50% of the pressure difference between supply and return mains, or 35 kPa (5 psi).
3) Three-way modulating service: select pressure drop equal to the smaller of twice the pressure drop through the coil exchanger (load) or 35 kPa (5 psi).

e. Fail Position. Water valves shall fail normally open or closed as follows unless otherwise specified.

1) Water zone valves: normally open.
2) Heating coils in air handlers: normally open.
3) Other applications: as scheduled or as required by sequences of operation.

D. Binary Temperature Devices.

1. Low-Voltage Space Thermostats. Low-voltage space thermostats shall be 24 V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater, concealed setpoint adjustment, 55°F-85°F setpoint range, 2°F maximum differential, and vented ABS plastic cover.

2. Line-Voltage Space Thermostats. Line-voltage space thermostats shall be bimetal-actuated, open-contact type or bellows-actuated, enclosed, snap-switch type or equivalent solid-state type, with heat anticipator, UL listing for electrical rating, concealed setpoint adjustment, 55°F-85°F setpoint range, 2°F maximum differential, and vented ABS plastic cover.

3. Low-Limit Thermostats. Low-limit airstream thermostats shall be UL listed, vapor pressure type. Element shall be at least 6 m (20 ft) long. Element shall sense temperature in each 30 cm (1 ft) section and shall respond to lowest sensed temperature. Low-limit thermostat shall be manual reset only.

E. Temperature Sensors.

1. Type. Temperature sensors shall be Resistance Temperature Device (RTD) or thermistor.

2. Duct Sensors. Duct sensors shall be single point or averaging as shown. Averaging sensors shall be a minimum of 5 ft in length per 10 ft^2 of duct cross-section.

3. Immersion Sensors. Provide immersion sensors with a separable stainless steel well. Well pressure rating shall be consistent with system pressure it will be immersed in. Well shall withstand pipe design flow velocities.

4. Space Sensors. Space sensors shall have setpoint adjustment, override switch, display, and communication port as shown.

5. Differential Sensors. Provide matched sensors for differential temperature measurement.

F. Humidity Sensors.

1. Duct and room sensors shall have a sensing range of 20%-80%.

2. Duct sensors shall have a sampling chamber.

3. Outdoor air humidity sensors shall have a sensing range of 20%-95% RH and shall be suitable for ambient conditions of 40°F-170°F.

4. Humidity sensors shall not drift more than 1% of full scale annually.

G. Carbon Dioxide Transmitter.

1. Materials: ABS Plastic, Silicon Sensor

2. Rating: UL and CE

3. Mounting: Wall, Duct

4. Range: 0-2000 ppm

5. Accuracy: At 68 degrees F + -30ppm CO2 + 2% of reading, non-linearity 1% of Full scale

6. Calibration: Every 5 years

7. Output: 0 to 20mA, 4 to 20mA, or 0 to 10 VDC Jumper Selectable

8. Special: Single-beam, Dual wavelength.

H. Flow Switches. Flow-proving switches shall be paddle (water service only) or differential pressure type (air or water service) as shown. Switches shall be UL listed, SPDT snap-acting, and pilot duty rated (125 VA minimum).

1. Paddle switches shall have adjustable sensitivity and NEMA 1 enclosure unless otherwise specified.

2. Differential pressure switches shall have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.

I. Relays.

1. Control Relays. Control relays shall be plug-in type, UL listed, and shall have dust cover and LED "energized" indicator. Contact rating, configuration, and coil voltage shall be suitable for application.

2. Time Delay Relays. Time delay relays shall be solid-state plug-in type, UL listed, and shall have adjustable time delay. Delay shall be adjustable ±100% from setpoint shown. Contact rating, configuration, and coil voltage shall be suitable for application. Provide NEMA 1 enclosure for relays not installed in local control panel.

J. Current Transmitters:

1. AC current transmitters shall be self-powered, combination split-core current transformer type with built-in rectifier and high-gain servo amplifier with 4-20 mA two-wire output. Full-scale unit ranges shall be 10 A, 20 A, 50 A, 100 A, 150 A, and 200 A, with internal zero and span adjustment. Unit accuracy shall be ±1% full-scale at 500 ohm maximum burden.

2. Transmitter shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized.

3. Unit shall be split-core type for clamp-on installation on existing wiring.

K. Current Transformers.

1. AC current transformers shall be UL/CSA recognized and shall be completely encased (except for terminals) in approved plastic material.

2. Transformers shall be available in various current ratios and shall be selected for ±1% accuracy at 5 A full-scale output.

3. Use fixed-core transformers for new wiring installation and split-core transformers for existing wiring installation.

L. Voltage Transmitters:

1. AC voltage transmitters shall be self-powered single-loop (two-wire) type, 4-20 mA output with zero and span adjustment.

2. Adjustable full-scale unit ranges shall be 100-130 Vac, 200-250 Vac, 250-330 Vac, and 400-600 Vac. Unit accuracy shall be ±1% full-scale at 500 ohm maximum burden.

3. Transmitters shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized at 600 Vac rating.

M. Voltage Transformers.

1. AC voltage transformers shall be UL/CSA recognized, 600 Vac rated, and shall have built-in fuse protection.

2. Transformers shall be suitable for ambient temperatures of 40°F-130°F and shall provide ±0.5% accuracy at 24 Vac and 5 VA load.

3. Windings (except for terminals) shall be completely enclosed with metal or plastic.

N. Current Switches.

1. Current-operated switches shall be self-powered, solid-state with adjustable trip current. Select switches to match application current and DDC system output requirements.

O. Pressure Transducers.

1. Transducers shall have linear output signal and field-adjustable zero and span.

2. Continuous operating conditions of positive or negative pressure 50% greater than calibrated span shall not damage transducer sensing elements.

3. Water pressure transducer diaphragm shall be stainless steel with minimum proof pressure of 150 psi. Transducer shall have 4-20 mA output, suitable mounting provisions, and block and bleed valves.

4. Water differential pressure transducer diaphragm shall be stainless steel with minimum proof pressure of 150 psi. Over-range limit (differential

pressure) and maximum static pressure shall be 300 psi. Transducer shall have 4-20 mA output, suitable mounting provisions, and 5-valve manifold.

P. Differential Pressure Switches. Differential pressure switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum) and shall have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.

Q. Local Control Panels.

1. Indoor control panels shall be fully enclosed NEMA 1 construction with hinged door key-lock latch and removable sub-panels. A common key shall open each control panel and sub-panel.

2. Prewire internal and face-mounted device connections with color-coded stranded conductors tie-wrapped or neatly installed in plastic troughs. Field connection terminals shall be UL listed for 600 V service, individually identified per control and interlock drawings, with adequate clearance for field wiring.

3. Each local panel shall have a control power source power switch (on-off) with overcurrent protection.

2.10 WIRING AND RACEWAYS

A. General: Provide copper wiring, plenum cable, and raceways as specified in applicable sections of *Division 26*.

B. Insulated wire shall use copper conductors and shall be UL listed for 200°F minimum service.

2.12 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Thoroughly examine project plans for control device and equipment locations. Report discrepancies, conflicts, or omissions to Architect or *ENGINEER* for resolution before starting rough-in work.

B. Inspect site to verify that equipment can be installed as shown. Report discrepancies, conflicts, or omissions to *ENGINEER* for resolution before starting rough-in work.

C. Examine drawings and specifications for work of others. Report inadequate headroom or space conditions or other discrepancies to *ENGINEER* and obtain written instructions for changes necessary to accommodate *Section 23 09 23* work with work of others. Controls Contractor shall perform at his expense necessary changes in specified work caused by failure or neglect to report discrepancies.

3.02 PROTECTION

A. Controls Contractor shall protect against and be liable for damage to work and to material caused by Contractor's work or employees.

B. Controls Contractor shall be responsible for work and equipment until inspected, tested, and accepted. Protect material not immediately installed. Close open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.03 COORDINATION

A. Site.

1. Assist in coordinating space conditions to accommodate the work of each trade where work will be installed near or will interfere with work of other trades. If installation without coordination causes interference with work of other trades, Contractor shall correct conditions without extra charge.

2. Coordinate and schedule work with other work in the same area and with work dependent upon other work to facilitate mutual progress.

B. Submittals. See *Section 23 09 23* Article 1.10 (Submittals).

C. Test and Balance.

1. Provide Test and Balance Contractor a single set of necessary tools to interface to control system for testing and balancing.

2. Train Test and Balance Contractor to use control system interface tools.

3. Provide a qualified technician to assist with testing and balancing.

4. Test and Balance Contractor shall return tools undamaged and in working condition at completion of testing and balancing.

D. Life Safety.

1. Duct smoke detectors required for air handler shutdown shall be provided by the mechanical contractor. Interlock smoke detectors to air handlers for shutdown as specified in Sequence of Operation on HVAC drawings.

E. Coordination with Other Controls. Integrate with and coordinate controls and control devices furnished or installed by others as follows.

1. Communication media and equipment shall be provided as specified in *Section 23 09 23* Article 2.03 (Communication).

2. Each supplier of a controls product shall configure, program, start up, and test that product to meet the sequences of operation of existing and new HVAC equipment

3. Coordinate and resolve incompatibility issues that arise between control products provided under this section and those provided under other sections or divisions of this specification.

4. Controls Contractor shall be responsible for integration of control products provided by multiple suppliers regardless of where integration is described within the contract documents.

3.04 GENERAL WORKMANSHIP

A. Install equipment, piping, and wiring or raceway horizontally, vertically, and parallel to walls wherever possible.

B. Provide sufficient slack and flexible connections to allow for piping and equipment vibration isolation.

C. Install equipment in readily accessible locations as defined by National Electrical Code (NEC) Chapter 1 Article 100 Part A.

D. Verify wiring integrity to ensure continuity and freedom from shorts and ground faults.

E. Equipment, installation, and wiring shall comply with industry specifications and standards and local codes for performance, reliability, and compatibility.

3.05 FIELD QUALITY CONTROL

A. Work, materials, and equipment shall comply with rules and regulations of applicable local, state, and federal codes and ordinances as identified in Specification *Section 23 05 00* (Codes and Standards).

B. Continually monitor field installation for code compliance and workmanship quality.

C. Contractor shall arrange for work inspection by local or state authorities having jurisdiction over the work.

3.06 EXISTING EQUIPMENT (Project related only)

A. Remove only pneumatic controls, thermostats, sensors, actuators, wiring, and control panels directly associated with HVAC equipment being removed or modified under this project. Retain and protect the existing JACE 8000, Trane BMS front end, existing control network, and controls serving equipment outside the project scope. Reuse existing devices only where specifically indicated and after verifying proper operation

B. Repair. Unless otherwise directed, BMS Contractor is not responsible for repair or replacement of existing HVAC equipment and systems, valves, dampers, or actuators. Notify *ENGINEER* in writing immediately of existing equipment that requires maintenance.

C. Indicator Gauges. Ensure operation of and recalibrate for reasonable accuracy or replace existing gauges.

D. Coordinate all control cutovers with the *OWNER*. Maintain operation of existing HVAC systems serving occupied areas during construction and perform shutdowns outside occupied hours unless otherwise approved by the *OWNER*

E. Maintain fan scheduling using existing or temporary time clocks or control systems throughout the control system installation.

F. Modify existing starter control circuits if necessary to provide hand-off-auto control of each controlled starter. Furnish new starters or starter control packages as required.

G. Patch holes and finish to match existing walls.

3.07 WIRING

A. Controls sub-contractor shall utilize dedicated circuits indicated on Electrical Drawings for 120V power. Any power requirements beyond that indicated on the Electrical Drawings shall be the responsibility of the controls sub-contractor.

B. Control and interlock wiring and installation shall comply with national and local electrical codes, *Division 26*, and manufacturer's recommendations. Where the requirements of this section differ from *Division 26*, this section shall take precedence.

C. NEC Class 1 (line voltage) wiring shall be UL listed in approved raceway as specified by NEC and *Division 26*.

D. Low-voltage wiring shall meet NEC Class 2 requirements. Subfuse low-voltage power circuits as required to meet Class 2 current limit.

E. NEC Class 2 (current-limited) wires not in raceway but in concealed and accessible locations such as return air plenums shall be UL listed for the intended application.

F. All control wiring shall be installed in conduit

G. Install Class 1 and Class 2 wiring in separate raceways. Boxes and panels containing high-voltage wiring and equipment shall not be used for low-voltage wiring except for the purpose of interfacing the two through relays and transformers.

H. Do not install wiring in raceway containing tubing.

I. Run exposed Class 2 wiring parallel to a surface or perpendicular to it and tie neatly at 3 m (10 ft) intervals.

J. Use structural members to support or anchor plenum cables without raceway. Do not use ductwork, electrical raceways, piping, or ceiling suspension systems to support or anchor cables.

K. Secure raceways with raceway clamps fastened to structure and spaced according to code requirements. Raceways and pull boxes shall not be hung on or attached to ductwork, electrical raceways, piping, or ceiling suspension systems.

L. Size raceway and select wire size and type in accordance with manufacturer's recommendations and NEC requirements.

M. Include one pull string in each raceway 2.5 cm (1 in.) or larger.

N. Use color-coded conductors throughout.

O. Locate control and status relays in designated enclosures only. Do not install control and status relays in packaged equipment control panel enclosures containing Class 1 starters.

P. Conceal raceways except within mechanical, electrical, or service rooms. Maintain minimum clearance of 15 cm (6 in.) between raceway and high-temperature equipment such as steam pipes or flues.

Q. Adhere to requirements in *Division 26* where raceway crosses building expansion joints.

R. Install insulated bushings on raceway ends and enclosure openings. Seal top ends of vertical raceways.

S. Terminate control and interlock wiring related to the work of this section. Maintain at the job site updated (as-built) wiring diagrams that identify terminations.

T. Flexible metal raceways and liquid-tight flexible metal raceways shall not exceed 1 m (3 ft) in length and shall be supported at each end. Do not use flexible metal raceway less than ½ in. electrical trade size. Use liquid-tight flexible metal raceways in areas exposed to moisture including chiller and boiler rooms.

U. Install raceway rigidly, support adequately, ream at both ends, and leave clean and free of obstructions. Join raceway sections with couplings and according to code. Make terminations in boxes with fittings. Make terminations not in boxes with bushings.

3.08 COMMUNICATION WIRING

A. Communication wiring shall be low-voltage Class 2 wiring and shall comply with Article 3.7 (Wiring).

B. Install communication wiring in separate raceways and enclosures from other Class 2 wiring.

C. During installation, do not exceed maximum cable pulling, tension, or bend radius specified by the cable manufacturer.

D. Verify entire network's integrity following cable installation using appropriate tests for each cable.

E. Install lightning arrestor according to manufacturer's recommendations between cable and ground where a cable enters or exits a building.

F. Each run of communication wiring shall be a continuous length without splices when that length is commercially available. Runs longer than commercially available lengths shall have as few splices as possible using commercially available lengths.

G. Label communication wiring to indicate origination and destination.

H. Ground coaxial cable according to NEC regulations article on "Communications Circuits, Cable, and Protector Grounding."

I. BACnet MS/TP communications wiring shall be installed in accordance with ASHRAE/ANSI Standard 135. This includes but is not limited to:

1. The network shall use shielded, twisted-pair cable with characteristic impedance between 100 and 120 ohms. Distributed capacitance between conductors shall be less than 100 pF per meter (30 pF per foot.)

2. The maximum length of an MS/TP segment is 1200 meters (4000 ft) with AWG 18 cable. The use of greater distances and/or different wire gauges shall comply with the electrical specifications of EIA-485.

3. The maximum number of nodes per segment shall be 32, as specified in the EIA 485 standard. Additional nodes may be accommodated by the use of repeaters.

4. An MS/TP EIA-485 network shall have no T connections.

3.10 INSTALLATION OF SENSORS

A. Install sensors according to manufacturer's recommendations.

B. Mount sensors rigidly and adequately for operating environment.

C. Install room temperature sensors on concealed junction boxes properly supported by wall framing.

D. Air seal wires attached to sensors in their raceways or in the wall to prevent sensor readings from being affected by air transmitted from other areas.

E. Use averaging sensors in mixing plenums and hot and cold decks. Install averaging sensors in a serpentine manner vertically across duct. Support each bend with a capillary clip.

F. Install mixing plenum low-limit sensors in a serpentine manner horizontally across duct. Support each bend with a capillary clip. Provide 3 m (1 ft) of sensing element for each 1 m^2 (1 ft^2) of coil area.

G. Install pipe-mounted temperature sensors in wells. Install liquid temperature sensors with heat-conducting fluid in thermal wells.

H. Install outdoor air temperature sensors on north wall at designated location with sun shield.

I. Differential Air Static Pressure.

1. Supply Duct Static Pressure. Pipe high-pressure tap to duct using a pitot tube. Make pressure tap connections according to manufacturer's recommendations.

2. Return Duct Static Pressure. Pipe high-pressure tap to duct using a pitot tube. Make pressure tap connections according to manufacturer's recommendations.

3. Building Static Pressure. Pipe pressure sensor's low-pressure port to the static pressure port located on the outside of the building through a high-volume accumulator. Pipe high-pressure port to a location behind a thermostat cover.

4. Piping to pressure transducer pressure ports shall contain a capped test port adjacent to transducer.

5. Pressure transducers, except those controlling VAV boxes, shall be located in control panels, not on monitored equipment or on ductwork. Mount transducers in a vibration-free location accessible for service without use of ladders or special equipment.

6. Mount gauge tees adjacent to air and water differential pressure taps. Install shut-off valves before tee for water gauges.

J. Smoke detectors, freezestats, high-pressure cut-offs, and other safety switches shall be hard-wired to de-energize equipment as described in the sequence of operation. Switches shall require manual reset. Provide contacts that allow DDC software to monitor safety switch status.

3.11 ACTUATORS

A. General. Mount actuators and adapters according to manufacturer's recommendations.

B. Electric and Electronic Damper Actuators. Mount actuators directly on damper shaft or jackshaft unless shown as a linkage installation. Link actuators according to manufacturer's recommendations.

1. For low-leakage dampers with seals, mount actuator with a minimum 5° travel available for damper seal tightening.

2. To compress seals when spring-return actuators are used on normally closed dampers, power actuator to approximately 5° open position, manually close the damper, then tighten linkage.

3. Check operation of damper-actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.

4. Provide necessary mounting hardware and linkages for actuator installation.

C. Valve Actuators. Connect actuators to valves with adapters approved by actuator manufacturer.

3.12 WARNING LABELS

A. Affix permanent warning labels to equipment that can be automatically started by the control system.

1. Labels shall use white lettering (12-point type or larger) on a red background.

2. Warning labels shall read as follows.

C A U T I O N
This equipment is operating under automatic control and may start or stop at any time without warning. Switch disconnect to "Off" position before servicing.

B. Affix permanent warning labels to motor starters and control panels that are connected to multiple power sources utilizing separate disconnects.

1. Labels shall use white lettering (12-point type or larger) on a red background.

2. Warning labels shall read as follows.

C A U T I O N
This equipment is fed from more than one power source with separate disconnects. Disconnect all power sources before servicing.

3.13 IDENTIFICATION OF HARDWARE AND WIRING

A. Label wiring and cabling, including that within factory-fabricated panels, with control system address or termination number at each end within 5 cm (2 in.) of termination.

B. Label pneumatic tubing at each end within 5 cm (2 in.) of termination with a descriptive identifier.

C. Permanently label or code each point of field terminal strips to show instrument or item served.

D. Label control panels with minimum 1 cm (½ in.) letters on laminated plastic nameplates.

E. Label each control component with a permanent label. Label plug-in components such that label remains stationary during component replacement.

F. Label room sensors related to terminal boxes or valves with nameplates.

G. Manufacturers' nameplates and UL or CSA labels shall be visible and legible after equipment is installed.

H. Label identifiers shall match record documents.

3.14 PROGRAMMING

A. Point Naming. Name points as shown on the equipment points list provided with each sequence of operation on drawings. If character limitations or space restrictions make it advisable to shorten the name, use industry standard abbreviations. Where multiple points with the same name reside in the same controller, each point name may be customized with its associated Program Object number. For example, "Zone Temp 1" for Zone 1, "Zone Temp 2" for Zone 2.

B. Software Programming. Programming shall provide actions for each possible situation. Graphic- or parameter-based programs shall be documented. Text-based programs shall be modular, structured, and commented to clearly describe each section of the program.

1. Application Programming. Provide application programming that adheres to sequences of operation specified on drawings. Program documentation or comment statements shall reflect language used in sequences of operation.

2. System Programming. Provide system programming necessary for system operation.

C. Operator Interface.

1. Standard Graphics. Provide graphics as specified herein. Show on each equipment graphic input and output points and relevant calculated points such as indicated on the applicable Points List on drawings. Point information on graphics shall dynamically update.

2. Update and test the existing operator interface, project database, and graphics for the new and modified HVAC equipment. Do not install a new operating system or new operator-interface software unless required for the approved expansion license

3.15 CONTROL SYSTEM CHECKOUT AND TESTING

A. Startup Testing. Complete startup testing to verify operational control system before notifying *OWNER* of system demonstration. Provide *OWNER* with schedule for startup testing. *OWNER* may have representative present during any or all startup testing.

1. Calibrate and prepare for service each instrument, control, and accessory equipment furnished under *Section 23 09 23.*

2. Verify that control wiring is properly connected and free of shorts and ground faults. Verify that terminations are tight.

3. Enable control systems and verify each input device's calibration.

4. Calibrate each device according to manufacturer's recommendations.

5. Verify that binary output devices such as relays, solenoid valves, two-position actuators and control valves, and magnetic starters, operate properly and that normal positions are correct.

6. Verify that analog output devices such as I/Ps and actuators are functional, that start and span are correct, and that direction and normal positions are correct. Check control valves and automatic dampers to ensure proper action and closure. Make necessary adjustments to valve stem and damper blade travel.

7. Prepare a log documenting startup testing of each input and output device, with technician's initials certifying each device has been tested and calibrated.

8. Verify that system operates according to sequences of operation. Simulate and observe each operational mode by overriding and varying inputs and schedules. Tune PID loops and each control routine that requires tuning.

9. Alarms and Interlocks.

    a. Check each alarm with an appropriate signal at a value that will trip the alarm.
    b. Trip interlocks using field contacts to check logic and to ensure that actuators fail in the proper direction.
    c. Test interlock actions by simulating alarm conditions to check initiating value of variable and interlock action.

3.16 CONTROL SYSTEM DEMONSTRATION AND ACCEPTANCE

A. Demonstration. Prior to acceptance, perform the following performance tests to demonstrate system operation and compliance with specification after and in addition to tests specified in Article 3.17 (Control System Checkout and Testing). Provide *ENGINEER* with log documenting completion of startup tests.

1. *ENGINEER* will be present to observe and review system demonstration. Notify *ENGINEER* at least 10 days before system demonstration begins.

2. Demonstration shall follow process submitted and approved under *Section 23 09 23* Article 1.10 (Submittals). Complete approved checklists and forms for each system as part of system demonstration.

3. Demonstrate actual field operation of each sequence of operation as specified in *Section 23 09 93*. Provide at least two persons equipped with two-way communication. Demonstrate calibration and response of any input and output points requested by *ENGINEER*. Provide and operate test equipment required to prove proper system operation.

4. Demonstrate compliance with *Section 23 09 23* Part 1 (System Performance).

5. Demonstrate compliance with sequences of operation through each operational mode.

6. Demonstrate complete operation of operator interface.

7. Demonstrate each of the following.

   a. DDC loop response. Supply graphical trend data output showing each DDC loop's response to a setpoint change representing an actuator position change of at least 25% of full range. Trend sampling rate shall be from 10 seconds to 3 minutes, depending on loop speed. Each sample's trend data shall show setpoint, actuator position, and controlled variable values. *ENGINEER* will require further tuning of each loop that displays unreasonably under- or over-damped control.
   b. Demonstrate only the project-specific safety interlocks required by the sequences of operation, including RTU duct-smoke-detector shutdowns and kitchen-hood fire-suppression interlocks for MAU-1 and KEF-1.

c. Trend logs for each system. Trend data shall indicate setpoints, operating points, valve positions, and other data as specified in the points list provided with each sequence of operation in *Section 23 09 93.* Each log shall cover three 48-hour periods and shall have a sample frequency not less than 10 minutes or as specified on its points list. Logs shall be accessible through system's operator interface and shall be retrievable for use in other software programs as specified in *Section 23 09 23* Article 2.3 Paragraph E.11 (Trend Configuration).

8. Tests that fail to demonstrate proper system operation shall be repeated after Contractor makes necessary repairs or revisions to hardware or software to successfully complete each test.

B. Acceptance.

1. After tests described in this specification are performed to the satisfaction of both *ENGINEER* and *OWNER*, *ENGINEER* will accept control system as meeting completion requirements. *ENGINEER* may exempt tests from completion requirements that cannot be performed due to circumstances beyond Contractor's control. *ENGINEER* will provide written statement of each exempted test. Exempted tests shall be performed as part of warranty.

2. System shall not be accepted until completed demonstration forms and checklists are submitted and approved as required in *Section 23 09 23* Article 1.10 (Submittals).

3.17 CLEANING

A. Each day clean up debris resulting from work. Remove packaging material as soon as its contents have been removed. Collect waste and place in designated location.

B. On completion of work in each area, clean work debris and equipment. Keep areas free from dust, dirt, and debris.

C. On completion of work, check equipment furnished under this section for paint damage. Repair damaged factory-finished paint to match adjacent areas. Replace deformed cabinets and enclosures with new material and repaint to match adjacent areas.

3.18 TRAINING

A. Provide training for a designated staff of *OWNER*'s representatives. Training shall be provided via self-paced training, web-based or computer-based training, classroom training, or a combination of training methods. Training shall cover both the existing BMS system and the new systems and equipment integrated under this project. Provide a total of min. 16 hours of *OWNER* training.

B. Training shall enable students to accomplish the following objectives.

1. Proficiently operate system

2. Understand control system architecture and configuration

3. Understand DDC system components

4. Understand system operation, including DDC system control and optimizing routines (algorithms)

5. Operate workstation and peripherals

6. Log on and off system

7. Access graphics, point reports, and logs

8. Adjust and change system setpoints, time schedules, and holiday schedules

9. Recognize common HVAC system malfunctions by observing system graphics, trend graphs, and other system tools

10. Understand system drawings and Operation and Maintenance manual

11. Understand job layout and location of control components

12. Access data from DDC controllers

13. Operate portable operator's terminals

14. Create and change system graphics

15. Create, delete, and modify alarms, including configuring alarm reactions

16. Create, delete, and modify point trend logs (graphs) and multi-point trend graphs

17. Configure and run reports

18. Add, remove, and modify system's physical points

19. Create, modify, and delete application programming

20. Add operator interface stations

21. Add a new controller to system

22. Download firmware and advanced applications programming to a controller

23. Configure and calibrate I/O points

24. Maintain software and prepare backups

25. Interface with job-specific, third-party operator software

26. Add new users and understand password security procedures

C. Divide presentation of objectives into three sessions (1-13, 14-23, and 24-26). Participants will attend one or more of sessions, depending on knowledge level required.

1. Day-to-day Operators (objectives 1-13)

2. Advanced Operators (objectives 1-13 and 14-23)

3. System Managers and Administrators (objectives 1-13 and 24-26)

D. Provide course outline and materials according to *Section 23 09 23* Article 1.10 (Submittals). Provide one copy of training material per student.

E. Instructors shall be factory-trained and experienced in presenting this material.

F. Perform classroom training using a network of working controllers representative of installed hardware.

****END OF SECTION****

SECTION 23 11 23

FACILITY NATURAL GAS PIPING

PART 1- GENERAL

1.01 DESCRIPTION

A. Work included:

1. Natural gas piping – above ground.
2. Unions and flanges.
3. Valves.
4. Pipe hangers and supports.
5. Strainers.
6. Natural gas pressure regulators.
7. Natural gas pressure relief valves.

B. Related Work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 03 30 00: Concrete*.

3. *Section 07 84 00: Firestopping*

4. *Section 08 31 13: Access Doors and Frames*

5. *Section 09 90 00: Painting*

1.02 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified, provide compatible system components and joints. Use non-conducting dielectric connections whenever jointing dissimilar metals in open systems.

B. Provide flanges, union, and couplings at locations requiring servicing. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.

C. Provide pipe hangers and supports in accordance with ASME B31.1, ASME B31.9 and ASTM F708.

D. Use plug or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Product Data:

1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturer's catalog information.

2. Valves: Submit manufacturers catalog information with valve data and ratings for each service.

3. Hangers and Supports: Submit manufacturers catalog information including load capacity.

4. Piping Specialties: Submit manufacturers catalog information including capacity, rough-in requirements, and service sizes for the following:

a. Strainers.
b. Natural gas pressure regulators.
c. Natural gas pressure relief valves.

C. Manufacturer’s Installation Instructions: Submit installation instructions for valves and accessories.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during

execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

4. Comply with requirements of local Gas Company.

5. Welders certification: In accordance with ANSI/AWS D1.1.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.05 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection:

1. Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

2. Provide temporary protective coating on cast iron and steel valves.

3. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

4. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original

unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.06 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

PART 2 – PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.

1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M forged steel welding type.

2. Joints: Threaded for pipe 2 inch and smaller; welded for pipe 2-1/2 inches and larger.

B. Copper Tubing: ASTM B88, Type K annealed.

1. Fittings: ASME B16.26 cast bronze, compression type.

2. Joints: Flared.

2.03 UNIONS AND FLANGES

A. Unions for Pipe 2-inches and Smaller:

1. Ferrous Piping: Class 150, malleable iron, threaded.

2. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

B. Flanges for Pipe 2½ inches and Larger:

1. Ferrous Piping: Class 150, forged steel, slip-on flanges.

2. Gaskets: 1/16 inch thick preformed neoprene gaskets.

2.04 BALL VALVES

A. Acceptable manufacturers:

1. Crane Valve, North America
2. Hammond Valve
3. Milwaukee Valve Company
4. NIBCO, Inc.
5. Stockham Valves & Fittings
6. Or equivalent.

B. ¼- inch to 1 inch: MSS SP 110, Class 125, two piece, threaded ends, bronze body, chrome plated bronze ball, reinforced teflon seats, blow-out proof stem, lever handle, UL 842 listed for flammable liquids and LPG, full port.

C. 1¼ inch to 3 inch: MSS SP 110, Class 125, two piece, threaded ends, bronze body, chrome plated bronze ball, reinforced teflon seats, blow-out proof stem, lever handle, UL 842 listed for flammable liquids and LPG, conventional port.

205 PLUG VALVES

A. Acceptable manufacturers:

1. DeZURIK, Unit of SPX Corp.
2. Flow Control Equipment, Inc.
3. Homestead Valve.
4. Or equivalent.

B. 2-inches and Smaller: MSS SP 78, Class 150, semi-steel construction, round port, full pipe area, pressure lubricated, teflon packing, threaded ends. Furnish one plug valve wrench for every ten plug-valves with minimum of one wrench.

C. 2½ inches and Larger: MSS SP 78, Class 150 construction, round port, full pipe area, pressure lubricated, teflon packing, flanged ends. Furnish wrench-operated.

2.06 PIPE HANGERS AND SUPPORTS

A. Comply with the requirements of *Section 23 05 29, Hangers and Supports for HVAC Piping and Equipment*.

2.07 STRAINERS

A. Acceptable manufacturers:

1. Mueller Steam Specialty
2. O.C. Keckley Company
3. Spirax Sarco, Inc.
4. Or equivalent.

B. 2 inch and Smaller: Screwed brass or iron body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.

C. 2½ inch to 4-inch: Flanged iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.

2.08 NATURAL GAS PRESSURE REGULATORS

A. Acceptable manufacturers:

1. Maxitrol Company
2. Or equivalent.

B. Product Description: Spring loaded, general purpose, self-operating service regulator including internal relief type diaphragm assembly and vent valve. Diaphragm case can be rotated 360 degrees in relation to body.

1. Temperatures: minus 20 degrees F to 150 degrees F.

2. Body: Cast iron.

3. Spring case, lower diaphragm casing, union ring, seat ring and disk holder: Aluminum.

4. Disk, diaphragm, and O-ring: Nitrile.

5. Maximum inlet pressure: 150 psig.

6. Furnish sizes 2 inches and smaller with threaded ends. Furnish sizes 2½ inches and larger with flanged ends.

2.09 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed with installation until conditions are satisfactory.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt, on inside and outside, before assembly.

C. All connections to equipment shall be with unions or flanges.

3.03 INSTALLATION - HANGERS AND SUPPORTS

A. Install hangers and supports in accordance with *Section 23 05 29*.

3.04 INSTALLATION - INSERTS

A. Provide inserts for placement in concrete forms.

B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 inches and larger.

D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.

3.05 INSTALLATION - ABOVE GROUND PIPING

A. Install natural gas piping in accordance with NFPA 54.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient.

D. Install piping to conserve building space and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Sleeve pipe passing through partitions, walls and floors.

H. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping as specified in *Section 07 84 00, Firestopping*.

I. Provide clearance for installation of insulation and access to valves and fittings.

J. Provide support for utility meters in accordance with requirements of utility company.

K. Install vent piping from gas pressure reducing valves to outdoors and terminate in weatherproof hood.

L. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with *ENGINEER*.

M. Where pipe support members are welded to structural building framing, scrape, brush clean, weld, and apply one coat of zinc rich primer in accordance with *Section 05 50 00, Metal Fabrications*.

N. Prepare pipe, fittings, supports, and accessories not pre-finished, ready for finish painting as specified in *Section 09 90 00, Painting*.

O. Install identification on piping systems including underground piping as specified in *Section 23 05 53, Identification of HVAC Piping and Equipment*.

N. Install valves with stems upright or horizontal, not inverted.

O. Install gas pressure regulator with tee fitting between regulator and upstream shutoff valve. Cap or plug one opening of tee fitting.

P. Install gas pressure regulator with tee fitting not less than 10 pipe diameters down stream of regulator. Cap or plug one opening of tee fitting.

Q. Install gas pressure regulator with independent vent full size opening on regulator and terminate outdoors.

R. Install Work in accordance with the Uniform Construction Code of New Jersey.

3.06 INSTALLATION - LEAK DETECTION AND LOCATION SYSTEM

A. All gas piping to be pressure tested as required by the International Fuel Gas Cose IFGC), 2021 edition.

3.07 CLEANING

A. Clean exposed surface of all grease, dirt and other foreign materials.

B. Touch up all marred or abraded surfaces in accordance with manufacturer's directions.

END OF SECTION

SECTION 23 21 15

PIPING SPECIALTIES FOR HEATING SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Piping specialties for heating systems.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 23 05 03: HVAC Piping*

C. References:

1. American Society of Mechanical Engineers:

   a. ASME B40.1 - Gauges - Pressure Indicating Dial Type - Elastic Element.
   b. ASME Section VIII - Boiler and Pressure Vessel Code - Pressure Vessels.

2. American Society for Testing and Materials:

   a. ASTM A105/A105M - Standard Specification for Carbon Steel Forgings for Piping Applications.
   b. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
   c. ASTM A216/A216M - Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service.
   d. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
   e. ASTM E1 - Standard Specification for ASTM Thermometers.

f. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers.

3. Underwriters Laboratories Inc.

a. UL 393 - Indicating Pressure Gauges for Fire Protection Service.
b. UL 404 - Gauges, Indicating Pressure, for Compressed Gas Service.

D. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *HEATING SPECIALTIES FOR HEATING SYSTEMS* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Shop drawings showing precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provision in concrete forming, reinforcement, and placement to accommodate the work of this section.

D. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by

manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance: The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 TEST PLUGS

A. ¼ inch (6mm) NPT or ½ inch (13mm) NPT brass fitting and cap for receiving 1/8 inch (3mm) outside diameter pressure or temperature probe with:

1. Viton core for temperatures up to 400 degrees F (204 degrees C).

2.03 AIR VENTS

A. Manufacturers:

1. Bell & Gossett
2. Amtrol
3. Spriovent

4. Or equal

B. Manual Type: Short vertical sections of 2 inch (50 mm) diameter pipe to form air chamber, with 1/8 inch (3 mm) brass needle valve at top of chamber.

C. Float Type:

1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.

D. Washer Type:

1. Brass with hydroscopic fiber discs, vent ports, adjustable cap for manual shut-off, and integral spring-loaded ball check valve.

2.04 "COIL PACK" MULTI-FUNCTION VALVE ASSEMBLIES

A. Two-way Type Strainer:

1. Size 1¼" and smaller (maximum coil pack size):

a. 600-CWP
b. 250F temperature rating
c. Rated for 50% glycol solution
d. Forged brass construction
e. NPT connections
f. P/T test plugs
g. Integral isolation ball valves
h. Integral wye strainer:
   (1) 20-mesh stainless steel screen
   (2) Blow-down/drain valve
   (3) Hose adapter and cap
i. Manual balancing valve:
   (1) Calibrated multi-turn globe style (preferred)
   (2) See paragraph *2.2.D Manual Balancing Valves* for specification
   (3) Calibrated orifice type allowed
   (4) Memory stop
   (5) P/T test plugs
j. Adapter/tail-pieces:
   (1) Union with P/T plug, drain, and/or vent

k. Air vent:
   (1) Tool-less type only; “coin vent” or “screwdriver vent” not allowed
   (2) Provision for horizontal attachment of hose or tubing
l. Hose (as applicable):
   (1) Rated 400-PSIG at 250-F.
   (2) 18” maximum length
   (3) Stainless steel braid
m. Elastomers:
   (1) Unions: Viton O-ring
      (a) Color coded (to prevent confusion with EPDM)
   (2) Other elastomers: EPDM
n. Insulated piping applications: Provide valve stem and P/T plug extensions. Formed metal valve stem extension not acceptable.
o. Identification tag with model number and GPM
p. Manufacturers:
   (1) Nexus
   (2) Macon
   (3) Griswold
   (4) TA/Victaulic
   (5) or equivalent

2.05 CONTROL VALVES FOR HYDRONIC APPLICATIONS

A. Modulating, Two-Way (HVAC Hydronic).

1. Characterized Ball Valve

a. Sizes 2” and Smaller, Threaded Characterized Ball Valve --Terminal and unitary equipment HYD-HVAC-MOD-2W-CBV-THD-S1

(1) 600 PSI cold working pressure
(2) 100 PSI shut-off rating
(3) 50 PSI differential pressure rating (dynamic pressure rating)
(4) 250F temperature rating
(5) Rated for 50% glycol/water solution
(6) Leakage class IV
(7) Forged brass body
(8) NPT connections, sweat connections acceptable only if pre-piped at factory
(9) Stainless steel ball

(10) Stainless steel stem with EPDM 0-ring stem seals
(11) Blow-out proof stem design.
(12) Valve position indicator on top of bare stem
(13) PTFE seats with o-ring backup
(14) Flow characterizing insert disc available in various size/shape openings for specific Cv and performance characteristic
(15) Characterized ball with no discs also allowed (preferred)
(16) Ball without characterizing disc not allowed
(17) Cv of .5 or greater to prevent clogging
(18) Performance characteristic: Equal percentage
(19) Five-year unconditional warranty from date of purchase
(20) Control valve and actuator shall be preassembled by manufacturer
(21) Approved Manufacturers:
  (a) Belimo CCV
  (b) Griswold
  (c) Siemens
  (d) Or equivalent

2.06 VALVE ACTUATORS AND ACCESSORIES

A. HVAC Grade, Electronic Actuators for Modulating and Two-Position Service (Same specifications for both services).

1. Rotary actuator, spring return (Fail-open or fail-closed). HVAC-E-R-SR

a. Brushless DC motor. Stepper motor not allowed
b. NEMA 1 or NEMA 2, as appropriate
c. Approved for air plenum application, as required
d. 24 VAC or 24 VDC power supply
e. 0-10, 2-10 VDC or 4-20 mA control input
f. Signal inverter switch
g. Proportional, floating point or two position as determined by application
h. Spring return for fail-safe operation
i. 60,000 cycle rated
j. 50% duty cycle rated
k. Sized for 150% of break-away torque at maximum differential pressure across valve
l. Multiple tandem-mounted actuators not allowed
m. Rated for 120 degree F ambient temperature

n. Motor overload/stall protection throughout rotation
o. Visual valve position indicator
p. Manual mechanical override
q. Conduit connection. Mounting bracket shall be provided for conduit connection if available.
r. Manual switchable direction of rotation.
s. Two adjustable SPDT auxiliary switches for position indication. Provide if scheduled or otherwise indicated in documents.
t. Electric analog feedback. Provide if scheduled or otherwise indicated in documents. Position feedback shall be provided on all modulating rotary valve larger than 2".
u. Adequate mounting height to accommodate 1" thick pipe insulation around valve body
v. Multiple tandem-mounted actuators not allowed
w. 5 year unconditional warranty.
x. Approved manufacturers:
    (1) Belimo L Series, A Series, G Series
    (2) Siemens OpenAir
y. Not approved manufacturers:
    (1) Schneider Duradrive
    (2) Belimo T Series
        a) Exception: T Series compact actuators may be used when specifically requested by Owner for application where compactness of size is essential. E.g. within finned tube, FCU or CUH cabinets.

2. Rotary Actuator, Non-Spring Return (Fail in place). HVAC-E-R-FIP

    a. Same specification as HVAC-E-R-SR Rotary Actuator, Spring Return except without spring return feature.

2.07 DRAINS

A. Drain valves shall be ¾" or 1" port ball valves. Drain shall incorporate hose adaptor and cap.

B. Smaller drain valves may be used when piping is smaller than ¾". In such cases drain valve shall be same size as pipe. Hose adapter not required for drains smaller than ½".

2.08 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION – HYDRONIC PIPING SPECIALITIES

A. Locate test plugs, adjacent to thermometers and thermometer sockets, adjacent to pressure gauges and pressure gauge taps, adjacent to control device sockets, and as indicated on Drawings.

B. Where large air quantities accumulate, provide enlarged air collection standpipes.

C. Install manual air vents at system high points.

D. For automatic air vents in ceiling spaces or other concealed locations, install vent tubing to nearest drain.

3.03. "COIL PACK" MULTI-FUNCTION VALVE ASSEMBLIES

A. Configuration:

1. Coil pack shall be assembled with isolation valves in supply and return piping such that components can be isolated from system piping.

B. Strainer Assembly:

1. Strainer assembly shall be provided with isolation valve, union, blow-down/drain, hose adapter, cap in supply piping near coil inlet.

C. Hoses (as applicable):

1. Hoses shall be connected at coil inlet and outlet.
2. Hose length shall be limited to maximum allowed (see above specification).
3. Bend radius shall be limited to manufacturer recommendation.
4. Piping shall be supported independently of unit.

D. Adapters:

1. Union/adapter shall be installed in return piping near coil outlet.
2. Control valve shall be installed (specified elsewhere).
3. Union/adapter and isolation valve shall be provided in return piping downstream of control valve.

E. Vents and Drains:

1. Air vent shall be provided at high point of coil outlet.
2. Drain shall be provided at low point of coil inlet.

F. P/T plugs:

1. P/T plugs shall be provided at coil inlet and outlet for pressure and temperature measurement.

3.04 CONTROL VALVES

A. Installation.

1. Accessibility.

a. Each control valve shall be located for ease of access to valve and actuator for service and removal/replacement.

2. Unions/Flanges.

a. A pipe union shall be provided on each side of each control valve to facilitate removal and replacement.

3. Strainers.

a. Line-size strainer shall be provided in the piping system upstream of each control valve.

B. Orientation.

1. Rotary Control Valves.

a. For hydronic applications, the preferred valve orientation is with the shaft oriented horizontally. Valve shall not be installed such that the shaft is oriented vertically downward (i.e. with actuator at bottom).

b. Valve shall be installed such that the preferred direction of flow as indicated within product literature matches the actual direction of fluid flow through the valve.

C. Insulation.

1. Insulated Piping Applications.

a. Control valves in insulated piping systems shall have bodies, flanges, etc. completely insulated. This applies to valves in heating systems (i.e. steam and hot water) as well as those in cooling systems. Practice of leaving heating valves and associated unions/flanges un-insulated is not acceptable. Steam valves shall be insulated such that actuator and accessories are protected from excessive convective and radiated heat.

b. Insulated valves shall be equipped with extended stems and protective shields as required to allow operation without disturbing insulation.

3.05 VALVE ACTUATORS

A. Wiring Method.

1. Electric Actuators.

a. If actuator is provided with both conduit connecter and prewired cable, conduit connector shall be used.

b. If provided with conduit connecter final connection to actuator shall be made with flexible metal conduit.

c. If provided with prewired cable only, cable shall be terminated within junction box or enclosure. Junction box shall be located near actuator to prevent free-air splice.

d. Rubber strain relief grommet shall be provided at junction box or enclosure to protect cable from damage.

B. Orientation.

1. Rotary Control Valves/Actuators.

a. For hydronic applications, the preferred valve orientation is with the shaft oriented horizontally. Valve shall not be installed such that the shaft is oriented vertically downward (i.e. with actuator at bottom).

C. Mounting Bracket.

1. Standoff.

e. Actuator mounting bracket shall have adequate standoff to protect actuator from excessive radiant, convective and conductive heat.

2. Isolation.

a. Actuator mounting bracket and linkage shall provide adequate isolation to protect actuator from excessive conducted heat.

3. Insulation.

a. Valve shall be insulated to protect actuator from excessive convective and radiated heat.

B. Special Note.

1. Electronic Actuators.

a. Electronic actuators are especially vulnerable to damage by heat (radiant, convective and conductive). It is essential that they be installed in strict compliance with the requirements of 3.01 and 3.02 above.

3.06 VENTS AND DRAINS

A. Vents:

1. Air vents shall be provided at highpoints in system where air may collect. Additionally, vents shall be provided at locations shown on drawings. When possible, vents shall be installed at locations where flow turns downward.

2. Air vents shall be "close coupled" to pipe and shall incorporate down-turned discharge pipe with hose adapter and cap. Exception: Hose adapter and cap not required for ¼" vent valves. Hose adapter and cap not required for vents integral to coil pack assemblies. Down-turned discharge still required.

3. Air vent installation shall be in compliance with *Drawing 23 21 13-02 Hydronic Air Vent and Drain Valve Installation.*

B. Drains:

1. Cooling Coil Vent and Drain:

a. Brass pipe nipples shall be provided at cooling coil vent and drain connections. Piping between coil and valve shall be schedule 80 brass.

C. Cooling Coil Condensate Drains:

1. Dedicated drain line shall be provided for each condensate drain connection.

2. Trap shall be provided in each drain line of sufficient depth to prevent conditioned air from moving through piping. Trap shall be constructed with plugged or capped tee for cleanout purposes.

3. Drain piping shall be extended to approved drain location, pitched downward 1/4" per foot and terminated in code compliant manner.

3.07 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Remove and dispose of all debris.

3.08 TESTS

A. Upon completion of this portion of the work and prior to acceptance by the *OWNER*, make all required tests and adjustments for free and smooth operation.

B. Secure all approvals from agencies having jurisdiction.

****END OF SECTION****

SECTION 23 31 13

SHEET METAL DUCTWORK

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Sheet Metal Ductwork and accessories.

B. Related work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 23 07 13: Ductwork Insulation*

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Shop drawings showing precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provisions in construction to accommodate the work of this section.

D. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. Fabrication and installation shall be by a single firm specializing and experience in metal ductwork for not less than 10 years.

4. Comply with SMACNA (American Metal and Air Conditioning Contractor's National Association) recommendations for fabrication, construction and details and installation procedures, except as otherwise indicated.

5. Comply with ASHRAE (American Society of Heating, Refrigeration and Air Conditioning Engineers) recommendations, except as otherwise indicated.

6. Compliance to SMACNA and ASHRAE is a minimum requirement. In case of disagreement between sheet metal work described in this section and SMACNA or ASHRAE, the Specification shall govern.

7. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

E. Protect shop fabricated ductwork, accessories and purchased products from damage during shipping, storage and handling. Protect ends of ductwork and prevent dirt and moisture from entering ducts and fittings.

F. Where possible, store ductwork inside and protect from weather. Where necessary to store outside, store above grade and enclosed with waterproof wrapping.

1.05 WARRANTY AND WARRANTY REPAIRS

A Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

PART 2 - PRODUCTS

2.01 GENERAL

A. Proprietary Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 GENERAL REQUIREMENTS FOR DUCTWORK

A. Furnish and install the size, connections and run of ducts as indicated on the Drawings.

B. While the Drawings shall be adhered to as closely as possible, the *ARCHITECT'S* right is reserved to vary the run and size of ducts during the progress of the work if required to meet structural conditions.

C. Install all ductwork in strict adherence to the ceiling height schedule indicated on the *ARCHITECT'S* Drawings. Consult with the Electric and Plumbing Contractors, and in conjunction with the above *CONTRACTOR*s, establish the necessary space requirements for each trade.

D. The sheet metal ductwork shall, whether indicated or not, rise and/or drop and/or change in shape to clear any and all conduits, lighting fixtures, plumbing and heating mains to maintain the desired ceiling heights and to provide adequate maintenance room and headroom in mechanical equipment rooms.

E. The ductwork shall be continuous, with airtight joints and seams presenting a smooth surface on the inside and neatly finished on the outside. Ducts shall be constructed with curves and bends so as to effect an easy flow of air. Unless otherwise shown on the Drawings, the inside radius of all curves and bends shall be not less than width of ducts in plane of bend.

F. All rectangular ductwork unless otherwise noted, shall be built from galvanized sheet steel and thoroughly braced and stiffened.

2.03 DUCT PENETRATION THRU FLOOR

A. Fill in space between duct and floor construction with mineral wool.

2.04 DRIP PANS

A. Provide copper pans and gutters under all equipment subject to leaks mounted above electrical equipment. Each copper pan shall be properly pitched and a drain outlet provided and piped to drain. See “Drip Pans” under section “Special Requirements for Mechanical and Electrical Work”.

2.05 DUCT MATERIALS

A. Galvanized Steel Ducts: ASTM A653/A653M galvanized steel sheet, lock-forming quality, having G90 zinc coating of in conformance with ASTM A90/A90M.

B. Stainless Steel Ducts: ASTM A167, Type 316 or 316L as indicated.

C. Fasteners: Rivets, bolts, or sheet metal screws.

D. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.06 DUCT FABRICATION

A. Ducts shall be neatly finished on the outside with all sharp edges removed.

B. Inside surfaces shall be smooth with no projections into the air stream except where otherwise indicated.

C. Longitudinal joints shall be Pittsburgh lock at corners or Acme lock on flat surfaces double seams hammered tight and shall be located above the horizontal axis of the duct. A snap lock seam shall not be permitted as a substitute for the Pittsburgh lock at corners of ducts.

D. Transverse joints shall be made airtight with all laps in the directions of airflow.

E. All fasteners and attachments shall be made of the same material as the ducts.

F. Furnish test wells 12" on the center horizontally and vertically in the suction and discharge duct of each fan. Test wells shall consist of a 1" x ¾", 125-lb., bronze, screwed hex bushing, secured to the duct with a bronze hex locknut on the inside of the duct. A ¾" x 2" long standard weight bronze, screwed nipple and cap shall be fitted to the housing on the outside of the duct. Test wells shall be No. 699 as made by Ventlok or equal.

G. All radius elbows shall have a minimum centerline radius of 1½ times the width of the duct.

H. All square elbows shall have factory-designed and built turning vanes with hollow vanes having different inside and outside curvature, similar to Tuttle and Bailey, Inc., “Ducturns”. Shop fabrication vanes will not be approved. Where turning vanes are in conflict with the access doors to fire dampers. They shall be made movable, so that fire dampers, shall be accessible.

I. Dissimilar metals shall be connected with flanged joints made up with fiber or neoprene gaskets to prevent contact between dissimilar metals. Flanges shall be fastened with bolts protected by ferrules and washers made of the same materials as the gaskets. Where an aluminum duct is to be connected to a galvanized steel duct, the end of the galvanized steel duct shall be coated with heavy black asphaltum paint before connecting it to the aluminum duct.

J. Changes in shape and dimension shall conform to the following: except where otherwise noted, for increases in cross-sectional area, the shape of the transformation shall not exceed 1" in 7". Except where otherwise noted, for reductions in area, the slope shall not be less than 1" in 4" but 1" in 7" preferred.

K. Wherever it may be necessary to make provisions for vertical hangers of the ceiling construction passing through ducts, provide streamlined shaped sleeves around such ceiling construction hangers as to fully protect the duct from being punched with holes for the passage of such hangers. Any such streamlined sleeves shall be made airtight at top and bottom of ducts. In no case shall there be more than two rods in any 9 square foot area. No rods shall pierce ducts smaller than 12" in horizontal area.

L. The construction for low-pressure rectangular sheet metal ducts shall be made in accordance with recommendations of ASHRAE Guide, Latest Edition, or as per SMACNA Manual but not less than the following weights and construction:

LOW PRESSURE - RECTANGULAR DUCTWORK

DIMENSION LONGEST SIDE, INCHES	SHEET METAL GAUGE (ALL FOUR SIDES) STEEL GAUGE	ALUMINUM THICKNESS IN.	COPPER OZ. PER SQ. FT.	TRANSVERSE REINFORCING AT JOINTS AND BETWEEN JOINTS
Up thru 12	26	0.020	16	1" pocket lock 24 gauge, standing seam joint 24 gauge, 1" standing S slip 24 gauge. Joint max. on 8' centers.
13 thru 18	24	0.025	24	Same as for up thru 12.
19 thru 30	24	0.025	24	1" pocket lock 22 gauge. Joints max., on 8' centers with 1 x 1 x ⅛" angles 4' from joint.

31 thru 42	22	0.032	32	Same as for 19 thru 30.
43 thru 54	22	0.032	32	1" standing S slip 22 gauge with 1½" x 1½" x ⅛" angles, 1½" standing seam joint, 1½" pocket lock 22 gauge. Joints on 8' centers with 1½ x 1½ x ⅛" angles max. 4' from joint.
55 thru 60	20	0.040	36	Same as for 43 thru 54.

1. Flat areas of duct over 18" wide shall be stiffened by cross breaking of beading.

2. All joints to have corner closures.

3. All joints shall be sealed with 3M EC-800 mastic.

M. The construction for low pressure round sheet metal ducts and fittings shall be as follows:

DIAMETER, INCHES	STEEL SHEET GAUGE
3” thru 14”	26
15” thru 26”	24
28” thru 36”	22
38” thru 50”	20
52” thru 84”	18

Construct fittings with the following minimum gauges:

DIAMETER, INCHES	STEEL SHEET GAUGE
3" thru 14"	26
15" thru 26"	24
28" thru 36"	22
38" thru 50"	20
52" thru 84"	18
62" thru 84"	16

2.07 GALVANIZED STEEL ROUND DUCTS

A. Material: Ductwork and reinforcements shall be ASTM A653, A924 mill galvanized steel. Galvanized coating to be 1.25 ounces per square foot, both sides of sheet, G90 in accordance with ASTM A90. Provide "Paint Grip" finish or galvanneal sheet metal for ductwork that will be painted.

B. Reinforcement: All reinforcement shall be external to the duct. Internal reinforcement is not allowed. Flat oval duct shall be reinforced the same as rectangular duct of similar size.

C. Construction: Machine-formed, round and/or flat oval spiral lock seam duct. Longitudinal or snap lock seams are not allowed. Duct shall be single wall or double wall type. Liner in double wall duct shall be solid and annular space between inner liner and outer duct shall be filled with 1" thick fiberglass insulation.

D. Manufacturers: Ajax, Lindab, Semco, Inc., United McGill, Sheet Metal Connectors, United Sheet Metal.

E. Joints: Slip type connection with a 2" minimum insertion length and a stop bead. Use inside slip couplings for duct-to-duct joints, and outside slip couplings for fitting-to-fitting joints.

F. Secure all joints with at least three (3) sheet metal screws before sealing.

G. Ducts and fittings larger than 36” dia. shall have flanged connections.

2.08 FLEXIBLE DUCT

A. Shall be factory fabricated, listed and labeled as a UL 181 Class 1 air duct, and shall comply with NFPA 90A and NFPA 90B.

B. Flame spread shall be 25 or less and smoke developed shall be 50 or less.

C. Minimum Service Temperatures and Pressures: -20 to 250 Degrees F; 10" w.c. positive; 10" w.c. negative thru 12" dia., 5" w.c. negative - 14" and 16" dia., 1" w.c. negative - 18" and 20" dia.

D. Rated Velocity: 5500 fpm.

E. Inner Liner: Liner shall be nonmetallic type composed of polyester film, polyethylene film, nylon film or woven and coated fiberglass fabric liner mechanically locked without adhesives to corrosion resistant galvanized steel wire helix.

F. Insulation: Fiberglass blanket – ¾ pound, factory wrapped, minimum 1 ½" thick.

G. Vapor Barrier: Barrier shall have a permeance of not over 0.1 perm and shall be fiberglass reinforced aluminum material or polyethylene.

H. Usage: Connections to air inlets and outlets. Maximum allowable length is 6'-0". Flexible duct is not permitted in medium and high-pressure duct systems.

J. Installation:

1. Shorten and reinstall all sagging or loose flexible duct. Avoid sharp elbows. Elbows shall maintain centerline radius to diameter ratio of 1.5.

2. Support flexible duct with pre-manufactured hangers.

3. To attach flexible duct to hard duct, tape the inner liner to the hard duct, then attach with two nylon tie wraps, one for the inner liner and one for the vapor barrier. Fold the vapor barrier inside itself so it has neat edges prior to tie wrapping.

2.09 KITCHEN HOOD EXHAUST DUCTWORK FABRICATION

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible and NFPA 96.

B. Exposed Kitchen Hood Exhaust Ducts: Construct of stainless steel ASTM A167, type 316 using continuous external welded joints.

C. Concealed Kitchen Hood Exhaust Ducts: Construct of 16 gauge (1.37 mm) carbon steel or 18 gauge (1.09 mm) stainless steel ASTM A167, type 316 using continuous external welded joints.

2.10 DAMPERS

A. At each main branch take-off and in such other locations where required to properly balance the low-pressure system, furnish and install volume dampers of the opposed blade, multi-louvered type, which shall be operated by indicating quadrants and set screws, for adjusting the system.

B. Volume dampers shall be constructed as follows: damper blades shall not be wider than 12", shall be complete with heavy angle iron frames, connecting and operating links, brass trunnions, and bronze bearings. Dampers, unless otherwise noted, shall be fabricated with not less than No. 16 gauge sheet steel. Blades shall overlap and shall be provided with continuous stops on all four sides of dampers to prevent leakage. Blades shall be galvanized. Blades of dampers shall be set into a flat steel frame with frame securely bolted to the duct. All dampers shall be fitted with a hexagonal brass spindle, which shall extend through the exterior of duct and be fitted with an indicating self-locking regulator. Regulator shall be similar to Ventlok 641 or equal. All hardware shall be Ventlock or equal for insulated ductwork provide No. 644 self-locking regulator as made by Ventlok or equal.

C. Movable splitter dampers shall be provided where indicated. Dampers shall be airfoil, double-wall type. Splitter damper assembly shall be Ventlok 603 Ball Joint Bracket and 600 Blade Bracket or equal. All hardware shall be Ventlok or equal. Blades to be spot-welded or pivoted to shafts. Elevated regulators shall be provided for insulated ductwork.

D. All dampers shall be made accessible from building construction. Access doors in building structure shall be furnished or provided as herein before specified.

2.11 ACCESS DOORS IN SHEET METAL WORK

A. Wherever necessary in ductwork, casings or sheet metal partitions, provide suitable access doors and frames to permit inspections, operation and maintenance of all valves, coils, controls, fire dampers, bearings, traps, or other apparatus concealed behind the sheet metal work. All such doors shall be of double construction of not less than No. 20 gauge sheet metal and shall have sponge rubber gaskets around their entire perimeter. Doors in insulated ducts of insulated casings shall have rigid fiberglass insulation between the metal panels.

B. All access doors in sheet metal ducts shall be hung on heavy flat hinges and shall be secured in the closed position by means of cast zinc clinching type latches. Where space conditions preclude hinges, use four heavy window type latches. Doors into ducts shall in general not be smaller than 18" x 18" except for access door to fire dampers which will depend on size of fire damper.

C. In no case shall access to any items of equipment requiring inspection, adjustment, or servicing require the removal of nuts, bolts, screws, wing nuts, wedges, or any other screwed or loose device.

D. Hinges shall be Ventlok No. 150 or 260 with or without screw holes or equal. Latch for access door in ductwork shall be Ventlok No. 100 or equal.

2.12 FLEXIBLE CONNECTIONS

A. All fan and air supply unit connections; both at inlet and discharge shall be made with material as hereinafter specified, so as to prohibit the transfer of vibration from fans to ductwork connecting thereto.

B. The flexible connector shall be limited in length to ten feet (10'). The flexible connection shall be made using extra wide fabric as specified and held in place with heavy metal bands, securely attached, to prevent any leakage at the connection points.

C. Flexible connections shall be fabricated from the following materials unless otherwise required by Local Authorities.

1. Range hood exhaust: Flame-Proof Silvaseal by Duro Dyme or equal.

2. Low pressure systems:

a. Neoprene coated glass fabric.

b. 30 ounce/square yard.

D. Flexible connections shall not be painted.

2.13 ACOUSTICAL PERFORMANCE SPECIFICATIONS - GENERAL

A. It is the intent of this Specification that noise levels due to air conditioning and/or ventilating equipment, ducts, grilles and registers, diffusers and air light fixtures, will permit attaining sound pressure levels in occupied spaces conforming to the following NC curves as explained in the ASHRAE Guide and Data Book.

1. Office and Conference Rooms: NC-35.

2. Lobby: NC-40.

2.14 OTHER MATERIALS

A All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

D. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION OF DUCTWORK

A. Install ductwork in accordance with recognized industry practices, to ensure that ductwork complies with requirements and serve intended purposes.

B. Coordinate with other work as necessary to interface installation or ductwork with other components of systems.

C. Duct sizes shown on the Drawings at connection to fans or other equipment may vary in actual installation. *CONTRACTOR* shall provide transition pieces as required.

D. Ducts, casings and hangers shall be installed straight and level and shall be free of vibration and noise when fans are operating.

E. Ducts at ceilings shall be suspended from joggle bolts in concrete slabs except where otherwise indicated. Ducts at floors shall be supported by steel angles suitably anchored to floor construction. Each duct shall be independently supported and shall not be hung from or supported by another duct, pipe, conduit or equipment of any trade.

F. Supports shall be placed at each joint and change in direction up to a maximum spacing of 8' on centers. Prevent buckling of ductwork.

G. All fastenings to building structure shall be adequate to insure permanent stability of sheet metal work and shall be capable of resisting all applied forces.

H. Vertical ducts in shafts or passing through floors shall be supported by steel angles or channels, welded, riveted, screwed or bolted to ducts and fastened to building structural members at each floor level. Provide safing to close all floor openings around ductwork - pack annular space with rockwool and 18 gauge sheet metal safing floor openings in plenums shall have ½" diameter steel bars.

I. Rigid connections between ductwork and non-rotating equipment shall be 12" on centers and shall be made with flanged joints, sealed with fireproof material (Fiber or Neoprene gaskets).

J. It is the intent to obtain low-pressure ductwork construction with minimum leakage. The construction noted in Specifications can produce low or high leakage rates, depending upon the workmanship, particularly with regard to the connection at the top of the ducts. Guarantee that total diffuser volume, measured by means of velometer, shall be at least 95% of actual fan supply (measured by means of a duct traverse taken with a Pitot tube and water manometer). Seal the ductwork at joints with suitable sealers 3M EC-800 and tape. Use of "HARDCAST" or any other material is subject to *ENGINEER'S* approval.

K. Install kitchen range hoods in accordance with NFPA 96. Refer to Section 11400.

L. Install residue traps in kitchen hood exhaust ducts at base of vertical risers with provisions for clean out.

M. Kitchen hood exhaust ducts: Use stainless steel for ductwork exposed to view and stainless steel or carbon steel where ducts are concealed.

3.03 DUCT HANGERS

A. Ducts up to 24" on a side or up to 20" diameter shall be suspended with 16 gauge, galvanized straphangers, 1" wide.

B. Ducts 25" to 40" on a side or 21" to 40" diameter shall be suspended with galvanized straphangers 1" wide by ⅛" thick.

C. Strap hangers shall be bent 90E, extended down sides of ducts and turned under bottom of ducts a minimum of 2". Straphangers shall be fastened at ceiling with nuts, bolts and lock washers and to sides and bottom of ducts with sheet metal screws.

D. Ducts 41" and larger on a side or diameter shall be suspended with either rod or angle type hangers. No screws shall penetrate medium and high-pressure ductwork.

E. Rod type hangers shall be ⅜" diameter black steel rods threaded at both ends and bottom bracing angles on ducts, with nuts and lock washers.

F. Angle type hangers shall be extensions of side bracing angles on ducts, bent 90E at ceiling and fastened with nuts, bolts and lock washers.

G. Hangers for vertical ducts shall be as per SMACNA Duct Manual.

3.04 CLEANING AND PROTECTION

A. Clean ductwork internally, unit by unit as it is installed of dust and debris. Clean external surfaces of foreign substances, which might cause corrosion, deterioration of metal or interfere with painting.

B. At end of ducts that are not connected to equipment or air distribution devices at the time of ductwork installation, provide temporary closure of polyethylene film or other covering.

****END OF SECTION****

SECTION 23 31 14
(15891)
OUTDOOR DUCTWORK

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Outdoor Ductwork consisting of inner foam liner for thermal efficiency, exterior pre-coated galvanized shell for low leakage, weather resistance, and accessories.

B. Related work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 23 07 13: Ductwork Insulation*

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Shop drawings showing precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provisions in construction to accommodate the work of this section.

D. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

2. Provide a 25-year warranty on this product.

3. Provide a 40-year warranty on the finish. The coating should pass the salt spray test for 1000 hours in accordance with ASTM B117.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. Fabrication and installation shall be by a single firm specializing and experience in outdoor ductwork for not less than 10 years.

4. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

C. Provide a 25-year warranty on this product.

D. Provide a 40-year warranty on the finish. The coating should pass the salt spray test for 1000 hours in accordance with ASTM B117.

PART 2 - PRODUCTS

2.01 GENERAL

A. Proprietary Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability, and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers:

1. Tuff Duct Systems
   25 S&T Drive
   McClellandtown, PA 15458
   Tel: 412-582-1978

2. Or equivalent.

2.02 GENERAL REQUIREMENTS FOR DUCTWORK

A. Inner Liner: System shall incorporate a fortified inner liner with included testing and passing the following:

1. ASTM C 423 noise reduction

2. ASTM C 518: 2004, Standard Test Method for Steady–State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

3. ASTM C 1071 for erosion

4. ASTM E 84 tested, Tunnel Test, Does not exceed 25 flame spread, 50 smoke developed.

5. ASTM E 96/E 96M Procedure A for permeability

6. ASTM E2257 Standard Test Method for Room Fire Test of Wall and Ceiling Materials and Assemblies

7. NFPA Compliance:

   a. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems"

   b. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems"

   c. NFPA 255, “Standard Method of Test of Surface Burning Characteristics of Building Materials

8. NRTL product approval, (Subpart S of 29 CFR Part 1910, OSHA)

9. UL 181 Standard for Factory-Made Air Ducts and Air Connectors

10. UL 723 Test for Surface Burning Characteristics of Building Materials

B. Exterior Shell: System shall incorporate a UV stable, pre-coated galvanized exterior shell.

1. .20-.30 mill primer baked on finish

2. .70-.80 mill polyester topcoat

2.03 DUCTWORK CLASSIFICATION

A. Duct systems are to be classified and constructed per the SMACNA Velocity-Pressure classification system.

2.04 RECTANGULAR DUCTWORK AND FITTINGS

A. The inner liner panel shall be manufactured of CFC-free closed cell rigid thermoset resin thermally bonded on both sides to a factory applied minimum 0.001" (25 micron) aluminum foil facing reinforced with a fiberglass scrim. The outer panel shall be a per-coated galvanized sheet metal jacket, with a .20-.30 mil primer baked on finish with a .70-.80 mill polyester UV stable top coat.

B. Materials:

1. The density of the inner foam liner shall not be less than 3.43 pcf (55 Kg/m3) with a minimum compressive strength of 28 psi.

2. Maximum Temperature: Continuous rating of 185 degF to -15 degF inside ducts or ambient temperature surrounding ducts.

3. Maximum Thermal Conductivity: 0.146 Btu-in./h-sqft.-degF at 75 degF mean temperature.

4. Antimicrobial Agent: Additive for antimicrobial shall not be used but instead, raw product must pass UL bacteria growth testing

5. Required Markings: All interior duct liner shall bear UL label and other markings required by UL 181 on each full sheet of duct panel.

6. All insulation materials shall be closed cell with a closed cell content of >90%.

7. Internal Tape: 3M high temperature, high strength, UL181A-P foil tape with coated cold weather acrylic adhesive.

8. Outer Sealant: Novagard, NovaFlex Metal Roof Adhesive Sealant.

9. Outer Jacket: galvanized steel pre-coated with a UV stable 20-.30 mil primer baked on finish with a .70-.80 mill polyester topcoat.

a. Standard white finish with custom colors available.

10. Duct Connections: Galvanized 4-point flanged connection.

11. Connection Cover:

a. Connection are field sealed airtight before the cover is installed.

b. Connection covers are manufactured from the same pre-coated galvanized material as the outer jacket.

2.05 OTHER MATERIALS

A All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

D. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION OF DUCTWORK

A. Install ductwork in accordance with recognized industry practices, to ensure that ductwork complies with requirements and serve intended purposes.

B. Coordinate with other work as necessary to interface installation or ductwork with other components of systems.

C. Duct sizes shown on the Drawings at connection to fans or other equipment may vary in actual installation. *CONTRACTOR* shall provide transition pieces as required.

D. Ducts, casings, and hangers shall be installed straight and level and shall be free of vibration and noise when fans are operating.

E. Each duct shall be independently supported and shall not be hung from or supported by another duct, pipe, conduit, or equipment of any trade.

F. Supports shall be placed at each joint and change in direction up to a maximum spacing of 8' on centers. Prevent buckling of ductwork.

G. All fastenings to building structure shall be adequate to insure permanent stability of sheet metal work and shall be capable of resisting all applied forces.

3.03 CLEANING AND PROTECTION

A. Clean ductwork internally, unit by unit as it is installed of dust and debris. Clean external surfaces of foreign substances, which might cause corrosion, deterioration of metal or interfere with painting.

B. At end of ducts that are not connected to equipment or air distribution devices at the time of ductwork installation, provide temporary closure of polyethylene film or other covering.

****END OF SECTION****

SECTION 23 33 00

DUCT ACCESSORIES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Back-draft dampers.
2. Duct access doors.
3. Volume control dampers.
4. Flexible duct connections.
5. Duct test holes.
6. Ultra-low leakage extruded aluminum control dampers.
7. Dynamic fire dampers.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 26 05 03: Equipment Wiring Systems*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for the *DUCT ACCESSORIES* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers, duct access doors, and duct test holes.

C. Product Data: Submit data for shop fabricated assemblies and hardware used.

D. Product Data: Submit for the following. Include where applicable electrical characteristics and connection requirements.

1. Backdraft dampers.

2. Flexible duct connections.

3. Volume control dampers.

4. Duct access doors.

5. Duct test holes.

6. Ultra-low leakage extruded aluminum control dampers.

7. Dynamic fire dampers including locations and ratings.

E. Product Data: For fire dampers submit the following:

1. Include UL ratings, dynamic ratings, leakage, pressure drop and maximum pressure data.

2. Indicate materials, construction, dimensions, and installation details.

3. Damper pressure drop ratings based on tests and procedures performed in accordance with AMCA 500.

F. Manufacturer’s Installation Instructions: Submit for Fire Dampers.

G. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar

with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery, storage and handling:

1. Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use.

2. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

3. Handle and lift dampers in accordance with manufacturer's instructions.

4. Protect materials and finishes during handling and installation to prevent damage.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 BACK-DRAFT DAMPERS

A. Product Description: Multi-Blade, back-draft dampers: Parallel-action, gravity-balanced, Galvanized extruded aluminum. Blades, maximum 6 inch width, center pivoted, with felt or flexible vinyl sealed edges. Blades linked together in rattle-free manner with 90-degree stop, steel ball bearings, and plated steel pivot pin. Furnish dampers with adjustment device to permit setting for varying differential static pressure.

2.03 DUCT ACCESS DOORS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated on Drawings.

B. Fabrication: Rigid and close fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, furnish minimum 1 inch thick insulation with sheet metal cover.

1. Less than 12 inches square, secure with sash locks.

2. Up to 18 inches Square: Furnish two hinges and two sash locks.

3. Up to 24 x 48 inches: Three hinges and two compression latches with outside and inside handles.

4. Larger Sizes: Furnish additional hinge.

5. Access panels with sheet metal screw fasteners are not acceptable.

2.04 DYNAMIC FIRE DAMPERS

A. Fabricate in accordance with NFPA 90A and UL 555.

B. Fire Resistance: 1½ hours.

C. Dynamic Closure Rating: Dampers classified for dynamic closure to 2000 fpm and 4 inches wg static pressure.

D. Construction:

1. Integral Sleeve Frame: Minimum 20 gage roll formed galvanized steel.

2. Length: 12 inches.

3. Blades:

a. Style: Curtain type.
b. Action: Spring or gravity closure upon fusible link release.
c. Material: Minimum 24 gage roll formed, galvanized steel.
d. Closure Springs: Type 301 stainless steel, constant force type, if required.

E. Fusible Link Release Temperature: 165 degrees F.

F. Mounting: Vertical or horizontal as indicated on Drawings.

G. Duct Transition Connection, Damper Style:

1. A style - rectangular connection, frame and blades in air stream.

2. B style - rectangular connection, blades out of air stream, high free area.

3. CR style - round connection, sealed.

4. R style - round connection, blades in air stream, non-sealed.

5. LR style - round connection, blades out of air stream, non-sealed.

H. Finish: Mill galvanized.

2.05 VOLUME CONTROL DAMPERS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated on Drawings.

B. Splitter Dampers:

1. Material: Same gage as duct to 24-inches size in both dimensions, and two gages heavier for sizes over 24-inches.

2. Blade: Fabricate of double thickness sheet metal to streamline shape, secured with continuous hinge or rod.

3. Operator: Minimum ¼- inch diameter rod in self aligning, universal joint action, flanged bushing with set screw.

4. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.

C. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized frame channel with suitable hardware.

D. End Bearings: Except in round ductwork 12 inches and smaller, furnish end bearings. On multiple blade dampers, furnish oil-impregnated nylon or sintered bronze bearings. Furnish closed end bearings on ducts having pressure classification over 2-inches wg.

E. Quadrants:

1. Furnish locking, indicating quadrant regulators on single and multi-blade dampers.

2. On insulated ducts mount quadrant regulators on standoff mounting brackets, bases, or adapters.

3. Where rod lengths exceed 30-inches furnish regulator at both ends.

2.06 FLEXIBLE DUCT CONNECTIONS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated on Drawings.

B. Connector: Fabric crimped into metal edging strip.

1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric conforming to NFPA 90A, minimum density 30 oz per sq yd.

2. Net Fabric Width: Approximately 6 inches wide.

3. Metal: 3 inch wide, 24 gage galvanized steel.

C. Leaded Vinyl Sheet: Minimum 0.55 inch thick, 0.87 lbs. per sq ft, 10 dB attenuation in 10 to 10,000 Hz range.

2.07 DUCT TEST HOLES

A. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Furnish extended neck fittings to clear insulation.

2.08 HIGH PERFORMANCE ULTRA-LOW LEAKAGE CONTROL DAMPER

A. Manufacturer:

1. Pottorff,
5101 Blue Mound Rd.
Fort Worth, TX 76106
Phone: (817) 509-2300
www.pottorff.com

2. Or equivalent.

B. Description:

1. Model: CD-51 and CD-52 – Ultra-low leakage control damper is Basis of Design.

2. Ratings:

a. Temperature Rating: -25ºF to 180ºF (-32ºC to 83ºC)
b. Leakage: 5.0 cfm/ft2 @ 4.0 in.wg. (0.03m3/s/ m2 @ 1.00 kPa) or 3.0 cfm/ft2 @ 1.0 in.wg. (0.02m3/s/ m2 @ 0.25 kPa).
c. Maximum Velocity: 6000 fpm (30.5 m/s)
d. Differential Pressure Rating: 10 in.wg. (2.5 kPa) at a 12 inch (305) blade length.

3. Construction:

a. Frame: Aluminum
b. Blades: 6 inch (152mm) maximum width, heavy duty 6063-T5 extruded aluminum air foil.
c. Blade Seals: PVC mechanically interlocked to blade edge (glue-on or grip-type seals are not acceptable).
d. Jamb Seals: Stainless steel, flexible metal compression type.
e. Axles: Minimum ½" (13mm) diameter plated steel hex-shaped, mechanically attached to blade.
f. Bearings: Synthetic sleeve-type turning in extruded hole in frame.
g. Linkage: Concealed in frame.
h. Finish: Mill Aluminum frame and mill aluminum blades.

C. Accessories:

1. Actuator

a. Type: Electric 24 V, 60 Hz, [two-position], fail [close].
b. Mounting: Internal

D. Source Quality Control:

1. Factory Tests: Factory cycle damper [and actuator] assembly to assure proper operation.

2.09 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify rated walls are ready for fire damper installation.

C. Verify ducts and equipment installation are ready for accessories.

D. Check location of air outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.

E. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Install in accordance with NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 23 31 00 for duct construction and pressure class.

B. Install back-draft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated on Drawings.

C. Access Doors: Install access doors at the following locations and as indicated on Drawings:

1. Spaced every 50 feet of straight duct.
2. Upstream of each elbow.
3. Upstream of each reheat coil.
4. Before and after each duct mounted filter.
5. Before and after each duct mounted coil.
6. Before and after each duct mounted fan.
7. Before and after each automatic control damper.

D. Access Door Sizes: Install minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated on Drawings. Review locations prior to fabrication.

E. Install permanent duct test holes where indicated on Drawings and required for testing and balancing purposes.

F. Install joint sealants as specified in Section 07 90 00.

G. Install dampers at locations indicated on drawings and in accordance with manufacturer's installation instructions.

H. Install dampers square and free from racking. DO NOT compress or stretch damper sleeve or frame into the duct or opening.

I. Handle dampers using the frame or sleeve. Do not lift or move damper using blades, actuator, or jackshaft.

J. The installing contractor shall provide and install bracing for multiple section assemblies to support assembly weight and to hold against system pressure.

K. Attach multiple damper section assemblies together in accordance with manufacturer's instructions. Install support mullions as reinforcement between assemblies as required.

L. Install connections to electric actuators

M. Install fire dampers at locations as indicated on Drawings. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

1. Install dampers square and free from racking with blades running horizontally.

2. Do not compress or stretch damper frame into duct or opening.

3. Handle damper using sleeve or frame. Do not lift damper using blades, actuator, or jack shaft.

4. Install bracing for multiple section assemblies to support assembly weight and to hold against system pressure. Install bracing as needed

3.03 CLEANING

A. Clean exposed surfaces of louvers with water and mild soap or detergent not harmful to finish taking care to remove fingerprints and soil. Thoroughly rinse surfaces and dry. Do not let soil accumulate during construction period.

B. Touch-up, repair, or replace louvers damaged during installation and construction so that no evidence remains of the corrective work.

3.04 DEMONSTRATION

A. Demonstrate re-setting of fire dampers to *OWNERS'* representative.

****END OF SECTION****

SECTION 23 34 16

HVAC FANS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Provide HVAC fans and accessories as shown on Plans and specified herein.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 07 71 00: Roof Specialties and Accessories*

3. *Section 23 31 13: Sheet Metal Ductwork*

4. *Division 26: Equipment Wiring Systems*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for the *EXHAUST FANS* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrates compliance with the specified requirements.

C. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. See fan schedules on drawings for required fan operating characteristics.

D. Acceptable manufacturers:

1. Loren Cook Company
   2015 E. Dale Street
   Springfield, MO 65803

Tel: 417-869-6474

2. Greenheck Fan Corporation
PO Box 410
Schofield, WI 54476
715-359-6171
WEB Site: http://www.greenheck.com/

3. Or equivalent.

2.02 DIRECT DRIVE ROOF DOWNBLAST CENTRIFUGAL EXHAUST FAN

A. General Description:

1. Downblast fan shall be for roof mounted applications.
2. Maximum continuous operating temperature is 180 Fahrenheit (82.2 Celsius).
3. Each fan shall bear a permanently affixed manufacture's engraved metal nameplate containing the model number and individual serial number.

B. Wheel:

1. Constructed of composite.
2. Non-overloading, backward inclined centrifugal
3. Statically and dynamically balanced in accordance to AMCA Standard 204-05
4. The wheel cone and fan inlet will be matched and shall have precise running tolerances for maximum performance and operating efficiency.

C. Motors:

1. AC Induction Motor

a. Motor Enclosure: Open drip proof (ODP) - opening in the frame body and or end brackets.

b. Motors are permanently lubricated, heavy duty ball bearing type to match with the fan load and pre-wired to the specific voltage and phase.

c. Accessible for maintenance.

D. Housing:

1. Motor cover, shroud, curb cap, and lower windband shall be constructed of heavy gauge aluminum
2. Shroud shall have an integral rolled bead for extra strength.
3. Shroud shall be drawn from a disc and direct air downward.
4. Lower windband shall have a formed edge for added strength.
5. Motor cover shall be drawn from a disc.
6. All housing components shall have final thicknesses equal to or greater then preformed thickness.
7. Curb cap shall have pre-punched mounting holes to ensure correct attachment.
8. Rigid internal support structure.
9. Leak proof.

E. Housing Supports and Drive Frame:

1. Drive frame assemblies shall be constructed of heavy gauge steel and mounted on vibration isolators.

F. Vibration Isolation:

1. Rubber isolators
2. Sized to match the weight of each fan

G. Disconnect Switches:

1. NEMA rated: 4X
2. Positive electrical shut-off
3. Wired from fan motor to junction box installed within motor compartment.

H. Options/Accessories:

1. Birdscreen:

    a. Material Type: Stainless
    b. Protects fan discharge

2. Curb Cap Adapter:

    a. Mounted onto existing curb
    b. Material: Aluminum
    c. Coating Type: Permatector

3. Curb Seal:

a. Rubber seal between the fan and the roof curb

4. Dampers:

a. Type: Gravity, WD 100
b. Prevents outside air from entering back into the building when fan is off.
c. Balanced for minimal resistance to flow.
d. Galvanized frames with prepunched mounting holes.

5. Finishes:

a. Types: Permatector

6. Pressure Probe:

a. ¼ inch diameter tube in the fan venturi that allows hook up to manometer

7. Tie-Down Points:

a. Four heavy gauge aluminum brackets to secure the fan in heavy wind applications

2.03 DIRECT DRIVE CEILING MOUNTED CENTRIFUGAL EXHAUST FANS

A. General Description:

1. Base fan performance at standard conditions (density 0.075 Lb/ft3)
2. Ceiling mounted applications
3. Maximum operating temperature is 130 Fahrenheit (54.4 Celsius)
4. Sound levels as low as 0.7 AMCA sones, Sound levels as low as <0.3 AMCA sones
5. UL/cUL listed for above bathtub exhaust
6. Fans are UL/cUL listed 507 - Electric Fans
7. Fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number

B. Wheel:

1. Forward curved centrifugal wheel
2. Constructed of galvanized steel or calcium carbonate filled polypropylene
3. Statically and dynamically balanced in accordance to AMCA Standard 204-05

C. Motors:

1. AC Induction Motor
2. Motor enclosures: Open drip proof (ODP) - opening in the frame body and or end brackets
3. Motors shall be permanently lubricated sleeve bearing type to match with the fan load and furnished at the specific voltage and phase.
4. Motor shall be mounted on vibration isolators and be accessible for maintenance
5. Thermal overload Protection

D. Housing:

1. Constructed of heavy gauge galvanized steel
2. Interior shall be lined with 0.5 inches of acoustical insulation
3. Profile as low as 10 1/2 inches

E. Spring Loaded Aluminum Backdraft Damper:

1. Prevents air from entering back into the building when fan is off
2. Eliminates rattling or unwanted backdrafts

F. Outlet:

1. Type of outlet: Round
2. Field rotatable from horizontal to vertical discharge
3. Shall include an aluminum backdraft damper

G. External Electrical Accessories:

1. Eliminates removing the motor pack which saves time on installation

H. Mounting Brackets:

1. Fully adjustable for multiple installation conditions

I. Options/Accessories:

1. Manual Switches:

a. 1 Function: indoor application no water. (Single pole rocker switch assembly)
b. UL Listed
c. Positive electrical shut-off
d. Access for wiring shall be external

2. Wall Discharge:

a. Round Wall Cap - Aluminum Construction with aluminum finish, for outside wall applications, built in birdscreen and damper
b. Round Duct Connector - replace the standard square discharge duct connector and damper, galvanized steel construction

3. Vibration Isolation:

a. Available for suspended installations
b. Includes pre-punched hole for ease of installation and shall have all hardware to mount one unit

2.04 AIR PRESSURE SENSING SWITCH

A. Acceptable Manufacturers:

1. Cleveland Controls
Cleveland, OH
Tel: (216) 398-0330

2. Robertshaw

3. Honeywell

4. Or equivalent.

B. Senses positive, negative or differential air pressure. Set point range of 0.05± 0.02" W.C. to 12.0" W.C.; SPDT switch rated at 15A @ 125/250/277VAC; include 12" length of ¼" O.D. flexible tubing.

C. Cleveland Controls Model # AFS-222-201, or equivalent.

2.05 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Install the curb and secure to the wall or roof.

B. Install duct work as shown and secure to the deck or base of the curb.

C. Install back-draft dampers and check to make sure they are free to open and close.

D. Install the fan:

1. Secure aluminum, fiberglass or PVC fans to the curb with stainless steel screws.

2. Secure galvanized steel fans to the curb with galvanized steel screws.

3. Secure to the wood trusses with hanging spring isolators.

E. Connect power and check rotation of fan.

F. This system is not complete until the system has been balanced to provide the correct air quantity and has been tested to demonstrate the correct system performance.

3.03 FIELD QUALITY CONTROL

A. Tests:

1. Upon completion of this portion of the work, and prior to its acceptance by the *OWNER*, make all required tests and adjustments for free and smooth operation.
2. Secure all approvals from agencies having jurisdiction.

3.04 CLEANING

A. Clean exposed surface of all grease, dirt and other foreign materials.

B. Touch up all marred or abraded surfaces in accordance with manufacturer's directions.

3.05 DEMONSTRATION

A. The manufacturer's representative shall instruct the *OWNER'S* operating personnel, at a time designated by the *OWNER*, as to the proper method of operation and recommended maintenance procedures.

B. The scheduling of the instruction shall be at the convenience of the *OWNER* and may not coincide with the start-up inspection.

****END OF SECTION****

SECTION 23 34 17

KITCHEN HOOD EXHAUST FAN

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. The fan shall be a spun-aluminum, roof-mounted, direct-drive, upblast centrifugal exhaust ventilator suitable for grease-laden kitchen exhaust.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 07 71 00: Roof Specialties and Accessories*

3. *Section 23 31 13: Sheet Metal Ductwork*

4. *Division 26: Equipment Wiring Systems*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for the *EXHAUST FANS* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrates compliance with the specified requirements.

C. Manufacturer’s recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

D. The fan shall be ETL Listed and comply with UL 705, UL 762, ULC-S645, and CSA Standard C22.2 No. 113.

E. Fan shall bear the AMCA certified rating seal for air performance.

F. The fan wheel shall be balanced in two planes in accordance with AMCA Standard 204-96, Balance Quality and Vibration Levels for Fans.

G. The fan shall be listed for restaurant exhaust service and shall operate continuously while exhausting air at 300°F until thermal equilibrium and withstand 600°F grease-laden air for 15 minutes without unsafe damage.

1.04 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 7823, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. See fan schedules on drawings for required fan operating characteristics.

D. Acceptable manufacturers:

1. Captiveaire

2. Or equivalent.

2.02 DIRECT DRIVE ROOF UPBLAST CENTRIFUGAL EXHAUST FANS

A. General Assembly:

1. The fan shall be factory assembled, tested, and shipped as a complete unit.

2. The fan shall meet the following specifications, deliver all scheduled capacities, and conform to the design indicated. Alternate layouts or dimensional changes will not be accepted.

B. Construction:

1. The fan wind band shall be constructed of heavy-gauge aluminum and shall be spun on an automatic lathe to provide consistent dimensions.

2. Horizontal and vertical internal supports shall be used to fasten the wind band to the discharge apron securely. This provides rigidity for hinging and added strength to reduce shipping damage.

3. The discharge apron shall have a rolled bead for added strength.

4. Base corners shall be welded to provide strength and support for hinging and cleaning and prevent leakage into the building.

5. The fan shall bear a permanently attached nameplate displaying model and serial number of unit for future identification.

6. Nylon washers provide a tight seal. All fasteners in the fan housing shall be backed with nylon washers.

7. The fan shall be factory tested after assembly.

C. Curb:

1. The curb shall be constructed of galvanized steel.

2. The heavy-duty G90 galvanized curb shall be 20-gauge construction with fully welded corners and a 3-inch flange for strength and leak protection.

3. The curb shall be vented and provided with an attached hinge kit to permit access to the fan wheel and duct for inspection and cleaning.

D. Wheel:

1. The fan wheel shall be centrifugal backward inclined and non-overloading.

2. The wheel blades shall be aerodynamically designed to minimize turbulence, increase efficiency and reduce noise.

3. The wheel blades shall be welded to the wheel inlet cone.

4. If balancing weights are required, they shall be riveted to the blades or wheel.

5. The wheel inlet shall overlap the fan base inlet for maximum performance and efficiency.

6. The wheel shall be firmly attached to the motor shaft with two set screws.

E. Motors:

1. Motor Type: Totally Enclosed Air Over Electronically Commutated Motor (TEAO-ECM).

2. Provide a factory-installed NEMA 3R safety disconnect switch.

3. Motor shall be permanently lubricated and rated for continuous duty.

4. Furnished at the specified voltage, phase, and enclosure. Motor speed shall be variable, controlled using an integrated speed controller.

5. The motor shall be mounted out of the airstream and furnished at the specified voltage, phase, and enclosure.

6. Motor mounting plate shall be constructed of heavy gauge galvanized steel.

7. The motor compartment shall be cooled by outside air drawn through an extruded aluminum conduit tube.

8. An integral electrical conduit running from the fan base to the motor compartment is provided for ease of installation.

9. The conduit tube passage shall be sealed to prevent noise. Silicone rubber grommets shall isolate the conduit tube from the fan housing.

10. The motor compartment shall be a two-piece construction. The cap has quick-release clips to provide fast and easy access to the motor compartment.

F. Grease:

1. The grease spout shall be made of aluminum tubing, welded to the fan housing. The weld shall be factory tested to ensure no leaks.

2. Grease Box.

G. ECM Exhaust Fan Wiring Packages:

1. Provide an ECM wiring package for variable-speed control by PWM signal from the kitchen hood control panel prewire (TELCO motor, counterclockwise rotation).

H. Accessories:

1. Upblast Fan Wheel Access Port.

2. Exhaust Fan Heat Baffle.

3. Hinge kit matched to the vented roof curb.

4. Provide a flexible, weatherproof electrical cable of sufficient length to permit the fan to be tilted open for inspection and cleaning without disconnecting the electrical wiring.

5. Provide a factory-approved restraint cable or chain to limit the travel of the fan when opened on its hinges.

2.05 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Install the curb and secure to the wall or roof.

B. Install duct work as shown and secure to the deck or base of the curb.

C. Install back-draft dampers and check to make sure they are free to open and close.

D. Install the fan:

1. Secure aluminum, fiberglass or PVC fans to the curb with stainless steel screws.

2. Secure galvanized steel fans to the curb with galvanized steel screws.

3. Secure to the wood trusses with hanging spring isolators.

E. Connect power and check rotation of fan.

F. This system is not complete until the system has been balanced to provide the correct air quantity and has been tested to demonstrate the correct system performance.

3.03 FIELD QUALITY CONTROL

A. Tests:

1. Upon completion of this portion of the work, and prior to its acceptance by the *OWNER*, make all required tests and adjustments for free and smooth operation.
2. Secure all approvals from agencies having jurisdiction.

3.04 CLEANING

A. Clean exposed surface of all grease, dirt and other foreign materials.

B. Touch up all marred or abraded surfaces in accordance with manufacturer's directions.

3.05 DEMONSTRATION

A. The manufacturer's representative shall instruct the *OWNER'S* operating personnel, at a time designated by the *OWNER*, as to the proper method of operation and recommended maintenance procedures.

B. The scheduling of the instruction shall be at the convenience of the *OWNER* and may not coincide with the start-up inspection.

****END OF SECTION****

SECTION 23 36 16

VARIABLE AIR VOLUME TERMINAL UNITS (SINGLE)

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Single duct terminal units with and without integral electric reheat.

2. Products furnished **but not installed** under this sections:

   a. Controls: Installation and wiring of thermostats and other control components.
   b. Equipment Wiring Systems: Thermostats and control components.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 23 31 13: Sheet Metal Ductwork*

3. *Section 23 33 00: Duct Accessories*

4. *Section 23 37 13: Diffusers, Registers and Grilles*

5. *Section 25 05 03: Equipment Wiring Systems*

C. References:

1 NFPA 90A - Installation of Air Conditioning and Ventilation Systems.

2 UL 181 - Factory-Made Air Ducts and Connectors.

3 UL 1995, Heating and Cooling Equipment.

4 CUL C22.2 No. 236, Heating and Cooling Equipment.

5 AHRI 880 - Air-Conditioning and Refrigeration Institute Standard Rating Conditions for Air Terminals.

6 AHRI 885 - Air-Conditioning, Heating and Refrigeration Institute Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets.

7 ASTM A 527 (Steel Sheet, Zinc Coated Galvanized).

8. A-A-1419 or F-F-310 – Federal Specification (Filter Element, Air-Conditioning, Viscous Impingement or Dry Type, Replaceable), Tested per UL 900.

D. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *VARIABLE AIR VOLUME TERMINAL UNITS (SINGLE)* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Shop drawings showing precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provision in concrete forming, reinforcement, and placement to accommodate the work of this section.

D. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

2. Manufacturer shall participate in the AHRI Certification program. Unit performance data shall be rated in accordance with AHRI Standard 880. The manufacturer shall display the AHRI Symbol on all units.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance: The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers:

1. Trane
2. Environmental Technologies Inc.
3. Titus
4. Price
5. Or equivalent

2.02 SINGLE DUCT TERMINAL UNITS

A. Ceiling mounted primary air control terminal units for connection to a single 5 in. w.g. maximum pressure duct of a central air distribution system. Terminals units shall be provided with controls and integral electric resistance reheat where scheduled.

B. Identify each terminal unit with clearly marked identification label and airflow indicator. Label shall include unit nominal air flow, maximum factory-set air flow, minimum factory-set air flow, and electric reheat type and capacity where applicable.

C. Fabrication:

1. Casings: Units shall be completely factory-assembled, manufactured of corrosion protected steel, and fabricated with a minimum of 18-gauge metal on the high pressure (inlet) side of the terminal unit damper and 22-gauge metal on the low pressure (outlet) side and unit casing.

2. Insulation: Matte Faced - The interior surface of unit casing acoustically and thermally lined with a minimum of 1/2-inch 1.5 lb/ft3 (12.7 mm, 24.0 kg/m3) composite density glass fiber with a high-density facing. Minimum insulation R-Value of 4.2. Insulation shall meet NFPA-90A and UL 181 requirements. The cut edges on the discharge of the unit shall be covered by a metal flange. There are no exposed edges of insulation (complete metal encapsulation).

3. Assembly: Primary air control damper, airflow sensor, controls and integral electric reheat section, where scheduled in single assembly.

4. Rectangular Supply Air Outlet Connections: Rectangular outlet connections for units without optional heating coils on the outlet of the terminal unit shall be flange type. Rectangular outlet connections for units with optional heating coils on the outlet of the terminal unit shall be slip and drive type.

D. Primary Air Control Damper Assembly:

1. Construct damper assembly from a minimum of 18 gauge galvanized steel on the primary air side of the terminal. Blade shall incorporate a full closed cell damper seal to minimize leakage. Damper blade shall be a minimum of 0.10 in. thickness. Maximum damper leak rate shall not exceed 1% of damper nominal CFM at 4 in. wg. differential pressure.

2. Damper assembly shall be constructed self-lubricating bearings and contain a mechanical stop.

3. Primary Damper Shaft shall have a position indicator stamped on the end of the shaft to identify damper position without disassembly of duct, unit casing, or removal of the control box cover.

4. Provide damper assembly with integral flow sensor. Flow sensor shall be provided regardless of control type. Flow sensor shall be a 16-point (minimum 8-points on high pressure side and 8-points on low pressure side), averaging ring or cross type. Bar or single point sensing type is not acceptable. Damper assembly shall be capable of maintaining airflow to within +/- 5 percent of rated unit airflow setpoint with 1.5 duct diameters straight duct upstream from the unit.

5. Flow sensor transducer shall not be integral to the unit controller.

6. Flow coefficient calibration data shall be provided for each terminal unit at or near the unit inlet.

7. Integral flow sensor pressure transducer shall be pressure tested, with air, prior field installation.

E. Integral electric reheat:

1. Where scheduled, provide factory-installed electric resistance reheat with capacity, voltage, phase, and control type as indicated on the drawings and equipment schedule.

2. Electric reheat shall be provided with modulating SCR control, an automatic-reset high-temperature limit, a manual-reset high-temperature limit, and an airflow interlock to prevent heater operation without proven airflow.

3. Units not scheduled with electric reheat shall be provided without an electric-heating section.

F. Wiring:

1. Factory install and wire terminal unit including electric reheat section where scheduled. Install electrical components in control box with removable cover. Incorporate single point electrical connection to power source.

2. Disconnect switch - Provide terminal units with a factory installed and wired switch to disconnect power to the unit.

3. Control Transformer - Provide terminal units with a factory installed and wired 24 VAC transformer to provide control voltage power to the unit.

G. DDC Controls Protocol/Description:

1 BAS Provider will be responsible for providing all damper actuators, linkages, flow transducers, controllers, room temperature sensors, and any other devices required for unit control, except as specified below.

2 BAS Provider will be responsible for calibrating the actuator and its controller through TAB work for scheduled airflow rates. Units shall be capable of field calibration and readjustment with external gauge taps.

3 Unit manufacturer shall provide unit inlet flow sensor and pneumatic tubing for BAS Provider's use.

4 Unit manufacturer shall factory install all devices furnished by BAS Provider to result in a complete functioning unit. Unit manufacturer shall be responsible for reviewing compatibility of devices furnished by BAS Provider to units provided.

H. Testing/Verification:

1. Maximum Casing Leakage: 1percent of nominal air flow at 0.5 wg inlet static pressure.

2. Maximum Damper Leakage: 1 percent of design air flow at 4 in wg inlet static pressure.

2.04 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work

of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

D. Verify ductwork is ready for air terminal installation.

3.02 INSTALLATION

A. Installation shall meet or exceed applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. Installation shall be in accordance with manufacturer's published recommendations

C. Connect to ductwork in accordance with Section 23 3100.

D. Install ceiling access doors or locate units above easily removable ceiling components.

E. Support units individually from structure. Do not support from adjacent ductwork. Terminal units shall be supported using units hanger brackets and threaded rods. Do not support from adjacent ductwork. Refer to other Division 23 Section(s) for vibration isolation requirements.

F. All controls shall be placed inside a controls enclosure attached to the terminal unit.

G. Wiring and controller compartments, electronic motors and damper motors shall have a minimum 42 inch clear wide and deep working space readily accessible from lift out ceiling tiles or access panels.

H. Provide clearance for inspection, repair, replacement, and service. Ensure accessibility to terminal unit electrical control panel doors, controllers and operators are located a minimum of 42-inches from all obstructions (walls, pipe, etc.).

3.03 ADJUSTING

A. Reset volume with damper operator attached to assembly allowing flow range modulation from 100 percent of design air flow to 25 percent nominal air flow for cooling only units and 30 percent for units with heating coils.

3.04 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Remove and dispose of all debris.

3.05 TESTS

A. Upon completion of this portion of the work and prior to acceptance by the *OWNER*, make all required tests and adjustments for free and smooth operation.

B. Secure all approvals from agencies having jurisdiction.

3.06 START-UP

A. The equipment manufacturer shall provide the services of a trained qualified representative, as required, excluding travel time for the purpose of inspecting the installation.

B. The representative shall prepare and submit a written report to both the *CONTRACTOR* and *ENGINEER* regarding the installation, including any conditions which might affect the manufacturer's guarantee. The equipment shall not be accepted by the *OWNER* until such time as this report has been received and accepted by the *ENGINEER*.

3.07 INSTRUCTIONS

A. The manufacturer's representative shall instruct the *OWNER'S* operating personnel, at a time designated by the *OWNER*, as to the proper method of operation and recommended maintenance procedures.

B. The scheduling of the instruction shall be at the convenience of the *OWNER* and may not coincide with the start-up inspection.

****END OF SECTION****

SECTION 23 37 13

DIFFUSERS, REGISTERS AND GRILLES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Grilles, registers, and diffusers and all auxiliaries.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 23 33 00: Duct Accessories*.

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *DIFFUSERS, REGISTERS AND GRILLES* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer: Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of installers: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

C. Basis of acceptance: The manufacturer's recommended installation procedures, when approved by the *ENGINEER*, will become the basis for inspecting and accepting or rejecting actual installation procedures used on this work.

1.04 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 RECTANGULAR CEILING DIFFUSERS (CD)

A. Acceptable Manufacturers:

1. Titus – Model TDC-AA

2. Price Industries.

3. Or equivalent.

B. Type: Square and rectangular, adjustable pattern, multi-louvered diffuser to discharge air in one-way, two-way, three-way, or four-way pattern as scheduled on drawings.

C. Frame: Surface mount or Inverted T-bar as scheduled on drawings.

D. Fabrication: Aluminum with baked enamel off-white finish.

E. Accessories (Where required and/or as noted on drawings): Square to round transitions where round duct sized indicated on drawings, lay-in module for 2' x 2' lay-in ceilings, face operated opposed blade balance damper.

2.03 PERFORATED CEILING DIFFUSERS AND REGISTERS (PCD, PER)

A. Manufacturers:

1. Titus

2. Price

3. Nailor

B. Type: Perforated ceiling diffusers for supply. The return models shall have the same face and border construction as the supply models for harmonious appearance in the room. Diffusers shall have a perforated face with 3/16-inch diameter holes on ¼-inch staggered centers and no less than 51 percent free area. Perforated face shall be steel. The backpan shall be one piece stamped heavy gauge steel of the sizes and mounting types shown on the plans and outlet schedule. The diffuser neck shall have 1 1/8-inch depth for easy duct connection.

C. Diffusers must discharge a uniform horizontal blanket of air into the room and protect ceiling against smudging. Pattern controllers in the supply models shall be mounted on the back of the perforated face and must be field adjustable to allow the discharged air to enter the room in either vertical or one-, two-, three- or four-way horizontal jets. The perforated face must be easily unlatchable from the backpan to facilitate option of the face for pattern controller adjustment or to access an optional damper.

D. The finish shall be #26 white. The finish shall be an anodic acrylic paint, baked at 315°F for 30 minutes.

E. The pencil hardness must be HB to H.

F. The paint must pass a 100-hour ASTM B117 Corrosive Environments Salt Spray Test without creepage, blistering or deterioration of film. The paint must pass a 250-hour ASTM D870 Water Immersion Test. The paint must also pass the ASTM D2794 Reverse Impact Cracking Test with a 50-inch pound force applied.

G. The manufacturer shall provide published performance data for the perforated diffuser. The diffuser shall be tested in accordance with ANSI/ASHRAE Standard 70-1991.

H. Provide R-6 molded insulation blanket on top side of backpan.

2.04 SLOT DIFFUSERS AND REGISTERS (SLD, SLR)

A. Acceptable Manufacturers:

1. Price – Model SDS with SDB plenum.

2. Or equivalent.

B. Construction:

1. The diffusers shall have 2 discharge slots with 1 inch slot width.

2. The supply diffusers shall have aerodynamically curved “ice-tong” shaped pattern controllers for 180 degree air pattern control and airflow dampening, if required.

3. The return units shall match the supply units in appearance.

4. The diffuser border shall be extruded aluminum construction with extruded aluminum spacers and mitered end flanges, open ends, flush end caps or flange end caps as required.

5. Continuous length units shall be provided with factory assembled corner modules to suit drawings and site conditions. Splice plates and alignment plates shall be provided to align continuous slot assemblies. The maximum section length shall be 72 inches.

6. The linear slot diffusers shall be compatible for installing in wooden slat type ceiling specified in our project. Freely suspended mounting frame or as appropriate. Coordinate with our drawings and provide appropriate border type and style for the ceiling type specified in our design documents.

C. Performance shall be as specified on schedules and drawings.

D. The finish color shall be selected by owner and architect.

E. Accessories (where required and specified on design documents):

1. Blank off (where specified on drawings):

a. The diffuser shall be supplied with [vinyl] or [metal] blank off sections. The blank-offs shall cover inactive sections of the slot diffuser, and shall be shipped loose for field cutting and installation.

2. Alignment Strips:

a. The diffuser shall include alignment strips when the diffuser is supplied in multiple sections to provide linear alignment to the continuous slot diffuser.

3. Plaster Frame Spacers:

a. The diffuser shall be supplied with plaster frame spacers to provide the correct spacing of the plaster frame prior to installation of the diffuser.

4. Equalizing Core:

a. The diffuser shall be supplied with an equalizing core to equalize the air velocity over the face of the diffuser.

F. Straight Shoulder Slot Diffuser Plenum

1. Description:

a. Supply and return slot diffusers shall be furnished and installed with straight shoulder plenum in sizes and capacities as shown on the plans and air distribution schedule.

2. Construction:

a. The plenums shall be constructed of zinc coated steel.
b. The plenum assembly shall have straight shoulders for enhanced throw characteristics.
c. The plenum assembly shall have a side inlet.
d. The plenum shall be available to suit the suspended wooden slat ceiling type specified in this project.
e. The plenum shall be internally lined with 1/4 inch thick fiber free foam interior insulation.

2.05 CEILING RETURN FILTER GRILLES (FRR/FRG)

A. Manufacturers:

1. Price Company Model 630FF.

2. Titus Model 350FLF1.

B. Type: Fixed deflection blades shall be available parallel to the long dimension of the grille.

C. Frame: 1-1/4 inch margin with countersunk screw mounting.

D. Fabrication: Aluminum with 20 gauge (0.90 mm) minimum frame, or aluminum extrusions, with factory baked enamel finish.

E. Filter: Return grille should be provided with 1" filter frame. Provide clean filters for each grille prior to Testing and Balancing.

F. Provide with Aluminum opposed blade damper operable from face of the grille.

G. Furnish with frame for lay-in ceiling installation.

2.06 CEILING EXHAUST AND RETURN REGISTERS/GRILLES (RR, ER)

A. Acceptable Manufacturers:

1. Titus. 350 FL/FS

2. E. H Price Company.

3. Or equivalent.

B. Type: Streamlined blades, 3/4-inch minimum depth, ½-inch maximum spacing, with blades set at 45 degrees, horizontal face.

C. Frame: 1¼ inch margin with countersunk screw mounting. Provide lay-in module panel for 2' x 2' lay-in ceilings (Refer to drawings and schedules for requirement).

D. Fabrication: Aluminum, with factory off-white enamel finish or color as noted on drawings.

E. Damper (Where required and/or as specified on drawings): Integral, gang-operated, opposed blade type with removable key operator, operable from face where not individually connected to exhaust fans.

F. Accessories (where required or as noted on drawings.): Square to round transitions where round duct sizes indicated on drawings, lay-in module panel for 2' x 2' lay-in ceilings, face operated opposed blade balance damper.

2.07 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General: Install the work of this section in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

B. The work of this section shall be installed plumb and perpendicular to piping where required on Plans.

C. Install grilles, registers, and louvers flush with surface and level or straight with other similar items.

D. Insulate the back of all ceiling diffusers, to cover all exposed metal, with ¼" thickness of self-adhesive insulating tape.

E. Drop from supply duct shall be internally insulated down to diffuser. If necessary, cut insulation back to clear operation of the OB damper and reinsulate only the exposed portion with external duct insulation.

F. Support the register from the duct at the proper level to hold it snug against the ceiling.

3.03 CLEANING

A. Clean exposed surface of all grease, dirt and other foreign materials.

B. Touch up all marred or abraded surfaces as specified herein.

****END OF SECTION****

SECTION 23 38 13

COMMERCIAL KITCHEN HOODS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Furnishing and installing commercial kitchen ventilation hoods with size, shape, and performance specified on the drawings.

    a. The ND2 series (basis of design-CaptiveAire) is a Type I, wall canopy hood for use over 450°F/600°F/700°F cooking surface temperatures. The aerodynamic design includes a mechanical baffle and performance enhancing lip for exceptional capture and containment.

2. The kitchen hood, fire suppression system, gas-fired make up air unit and kitchen hood exhaust fan shall all be provided by a single manufacturer.

    a. CaptiveAire or approved equivalent.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 07 71 00: Roof Specialties and Accessories*

3. *Section 21 23 00: Wet-Chemical Fire Extinguishing System*

4. *Section 23 34 17: Kitchen Hood Exhaust Fans*

5. *Section 23 74 23: Packaged Outdoor Heating Only Makeup Air Unit*

6. *Division 26: Equipment Wiring Systems*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for the *COMMERCIAL KITCHEN HOODS* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrates compliance with the specified requirements.

C. The manufacturer shall supply complete submittal drawings, including hood section view(s) and hood plan view(s). These drawings must be available to the *ENGINEER* and *OWNER* for their use in construction, operation, and maintenance.

D. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

D. This hood is ETL-listed to standard UL710, ULC710, and ULC-S646 when installed in accordance with these installation instructions and National Fire Protection Association Standard "NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations."

E. Built-in compliance with NSF/ANSI Standard 2.

F. The hood shall be ETL Listed as:

1. "Exhaust Hood Without Exhaust Damper."

2. ETL Sanitation Listed and built in accordance with NFPA 96.

3. The ETL label shall list temperature rating(s) and minimum CFM/ft rating(s).

1.04 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The Contractor and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 7823, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Construction shall be dependent on the structural application to minimize distortion and other defects. All seams, joints, and penetrations of the hood enclosure to the lower outermost perimeter, which directs and captures grease-laden vapor and exhaust gases, shall have a liquid-tight continuous external weld in accordance with NFPA 96.

D. Duct sizes, CFM, and static pressure requirements shall be as shown on drawings. Static pressure requirements shall be precise and accurate; air velocity and volume information shall be accurate within 1-ft increments along the length of the ventilator.

E. Acceptable manufacturers:

1. CaptiveAire

2. Or equivalent

2.02 CONSTRUCTION

A. Construction shall be type 304/430 stainless steel.

B. Double wall insulated front to eliminate condensation and increase rigidity on wide sizes. The insulation shall have a flexural modulus of 475 EI, meet UL 181 requirements and be in accordance with NFPA 90A and 90B.

C. Hood shall be equipped with a minimum of four connections for hanger rods. Hood lengths greater than 12’ will have added hangers.

D. Exhaust duct collar to be 3” or 4” high with flange.

E. The grease drain system shall be an enclosed integral part of the hood back and have slopes with an exposed, removable 1/2 grease cup to facilitate cleaning.

F. Low profile design to allow plate shelf and passover design.

G. Removable grease cup for easy cleaning.

H. An integral baffle to direct grease laden vapors toward the exhaust filter bank.

I. Hood shall be furnished with UL classified filters, supplied in size and quantity as required by ventilator.

J. All seams shall be welded and have stainless steel on exposed surfaces.

2.03 LIGHTING

A. Recessed LED light, 3K warm output.

B. Recessed LED light, 4K natural output.

C. L55 Series canopy light fixture, includes clear thermal and shock resistant globe.

D. Recessed round dimmable LED fixture and LED light, 3500K Warm output.

E. Recessed round LED fixture and LED light, 3500K Warm output.

F. Recessed incandescent light.

G. Screw-in compact fluorescent bulb. High temperature assembly includes clear and shock resistant globe.

H. Screw-in halogen bulb. High temperature assembly includes clear and shock resistant globe.

I. Wire Guards

2.04 FILTERS

A. Stainless Steel Captrate Combo Filter (redesigned for low static pressure) with hook, ETL Listed. Particulate capture efficiency: 99% efficient at 9 microns, 92% efficient at 3 microns.

B. Stainless Steel Captrate Solo filter with hook, ETL Listed. Particulate capture efficiency: 85% efficient at 9 microns, 76% efficient at 5 microns.

C. SS Single wall filter with Bottom Hanging Hook. For use in Type 2 Hoods only.

D. Spark Arrestor Filters with Hook. Stainless Steel Filter with Baffle and Spark Arrestor Screen and Bottom Hanging Hook.

E. High Velocity Cartridge Filter, Stainless steel with Bottom Hanging Hook.

F. High Velocity Cartridge Filter, Stainless steel with Bottom Hanging Hook. 2 inches Wide Maximum, for Self Cleaning Hoods with Drip Blanks.

G. Kleen-Gard Stainless Steel Baffle Filter with Handles and Bottom Hanging Hook, UL Classified.

H. Kleen-Gard Stainless Steel Baffle Filter with Handles, UL Classified.

2.05 FEATURES

A. Fire Suppression System: UL 300 fire suppression system.

B. Optional perforated supply plenum shall provide make-up air discharged below the cooking equipment.

1. Perforated diffuser plates shall be included in the design to provide even air distribution.

2. Unexposed surfaces shall be constructed of aluminized steel. Plenum shall be insulated to prevent condensation.

3. Perforated Supply Plenum (PSP)

4. Dual Plenum (AC-PSP)

C. Hood or Wall Mounted Utility Cabinet – The cabinet can store listed fire suppression system, listed components, and pre-wired electrical controls.

2.06 ACCESSORIES

A. CORE Protection – CORE Protection plenum spray bar added.

B. Balance Damper - Used to manually balance exhaust flow rate. Installed in hood plenum.

C. End Panel(s) maximize hood performance and eliminate the effects of cross drafts in the kitchen. Units constructed of stainless steel and sized according to hood width and cooking equipment. Exposed edges hemmed for safety and rigidity. Selected panels:

1. End Panel
2. Quarter End Panel
3. Vertical End Panel
4. Wall as End Panel
5. Wide Vertical End Panel

D. Splash panel(s) selected:

1. Backsplash
2. Backsplash - Inside Corner
3. Backsplash - Outside Corner
4. Left Sidesplash
5. Right Sidesplash

E. Standoff(s) selected:

1. Back Standoff «BACK» Bolt Together
2. Left End Standoff
3. Right End Standoff

4. Front Standoff

F. Wrapper(s) may be installed from the factory or field installed. Wrapper(s) selected:

1. Wrapper
2. Wrapper Channel

G. Miscellaneous option(s) selected:

1. 16 Gauge Hood Top – Option for pass-through hoods to stiffen top shelf.
2. Minimum 18 Gauge Hood – Upgrade option to hood's construction from 20 gauge to 18 gauge.
3. 1-Pint Grease Cup – Replaces 1/2 pint grease cup.
4. DI-PSP – Drop-In Perforated Supply Plenum for supply air.
5. Ground/Polished Corners – Corners of hood welded along seams. Grind and polished corners for final finish.
6. Finished Top – Finished top for storage/pass-through top.
7. Full Dimension Hanging Bracket – Unistrut added to allow for various hood mounting locations.
8. Insulation for Top of Hood – Fully insulated top of hood.
9. Insulation for Back of Hood – Backside of hood is fully insulated.
10. NYC Construction – Hood construction will follow NYC construction requirements. All filters stamped with NYC certificate of approval.
11. Pizza Oven Top Mount Flanges – Flanged brackets added to mount hood over pizza over.
12. Prison Package – Includes security screws in place of standard screws and cabinet locks.
13. Riser Sensor Install – Sensor set-up for 3" thick double wall duct.
14. Riser Sensor Install – Sensor set-up for 6" plenum.
15. Sensor-Capture Volume – Duct stat installed in the capture volume of the hood.
16. Structural Front Panel – Front panel made with 18 gauge material.
17. Timer Bracket – Centered bracket along the length of the hood.
18. Top Anchor – Angle iron added to the top of the back support.
19. Wall End Cap – Stainless steel U channel.
20. Wall Mount Bracket – Used to hang hood onto a back wall.
21. Dye Test Plenum – Plenum and exhaust risers dye tested from the factory.
22. GFCI Duplex Outlet – GFCI outlet added to hood.
23. Self Cleaning – Self cleaning spray bar, self cleaning filters, and water wash drain kit added.
24. Heat Recovery Coil – Heat Recovery Coil for hood plenum.
25. Concession Trailer Install Kit – Hardware kit for concession trailer hood installation.
26. Condensate Gutter – Full perimeter condensate gutter.

2.07 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the Contractor subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions, drawings, written specifications, manufacturer's installation manual, and all applicable building codes.

3.03 CLEANING

A. Clean exposed surface of all grease, dirt and other foreign materials.

B. Touch up all marred or abraded surfaces in accordance with manufacturer's directions.

3.04 DEMONSTRATION

A. The manufacturer's representative shall instruct the *OWNER'S* operating personnel, at a time designated by the *OWNER*, as to the proper method of operation and recommended maintenance procedures.

B. The scheduling of the instruction shall be at the convenience of the *OWNER* and may not coincide with the start-up inspection.

****END OF SECTION****

SECTION 23 74 20

PACKAGED ROOFTOP UNIT

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Packaged Rooftop Unit (RTU-20)

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 23 05 93: Testing and Balancing for HVAC*

C. References

1. AFBMA 9 – Load Ratings and Fatigue Life for Ball Bearings.

2. AMCA 99 – Standards Handbook.

3. AMCA 210 – Laboratory Methods of Testing Fans for Rating Purposes.

4. AMCA 500 – Test Methods for Louvers, Dampers, and Shutters.

5. AHRI 340/360 – Unitary Large Equipment.

6. NEMA MG1- Motors and Generators.

7. National Electronic Code

8. NFPA 70 – National Fire Protection Agency.

9. SMACNA – HVAC Duct Construction Standards – Metal and Flexible.

10. UL 900 – Test Performance of Air Filter Units.

11. AHRI 210/240 – Performance Rating of Unitary Air Conditioning and Air Source Heat Pump Equipment.

D. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *PACKAGED, ROOFTOP UNITS* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Product data, including dimensions, duct & service connections, accessories, controls with schematics and sequence of operation, electrical nameplate data, wiring diagrams, fan curves and burner & filter data.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Manufacturer's recommended installation procedures including rigging and assembly instructions.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and

properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance: The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers:

1. Trane.

2. Or equivalent.

2.02 PACKAGED ROOFTOP UNIT WITH HEAT PUMP AND AUXILIARY ELECTRIC HEAT

A. Unit performance and electrical characteristics shall be per the schedule shown on the Drawings.

B. Casing:

1. Unit casing shall be zinc coated, heavy gauge, galvanized steel.

2. Weather resistant painted metal with galvanized substrate.

3. Meets ASTM B117, 672 hour salt spray test.

4. Removable single side maintenance access panels.

5. Exposed vertical panels and top covers in the indoor air section insulated with a cleanable foil-faced, fire-retardant permanent, odorless glass fiber material.

6. Base pan with no penetrations within the perimeter of the curb other than the raised 1-inch downflow supply/return openings to provide an added water integrity precaution, if the condensate drain backs up.

7. Base of the unit insulated with 1/8-inch, foil-faced, closed-cell insulation.

8. Unit base provisions for forklift and/or crane lifting on three sides of unit.

C. Microchannel Coils:

1. Optimal heat transfer performance due to flat, streamlined tubes with small ports, and metallurgical tube to fin bond.

2. Reduce system refrigerant charge by up to 50 precent leading for better compressor reliability.

3. All-aluminum construction minimizes galvanic corrosion.

4. Strong aluminum brazed structure provides better fin protection.

5. Flat streamlined tubes more dust resistant and easy to clean.

6. Coils leak tested at the factory to verify the pressure integrity.

D. Fin and Tube Coils (heat pump only):

1. Heat pump units shall have internally finned, 5/167-inch copper tubes, mechanically bonded to a configured aluminum plate fin.

2. Assembled coil shall be factory leak tested to 600 psi.

3. Assembled unit shall be leak tested to 465 psi.

E. Coil Guards:

1. Provides condenser coil protection.

F. Compressors:

1. All units have direct-drive, hermetic, scroll type compressors with centrifugal type oil pumps.

2. Suction gas-cooled motor with voltage utilization range of plus or minus 10 percent of unit nameplate voltage.

3. Internal overloads shall be standard with scroll compressors.

4. Crankcase heaters shall be standard on all compressors.

5. Unit shall have minimum 3 stages of cooling.

G. Units with Variable Speed Compressor Systems:

1. All unit have a variable speed compressor matched with a variable frequency drive that modulated the speed of the compressor motor.

2. Compressor motors shall include permanent magnet motor with voltage utilization range of plus or minus 10 percent of unit nameplate voltage.

3. Unit shall have a single variable speed compressor manifolded to a fixed speed compressor.

4. Variable speed modulation to 15 HZ equating to 27% or less of full capacity.

5. Variable speed shall be commanded by the unit controller and shall be based on the temperature offset to space temp set point.

H. Filters:

1. 2-inch MERV 8 and MERV 13 filters.

I. Frostat™:

1. Frostat shall be standard on all units.

J. Indoor Fan:

1. Unit shall have direct drive plenum fans with ECM motors. Plenum fan shall be backward-curved fan wheel along with an external rotor direct drive variable speed indoor motor.

2. Plenum fan design – backward-curved fan wheel along with an external rotor direct drive variable speed indoor motor.

3. Supply fan speed adjustments can be made using the unit controller or using a manufacturer supplied app. The connection between the unit control and the app shall be Bluetooth.

4. Motors are electronically protected.

K. Powered Convenience Outlet:

1. Powered GFCI, 120V/15A, 2 plug, convenience outlet shall be available.

2. Powered outlets must include a service receptacle disconnect. This outlet shall be powered from the line side of the disconnect or circuit breaker, and will remain powered when the disconnect or circuit breaker is in the open position.

L. Through-the-Base Electrical with Disconnect Switch:

1. Optional 3-pole, molded case, disconnect switch with provisions for through-the-base electrical connections shall be available.

2. Disconnect switch installed within unit and shall be protected from outdoor elements.

3. Wiring shall be provided from the switch to the unit high voltage terminal block.

4. Switch shall be cULus recognized.

5. Provided disconnect switch does not satisfy the need for overcurrent protection. When disconnect switch is factory provided, overcurrent protection shall be provided by others.

M. Economizer:

1. Economizer shall be available with barometric relief. It shall be fully modulating from 0 to 100 percent and shall include provision for a minimum position setting. Assembly also includes, preset linkage, wiring harness with plug, and spring return actuator.

2. Barometric relief provides a pressure-operated, gravity-closing damper.

3. Barometric relief prevents entrance of outside air during the equipment off cycle.

4. Control options include dry bulb, differential dry bulb, reference enthalpy, or comparative enthalpy.

5. A standard discharge air sensor shall be included on all units with economizers.

N. Electric Heaters:

1. Electric heaters shall be nickel chromium elements and will be delta connected for 240V and wye connected for 480V and 600V.

2. Heater staging is commanded by the unit microprocessor control.

3. Heater shall include at least one automatic reset high temperature device and a single operation high temperature limit control.

4. Heaters shall be individually fused from the factory and shall be wired such that the unit electrical connection is a single-point connection.

O. Ventilation Override Operation:

1. Unit can be set to transition up to 3 different pre-programmed sequences for smoke purge, pressurization, and exhaust.

P. Leak Detection Sensors:

1. Unit shall be furnished with a leak detection system from the factory when a circuit refrigerant charge exceeds 3.91 lbs. The leak detection system shall consist of one or more refrigerant detection sensors. When the system detects a leak, the unit controller shall initiate mitigation actions.

Q. Roof Mounting Curb:

1. Roof mounting curb shall be heavy gauge zinc coated steel with nominal two-inch by four-inch nailer setup. Supply/return air opening gasketing shall be provided. Curb shall ship knocked down for easy assembly. Channel shall be provided to allow for adjustment of return air opening location. Curb shall be manufactured to National Roofing Contractors Association guidelines.

2.03 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work

of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Examine roughing-in of plumbing, electrical and HVAC services to verify actual location and compliance with unit requirements.

D. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General: Install the work of this section in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

B. Painting: Marred or abraded surfaces shall be cleaned and refinished in accordance with manufacturer's recommendations.

3.03 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Remove and dispose of all debris.

3.04 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory authorized service representative to inspect field assembled components and equipment installation, to include electrical and piping connections. Report results to A/E in writing. Inspection must include a complete startup checklist

3.05 START-UP

A. Comply with provisions of *Section 23 05 93, Testing and Balancing for HVAC*.

B. Engage a factory authorized service representative to perform startup service. Clean entire unit, comb coil fins as necessary, and install clean filters. Verify water source for compliance with manufacturer's requirements for flow and temperature. Measure and record electrical values for voltage and amperage.

3.06 INSTRUCTIONS

A. The manufacturer's representative shall instruct the *OWNER'S* operating personnel, at a time designated by the *OWNER*, as to the proper method of operation and recommended maintenance procedures.

B. The scheduling of the instruction shall be at the convenience of the *OWNER* and may not coincide with the start-up inspection.

****END OF SECTION****

SECTION 23 74 21

DEDICATED OUTSIDE AIR SYSTEM (DOAS UNITS)

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Dedicated Outside Air Systems (DOAS-1)

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 23 05 93: Testing and Balancing for HVAC*

C. References

1. AFBMA 9 – Load Ratings and Fatigue Life for Ball Bearings.

2. AMCA 99 – Standards Handbook.

3. AMCA 210 – Laboratory Methods of Testing Fans for Rating Purposes.

4. AMCA 500 – Test Methods for Louvers, Dampers, and Shutters.

5. AHRI 340/360 – Unitary Large Equipment.

6. NEMA MG1- Motors and Generators.

7. National Electronic Code

8. NFPA 70 – National Fire Protection Agency.

9. SMACNA – HVAC Duct Construction Standards – Metal and Flexible.

10. UL 900 – Test Performance of Air Filter Units.

D. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *PACKAGED, ROOFTOP UNITS* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Product data, including dimensions, duct & service connections, accessories, controls with schematics and sequence of operation, electrical nameplate data, wiring diagrams, fan curves and burner & filter data.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Manufacturer's recommended installation procedures including rigging and assembly instructions.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance: The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers:

1. Daikin Applied
   13600 Industrial Park Blvd.
   Minneapolis, MN 55441
   Tel: 800-432-1342
   Tel: 763-553-5330

2. Or equivalent.

2.02 PACKAGED ROOFTOP UNIT

A. Unit performance and electrical characteristics shall be per the schedule shown on the Drawings.

B. Configuration: Fabricate as detailed on prints and drawings:

1. 100% intake, low leakage damper and OA measuring station.

2. Energy recovery wheel and EA section.

3. Pre-filter and Final filter.

4. DX cooling coil section.

5. Modulating HGRH section.

6. Direct drive supply fan.

7. Modulating electric heat section.

8. Heat pump condensing section.

C. The complete unit shall be cETLus listed.

D. The unit shall be ASHRAE 90.1-2019 compliant and labeled.

E. The unit shall be specifically designed for outdoor rooftop application and include a weatherproof cabinet. The unit shall be completely factory assembled and shipped in one piece. Packaged units shall be shipped fully charged with R-32 Refrigerant and oil.

F. The unit shall undergo a complete factory run test prior to shipment. The factory test shall include a refrigeration circuit run test, a unit control system operations checkout, a unit refrigerant leak test and a final unit inspection.

G. The unit shall have decals and tags to indicate caution areas and aid unit service. Unit nameplate shall be fixed to the main control panel door. Electrical wiring diagrams shall be attached to the control panel. Installation, operating and maintenance bulletins and start-up forms shall be supplied with the unit.

H. Performance: Refer to schedules on drawings.

I. Warranty: The manufacturer shall provide 12-month parts only warranty. Defective parts shall be repaired or replaced during the warranty period at no charge. The warranty period shall commence at startup or six months after shipment, whichever occurs first.

2.03 CABINET, CASING, AND FRAME

A. Panel construction shall be double-wall construction for all panels. All floor panels shall have a solid galvanized steel inner liner on the air stream side of the unit to protect insulation during service and maintenance. Insulation shall be a minimum of 1" thick with an R-value of 7.0 and shall be 2 part injected foam. Panel design shall include no exposed insulation edges. Unit cabinet shall be designed to operate at total static pressures up to 5.0 inches w.g.

B. Exterior surfaces shall be constructed of painted galvanized steel, for aesthetics and long-term durability. Paint finish will include a base primer with a high-

quality polyester resin topcoat. Finished, unabraded panel surfaces shall be exposed to an ASTM B117 salt spray environment and exhibit no visible red rust at a minimum of 3,000 hours exposure. Finished, abraded surfaces shall be tested per ASTM D1654, having a mean scribe creepage not exceeding 1/16" at 1,000 hours minimum exposure to an ASTM B117 salt spray environment. Measurements of results shall be quantified using ASTM D1654 in conjunction with ASTM D610 and ASTM D714 to evaluate blister and rust ratings.

C. Service doors shall be provided on the fan section, filter section, control panel section, and heating vestibule in order to provide user access to unit components. All service access doors shall be mounted on multiple, stainless steel hinges and shall be secured by a latch system. Removable service panels secured by multiple mechanical fasteners are not acceptable.

D. The unit base shall overhang the roof curb for positive water runoff and shall seat on the roof curb gasket to provide a positive, weathertight seal.

2.04 OUTDOOR/RETURN AIR SECTION

A. Unit shall be provided with a 100% outdoor air hood. The 100% outdoor air hood shall allow outdoor air to enter from the back of the unit, at the draw-through filter section. The outdoor air hood shall be factory installed and constructed from galvanized steel finished with the same durable paint finish as the main unit. The hood shall include a bird screen to prevent infiltration of foreign materials and a rain lip to drain water away from the entering air stream.

B. Low leak dampers shall be provided. Damper blades shall be fully gasketed and side sealed and arranged vertically in the hood. Damper leakage shall be less than 1.5 CFM/Sq. Ft. of damper area at 1.0 inch static pressure differential. Leakage rate to be tested in accordance with AMCA Standard 500. Damper blades shall be operated from multiple sets of linkages mounted on the leaving face of the dampers. Control of the dampers shall be from a factory installed actuator.

C. Control of the outdoor dampers shall be by a factory installed actuator. Damper actuator shall be of the modulating type. Damper to open when supply fan starts, and close when supply fan stops.

D. Unit is provided with a factory installed and tested outdoor air monitor, with +/- 15% accuracy down to 40 cfm/ton, and a field installed Duct/Space mounted C02 sensor. Outside air damper position will modulate between the Demand Control Ventilation Limit (minimum position setpoint) and the Ventilation Limit (maximum non-economizer position setpoint) to satisfy the space requirements.

Damper position will be controlled to the greater of the two command signals, either minimum outside air flow or space IAQ (CO2).

2.05 ENERGY RECOVERY

A. The rooftop unit shall be provided with an AHRI certified rotary wheel air-to-air heat exchanger in a cassette frame complete with seals, drive motor and drive belt. The energy recovery wheel shall be an integral part of the rooftop unit with unitary construction and does not require field assembly. Bolt-on energy recovery units that require field assembly and section to section gasketing and sealing are not acceptable.

B. The wheel capacity, air pressure drop and effectiveness shall be AHRI certified per AHRI Standard 1060. Thermal performance shall be certified by the manufacturer in accordance with ASHRAE Standard 84, Method of Testing Air-to-Air Heat Exchangers and AHRI Standard 1060, Rating Air-to-Air Heat Exchangers For Energy Recovery Ventilation Equipment.

C. The rooftop unit shall be designed with a track so the entire energy recovery wheel cassette can slide out from the rooftop unit to facilitate cleaning.

D. The unit shall have 2" Merv 8 filters for the outdoor air before the wheel to help keep the wheel clean and reduce maintenance. Filter access shall be by a hinged access door with ¼ turn latches.

E. The matrix design shall have channels to reduce cross contamination between the outdoor air and the exhaust air. The layers shall be effectively captured in aluminum and stainless-steel segment frames that provide a rigid and self-supporting matrix. All diameter and perimeter seals shall be provided as part of the cassette assembly and shall be factory set. Drive belt(s) of stretch urethane shall be provided for wheel rim drive without the need for external tensioners or adjustment.

F. The total energy recovery wheel shall be coated with silica gel desiccant permanently bonded without the use of binders or adhesives, which may degrade desiccant performance. The substrate shall be lightweight polymer and shall not degrade nor require additional coatings for application in marine or coastal environments. Coated segments shall be washable with detergent or alkaline coil cleaner and water. Desiccant shall not dissolve nor deliquesce in the presence of water or high humidity.

G. Wheels shall be provided with removable energy transfer matrix. Wheel frame construction shall be a welded hub, spoke and rim assembly of stainless, plated

and/or coated steel and shall be self-supporting without matrix segments in place. Segments shall be removable without the use of tools to facilitate maintenance and cleaning.

H. Wheel bearings shall be selected to provide an L-10 life in excess of 400,000 hours. Rim shall be continuous rolled stainless steel. Wheels shall be connected to the shaft by means of taper lock hubs.

I. The exhaust air fan shall be a direct drive SWSI plenum fan. The exhaust fan shall be sized for the airflow requirements per the construction schedule. The unit controller shall control the exhaust fan to maintain building pressure. The exhaust fan motor shall be an ECM motor. The rooftop unit shall have single point electrical power connection and shall be ETL listed.

J. The control of the energy recovery wheel shall be an integral part of the rooftop unit's DDC controller. Th DDC controller shall have visibility of the outdoor air temperature, leaving wheel temperature, return air temperature, and exhaust air temperature. These temperatures shall be displayed at the rooftop units DDC controller LCD display. All of these temperatures shall be made available through the BACnet interface.

K. The rooftop unit DDC controller shall provide frost control for the energy recovery wheel. When a frost condition is encountered the unit controller shall stop the wheel. When in the frost control mode the wheel shall be jogged periodically and not be allowed to stay in the stationary position.

2.06 EXHAUST FAN

A. Exhaust fan shall be a single width, single inlet (SWSI) airfoil centrifugal fan. The fan wheel shall be Class II construction with aluminum fan blades that are continuously welded to the hub plate and end rim. The exhaust fan shall be a direct drive fan mounted to the motor shaft. Belts and sheaves are not acceptable due to the additional maintenance.

B. The fan motor shall be a totally enclosed EC motor that is speed controlled by the rooftop unit controller. The motor shall include thermal overload protection and protect the motor in the case of excessive motor temperatures. The motor shall have phase failure protection and prevent the motor from operation in the event of a loss of phase. Motors shall be premium efficiency.

C. The unit DDC controller shall provide building static pressure control. The unit controller shall provide proportional control of the exhaust fans from 25% to 100% of the supply air fan designed airflow to maintain the adjustable building

pressure setpoint. The field shall mount the required sensing tubing from the building to the factory mounted building static pressure sensor.

2.07 FILTERS

A. Unit shall be provided with a draw−through filter section. The filter rack shall be designed to accept a 2” prefilter and a 4” final filter. The unit design shall have a hinged access door for the filter section. The manufacturer shall ship the rooftop unit with 2” MERV 8 and 4" MERV 14 filters.

B. The unit shall be provided with a dirty filter switch and alarm indication that displays filter loading on the exterior of the unit.

2.08 COOLING COIL

A. The indoor coil section shall be installed in a draw through configuration, upstream of the supply air fan. The coil section shall be complete with a factory piped cooling coil and an ASHRAE 62.1 compliant double sloped drain pan.

B. The direct expansion (DX) cooling coils shall be fabricated of seamless high efficiency copper tubing that is mechanically expanded into high efficiency aluminum plate fins. Coils shall be a multi-row, staggered tube design with a minimum of 3 rows. All cooling coils shall have an interlaced coil circuiting that keeps the full coil face active at all load conditions. All coils shall be factory leak tested with high pressure air under water.

C. The cooling coil shall have an electronic controlled expansion valve. The unit controller shall control the expansion valve to maintain liquid subcooling and the superheat of the refrigerant system.

D. The refrigerant suction lines shall be fully insulated from the expansion valve to the compressors.

E. The drain pan shall be stainless steel and positively sloped. The slope of the drain pan shall be in two directions and comply with ASHRAE Standard 62.1. The drain pan shall have a minimum slope of 1/8" per foot to provide positive draining. The drain pan shall extend beyond the leaving side of the coil. The drain pan shall have a threaded drain connection extending through the unit base.

2.09 HOT GAS REHEAT

A. Unit shall be equipped with a fully modulating hot gas reheat coil with hot gas coming from the unit condenser.

B. Hot gas reheat coil shall be a Micro Channel design. The aluminum tube shall be a micro channel design with high efficiency aluminum fins. Fins shall be brazed to the tubing for a direct bond. The capacity of the reheat coil shall be as scheduled.

C. The modulating hot gas reheat system shall allow for independent control of the cooling coil leaving air temperature and the reheat coil leaving air temperature. The cooling coil and reheat coil leaving air temperature setpoints shall be adjustable through the unit controller. During the dehumidification cycle the unit shall be capable of 100% of the cooling capacity. The hot gas reheat coil shall provide discharge temperature control within +/− 2˚F.

D. Each coil shall be factory leak tested with high-pressure air under water.

2.10 SUPPLY FAN

A. Supply fan shall be a single width, single inlet (SWSI) airfoil centrifugal fan. The fan wheel shall be Class II construction with fan blades that are continuously welded to the hub plate and end rim. The supply fan shall be a direct drive fan mounted to the motor shaft. Belts and sheaves are not acceptable due to the additional maintenance.

B. The fan motor shall be a totally enclosed EC motor that is speed controlled by the rooftop unit controller. The motor shall include thermal overload protection and protect the motor in the case of excessive motor temperatures. The motor shall have phase failure protection and prevent the motor from operation in the event of a loss of phase. Motors shall be premium efficiency.

C. The supply fan shall be capable of airflow modulation from 30% to 100% of the scheduled designed airflow. The fan shall not operate in a state of surge at any point within the modulation range.

2.11 VARIABLE AIR VOLUME CONTROL

A. The unit controller shall proportionally control the supply and exhaust fan motors. The supply fan shall be controlled to maintain an adjustable duct pressure setpoint. A duct static pressure sensor shall be factory mounted in the control

panel. The field shall furnish and install the pneumatic tubing for the duct static pressure sensor and the building pressure sensor. The field shall furnish and install the outdoor air pressure sensor.

B. The unit manufacturer shall install all power and control wiring.

C. The supply air fan drive output shall be controlled by the factory installed main unit control system and drive status and operating speed shall be monitored and displayed at the main unit control panel.

2.12 HEATING SECTION

A. The rooftop unit shall include an electrical resistance heating coil section. An electric heating coil module shall be factory installed downstream of the supply air fan in the heating section of the rooftop unit. Heating coils shall be constructed of a low watt density, nickel - chromium alloy resistance wire with intermediate supports that include ceramic bushings. The electrical contactors shall be of the full line-breaking type with all the electrical power legs being disconnected when the contactors are not energized. All electrical circuit wiring shall be designed with copper conductors, aluminum wires are not acceptable. Heating element branch circuits shall be individually fused to a maximum of 48 Amps per NEC requirements. The power supply for the electric heater shall be factory wired into the unit's main power block or disconnect switch.

B. The heating modules shall have an automatic reset, high temperature limit safety protection. A secondary high limit protection shall also be provided that requires a manual reset. An airflow switch shall be provided with the heating module to prevent the electric heater from operating in the event of no airflow.

C. The electric heat elements shall be controlled by the factory installed DDC unit control system. The heater shall have proportional SCR control. The unit controller shall modulate the electric heater to maintain the discharge air temperature setpoint.

D. Field installed heating modules shall require a field ETL certification. Duct heaters mounted within the rooftop unit in the field shall not be acceptable. The manufacturer’s rooftop unit ETL certification shall cover the complete unit including the electric heating modules.

2.13 HEAT PUMP HEATING

A. The evaporator coil, condenser coil, compressors and refrigerant circuit shall be

designed for heat pump operation. The refrigerant circuit shall contain a 4-way reversing valve for the heat pump operation. The outdoor coil shall have an electronic expansion valve to control the refrigerant flow. The unit controller shall modulate the expansion valve to maintain compressor operation within the compressor operational envelope.

B. The refrigerant system shall have a pump-down cycle.

C. The heat pump will use a compressor boost sequence to allow the compressor speed to increase as the ambient temperature goes down until the compressor reaches the maximum speed maximizing the heating capacity at lower ambient temperatures.

D. To maximize heating capacity and avoid damaging the condenser fan, the heat pump will utilize a defrost on demand sequence that determines when the unit will need to go into defrost based on leaving outside air coil temperature, suction temperature, suction pressure, trend data, and ambient temperature. Once defrost is initiated, the outside air damper will close, the compressor speed will be turn down to it's minimum setting, and the 4 way valve will be reversed. During defrost operation the supply fan will continue it's normal operation, and the compressor will be ramped up to a preset speed to maximize the melting of frost on the outdoor coil, and the indoor expansion valve will allow a higher superheat to avoid overcooling. The auxiliary heater will maintain the heat discharge air setpoint. Timed defrost sequences will not be acceptable.

E. The unit shall have an electric resistance heating coil for auxiliary heating. The heat pump will serve as the primary heating source to optimize heating efficiency whenever there is a call for heating or MinDAT until the ambient temperature has reached the adjustable low ambient compressor lock out temperature. When the heat pump operation cannot maintain the discharge air temperature setpoint the electric heating coil shall temper the airstream to the discharge air temperature setpoint. The adjustable low ambient compressor lock out temperature will have default setting allowing the heat pump to operate as low as −10˚F.

2.14 CONDENSING SECTION

A. Outdoor coils shall have seamless copper tubes, mechanically bonded into aluminum plate-type fins. The fins shall have full drawn collars to completely cover the tubes. A sub-cooling coil shall be an integral part of the main outdoor air coil. Each outdoor air coil shall be factory leak tested with high-pressure air under water.

B. Fan motors shall be an ECM type motor for proportional control. The unit

controller shall proportionally control the speed of the condenser fan motors to maintain the head pressure of the refrigerant circuit in ambient conditions up to 125˚F]. Mechanical cooling shall be provided to 0˚F. Heat Pump Heating shall be provided to -10F. The motor shall include thermal overload protection and protect the motor in the case of excessive motor temperatures. The motor shall have phase failure protection and prevent the motor from operation in the event of a loss of phase.

C. The condenser fan shall be low noise blade design. Fan blade design shall be a dynamic profile for low tip speed. Fan blade shall be of a composite material.

D. The compressor shall be an inverter compressor providing proportional control. The unit controller shall control the speed of the compressor to maintain the discharge air temperature. [The inverter compressor shall have a separate oil pump and an oil separator for each compressor that routes oil back to the compressor instead of through the discharge line. Variable Capacity compressors, two step compressors, fixed speed compressors, or anything other than a variable speed compressor will not be acceptable.

E. Pressure transducers shall be provided for the suction pressure and head pressure. Temperature sensor shall be provided for the suction temperature and the refrigerant discharge temperature of the compressors. All of the above devices shall be an input to the unit controller and the values be displayed at the unit controller.

F. Refrigerant circuit shall have a bypass valve between the suction and discharge refrigerant lines for low head pressure compressor starting and increased compressor reliability. When there is a call for mechanical cooling the bypass valve shall open to equalizing the suction and discharge pressures. When pressures are equalized the bypass valve shall close and the compressor shall be allowed to start.

G. Each circuit shall be dehydrated and factory charged with R32 Refrigerant and oil.

2.15 ELECTRICAL

A. Unit wiring shall comply with NEC requirements and with all applicable UL standards. All electrical components shall be UL recognized where applicable. All wiring and electrical components provided with the unit shall be number and color-coded and labeled according to the electrical diagram provided for easy identification. The unit shall be provided with a factory wired weatherproof control panel. Unit shall have a single point power terminal block for main power connection. A terminal board shall be provided for low voltage control wiring.

Branch short circuit protection, 115-volt control circuit transformer and fuse, system switches, and a high temperature sensor shall also be provided with the unit. Each compressor and condenser fan motor shall be furnished with contactors and inherent thermal overload protection. Supply fan motors shall have contactors and external overload protection. Knockouts shall be provided in the bottom of the main control panels for field wiring entrance.

B. GFI receptacle shall be unit mounted that is field powered.

C. A single non-fused disconnect switch shall be provided for disconnecting electrical power at the unit. Disconnect switches shall be mounted internally to the control panel and operated by an externally mounted handle.

2.16 CONTROLS

A. Provide a complete integrated microprocessor based Direct Digital Control (DDC) system to control all unit functions including temperature control, scheduling, monitoring, unit safety protection, including compressor minimum run and minimum off times, and diagnostics. This system shall consist of all required temperature sensors, pressure sensors, controller and keypad/display operator interface. All MCBs and sensors shall be factory mounted, wired and tested.

B. The stand-alone DDC controllers shall not be dependent on communications with any on-site or remote PC or master control panel for proper unit operation. The microprocessor shall maintain existing set points and operate stand-alone if the unit loses either direct connect or network communications. The microprocessor memory shall be protected from voltage fluctuations as well as any extended power failures. All factory and user set schedules and control points shall be maintained in nonvolatile memory. No settings shall be lost, even during extended power shutdowns.

C. The DDC control system shall permit starting and stopping of the unit locally or remotely. The control system shall be capable of providing a remote alarm indication. The unit control system shall provide for outside air damper actuation, emergency shutdown, remote heat enable/disable, remote cool enable/disable, heat indication, cool indication, and fan operation. The unit shall include a BACnet MS/TP communication interface for BAS integration.

D. All digital inputs and outputs shall be protected against damage from transients or incorrect voltages. All field wiring shall be terminated at a separate, clearly marked terminal strip.

E. The DDC controller shall have a built-in time schedule. The schedule shall be programmable from the unit keypad interface. The schedule shall be maintained in nonvolatile memory to ensure that it is not lost during a power failure. There shall be one start/stop per day and a separate holiday schedule. The controller shall accept up to sixteen holidays each with up to a 5-day duration. Each unit shall also have the ability to accept a time schedule via BAS network communications.

F. The keypad interface shall allow convenient navigation and access to the commissioning functions. The unit keypad/display character format shall be 4 lines x 20 characters. All control settings shall be password protected against unauthorized changes. For ease of service, the display format shall be English language readout. Coded formats with look-up tables will not be accepted. The user interaction with the display shall provide the following information as a minimum:

1. Supply and exhaust fan speed control.
2. All Refrigeration Capacities and control input signals.
3. Refrigeration alarm details.
4. Return air temperature.
5. Discharge air temperature
6. Outdoor air temperature.
7. Outdoor enthalpy, high/low.
8. Compressor suction temperature and pressure.
9. Compressor head pressure and temperature.
10. Expansion valve position.
11. Condenser fan speed.
12. Inverter compressor speed.
13. Dirty filter indication.
14. Airflow verification.
15. Cooling status.
16. Control temperature (Changeover).
17. Cooling status/capacity.
18. Unit status.
19. All time schedules.
20. Previous alarms with time and date.
21. Optimal start.
22. System operating hours.

G. The user interaction with the keypad shall provide the following:

1. Controls mode.
2. Cooling and heating change-over temperature with deadband.
3. Cooling discharge air temperature (DAT).
4. Supply reset options.

5. Temperature alarm limits.
6. Lockout control for compressors.
7. Compressor interstage timers.
8. Night setback and setup space temperature.
9. Building static pressure.
10. Currently time and date.
11. Tenant override time.
12. Occupied/unoccupied time schedule.
13. One event schedule.
14. Holiday dates and duration.
15. Adjustable set points.
16. Service mode.

H. If the unit is to be programmed with a night setback or setup function, an optional space sensor shall be provided. Space sensors shall be available to support field selectable features. Sensor options shall include:

1. Zone sensor with tenant override switch.

I. To increase the efficiency of the cooling system the DDC controller shall include a discharge air temperature reset program for part load operating conditions. The discharge air temperature shall be controlled between a minimum and a maximum discharge air temperature (DAT) based on one of the following inputs:

1. Airflow.
2. Outside air temperature.
3. Space temperature.
4. Return air temperature.
5. External signal of 1-5 vdc.
6. External signal of 0-20 mA.
7. Network signal.

J. Units shall contain eight programmable input/output control ports to be controlled using the connected building automation system. These ports shall be input/output capable of utilizing the following signal types:

1. mA signal (0−20 mA − Adjustable)
2. VDC (0−10 VDC − Adjustable).
3. 10k Thermistor.
4. Digital on/off.

2.17 A2L LEAK MITIGATION REFRIGERANT DETECTION SYSTEM (RDS) FOR COMPRESSORIZED ROOFTOP EQUIPMENT USING A2L REFRIGERANT.

A. The unit shall come equipped with a factory installed Refrigerant Detection System (RDS) in compliance with UL60335-2-40. The factory-installed unit controller will respond and control the unit to comply with UL60335-2-40 according to the alarm status of the refrigerant detection system. See the unit Operations Manual for a detailed sequence of operations.

B. The Refrigerant Detection System (RDS) shall consist of the following components:

1. Dedicated A2L Refrigerant Detection Control Board.
2. Refrigerant Sensor or Sensors. The number of sensors will vary based on the product and configuration as needed to comply with UL requirements.

C. Operation and Monitoring:

1. The refrigerant sensor or sensors communicate with the refrigerant detection control board. The refrigerant sensors detect the presence of the A2L refrigerant outside of the sealed refrigeration piping and communicate the levels to the refrigerant detection control board. The refrigerant detection controller communicates the RDS status to the factory-installed unit controller.
2. Alarm Communication: The unit controller will communicate RDS alarms based on the RDS status in the same way as any other alarm. Alarms are triggered by the following: 1) Refrigerant detected above 15% of the refrigerant lower flammability level (LFL); 2) Refrigerant Sensor Fault.
3. A customer relay is provided for the field to connect directly to the refrigerant detection control board as an alternative means to receive the above two alarm statuses.

D. Factory unit wiring diagrams must show the refrigerant leak detection system wiring.

2.18 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Examine roughing-in of plumbing, electrical and HVAC services to verify actual location and compliance with unit requirements.

D. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General: Install the work of this section in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

B. Painting: Marred or abraded surfaces shall be cleaned and refinished in accordance with manufacturer's recommendations.

3.03 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Remove and dispose of all debris.

3.04 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory authorized service representative to inspect field assembled components and equipment installation, to include electrical and piping connections. Report results to A/E in writing. Inspection must include a complete startup checklist

3.05 START-UP

A. Comply with provisions of *Section 23 05 93, Testing and Balancing for HVAC*.

B. Engage a factory authorized service representative to perform startup service. Clean entire unit, comb coil fins as necessary, and install clean filters. Verify water source for compliance with manufacturer's requirements for flow and temperature. Measure and record electrical values for voltage and amperage.

3.06 INSTRUCTIONS

A. The manufacturer's representative shall instruct the *OWNER'S* operating personnel, at a time designated by the *OWNER*, as to the proper method of operation and recommended maintenance procedures.

B. The scheduling of the instruction shall be at the convenience of the *OWNER* and may not coincide with the start-up inspection.

****END OF SECTION****

SECTION 23 74 23

PACKAGED, OUTDOOR, HEATING-ONLY, MAKEUP-AIR UNITS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Outdoor, packaged, rooftop mounted, direct-fired heating-only makeup-air units.

2. Roof curb.

3. Controls.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 23 05 93: Testing and Balancing for HVAC*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *PACKAGED, OUTDOOR, HEATING-ONLY, MAKEUP-AIR UNITS* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Product data, including dimensions, duct & service connections,

accessories, controls with schematics and sequence of operation, electrical nameplate data, wiring diagrams, fan curves and burner & filter data.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Manufacturer's recommended installation procedures including rigging and assembly instructions.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance: The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

1.07 MAINTENANCE

A. Spare parts and materials:

1. Comply with provisions of *Section 01 78 45, Spare Parts and Maintenance Materials*.

2. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

a. Filters: One (1) case of MERV 8 disposable filters for each unit.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers:

1. Captiveaire.
2. Or equivalent.

2.02 GENERAL ASSEMBLY

A. The unit shall be factory assembled, tested, and shipped as a complete outdoor packaged assembly. The unit shall deliver all scheduled capacities and conform to the design indicated.

2.03 CABINET

A. The unit shall be constructed of minimum 20-gauge G-90 galvanized steel riveted together with structural pop rivets. All metal shall be CNC bent for precise assembly.

1. Base Construction: The base shall be constructed of galvanized steel for improved rigidity. Base shall be structurally reinforced to accommodate the blower assembly and burner.

2. Rigging Provisions: The unit shall have a structural base constructed of minimum 14-gauge G-90 galvanized steel, and include lifting points on all four sides.

3. Roof Construction: Roof shall be pitched to allow for proper drainage.

4. Exterior Wall Construction: All exterior walls shall consist of insulated galvanized steel construction.

5. Service Access Doors: Door jambs shall be gasketed around their perimeter. Provide a hinged, double-wall, insulated access-door assembly for the burner and blower sections, with stainless-steel hinges and self-compressing, padlockable latches.

6. Each compartment shall have access panels to allow ease of service and maintenance. The electrical-cabinet door shall include a manual pouch and a factory-attached wiring diagram.

B. The entire interior and exterior casing shall be constructed of minimum 20-gauge G-90 galvanized steel with no painting, and shall have undergone a salt spray corrosion test as per ASTM B 117.

C. An observation port shall be located on the exterior of the unit for observation of the main flame and pilot flame. All controls, gas valves, modulating controls and electrical components shall be mounted within the burner vestibule. The burner vestibule shall be an integral part of the unit and not extend outside the exterior casing of the unit and not exposed to the main air stream.

2.04 AIRFLOW CONFIGURATIONS

A. The unit shall be configured for down (vertical) discharge, with airflow direction as indicated on the drawings.

B. The unit shall be configured for 100 percent outdoor air and shall include a factory intake hood with removable filters and a motorized backdraft damper.

1. Damper: Provide a factory-installed, low-leakage, motorized backdraft damper with actuator. The damper shall meet AMCA Class 1A leakage requirements, open upon unit start, and close upon unit shutdown or loss of power.

2.05 SUPPLY AIR BLOWER AND MOTOR

A. The supply fan shall be:

1. Direct Drive: Provide a 15-inch mixed-flow, direct-drive fan with the fan wheel secured directly to the motor shaft. The fan and motor assembly shall be mounted on a heavy-gauge galvanized-steel frame. Belts and pulleys shall not be used.

B. Blower Motor: Provide a totally enclosed air-over electronically commutated motor (TEAO-ECM), rated for the voltage and phase indicated on the drawings.

C. The fan shall be selected at or near its efficiency peak. Submit the fan curve with the scheduled operating point identified.

D. The fan and motor assembly shall be dynamically balanced and mounted on rubber vibration isolators in accordance with AMCA 204.

2.06 ECM SPEED CONTROL

A. The ECM supply-fan motor shall receive a PWM speed signal from the kitchen-hood control-panel prewire and shall operate at the airflow indicated on the drawings.

2.07 HEATING SYSTEM

A. The direct-fired burner shall use natural gas at an inlet-supply pressure between 7 and 14 inches w.c.

B. The natural-gas burner shall use direct-spark ignition with remote flame sensing at the pilot assembly.

C. Direct-sparking sequence shall last through the complete duration of the trial for ignition period for guaranteed light-off. Each burner ignition module shall have LED indicators for troubleshooting and a set of exposed prongs for testing flame indication signal.

D. The unit shall include self-adjusting, spring-loaded burner profile plates designed to maintain proper air velocity and pressure drop across the burner without motors, actuators, or manual adjustment.

E. The burner assembly shall include:

1. Non-clogging stainless-steel combustion baffles attached to a ductile-aluminum gas-supply section with no moving parts. Burner combustion efficiency shall be 92 percent, with a maximum turndown ratio of 30:1.

2. Factory exterior stainless-steel Quick Seal gas connection with anti-rotation bracket.

3. Inlet gas-pressure gauge, 0 to 35 inches w.c.

4. Manifold gas-pressure gauge, -5 to 15 inches w.c.

5. High gas-pressure switches to disable heating if gas pressure is too high.

6. Low gas-pressure switch to disable heating if gas pressure is too low.

7. Proof-of-closure switch to energize the main-burner circuit only if the motorized gas valve is in a closed position.

2.08 FILTERS

A. Provide filters as part of unit. All filters shall be furnished and installed to meet the performance requirements set forth in the schedule.

B. Provide a factory intake hood with removable EZ filters. Filters shall be sized for the scheduled airflow and shall be accessible without disturbing ductwork.

C. All filters shall be installed on tracks for easy removal from the unit.

D. Shall be either insulated or non-insulated constructed of G-90 galvanized steel with filters supported by internal slides and with removable access panels.

E. Unit shall have an optional adjustable pressure differential sensor for the filter bank to alert in the event of a clogged filter.

2.09 ELECTRICAL

A. The controls shall be pre-wired and housed in an insulated electrical cabinet within the unit to protect against risk of condensation.

B. The unit shall be provided with a single-point electrical connection and a factory-mounted service disconnect.

C. Unit shall be provided with a door safety switch that de-energizes the supply fan when the door is opened.

D. The unit shall be provided with a factory-mounted intake-air temperature sensor for accurate outdoor-air temperature measurement.

E. The electrical cabinet shall be outfitted with the following:

1. LED electrical cabinet service light with automatic activation upon door switch.

2. Color wiring schematics, laminated to the interior wall of the cabinet doors.

3. Factory mounted disconnect with unit bottom knockouts.

4. A backlit LCD Human-Machine Interface (HMI) shall be mounted within the unit control cabinet for setpoint configuration, status display, and unit monitoring.

2.10 CONTROLS

A. Unit shall be outfitted with a control board to allow for full control of the entire unit.

B. Provide onboard air flow switch located on MUA control board to sense air flow.

C. The unit controls shall be compatible with BACnet-based building management systems. Provide a factory-installed BACnet communications interface for BAS integration.

D. The unit shall be provided with CasLink building monitoring, including configurable fault alerts and remote monitoring capabilities.

E. Provide the communication hardware required for an internet or cellular connection in accordance with the manufacturer's requirements.

F. Temperature Control System:

1. Discharge Temp Control (Heating) - Unit modulates the burner flame to accurately maintain the desired discharge temperature set point and compensate for fluctuations in entering air temperature, air volume and % of OA using heating PID controls.

G. Activation Controls:

1. Activate Based on Intake (Heating) - Unit will activate heating when the intake temperature drops below the desired set point.

H. Safety and Interlock Controls:

1. The unit shall accept a remote start/stop interlock from the kitchen-hood control panel. Heating shall be enabled only when the supply fan is proven on.

2. The ECM supply-fan speed shall be controlled by a PWM signal from the kitchen-hood control-panel prewire.

3. Upon activation of the kitchen-hood fire-suppression system, the supply fan and burner shall shut down and the outdoor-air damper shall close.

4. Provide a factory modular-unit intake firestat set to 135 degrees F.

5. Provide a commercial smoke-detector/alarm interlock. Smoke detector and alarm shall be provided by others.

2.11 CURBS

A. Provide a factory curb assembled and constructed of 20-gauge minimum, galvanized steel with full bottom corners.

B. Curb shall be insulated with 2-inch, R-13 foil-faced fiberglass insulation.

C. Curb joints and corners shall be securely riveted or welded to provide a rigid, weather-resistant assembly.

2.12 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Examine roughing-in of plumbing, electrical and HVAC services to verify actual

location and compliance with unit requirements.

D. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General: Install the work of this section in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

B. Painting: Marred or abraded surfaces shall be cleaned and refinished in accordance with manufacturer's recommendations.

3.03 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Remove and dispose of all debris.

3.04 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory authorized service representative to inspect field assembled components and equipment installation, to include electrical and piping connections. Report results to A/E in writing. Inspection must include a complete startup checklist

3.05 START-UP

A. Comply with provisions of *Section 23 05 93, Testing and Balancing for HVAC*.

B. Engage a factory authorized service representative to perform startup service. Clean entire unit, comb coil fins as necessary, and install clean filters. Verify water source for compliance with manufacturer's requirements for flow and temperature. Measure and record electrical values for voltage and amperage.

3.06 INSTRUCTIONS

A. The manufacturer's representative shall instruct the *OWNER'S* operating personnel, at a time designated by the *OWNER*, as to the proper method of operation and recommended maintenance procedures.

B. The scheduling of the instruction shall be at the convenience of the *OWNER* and may not coincide with the start-up inspection.

****END OF SECTION****

SECTION 23 81 14

VARIABLE REFRIGERANT VOLUME (VRV) INDOOR UNITS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Provide and install fan coil indoor units and associated piping, power, and control wiring as part of the cooling and heating of the VRV system.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 03 30 00: Concrete*

3. *Section 23 81 29: Variable Refrigerant Volume Condensers*

4. *Section 23 81 30: Variable Refrigerant Controllers*

5. *Section 23 81 32: Variable Refrigerant Volume Cloud Service and Associated Control Devices*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *VARIABLE REFRIGERANT VOLUME INDOOR UNITS* in the prices proposed for the various related items of work as designated in the Proposal.

1.02 REFERENCES

A. UL 60335-2-40 – Heating and Cooling Equipment; current edition including all revisions

B. NFPA 70 – National Electrical Code; National Fire Protection Association; current edition including all revisions and supplements.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Shop drawings showing precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provision in concrete forming, reinforcement, and placement to accommodate the work of this section.

D. Manufacturer's recommended installation procedures.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

2. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL), in accordance with ANSI/UL 60335-2-40 – Heating and Cooling Equipment and bear Listed Mark.

3. All wiring shall be in accordance with the National Electric Code (NEC).

4. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.

5. The outdoor unit will be factory charged with R-32.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for

their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance: The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.06 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

1.07 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability, and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers:

1. Daikin

2. Or equivalent

2.02 ROUND FLOW SENSING CEILING CASSETTE UNIT

A. General:

1. The indoor unit shall be a round flow ceiling cassette fan coil unit, operable with R32 refrigerant, equipped with an electronic expansion valve, refrigerant leak sensor, direct drive DC (ECM) type fan, for installation into the ceiling cavity equipped with an air panel grill.

2. Capacity and performance shall be as described in the schedules.

3. Shall be a round flow air distribution type, fresh white, impact resistant decoration panel, or optional self-cleaning filter panel.

4. The supply air is distributed via four individually motorized louvers.

5. To save energy and optimize occupancy comfort, the indoor unit shall be equipped with built in occupancy sensor and surface temperature sensor. Computerized PID control shall be used to

control superheat to deliver a comfortable room temperature condition.

6. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature when used with a remote controller.

7. The indoor unit sound pressure shall range from 30 dB(A) to 45 dB(A) at High speed measured at 5 feet below the unit.

B. Performance: As specified on drawings.

C. Indoor Unit:

1. The indoor unit shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, condensate safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.

2. The indoor unit shall have a factory installed refrigerant leak sensor built in. If a leak is detected, the unit shall go into circulation mode and provide full airflow. The unit shall have signal output in event of leak to connect to external ventilation, damper, alarm etc.

3. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.

4. Both refrigerant lines shall be insulated from the outdoor unit.

5. The round flow supply air flow can be field modified to 18 different airflow patterns to accommodate various installation configurations including corner installations.

6. Return air shall be through the concentric panel, which includes a resin net, mold resistant, antibacterial filter.

7. The indoor unit shall be equipped with a condensate pan with antibacterial treatment and condensate pump. The condensate pump provides up to 33-1/2 lift from bottom of unit to top of drain piping and has a built-in safety shutoff and alarm.

8. The indoor unit shall be equipped with a return air thermistor.

9. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.

10. The voltage range will be 253 volts maximum and 187 volts minimum.

11. To save energy and optimize occupancy comfort, the indoor unit shall be equipped with built in occupancy sensor and surface temperature sensor.

12. Supplied air shall be directed automatically by four individually controlled louvers.

D. Unit Cabinet:

1. The cabinet shall be space-saving and shall be located onto the ceiling.

2. Four auto-adjusted louvers shall be available to choose, which include standard, draft prevention, and ceiling stain prevention.

3. The air flow of the unit shall have the ability to shut down outlets with multiple patterns allowing for simpler installation in irregular spaces.

4. Fresh air intake shall be possible by optional fresh air intake kit.

5. A branch duct knockout shall exist for branch ducting of supply air.

6. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

7. Provide high-efficiency air filters.

E. Fan:

1. The fan shall be direct-drive DC (ECM) type fan, statically and dynamically balanced impeller with three fan speeds available.

2. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range from 0.08 to 0.16 HP.

3. The airflow rate shall be available in three manual settings.

4. The DC fan shall be able to automatically adjust the fan speed in 5 speeds based on the space load.

5. The fan motor shall be equipped as standard with adjustable external static pressure (ESP) settings to allow operation with the high efficiency air filter options.

6. The fan motor shall be thermally protected.

F. Filter:

1. The return air shall be filtered by means of a washable long-life filter with mildew proof resin and antibacterial treatment.

G. Coil:

1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.

2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.

3. The coil shall be a 2, or 3-row cross fin copper evaporator coil with up to 21 FPI design completely factory tested.

4. The refrigerant connections shall be flare connections and the condensate will be 1 -1/4 inch outside diameter PVC.

5. A condensate pan with antibacterial treatment shall be located under the coil.

6. A thermistor will be located on the liquid and gas line.

H. Electrical:

1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.

2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).

3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.

I. Control:

1. The unit shall have controls provided by manufacturer to perform input functions necessary to operate the system.

2. The unit shall be compatible with interfacing with a BMS system via BACnet gateways.

3. The unit shall be compatible with a manufacturer provide centralized controller and remote controller.

J. Required Accessories:

1. Condensate pump.

2. Remote controller.

3. Branch piping kit as required.

4. Factory provided BACnet adapter to integrate controls into BMS.

5. All accessories as specified in drawings and as required for proper installation, operation and control.

2.03 CONCEALED CEILING DUCTED UNIT (Med. Static)

A. General Requirements:

1. The indoor/evaporator unit shall be factory assembled and tested DX-fan coil unit, operable with refrigerant R32.

2. The unit shall be completely factory assembled and tested and shall be charged with dehydrated air prior to shipment from the factory.

3. The unit shall be equipped with an electronic expansion valve controlled using a PID loop to automatically adjust the refrigerant flow rate through the unit.

4. The unit shall be equipped with a programmed drying operation that dehumidifies while limiting changes in room temperature when used with remote controller.

5. The unit shall feature self-diagnostics, auto-restart functionality, 3-minute fused time delay, and a test run switch.

6. All refrigerant piping, both liquid and suction, shall be fully insulated from the outdoor unit.

B. Performance: As specified on drawing.

C. Indoor Unit:

1. The indoor unit shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, condensate safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The unit shall be equipment with automatically adjusting external static pressure logic that is selectable during commissioning. This adjusts the airflow based on the installed external static pressure.

2. The indoor unit shall have a factory installed refrigerant leak sensor built in. If a leak is detected, the unit shall go into circulation mode and provide full airflow. Signal will be sent to shut compressor and close safety shut off valve in BS Box or Dedicated SSOV as needed. The unit shall have signal output directly or through an accessory PCB in event of leak to connect to external ventilation, damper, alarm etc.

3. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.

4. Both refrigerant lines shall be insulated from the outdoor unit.

5. The indoor unit shall be equipped with a return air thermistor.

6. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.

7. The voltage range will be 253 volts maximum and 187 volts minimum.

D. Unit Cabinet:

1. The unit cabinet shall be constructed of heavy gauge galvanized steel.

2. The unit shall be internally insulated and shall be capable of installation in indoor environments up to 80% relative humidity without requiring additional field installed insulation.

3. The unit shall ship from the factory in a rear-return configuration and shall be field-convertible to a bottom-return configuration.

4. The unit shall be equipped with a return air thermistor.

5. The cabinet shall be constructed with sound absorbing foamed fiber-less closed cell polystyrene and polyethylene insulation.

E. Fan:

1. The fan shall be a direct-drive, brushless DC fan motor with (3) user-selectable fan speeds (H, M, L).

2. The unit shall be equipment with automatically adjusting external static pressure logic selectable during commissioning.

3. The unit shall be equipped with internal controls to allow the fan to automatically select the operating fan curve to deliver nominal airflow CFM (within +/- 10%) when the connect ductwork has been designed with a total external static within the range of the unit. This setting shall be accessible as a setting to be used during startup and commissioning of the system.

4. The fan motor shall be capable of Auto fan speed control when the unit is connected to the Remote Controller. The Auto fan speed control shall automatically adjust the unit's fan speed in response to the difference between the indoor unit's current set point and the current room temperature measurement. The Auto fan speed control shall utilize (5) fan speeds.

5. The fan motor shall be internally isolated using rubber grommets to reduce transmission of vibrations to the unit.

6. The airflow rate shall be available in three settings.

7. The fan motor shall be thermally protected.

8. Fan motor external static pressure range for nominal airflow: 0.2" to 0.6".

F. Fan Blade

1. The fan blade shall be constructed of lightweight polymer.

2. The fan blade shall be statically and dynamically balanced to minimize vibration.

G. Coil:

1. Coils shall be of the direct expansion type, constructed from copper tubes expanded into aluminum fins to form a mechanical bond.

2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.

3. The coil shall be 2 or 3 row cross fin copper evaporator coil with 18 fpi design, completely factory tested.

4. The refrigerant connections shall be flare connections.

5. Factory mounted thermistors shall be installed on the liquid and gas lines.

H. Condensate Drainage

1. The unit shall be equipped with a condensate drain pan under the coil.

2. The condensate drain outlet shall be of PVC construction and VP25 (1" ID, 1-1/4" OD).

3. The unit shall be equipped with a factory-integral condensate pump capable of 25-5/16" lift from the condensate drain outlet. The condensate pump shall be equipped with a float switch to automatically stop unit operation and provide a system error code in the event drain pan water level rises too high.

I. Electrical:

1. Provide a separate power supply connection of 208/230V, 1 phase, 60 hertz. The allowable voltage range shall be 187 to 253 volts.

2. Refer to the engineering data book for all other electrical data including MCA, MOCP, and FLA values.

3. The transmission (control) wiring distance between the indoor unit and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).

4. The transmission (control) wiring between the indoor unit and the remote controller shall be a maximum distance of 1,640 feet.

J. Control:

1. The unit shall have controls provided by manufacturer to perform input functions necessary to operate the system.

2. The unit shall be compatible with interfacing with a BMS system via BACnet gateways.

3. The unit shall be compatible with a manufacturer provide centralized controller and remote controller.

K. Accessories:

1. Condensate pump
2. Remote controller
3. Branch piping kit as required
4. Factory provided BACnet adapter to integrate controls into BMS
5. All accessories as specified in drawings and as required for proper installation, operation and control.

2.04 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General: Install the work of this section in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

B. Painting: Marred or abraded surfaces shall be cleaned and refinished in accordance with manufacturer's recommendations.

3.03 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Remove and dispose of all debris.

3.04 TESTS

A. Upon completion of this portion of the work and prior to acceptance by the *OWNER*, make all required tests and adjustments for free and smooth operation.

B. Secure all approvals from agencies having jurisdiction.

3.05 START-UP

A. The equipment manufacturer shall provide the services of a trained qualified representative, for one (1) trip each with a minimum of one (1) day, excluding travel time for the purpose of inspecting the installation.

B. The representative shall prepare and submit a written report to both the *CONTRACTOR* and *ENGINEER* regarding the installation, including any conditions which might affect the manufacturer's guarantee. The equipment shall not be accepted by the *OWNER* until such time as this report has been received and accepted by the *ENGINEER*.

3.06 INSTRUCTIONS

A. The manufacturer's representative shall instruct the *OWNER'S* operating personnel, at a time designated by the *OWNER*, as to the proper method of operation and recommended maintenance procedures.

B. The scheduling of the instruction shall be at the convenience of the *OWNER* and

may not coincide with the start-up inspection.

****END OF SECTION****

SECTION 23 81 28

HEAT PUMP AIR CONDITIONING SPLIT SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. The variable capacity, heat pump split system consisting of a round flow ceiling cassette indoor evaporator exclusively matched to the outdoor condensing unit as follows (Basis of Design – Daikin):

Outdoor Model (MSHP-2)	**Indoor Model (MSE-2)**
RXV18AVJU9	FFA18AVJU9

The outdoor condensing unit shall be a direct expansion (DX), air-cooled heat pump system, with a variable speed inverter driven compressor & fan motor using R-32 refrigerant. The outdoor unit is a horizontal discharge, variable speed, single fan unit using a single-phase power supply.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Division 26: Equipment Wiring Systems*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for the *HEAT PUMP AIR CONDITIONING SPLIT SYSTEM* in the prices bid for the various related items of work as designated in the Proposal.

1.02 OPERATING REQUIREMENTS

A. The operating requirements are shown on the Drawings.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

1. Specifications and other data required that demonstrates compliance with the specified requirements, including:

a. Cooling capacities/heating capacities.
b. Dimensions.
c. Weights.
d. Rough-in connections and connection requirements.
e. Electrical requirements with electrical characteristics and connection requirements.
f. Piping and connection details
g. Controls.
h. Accessories.

3. Submit assembly instructions, support details, connection requirements, and include start-up instructions.

4. Submit drawings indicating capacity, weights, electrical characteristics and connection requirements. Indicate electrical characteristics.

1.04 QUALITY ASSURANCE

A. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL), in accordance with ANSI/UL 1995 – Heating and Cooling Equipment and bear the Listed Mark.

B. All wiring shall be in accordance with the National Electric Code (NEC).

C. The system shall be rated in accordance with Air Conditioning Refrigeration Institute's (ARI) Standard 210/240 and bear the ARI label.

D. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.

E. The outdoor unit will be factory charged with R-32.

F. A holding charge of dry nitrogen shall be provided in the evaporator.

G. System efficiency shall meet or exceed 21 SEER2, 12.0 EER2 and 9.1 HSPF2.

1.05 QUALIFICATIONS

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance: The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.06 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.07 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. All products under normal use and maintenance for comfort cooling and conditioning applications will be free from defects in material or workmanship. Warranty coverage begins on the "installation date" which is one of two dates:

1. The installation date is the date that the unit is originally installed.

2. If the date the unit is originally installed cannot be verified, the installation date is three months after the manufacture date. The warranty lasts for a period up to 5 years.

C. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period period.

1.08 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability, and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers

1. Daikin Applied
13600 Industrial Park Blvd.
Minneapolis, MN 55441
Tel: 800-432-1342
Tel: 763-553-5330

2. Or equivalent.

2.02 INDOOR UNIT (BASIS OF DESIGN – DAIKIN FFA18AVJU9)

A. General:

1. The indoor unit shall be completely factory assembled and tested. The unit shall include factory wiring, piping, electronic expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, condensate safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.

2. The indoor unit shall be designed specifically for use with R-32 refrigerant systems and compatible outdoor unit.

3. The indoor unit and refrigerant piping shall be charged with dehydrated air prior to shipment from the factory.

4. The unit shall be installed in accordance with manufacturer requirements for R-32 (A2L) refrigerant systems, including compliance with applicable safety codes to prevent refrigerant concentration exceeding allowable limits in the event of a leak.

5. Both liquid and gas refrigerant lines shall be insulated.

6. The airflow configuration shall be 4-way discharge as standard, with field selectable 3-way and 2-way configurations using field settings and outlet blocking kits to match installation locations such as corners or perimeter applications.

7. Return air shall be through the decorative panel, which includes a mold-resistant air filter.

8. The indoor unit shall include a condensate drain pan and factory-installed drain pump. The drain pump shall provide up to 21 inches of lift and include a built-in safety shutoff and alarm.

9. The indoor unit shall be equipped with return air temperature sensing via thermistor.

10. All electrical components shall be accessible through the decorative panel to minimize side service clearance requirements.

11. The unit shall include safety and installation provisions associated with R-32 refrigerant, including requirements for proper handling, piping integrity, and prevention of ignition sources during installation and servicing.

B. Unit Cabinet:

1. The cabinet shall be compact and designed for ceiling recessed installation.

2. The unit shall provide automatic airflow distribution with multi-directional discharge and auto-swing capability to ensure uniform air coverage.

3. The airflow configuration shall allow field selection of 4-way, 3-way, or 2-way discharge using field settings and outlet blocking components to accommodate various installation conditions, including corner applications.

4. The unit shall support fresh air intake through field-installed duct connection to the side of the cabinet using optional fresh air intake kits.

5. The cabinet shall include provisions for branch duct connection for auxiliary air distribution where required.

6. The cabinet shall be internally insulated with factory-applied materials to minimize sound and condensation, including foamed insulation materials.

7. The unit shall be designed for application with R-32 refrigerant systems and installed in accordance with manufacturer requirements for A2L refrigerant, including consideration of installation space, ventilation, and ignition source control.

C. Fan:

1. The fan shall be a direct-drive turbo fan type with statically and dynamically balanced impeller.

2. The fan motor shall be a DC motor designed for high efficiency operation in R-32 inverter systems.

3. The indoor fan shall provide multiple selectable fan speed settings (minimum 3 speeds) through the control system.

4. The airflow rate shall be adjustable across the available fan speed settings to match space load requirements.

5. The fan motor shall include integral thermal protection and be controlled by the unit microprocessor.

D. Filter:

1. Return air shall be filtered by means of a washable long-life filter.

2. The filter shall be mold-resistant and suitable for maintaining indoor air quality in ductless cassette applications.

3. The unit shall include a filter maintenance indication function to notify when cleaning is required.

E. Coil:

1. Coils shall be direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.

2. The coil shall utilize high-efficiency fin design and rifled bore tubing to enhance heat transfer performance.

3. The evaporator coil shall be factory tested and configured for use with R-32 refrigerant systems.

4. Refrigerant connections shall be flare type connections.

5. Both liquid and gas refrigerant piping shall be fully insulated to prevent condensation.

6. A condensate drain pan shall be located beneath the coil.

7. A factory-installed condensate pump shall be provided with a minimum lift capability of 21 inches and include a safety shutoff and alarm.

8. The refrigerant system shall be installed in accordance with R-32 (A2L) requirements, including cleanliness, dryness, and airtight construction of the piping system.

F. Electrical:

1. The outdoor unit shall be powered with 208-230 volts, 1 phase, and 60 hertz power. The indoor unit shall receive 208-230 volt, 1 phase, 60 hertz power from the outdoor unit.

2. The allowable voltage range shall be 187 volts to 253 volts.

3. All wiring shall be installed in accordance with national and local electrical codes and manufacturer requirements.

4. Control wiring between indoor and outdoor units shall be field installed and shall follow manufacturer recommendations for cable type, routing, and shielding.

5. The system shall include microprocessor-based controls for fan operation, temperature regulation, and system protection.

6. The unit shall include automatic restart after power interruption and self-diagnostic capability.

G. Control:

1. The unit shall be furnished with factory-installed microprocessor-based controls by the manufacturer to perform all functions necessary for system operation, including temperature control, fan speed control, and system protection features.

2. A compatible wired remote controller shall be required for operation of the indoor unit. The wired remote controller shall be field supplied and purchased separately from the indoor unit package.

3. The unit shall be compatible with manufacturer-provided wired remote controllers, central controllers, and optional control accessories as specified for the system.

4. The unit shall support integration with building management systems through manufacturer-provided adapters and centralized control interfaces, where applicable.

5. The control system shall include features such as self-diagnostics, automatic restart after power failure, and multiple operating modes including cooling, heating, fan, and dry operation.

6. The control system shall allow field configuration of airflow direction, fan speed, and system parameters through the remote controller interface.

7. The control system shall be compatible with split and multi-system configurations and support communication between indoor and outdoor units via manufacturer-defined control wiring.

H. Sound:

1. Indoor unit sound levels shall not exceed:

Indoor Unit (Basis of Design - Daikin)	**Cooling Mode Sound Level (H/M/L) dB(A)**	**Heating Mode Sound Level (H/M/L) dB(A)**
FFA18AVJU9	44 / 40 / 32	44 / 40 / 32

*values are measured approximately 3 feet away with JIS standard operating conditions.

2.03 OUTDOOR UNIT (BASIS OF DESIGN – DAIKIN RXV18AVJU9)

A. General:

1. The outdoor unit shall be factory matched with the corresponding indoor unit and designed for operation with R-32 refrigerant systems. The outdoor unit shall be completely factory assembled, pre-wired, and pre-charged with R-32 refrigerant.

2. The unit shall include inverter-driven control logic to modulate capacity and optimize part load performance.

3. The system shall utilize an electronic expansion device controlled by the system microprocessor for refrigerant flow control.

4. The outdoor unit shall be controlled by an integrated microprocessor to manage compressor operation, fan speed, and system protection functions.

5. The equipment shall be installed in accordance with manufacturer requirements for R-32 (A2L) refrigerant systems.

B. Unit Cabinet:

1. The outdoor unit cabinet shall be weatherproof and suitable for outdoor installation.

2. The cabinet shall be constructed of coated steel with corrosion-resistant treatment for durability in outdoor environments.

3. The outdoor unit shall be provided with mounting provisions for secure installation on a pad or structural support.

4. The unit construction shall allow installation in accordance with applicable wind, load, and environmental conditions.

5. The outdoor unit shall be designed for R-32 application and installed in locations that meet safety clearance and ventilation requirements.

C. Fan:

1. The outdoor fan shall be a direct-drive propeller type fan.

2. The fan motor shall be inverter-driven for variable speed operation and improved efficiency.

3. The fan motor shall be permanently lubricated and designed for outdoor operation.

4. A protective fan guard shall be provided to prevent accidental contact.

5. Airflow shall be horizontal discharge.

D. Coil:

1. The outdoor heat exchanger shall be constructed of copper tubing with aluminum fins mechanically bonded to the tubing.

2. The coil fins shall include anti-corrosion treatment to improve durability and performance.

3. Refrigerant flow shall be controlled by the system controls and associated expansion device.

4. The unit shall include automatic defrost control to maintain heating performance during low ambient operation.

5. The refrigerant system shall be designed for R-32 and installed to maintain a clean, dry, and airtight system.

E. Compressor:

1. The compressor shall be inverter-driven, variable speed, hermetically sealed swing type.

2. The compressor design shall provide low noise, high efficiency, and reduced vibration during operation.

3. The outdoor unit shall include a refrigerant accumulator and a four-way reversing valve for heat pump operation.

4. The compressor shall utilize manufacturer-specified refrigerant oil for R-32 systems.

5. The compressor shall be protected by internal thermal overload protection.

6. The system shall operate within manufacturer-defined piping length and height limits without requiring oil traps or additional components.

a. The outdoor unit can operate with a maximum vertical height difference of 49-1/4 feet for 9k btu and 12k btu and 65-5/8 feet for 15k btu and 18k btu without any oil traps or additional components.

b. The outdoor unit can operate with an overall maximum length of 65-5/8 feet for 9k btu and 12k btu and 98-1/2 feet for 15k btu and 18k btu without any oil traps or additional components.

F. Electrical:

1. The electrical power requirement is 208-230 volt, 1-phase, and 60 Hz power.

2. The voltage range limitations shall be a minimum of 187 volts and a maximum of 253 volts.

G. Sound:

1. Outdoor unit sound levels shall not exceed:

Outdoor Unit (Basis of Design – Daikin)	**Cooling Mode Sound Level dB(A)**	**Heating Mode Sound Level dB(A)**
RXV18AVJU9	55	57

*values are measured approximately 3 feet away with JIS standard operating conditions

2.04 SYSTEM DIAGNOSTICS

A. General: The system shall be capable of producing 2-digit fault codes.

1. Controls

a. I/R controller
b. Wi-Fil module
c. Wired controller

2. D-Checker software: The D-Checker software has the ability to display error codes and values for every sensor on the system through the outdoor unit. The sensor data points shall be graphed or recorded for export to a spreadsheet. The spreadsheet can then be analyzed to troubleshoot operational issues or acknowledge proper operation.

2.05 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify piping is at correct location.

C. Verify electrical work is at correct location.

D. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION - GENERAL

A. Installation shall be in accordance with the International Mechanical Code, the Uniform Construction Code of New Jersey, and the manufacturer's instructions.

B. Install units plumb and level; firmly anchored in locations indicated and maintain manufacturer's recommended clearances.

C. Install and connect electrical devices furnished by manufacturer but not specified to be factory mounted.

3.03 INSTALLATION

A. Install units in accordance with manufacturers' directions.

B. Install floor mounted units on concrete housekeeping pads at least 3-1/2 inches high and 6 inches wider than the unit. Refer to *Section 03 30 00, Concrete*.

C. Install condensate piping with trap and route from drain pan to condensate drainage system.

D. Install components furnished loose for field mounting.

F. Firestop all penetrations of fire rated walls in accordance with *Section 07 84 00*, *Firestopping*.

3.04 FIELD QUALITY CONTROL

A. Upon completion of this portion of the work, and prior to its acceptance by the O*WNER*, make all required tests and adjustments for free and smooth operation.

B. Start up units in accordance with manufacturer's startup instructions. Test controls and demonstrate compliance with requirements.

C. Secure all approvals from agencies having jurisdiction.

3.05 CLEANING

A. Clean exposed surface of all grease, dirt, and other foreign materials.

B. Touch up all marred or abraded surfaces in accordance with manufacturer's directions.

C. Vacuum clean coils and inside of unit cabinet.

D. Install new throwaway filters in units at Substantial Completion.

3.06 DEMONSTRATION

A. The manufacturer's representative shall instruct the *OWNER'S* operating personnel, at a time designated by the *OWNER*, as to the proper method of operation and recommended maintenance procedures.

B. The scheduling of the instruction shall be at the convenience of the *OWNER* and may not coincide with the start-up inspection.

****END OF SECTION****

SECTION 23 81 29

VARIABLE REFRIGERANT VOLUME (VRV)
HEAT PUMP CONDENSING UNIT

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Provide and install variable refrigerant volume heat pump condensing units for HVAC system as shown on Plans specified herein.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 03 30 00: Concrete*

3. *Section 23 81 14: Variable Refrigerant Volume Indoor Units*

4. *Section 23 81 30: Variable Refrigerant Controllers*

5. *Section 23 81 32: Variable Refrigerant Volume Cloud Service and Associated Control Devices*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *VARIABLE REFRIGERANT VOLUME HEAT PUMP CONDENSING UNITS* in the prices proposed for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Shop drawings showing precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provision in concrete forming, reinforcement, and placement to accommodate the work of this section.

D. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

2. The units shall be tested by a National Recognized Testing Laboratory (NRTL), in accordance with 60335-2-40 – Heating and Cooling Equipment and Bear the Listed Mark.

3. All wiring shall be in accordance with the National Electric Code (NEC).

4. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.

5. The condensing unit will be factory charged with R-32 or R-454B as per current codes.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance: The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

C. All the products under normal use and maintenance for comfort cooling and conditioning applications will be free from defects in material and workmanship. This warranty applies to compressor and all parts and is limited in duration to ten (10) years starting from the ''installation date'' which is one of the two dates below:

1. The installation date is the date that the unit is originally commissioned, but no later than 18 months after the manufacture date noted on the unit's rating plate.

2. If the date the unit is originally commissioned cannot be verified, the installation date is three months after the manufacture date.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability, and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers:

1. Daikin

2. Or approved equivalent

2.02 HVAC SYSTEM DESIGN – ACCU-4 (Basis of Design – DAIKIN RXYA96AAYDA)

A. System Description:

1. Provide a variable capacity heat pump air conditioning system.

2. The system shall consist of multiple evaporators using PID control, Refrigerant joints and headers and VRV condenser unit.

3. The condenser shall be a direct expansion (DX), air-cooled heat pump, multi-zone air-conditioning system with variable speed inverter driven compressor using R-32 refrigerant.

4. The condensing unit may connect an indoor evaporator nominal capacity up to 200% of the condensing unit's nominal capacity. All zones can operate separately with individual temperature control.

5. The Daikin condensing unit shall be able to connect to all indoor units specified in the design drawings and schedules.

    a. The indoor units shall be connected to the condensing unit utilizing piping joints (Daikin REFNET or similar) and headers to ensure correct refrigerant flow and balancing. T-style joints are not acceptable for a variable refrigerant system.

6. Operation of the system shall permit either individual cooling or heating of each indoor unit simultaneously. Each indoor unit or group of indoor units shall be able to provide set temperature independently via a local remote controller, a centralized controller or a BMS interface.

B. Required Features:

1. Voltage Platform - Heat Pump condensing unit shall be available with a 460V/3ph/60 Hz power supply.

2. Single-module outdoor unit.

3. The condensing unit shall feature a sealed E-box with a minimum IP55 rating to provide high dust and moisture protection for reliability.

4. The system shall be able to enlarge from single to dual module without the need for installed main pipe size changes. The manufacturer shall provide predefined pipe sizes and design rules ensuring reliable system operation and offering design flexibility in phased installation applications.

5. Stable Operation – System shall provide stable inverter operation at varied ambient conditions.

6. No Drain Pan Heater – System shall be capable of heating operation without the need for a drain pan heater. If an alternate manufacturer is chosen, an additional drain pan heater shall be provided by the manufacturer.

7. Auto Changeover – System shall, below the field selected outdoor ambient temperature provide signal to initiate auxiliary or back up heat.

8. Advanced Zoning - A single system shall provide up to 64 zones.

9. Independent Control - Each indoor unit shall use a dedicated electronic expansion valve with up to 2000 positions for independent control.

10. VFD Inverter Control and Smart Variable Refrigerant Temperature - Each condensing unit shall use high efficiency, variable speed all "inverter" based flash vapor injection compressor(s) coupled with inverter fan motors to optimize part load performance. The system capacity and refrigerant temperatures shall be modulated automatically to set suction and condensing pressures while varying the refrigerant volume for the needs of the cooling or heating loads. The control will be automatic and customizable depending on load and weather conditions.

    a. Indoor shall use PID to control superheat to deliver a comfortable room temperature condition and optimize efficiency.

11. Configurator software - Each system shall be available with configurator software package to allow for remote configuration of operational settings and for assessment of operational data and error codes.

    a. If this software is not provided by an alternate manufacturer, for each individual outdoor unit the contractor shall do the settings manually and keep detailed records for future maintenance purposes.

12. The system shall include a built-in data recorder that can store up to 40 minutes of operational data which can help identify the issue in case of a product failure.

13. Heating during Defrost and Oil Return. Reverse cycle (cooling mode) in these modes shall not be permitted due to the potential reduction in space temperature.

14. Low Ambient Cooling - The system shall be capable of low ambient cooling operation to -4°FDB (-20°CDB) with the use of a Safety Shut off Valve.

15. Independent Control - Each indoor unit shall use a dedicated electronic expansion valve for independent control.

16. Flexible Design –

    a. System shall be capable of up to 540ft (165m) [623 ft. (190m) equivalent] of linear piping between the condensing unit and furthest located indoor unit.

    b. System shall be capable of up to 3,280ft (1,000m) total “one-way” piping in the piping network.

    c. System shall have a vertical (height) separation of up to 361 ft between the condensing unit and the indoor units.

    d. System shall be capable of up to 295ft (90m) from the first Refrigerant branch point.

    e. The condensing unit shall have the ability to connect an indoor unit evaporator capacity of up to 200% of the condensing unit nominal capacity.

    f. System shall be capable of 98ft (30m) vertical separation between indoor units.

    g. Condensing unit shall be supported with a fan motor ESP up to 0.32” WG as standard to allow connection of discharge ductwork and to prevent discharge air short circuiting.

17. Oil return – Each system shall be furnished with a centrifugal oil separator and active oil recovery cycle.

18. Simple wiring – Systems shall use 16/18 AWG, 2 wire, stranded, non-shielded and non-polarized daisy chain control wiring.

19. The condensing unit shall include a multi-functional digital display that can provide system operation status such as operating refrigerant temperatures, pressures, outdoor electronic expansion valve opening and compressor operation time.

20. The condensing unit shall include a service window that can provide easy access to system field settings and operation status without completely removing the condensing unit panel.

21. Advanced diagnostics – System shall include a self-diagnostic, auto-check function to detect a malfunction and display the type and location.

22. The condensing unit shall incorporate contacts for electrical demand shedding with optional 3 stage demand control with 12 customizable demand settings.

23. Advanced controls – The system shall have at least one remote controller capable of controlling up to 16 indoor units.

24. The system shall be capable of integrating with open protocol BACnet, LonWorks and Modbus building management systems.

25. Low sound levels - The system shall use indoor and condensing units with quiet operation as low as 27 dB(A).

26. The system shall be certified and listed in the OSHPD directory for seismic certification.

27. The condensing unit can be installed up to 200 ft above the ground without requiring any additional field modifications to the unit to comply with the Florida Miami Dade Wind code requirements.

28. The condensing unit shall be factory equipped with a Schrader valve for connection to a pressure relief kit for compliance with the City of Chicago Pressure relief code.

2.03 EQUIPMENT – ACCU-4 (Basis of Design – DAIKIN RXYA96AAYDA)

A. Performance:

1. The system shall perform as indicated below:

Condensing unit	**SYSTEM IEER (Ducted)**	**SYSTEM IEER (Non-Ducted)**

Basis of Design - Daikin RXYA96AAYD*	20.80	24.50

Condensing unit	**SYSTEM EER (Ducted)**	**SYSTEM EER (Non-Ducted)**
Basis of Design - Daikin RXYA96AAYD*	12.00	12.20

Condensing unit	**SYSTEM COP@47°F (Ducted)**	**SYSTEM COP@47°F (Non-Ducted)**
Basis of Design - Daikin RXYA96AAYD*	3.40	3.50

Condensing unit	**SYSTEM COP@17°F (Ducted)**	**SYSTEM COP@17°F (Non-Ducted)**
Basis of Design - Daikin RXYA96AAYD*	2.25	2.30

Condensing unit	**SYSTEM COP@5°F (Ducted)**	**SYSTEM COP@5°F (Non-Ducted)**
Basis of Design - Daikin RXYA96AAYD*	1.75	1.81

Please note that the performance for 5F COP numbers provided here are for reference and are not AHRI rated

2. Performance Conditions:

   a. Cooling: Indoor temperature of 80°FDB (26.7°CDB), 67°FWB (19.5°CWB) and outdoor temperature of 95°FDB (35°CDB).

   b. Heating: Indoor temperature of 70°FDB (21.1°CDB) and outdoor temperature of 47°FDB (8.3°CDB), 43°FWB (6.1°CDB).

   c. Equivalent piping length: 25ft (7.5m)

3. Cooling Operation:

   a. The standard operating range in cooling will be 23°FDB (-5°CDB) ~ 122°FDB (50°CDB).

   b. Cooling mode indoor room temperature range will be 57-77°FWB (13.9 - 25°CWB).

4. Heating Operation:

   a. The standard operating range in heating will be -22° – 60°FWB (-30 – 15.6°CWB).

      1) If an alternate equipment manufacturer is selected, the mechanical contractor shall provide, at their own risk and cost, all additional material and labor to meet low ambient operating condition and performance.

   b. Heating mode indoor room temperature range will be 59°FDB - 80°F DB (15°CDB – 26.7°CDB).

B. Electrical:

1. The power supply to the condensing unit shall be as specified on drawings.

C. Wiring:

1. The control voltage between the indoor and condensing unit shall be 16VDC non-shielded, stranded 2 conductor cable.

2. The control wiring shall be a two-wire multiplex transmission system, making it possible to connect multiple indoor units to one condensing unit with one 2-cable wire, thus simplifying the wiring installation.

3. The control wiring maximum lengths shall be as shown below:

	CONDENSER TO INDOOR UNIT	**CENTRAL CONTROLLER TO FIRST ODU**	**INDOOR UNIT TO REMOTE CONTROL**
CONTROL WIRING LENGTH	6,560ft (2,000m)	656FT (200m)	1640 ft. (500m)
WIRE TYPE	16/18 AWG, 2 wire, non-polarity, non-shielded, stranded		

D. Refrigerant Piping:

1. The system shall be capable of refrigerant piping up to 540ft (165m) actual or 623ft (190m) equivalent from the condensing unit to the furthest indoor unit, a total combined liquid line length of 3,280ft (1,000m) of piping between the condensing and indoor units, without any oil traps or additional components.

2. Refrigerant piping joints (Daikin REFNET or similar) and headers shall be used to ensure proper refrigerant balance and flow for optimum system capacity and performance.

   a. T-style joints shall not be acceptable as this will negatively impact proper refrigerant balance and flow for optimum system capacity and performance.

E. Paint/Corrosion Resistance:

1. Paint and corrosion resistance shall be at a minimum per the table below:

COMPONENT	**VRV EMERION**		
	BASE MATERIAL	**SURFACE TREATMENT**	**COATING THICKNESS** **External & Internal Surface**
EXTERNAL PANEL BASE	Galvanized steel	POLYESTER	≧1.5 mils
EXTERNAL FRONT PANEL	Galvanized steel	POLYESTER	≧1.5 mils
PILLAR	Galvanized steel	POLYESTER	≧1.5 mils
COMPRESSOR COVER	ASTM material	Resin Paint	≧0. 78 mils
FIN GUARD	Iron wire	Resin Paint	≧0. 79 mils
FAN GUARD AND DRUM	Polypropylene	No treatment required	N/A
FAN	Acrylonitrile - glass	No treatment required	N/A
FAN MOTOR FRAME	Resin	No treatment required	N/A
FAN MOTOR SHAFT	Carbon steel	No treatment required	N/A

HEAT EXCHANGERS (FIN ONLY)	Aluminum	Polymer Anti-corrosion surface treatment	Salt Spray 1000 hours, blister rating 10
ELECTRICAL PARTS BOX	Hot-dip zinc-coated steel	No treatment required	N/A
ELECTRICAL PARTS BOARD	Glass cloth / Glass nonwoven cloth material	Insulation Varnish	No specific thickness
SCREWS	Carbon steel wire rods	High corrosion resistance treatment	≧0. 28 mils

2.04 OUTDOOR/CONDENSING UNIT – ACCU-4 (Basis of Design – DAIKIN RXYA96AAYDA)

A. General:

1. The condensing unit is designed specifically for use with R-32.
2. The refrigeration circuit of the condensing unit shall consist of inverter scroll compressor, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports, liquid receiver, and suction accumulator.
3. Liquid and suction lines must be individually insulated between the condensing and indoor units.
4. The condensing unit can be wired and piped with access from the left, right, rear or bottom.
5. The connection ratio of indoor units to condensing unit shall be permitted up to 200% of nominal capacity.
6. The condensing system shall be able to support the connection of up to 64 indoor units dependent on the model of the condensing unit.
7. The system will automatically restart operation after a power failure and will not cause any settings to be lost, thus eliminating the need for reprogramming.
8. The condensing unit shall be modular in design and should allow for side-by-side installation.

9. The following safety devices shall be included on the condensing unit, high pressure sensor and switch, low pressure sensor low pressure switch control circuit fuses, crankcase heaters, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.

10. To ensure the liquid refrigerant does not flash when supplying to the various indoor units, the circuit shall be provided with a sub-cooling feature.

11. Oil recovery cycle shall be automatic occurring 2 hours after start of operation and then every 8 hours of operation.

12. The condensing unit shall be capable of heating operation at -22°F (-30°C) wet bulb ambient temperature without additional low ambient controls or an auxiliary heat source.

B. Unit Cabinet:

1. The condensing unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proof galvanized steel panels coated with a baked enamel finish.

2. The condensing unit shall have a three-segment panel design which allows for direct access to outdoor fans, critical mechanical, and electrical components separately for ease of installation and service.

3. The outdoor unit shall have separate knockouts for both refrigerant piping and wiring on the bottom panel.

4. The condensing unit fan motor shall have multiple speed operation of the DC (digitally commutating) inverter type, and be of high external static pressure and shall be factory set as standard at 0.12 in. WG. A field setting switch to a maximum 0.32 in. WG pressure is available to accommodate field applied duct for indoor mounting of condensing unit.

5. The condensing unit shall have configurable settings for intermittent fan operation to help minimize snow accumulation on fan blades when the system is off.

6. The outdoor unit fan shall be a vertical discharge configuration, and the nominal airflow rate for each module will range from 6,210 CFM to 14,505 CFM dependent on the model specified.

7. The fan motor shall have inherent protection and permanently lubricated bearings and be mounted.

8. The fan motor shall be provided with a fan guard to prevent contact with moving parts.

C. Sound:

1. Nominal sound pressure levels shall be 61 dB (A)

2. Night setback control of the fan motor for low noise operation by way of automatically limiting the maximum speed shall be a standard feature. Operation sound level shall be selectable from 3 steps.

OPERATION SOUND dB(A)	**NIGHT MODE** **SOUND PRESSURE LEVEL dB(A) APPROX.**
Level 1	55
Level 2	50
Level 3	45

D. Condenser Coil:

1. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond.

2. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure high efficiency performance.

3. The heat exchanger on the condensing unit shall be manufactured from Hi-X seamless copper tube with N-shape internal grooves mechanically bonded on to aluminum fins to an e-Pass Design.

4. The fins shall be coated with an anti-corrosion hydrophilic blue coating as standard from factory with a salt spray test rating of 1000hr per ASTM B117 test standards.

5. The outdoor coil shall have three-circuit heat exchanger design eliminating the need for a drain pan heater. The lower part of the coil shall be used for inverter cooling and be on or off during operation enhancing the defrost operation.

6. The condensing unit shall be factory equipped with condenser coil guards on all sides.

E. Compressor:

1. The inverter scroll compressor shall be variable speed (PVM inverter) controlled which is capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure as measured in the condensing unit.

   a. In addition, samplings of evaporator and condenser temperatures shall be made so that the high/low pressures detected are read every 20 seconds and calculated. With each reading, the compressor capacity (INV frequency) shall be controlled to eliminate deviation from target value.

      1) Non–inverter-driven compressor, which may cause starting motor current to exceed the nominal motor current (RLA) and require larger wire sizing, shall not be allowed.

2. The inverter driven compressor in the condensing unit shall be of highly efficient reluctance DC (digitally commutating), hermetically sealed scroll "P-type."

3. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type.

   a. At complete stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.

4. The capacity control range shall be as low as 1% to 100%.

5. The compressor's motor shall have a cooling system using discharge gas, to avoid sudden changes in temperature resulting in significant stresses on winding and bearings.

6. The compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.

7. Oil separators shall be standard with the equipment together with an intelligent oil management system.

8. The compressor shall be mounted on vibration dampening rubber grommets to minimize the transmission of vibration, eliminating the standard need for external spring isolation.

9. In the event of compressor failure, the remaining compressor, if applicable, shall continue to operate and provide heating or cooling as required at a proportionally reduced capacity. The microprocessor and associated controls shall be manually activated to specifically address this condition for single module and manifold systems.

2.05 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General: Install the work of this section in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

B. Painting: Marred or abraded surfaces shall be cleaned and refinished in accordance with manufacturer's recommendations.

3.03 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Remove and dispose of all debris.

3.04 TESTS

A. Upon completion of this portion of the work and prior to acceptance by the *OWNER*, make all required tests and adjustments for free and smooth operation.

B. Secure all approvals from agencies having jurisdiction.

3.05 START-UP

A. The equipment manufacturer shall provide the services of a trained qualified representative, for one (1) trip each with a minimum of one (1) day, excluding travel time for the purpose of inspecting the installation.

B. The representative shall prepare and submit a written report to both the *CONTRACTOR* and *ENGINEER* regarding the installation, including any conditions which might affect the manufacturer's guarantee. The equipment shall not be accepted by the *OWNER* until such time as this report has been received and accepted by the *ENGINEER*.

3.06 INSTRUCTIONS

A. The manufacturer's representative shall instruct the *OWNER'S* operating personnel, at a time designated by the *OWNER*, as to the proper method of operation and recommended maintenance procedures.

B. The scheduling of the instruction shall be at the convenience of the *OWNER* and may not coincide with the start-up inspection.

****END OF SECTION****

SECTION 23 81 30

VARIABLE REFRIGERANT VOLUME (VRV) CONTROLLERS

PART 1 - GENERAL

1.01 DESCRIPTION

A. General:

1. The local remote control shall be made from plastic materials with a neutral color. Each controller shall have a LCD (Liquid Crystal Display) that shows set point, room temperature, mode of operation (on/off/cool/ heat), and fan speed.

B. Electrical Characteristics:

1. General: Each indoor unit control circuit board shall supply 16 volts DC to the local remote controller. The voltage may rise or fall in relation to the transmission packets that are sent and received.

2. Wiring: The control wiring shall be terminated in a daisy chain design from outdoor unit, to branch selector, then daisy chaining to each indoor unit in the system and terminating at the farthest indoor unit. The remote control wiring shall run from the indoor unit control board terminal block to the remote controller connected to that indoor unit.

3. Wiring Size: Wiring shall be non-shielded, 2-conductor sheathed vinyl cord or cable, and 18 AWG stranded copper wire.

C. VRV Controls Network:

1. The VRV Controls Network is comprised of local remote controllers, multi-zone controllers, advanced multi-zone controllers, and open protocol software devices that transmit information via the high-speed communication bus and may also be controlled via a network PC. The VRV Controls Network supports operation monitoring, scheduling, error e-mail distribution, general user software, tenant billing, maintenance support, and integration with Building Management Systems (BMS) using open protocol via BACnet® interfaces; all of which blend to provide the optimal control strategy for the best HVAC comfort solution.

D. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 03 30 00: Concrete*

3. *Section 23 81 14: Variable Refrigerant Volume Indoor Units*

4. *Section 23 81 29: Variable Refrigerant Volume Condensers*

5. *Section 23 81 32: Variable Refrigerant Volume Cloud Service and Associated Control Devices*

E. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *VARIABLE REFRIGERANT CONTROLLERS* in the prices proposed for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Shop drawings showing precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provision in concrete forming, reinforcement, and placement to accommodate the work of this section.

D. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance: The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability, and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers:

1. Daikin

2. Or approved equivalent

2.02 REMOTE CONTROLLERS (BASIS OF DESIGN – DAIKIN)

A. VRV local remote controllers are compatible with all VRV indoor units. The remote controller wiring consist of a non-polar two-wire connection to the indoor unit. The local remote controllers may be wall-mounted and can be adjusted to

maintain the optimal operation of the connected indoor unit(s). Temperature setpoint can be adjusted in increments of 1°F/°C. In the cases where a system or unit error may occur, the VRV controllers will display a two-digit error code and the unit address. The local remote controllers do not need to be addressed.

2.03 NAVIGATION REMOTE CONTROLLER (BASIS OF DESIGN – DAIKIN BRC1NRV71)

A. The Remote Controllers shall be capable to provide control for all R-32 VRV indoor units. The remote controller wiring consists of a non-polar two-wire connection to the indoor unit at terminals P1/P2. The Remote Controller is wall mounted and can be adjusted to maintain the optimal operation of the connected indoor units. The Remote Controller does not need to be addressed.

The Remote Controller can be used in conjunction another Remote Controller to control the same indoor unit group. No more than 2 remote controllers can be placed in the same group.

1. Mounting:

   a. The Remote Controller shall be mounted into a standard.
   b. 2” x 4” junction box.

2. Display Features:

   a. The Remote Controller shall be approximately 4.75” x 4.75” in size with a 2.75” x 1.75” LCD display.
   b. Backlit LCD display with contrast adjustment and auto off after 30 seconds.
   c. Display language shall be selectable from English, French or Spanish.
   d. Selectable display – Detailed, Standard and Simple
      1) Detailed display
         i. Shall display Operation Mode, Cool, Heat and Setback setpoints, Fan Speed, Louver position, Room Temperature, Time, and Day of the Week
      2) Standard display
         i. Shall display Operation Mode, Cool, Heat and Setback setpoints and Fan Speed
      3) Simple display
         i. Shall display Operation Mode, Cool, Heat and Setback setpoints, Fan Speed and Room Temperature

ii. The room temperature shall be displayed with a large 11/16" font

e. All displayed items configurable
   1) Configure "Off" to be displayed when unit is turned off (field setting required)
      i. Prevents mode adjustment
   2) Setpoint can be removed from display when unit is turned Off (field setting required)
      i. Prevents setpoint adjustment
   3) Fan speed display removable (field setting required)
      i. Prevents fan speed adjustment
f. System Status icons.
g. The controller shall display temperature setpoint in one degree increments with a range of 60-90ºF (16-32ºC)
h. Detailed and Simple display will reflect room temperature (0-176ºF/-18-80ºC range in one degree increments).
   1) Display of temperature information shall be configurable for Fahrenheit or Celsius
      i. On/Off status shall be displayed with an LED.
j. Error codes will be displayed with a alpha numeric code in the event of system abnormality/error.
   1) A blinking LED will also signal system abnormality/error
k. The following system temperatures can be displayed to assist service personnel in troubleshooting:
   1) Return Air Temperature
   2) Liquid Line Temperature
   3) Gas Line Temperature
   4) Discharge Air Temperature (depending on unit),
   5) Remote Controller Sensor Temperature
   6) Temperature used for Indoor Unit Control

3. Basic Operation:

a. Capable of controlling a group of up to 16 indoor units.
b. Controller shall control the following group operations:
   1) On/Off, Operation Mode (Cool, Heat, Fan, Dry and Auto* (*with VRV Heat Pump Systems))
      i. Configure only the essential modes to be selectable – remove unnecessary mode selection(s) from display
   2) Independent Cooling and Heating setpoints in the occupied mode
      i. Dual setpoints (individual Cool and Heat setpoints with minimum setpoint differential 0 – 7ºF (0 – 4ºC) default 2ºF (1ºC)) or Single setpoint

3) Independent Cooling Setup and Heating Setback setpoints in the unoccupied mode
4) Fan Speed
   i. Up to 5 speeds (dependent on indoor unit type)
5) Vane direction and oscillation (dependent on indoor unit type)
   i. Airflow direction
      i.i Up to 5 louver positions and auto swing
   ii. Individual airflow
      i.i Provides individual control of up to four (4) louvers on an indoor unit
   iii. Dual airflow
      i.i Provides control of both internal and external louver positions
      i.ii Automatic draft protection
   iv. Automatically prevents air flow from blowing directly on occupants

c. The controller shall be able to limit the user adjustable setpoint ranges individually for cooling and heating in the occupied period
d. Function button lockout (On/Off, Mode, Fan Speed, Up/Down, Left, Right Arrows)
e. Optional Controller Face Decal to hide unnecessary (locked out) buttons
f. Indoor Unit group assignment
g. Filter indicator
   1) Filter service indicator shall be displayed after 100, 1250 or 2500 (default) hours of run time configurable via field setting
h. Clock (12/24 hour) and Day display
i. Automatic adjustment for Daylight Savings Time (DST)
   1) Set changeover period (second Sunday in March / first Sunday in November)

4. Programmability:

a. Controller shall support schedule settings with selectable weekly pattern options.
   1) 7-day
   2) Weekday + Weekend
   3) Weekday + Saturday + Sunday
   4) Everyday
   5) The schedule shall support unit On/Off
   6) Independent settings for Cooling and/or Heating setpoints when unit is on (occupied)

7) Independent Setup (Cooling) and Setback (Heating) setpoints when unit is off (unoccupied)
8) A maximum of 5 operations can be schedulable per day
9) Time setting in 1-minute increments

b. The Controller shall support Auto-changeover mode for both Heat Pump and Heat Recovery systems, therefore, allowing the optimal room temperature to be maintained by automatically switching the indoor unit's mode between Cool and Heat according to the room temperature and temperature setpoint.
1) Changeover to cooling mode shall occur at cooling setpoint + 1ºF (0.5ºC) as the primary changeover deadband and takes the guard timer into consideration
i. Configurable from 1 – 4ºF (0.5 – 2ºC)
2) Changeover to cooling mode shall occur at the primary changeover deadband to cooling + 1ºF (0.5ºC) as the secondary changeover deadband.
i. Configurable from 1 – 4ºF (0.5 – 2ºC)
3) Changeover to heating mode shall occur at heating setpoint - 1ºF (0.5ºC) as the primary changeover deadband and takes the guard timer into consideration
i. Configurable from 1 – 4ºF (0.5 – 2ºC)
4) Changeover to heating mode shall occur at the primary changeover deadband to heating - 1ºF (0.5ºC) as the secondary changeover deadband.
i. Configurable from 1 – 4ºF (0.5 – 2ºC)
5) 1 hour guard timer
i. Upon changeover, guard timer will prevent another changeover during this period.
ii. Guard timer is ignored by a change of setpoint manually from either the Multi-zone Controller, Remote Controller, or by schedule.
iii. The Guard timer is also ignored if the space temperature reaches the secondary changeover deadband (configurable from 1 - 4ºF (0.5 – 2ºC)) from the primary changeover deadband, and the guard timer has been activated
iv. 60 minutes as default, configurable to 15, 30, or 90 minutes

c. The controller shall support the Auto-setback by sensor function (dependent on indoor unit type)
1) The cooling and heating setpoints shall gradually relax (configurable) internally when the room is determined to be unoccupied
i. The internal setpoint shall return to the original setpoint when room occupancy is detected

d. The controller shall support the Auto-off by sensor function (dependent on indoor unit type)
    1) The indoor unit shall turn off when it is determined that the room is unoccupied after a specified time has elapsed
        i. The indoor unit shall be turned on manually when occupancy is detected
e. The controller shall support the Filter Auto Clean function to be performed once a day (dependent on indoor unit type)
    1) Eight (8) time periods (00:00-03-00, 03:00-06:00, 06:00-09:00, 09:00-12:00, 12:00-15:00, 15:00-18:00, 18:00-21:00, 21:00-00:00) shall be available to select from to enable the automatic filter cleaning function
        i. Default time period (00:00 to 3:00) shall be used if the period for filter auto cleaning is not specified
    2) The indoor unit shall be stopped during auto filter cleaning function operation
f. The Controller shall support an afterhours override Timer for temporarily enabling indoor unit operation during the unoccupied period.
    1) When the Off Timer is enabled and when the unit is manually turned on at the remote controller
    2) The controller shall shut off the unit after a set time period
    3) The time period shall be configurable in the controller menu with a range of 10 minutes - 10 hours in 10 minute increments
g. The room temperature shall be capable of being sensed at the Remote Controller.
h. The controller shall support room temperature offset range of -5.4°F (-3.0°C) to 5.4°F (3.0°C) during Cool, Heat and Auto modes configured through the field settings.

2.04 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work

of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General: Install the work of this section in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

B. Painting: Marred or abraded surfaces shall be cleaned and refinished in accordance with manufacturer's recommendations.

3.03 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Remove and dispose of all debris.

3.04 TESTS

A. Upon completion of this portion of the work and prior to acceptance by the *OWNER*, make all required tests and adjustments for free and smooth operation.

B. Secure all approvals from agencies having jurisdiction.

3.05 START-UP

A. The equipment manufacturer shall provide the services of a trained qualified representative, for one (1) trip each with a minimum of one (1) day, excluding travel time for the purpose of inspecting the installation.

B. The representative shall prepare and submit a written report to both the *CONTRACTOR* and *ENGINEER* regarding the installation, including any conditions which might affect the manufacturer's guarantee. The equipment shall not be accepted by the *OWNER* until such time as this report has been received and accepted by the *ENGINEER*.

3.06 INSTRUCTIONS

A. The manufacturer's representative shall instruct the *OWNER'S* operating personnel, at a time designated by the *OWNER*, as to the proper method of operation and recommended maintenance procedures.

B. The scheduling of the instruction shall be at the convenience of the *OWNER* and may not coincide with the start-up inspection.

****END OF SECTION****

SECTION 23 81 32

VARIABLE REFRIGERANT VOLUME (VRV) HVAC SYSTEM
CLOUD SERVICE AND ASSOCIATED CONTROL DEVICES

PART 1 - GENERAL

1.01 DESCRIPTION

A. General:

1. The Cloud Service and associated control devices provides monitoring and diagnostic services for the connected VRV system. The device shall have an LED that displays the operation status of the device. The Basis of Design is Daikin HERO Cloud Service and Edge Devices.

B. Electrical characteristics:

1. General: The cloud service device (Basis of Design – Daikin Edge Devices) shall be powered by the outdoor unit's built-in power supply and shall communicate with the outdoor unit using the communication cable included or field supplied cable (dependent upon cloud service device).

C. VRV Controls Network: The VRV Controls Network is made up of local remote controllers, multi-zone controllers, advanced multi-zone controllers, open protocol network devices and manufacturer's cloud service gateways. The VRV Controls Network shall have the ability to be accessed via a networked PC or other compatible devices such as Tablets or Smartphones. The VRV Controls Network supports operation monitoring, scheduling, error e-mail distribution, general user software, tenant billing, maintenance support, and integration with Building Management Systems (BMS) using open protocol via BACnet interface, BACnet MSTP adaptor or Modbus adapter and/or cloud connectivity with remote access; all of which blend to provide the optimal control strategy for the best HVAC comfort solution.

D. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 03 30 00: Concrete*

3. *Section 23 81 14: Variable Refrigerant Volume Indoor Units*

4. *Section 23 81 29: Variable Refrigerant Volume (VRV) Heat Pump Condensing Units*

5. *Section 23 81 30: Variable Refrigerant Controllers*

E. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *VARIABLE REFRIGERANT VOLUME HVAC SYSTEM CLOUD SERVICE AND ASSOCIATED CONTROL DEVICES* in the prices proposed for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Shop drawings showing precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provision in concrete forming, reinforcement, and placement to accommodate the work of this section.

D. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and

with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance: The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all

costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability, and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers:

1. Daikin

2. Or approved equivalent

2.02 CLOUD SERVICE GATEWAYS (BASIS OF DESIGN – DAIKIN HERO EDGE)

A. The cloud service devices shall allow connection of VRV a system to the cloud services. The gateway shall be compatible with outdoor unit specified on the Drawings.

2.03 CLOUD SERVICE DEVICE (BASIS OF DESIGN – (DAIKIN HERO SIMPLE EDGE DSE401A71)

A. The cloud service device shall allow manufacturer's cloud services to monitor the VRV system. Each cloud service device shall be capable of controlling a maximum of 64 indoor units and 1 outdoor unit. The Manufacturer's cloud service shall support system configuration view and edit, monitoring of operation status, and malfunction monitoring.

B. The cloud service device is mounted on the outdoor unit and can be accessed remotely from the manufacturer's cloud service.

C. The cloud service and associated devices can be used in conjunction with the Navigation Remote Controller, the iTouch Manager, BACnet interface, BACnet MSTP adaptor to monitor the same indoor unit groups.

D. The cloud service devices shall be capable of connecting using wireless communication to connect to manufacturer's cloud service. The device shall be provided with a factory mounted SIM card for cellular connection (Continental US, Hawaii, Alaska) using the LTE-CAT-M1 band.

1. Mounting: The device shall mount to the compatible outdoor unit.

2. The device shall be installed outdoors.

3. The device shall be suitable to operate in the range of -22 to 125 °F (-30～52℃)

4. The device enclosure shall have a rating of IP66.

5. Features of the cloud service device:

a. The on-board LED provides the operation status.
b. The device shall be powered by the outdoor unit.
c. The device shall connect to the outdoor unit using an included cable.
d. The device shall include the factory installed SIM card for wireless communication.

2.04 CLOUD SERVICES (BASIS OF DESIGN – DAIKIN HERO CLOUD SERVICES)

A. General:

1. The manufacturer's cloud service shall provide remote monitoring of the VRV system connected using a compatible Edge gateway.

2. The cloud service shall be accessible using a PC/Laptop, tablet or smartphone using a web browser.

3. The interface shall allow normal or dark mode display.

4. The cloud service shall require an active license subscription for access.

5. The cloud service shall be capable of adding or removing a device for monitoring the VRV system.

6. The cloud service shall provide an activity log for activities performed on the Cloud Service.

7. The cloud service shall provide notification in case of error, warning or alarm that has occurred in the VRV system.

8. The cloud service shall monitor the prediction codes from the VRV outdoor unit.

9. The cloud service shall allow to view and change up to 50 outdoor unit field settings.

10. The cloud service shall provide data in 1-minute intervals based upon a change of value.

B. Cloud Service User Interface:

1. The user interface shall provide a dashboard for system operation overview, energy management monitoring page, equipment monitoring page and alarms page for equipment monitoring.

2. The Dashboard page shall be customizable with the following widgets:

   a. Total Status Widget: Shall provide count of units that are offline or in error or in alarm or in warning for all building sites connected to the user account.
   b. Map Widget: Shall display connected sites on a Map.
   c. Subscription Widget: Shall display subscriptions status for connected buildings.
   d. Outdoor Units Widget: Shall provide the count of outdoor units that have or have not generated an Error, Alarm, a Warning or is Offline. Additionally, it shall also display the count of units that are in Fan mode, Heat mode, Parallel mode (Heat recovery systems only) and Cool mode.

e. Indoor Units Widget: Shall provide the count of indoor units that have or have not generated an Error, Alarm, a Warning or is Offline. Additionally, it shall also provide a count of units that are in Fan mode, Heat mode, Cool mode or off.
f. Energy Management Widget: Displays the calculated energy consumption data from the associated outdoor unit on an hourly, daily, weekly, or monthly basis.

3. Equipment Page:

a. list all indoor units and outdoor units connected to the user account on the cloud service.
b. Shall link to details that shows:
   1). Animated piping diagram specific to each type of unit with live or past sensor values.
   2). Trend graph to plot data: The trend graphs shall be exportable on a .CSV.
   3). Display all operation data on a list with appropriate ranges.

4. Energy Management Page:

a. Shall provide energy consumption data on a bar chart hourly, daily, weekly, and monthly.
b. Shall provide a bar chart to compare energy consumption between the outdoor units.
c. Shall provide a chart to compare energy consumption between different sites.

5. Alarms Page:

a. Shall provide a search list of active and past alarms.
b. Shall link to an alarms details page that provides the user with alarm description, possible causes, tech tips, method of detection for each alarm and ability to add comments for each unit.

6. User Management:

a. The cloud service shall support multiple user types such as Building Owner, Building Manager, Facility Manager, Facility Staff and Service Contractor.
b. The cloud service shall allow the user with higher permission to manage permissions for the other user type.

7. Demand Control:

a. The cloud service shall allow the setting of the compressor capacity limits based upon a scheduled time.

2.05 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 TESTS

A. Upon completion of this portion of the work and prior to acceptance by the *OWNER*, make all required tests and adjustments for free and smooth operation.

B. Secure all approvals from agencies having jurisdiction.

3.03 START-UP

A. The equipment manufacturer shall provide the services of a trained qualified representative, for one (1) trip each with a minimum of one (1) day, excluding travel time for the purpose of inspecting the installation.

B. The representative shall prepare and submit a written report to both the *CONTRACTOR* and *ENGINEER* regarding the installation, including any conditions which might affect the manufacturer's guarantee. The equipment shall

not be accepted by the *OWNER* until such time as this report has been received and accepted by the *ENGINEER*.

3.04 INSTRUCTIONS

A. The manufacturer's representative shall instruct the *OWNER'S* operating personnel, at a time designated by the *OWNER*, as to the proper method of operation and recommended maintenance procedures.

B. The scheduling of the instruction shall be at the convenience of the *OWNER* and may not coincide with the start-up inspection.

****END OF SECTION****

SECTION 23 82 19

CABINET UNIT HEATERS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Cabinet Unit Heaters.

2. Products furnished but not installed under this section:

a. Controls: Installation and wiring of thermostats and other control components.

b. Equipment Wiring Systems: Electrical connections to building equipment.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 23 05 03: HVAC Piping*

3. *Section 23 05 53: Identification of HVAC Piping and Equipment*

4. *Division 26 05 03: Equipment Wiring Systems*

C. References:

1 ANSI/NFPA 70 - National Electrical Code
2 NFPA 90 A & B - Installation of Air Conditioning and Ventilation Systems and Installation of Warm Air Heating and Air Conditioning Systems
3 UL 883 - Fan-Coil Units and Room Fan-Heater Units Standard for safety requirements
4 UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.
5 AHRI 350 - Standard for Sound Rating of Non-Ducted Indoor Air-Conditioning Equipment

6 ANSI S1.32 - Precision methods for the determination of sound power levels of discrete-frequency and narrow-band noise sources in reverberation rooms
7 ASHRAE Standard 62-89R - Ventilation for acceptable indoor air quality
8 ASHRAE 79 - Methods of testing for Room Fan-Coil Air-Conditioners
9 UL 181 - Factory Made Air Ducts and Connectors

D. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for *CABINET UNIT HEATERS* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Shop drawings showing precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provision in concrete forming, reinforcement, and placement to accommodate the work of this section.

D. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance: The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

1.07 REGULATORY REQUIREMENTS

A. Units must be UL listed as a Fan-Coil Units and meet UL 883 - Room Fan-Heater Units Standard for safety requirements, and UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.

B. In the event the unit is not UL/CUL or ETL approved, the contractor shall, at his expense provide for a field inspection by a UL/CUL representative to verify conformance. If necessary, Contractor shall perform modifications to the unit to comply with UL/CUL or ETL as directed by the representative, at no additional expense to the *OWNER*.

1.08 START-UP AND OPERATING REQUIREMENTS

A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters in place, condensate properly trapped, piping connections verified and leak-tested, all shipping braces removed, and fan has been test run under observation.

B. Include manufacturers' descriptive literature, operating instructions, installation instructions, maintenance and repair data, including filter replacement.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Manufacturer must clearly define any exceptions made to Plans and specifications. Any deviations in layout or arrangement shall be submitted to *ENGINEER* prior to bid date for approval. Mechanical contractor is responsible for expenses that occur due to exceptions made.

D. Acceptable manufacturers:

1. Trane (FFEB or similar)

2. Carrier

3. York

4. Or equivalent

2.02 GENERAL UNIT DESCRIPTION

A. Cabinet Construction.

1. Recessed Units: Recessed panels shall be fabricated from a minimum 18-gauge galvanized steel and shall ship separate from the unit.

a. Horizontal recessed units: Bottom panels shall ship with tamper proof screw fasteners and safety chain. Units shall be provided with a telescoping panel to allow panel to be adjusted to be flush with the ceiling.

2. Finish: Factory applied baked powder coat on all visible surfaces of cabinet. Non-lead based paint must be used. To maintain a better long term appearance all bases, control doors and grilles shall be black. Standard finish shall meet ASTM B117 specifications.

B. Accessories.

1. Filters: 1-inch MERV 8 plenum air filters shall be provided and installed on all units. Rating based on ASHRAE Standard 52.2.

2. Disconnect Switch: Unit shall be have a non-fused disconnect switch.

C. Cabinet Insulation.

1. Closed cell insulation shall be the only acceptable material for insulating in accordance with ASHRAE 62-89R. Matted or fiber-glass insulation of any type is not acceptable.

2. Insulation shall meet UL rating 94-5v for fire hazard classification which satisfies flame and smoke safety requirements.

D. Fan Assembly.

1. Fans: Centrifugal forward-curved double-width, double-inlet corrosion resistant wheels, statically and dynamically balanced, direct driven. Fans shall be constructed of metal with metal housing for long-term high reliability and shall be in the blow through configuration.

2. Motors: All motors are brushless DC (BLDC)/electronically commutated motors (ECM) factory-programmed and run-tested in assembled units. The motor controller is mounted in a touch-safe control box with a built-in integrated user interface and LED tachometer. If adjustments are needed, motor parameters can be adjusted through momentary contact switches accessible without factory service personnel on the motor control board.

a. Motors will soft-ramp between speeds to lessen the acoustics due to sudden speed changes. Motors can be operated at three speeds or with a field-supplied variable speed controller. The motor will choose the highest speed if there are simultaneous/conflicting speed requests.

b. All motors have integral thermal overload protection with a maximum ambient operating temperature of 104°F and are permanently lubricated. Motors are capable of starting at 50 percent of rated voltage and operating at 90 percent of rated voltage on all speed settings. Motors can operate up to 10 percent over voltage.

E. Coils.

1. Hydronic heating coil shall be factory-installed and consist of aluminum plated fins and seamless copper tubes. Coils shall be constructed with 144 aluminum-plated fins per foot (.305 m). The 3/8 inch OD tubes shall be mechanically expanded into the fin collars. Coils shall be burst tested at 450 psi (air) and leak tested at 100 psi (air under water). Coil connections shall be 5/8 inch OD copper tubing.

F. Piping Packages.

1. Provide complete factory-assembled, installed piping package. All packages shall be leak tested under water at 300 psig piping package.

Bleed lines or ports will not be accepted. If piping package is shipped loose, the contractor is responsible for installing, and leak testing the piping package, without any additional cost to the owner.

2. Deluxe Piping Package with Manual Circuit Setter: Shall include a union, strainer, P/T port, and shut-off ball valve on the supply line. The return line has a union, control valve, and manual circuit setter. Three-way packages have a balancing fitting on the bypass line.

2.03 CONTROLS

A. Customer Supplied Terminal Interface.

1. A control interface shall be provided for use with a field-supplied, low-voltage thermostat or a third party controller.

2. The control box shall contain a relay board which includes a line voltage to 24-volt transformer, quiet contactors (for electric heat units), and optional disconnect switch. All end devices shall be wired to a low-voltage terminal block and run-tested, only a power connection and/or thermostat connection is needed to commission the unit.

3. When normally open valves are selected, inverting relays shall be provided for use with standard thermostats.

2.04 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Verify that surfaces are ready to receive work and opening dimensions are as indicated on the shop drawings and contract drawings.

D. Mechanical contractor shall verify that the proper power supply is available prior to starting the fan.

E. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General: Install the work of this section in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

B. Provide units with shut-off valve on supply and lockshield balancing valve on return piping if factory packages are not factory provided. Where not accessible, extend vent to exterior surface of cabinet for servicing. Install manual air vents with stop valve.

C. Install equipment exposed to finished areas after walls and ceiling are finished and painted. Avoid damage.

D. Protection: Install finished cabinet units with protective covers during remainder of construction.

E. Install at locations as indicated on drawings. Coordinate to assure correct recess size recessed units.

F. Field install all devices shipped loose in accordance with manufacturer's recommendations.

G. Painting: Marred or abraded surfaces shall be cleaned and refinished in accordance with manufacturer's recommendations.

3.03 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Clean work.

C. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.

D. Ensure all shipping materials have been removed.

E. Install new filters.

F. Remove and dispose of all debris.

3.04 TESTS

A. Upon completion of this portion of the work and prior to acceptance by the *OWNER*, make all required tests and adjustments for free and smooth operation.

B. Secure all approvals from agencies having jurisdiction.

3.05 START-UP

A. The equipment manufacturer shall provide the services of a trained qualified representative, as required, excluding travel time for the purpose of inspecting the installation.

B. The representative shall prepare and submit a written report to both the *CONTRACTOR* and *ENGINEER* regarding the installation, including any conditions which might affect the manufacturer's guarantee. The equipment shall not be accepted by the *OWNER* until such time as this report has been received and accepted by the *ENGINEER*.

3.06 INSTRUCTIONS

A. The manufacturer's representative shall instruct the *OWNER'S* operating personnel, at a time designated by the *OWNER*, as to the proper method of operation and recommended maintenance procedures.

B. The scheduling of the instruction shall be at the convenience of the *OWNER* and may not coincide with the start-up inspection.

****END OF SECTION****

SECTION 26 05 00
(16010)
BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Basic Electrical Requirements specifically applicable to Division 26 sections, in addition to Division 1 - General Requirements.

1.02 REFERENCES/STANDARDS

A. American National Standards Institute (ANSI)
B. National Fire Protection Association (NFPA)
C. National Electrical Code (NEC) (NFPA-70)
D. Life Safety Code (NFPA-101)
E. American Society for Testing and Materials (ASTM)
F. Illuminating Engineering Society (IES)
G. Institute of Electrical and Electronics Engineers (IEEE)
H. Insulated Cable Engineers Association (ICEA)
I. National Electrical Manufacturers Association (NEMA)
J. National Electrical Safety Code (NESC) (ANSI-C2)
K. Standard for Electrical Safety in the Workplace (NFPA-70E)
L. National Electrical Testing Association (NETA)
M. Occupational Safety and Health Administration (OSHA)
N. Underwriters Laboratories (UL)

1.03 SUBMITTALS

A. Submit under provisions of *Section 01 33 23*, *Shop Drawings, Product Data and Samples*.

B. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal.

C. Mark dimensions and values in units to match those specified.

1.04 REGULATORY REQUIREMENTS

A. Conform to the Uniform Construction Code for the State of New Jersey and N.J.A.C. 5:23-3.16 et. seq. as applicable.

B. Conform to applicable References and Standards as listed in Section 1.02.

C. Obtain permits, and request inspections from Authority having jurisdiction.

D. All work shall be performed by a State of New Jersey licensed electrician.

E. Comply with Local, County, State and Federal Regulations and Codes in effect as of date of purchase.

1.05 CONTRACT DRAWINGS

A. The Contractor shall furnish all labor and material necessary and shall install, complete to be ready for use, the electrical power systems, including the installation and wiring of miscellaneous electrical power equipment, panels, and other electrical equipment as indicated on the Drawings and as herein specified.

B. The Contract Drawings, which constitute an integral part of this Contract, are for engineering and general arrangement purposes only. They indicate the general layout of the electrical power system, arrangement of switchgear, substation equipment, conduits and other work. Raceway locations shown in details and in the plan on the Contract Drawings indicate the approximate location and routing of all raceways.

C. Electrical devices and material shall comply with the standards of NEMA and shall be listed and/or labeled by the Underwriters' Laboratories, Inc. Where Underwriters' Laboratories listing is not available for equipment, the Contractor shall submit certified test reports of an adequately equipped, recognized, independent testing laboratory, approved by the local inspecting authority, indicating that the equipment is in conformance with the local code requirements or any other applicable requirements. In lieu of the independent test reports, written approval of the equipment by the local electrical inspecting authority will be acceptable. The Contractor shall pay all cost of tests and/or inspections necessary for approval of the equipment.

D. All work shall be systematically, carefully and neatly performed in a workmanlike manner, and shall comply with all applicable current standards and practices of the latest National Electric Code (NEC), the latest National Electrical Safety Code (NESC), National Fire Code (NFC), the Institute of Electrical and Electronic Engineers, Inc. (IEEE), Occupational Safety and Health Administration (OSHA),

and any local codes or standards which may govern the work being performed or equipment furnished under this Contract.

E. All manufacturers published data including installation and operation recommendations shall be part of the specifications for this Contract. All equipment shall be installed and connected as recommended by its manufacturer, as specified in these specifications and as shown on the Contract Drawings.

F. All programmable devices which include but are not limited to circuit breakers, ground faults, timers, generators, transfer switches, variable frequency drives and control panels shall be programmed by the Contractor. All settings shall be programmed based on the end user owner requirements, final field installed components, and per the devices manufacturer recommendations. Contractor shall provide and perform all calculations, system reports and electrical system studies required for these programmable parameters based on manufacturer requirements and shall be included within their final bid at no additional cost to the OWNER and with no assistance from the Design Engineer. All devices shall be fully programmed and commissioned and all systems and subsystems shall be demonstrated to be fully operational. All settings, calculations and system studies required shall be included within the submittal packages and final operations and maintenance manuals. Approval of devices without these documents being submitted does not alleviate the Contractor of these requirements.

G. In case of interference with other work or erroneous locations with respect to equipment or structures, the Contractor shall furnish all labor and materials necessary to complete the work in an acceptable manner without additional cost to the Owner.

H. The plans, as drawn, show conditions as accurately as it is possible to indicate them in scale. Plans are diagrammatical and do not necessarily show all the fittings, etc., necessary to suit the building conditions. Locations of outlets, equipment, etc. are approximate. The Contractor shall be responsible for the proper location in order to make them fit with the site details to the satisfaction of the Engineer.

1.06 PROJECT/SITE CONDITIONS

A. The Contractor is responsible for field verification of all scale dimension on drawings. Actual locations, distances and levels will be governed by actual field conditions. Dimensional changes required due to differing site conditions shall be made at no additional cost.

B. The Contractor shall check structural, mechanical, equipment, and site plans, shop drawings and equipment wiring diagrams, to avert possible installation conflicts.

Should drastic changes from original plans be necessary to resolve such conflicts, the Contractor shall notify the Engineer and secure written approval and agreement on necessary adjustments before installation is started.

C. The Contractor shall promptly, and before such conditions are disturbed, notify the Engineer or Construction Manager in writing of subsurface, latent or unknown physical conditions at the site of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this Contract. The Engineer shall promptly investigate the conditions, and if such conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the work under this Contract, whether or not changed as a result of such conditions, an equitable adjustment shall be made, and the Contract modified accordingly.

D. The Contractor represents that he/she has carefully examined all of the Contract Documents and the construction site and has satisfied himself as to the character, quality and quantity of work to be performed, the materials, equipment and other items to be furnished, and all other requirements of this Contract, as well as conditions that will be encountered at the site or otherwise may affect the cost of performing the work or providing the equipment required for this Contract.

E. The Contractor shall provide to the Owner at the completion of the contract, certificates of approval for compliance with the National Electric Code and any other authority having jurisdiction.

1.07 ELECTRICAL WORKING DRAWINGS/RECORD DOCUMENTS

A. The Contract Drawings are not intended to serve as working or installation drawings. These drawings are for engineering and general arrangement purposes only. The Contractor shall prepare and submit to the Engineer for approval of his own working and installation drawings based on the Contract Drawings, but showing all details of construction, such as equipment dimensions, as-built circuit information, conduit plan views/sections, junction box wiring tables, interconnection wiring tables (showing each wire/cable installed), motor mounting details and dimensions, pad and vault details and transformer mounting details, interconnection wiring diagrams, wire label tables and similar drawings depicting the construction and installation work to be performed.

B. The working drawings shall be prepared based on certified manufacturer's shop drawing of equipment furnished under this and other contracts. It shall be the responsibility of the Contractor to obtain all required shop drawings and wiring diagrams from manufacturers and other contractors, and other relate drawings to

properly coordinate all electrical installations and to fulfill the intent of these specifications.

C. Installation of any electrical equipment, conduit, or wire prior to the approval of these working drawings will be the contractor's responsibility and any modification of the electrical work necessary to meet the equipment requirements or changes made by the Engineer shall be made without additional cost to the Owner.

D. The interconnection wiring diagrams shall show all connections between the control panels or starters and any field device.

E. During the course of work, the Contractor shall maintain a record set of as-built drawings on-site (available for the resident Engineer's use) on which the actual physical location of all equipment will be noted with dimensions as well as wiring numbers and/or connection diagrams. The Contractor shall bring these as-built drawings to each monthly job meeting for inspection by the Engineer.

F. At the completion of the project, the Contractor shall obtain a copy of the O&M manuals and shop drawings from each manufacturer. The Contractor shall mark all as-built records on these drawings and shall correct/change his own working drawings and shall supply any other as-built wiring diagrams, schematics, interconnection tables or layout drawings that differ in any way from the approved shop drawings, working drawings and the Contract Drawings.

G. Submission and approval of these as-built drawings/tracings shall be made before any final payment of non-retainer money owed to the Contractor. The Contractor may choose to submit as-built drawings by building/area as he completes such an area to the satisfaction of the Engineer.

1.08 SEQUENCING AND SCHEDULING

A. Construct work in sequence as required.

B. Description of work:

1. Power and lighting branch circuit distribution system.

2. Lighting fixtures, interior and exterior including lamps.

3. Grounding and bonding as required by the National Electrical Code (NEC).

4. Cutting and patching associated with Electrical work.

5. Furnishing and setting of all sleeves through floors and walls, including waterproof and fireproof sealing and cap flashing. Restore integrity of fire barriers by sealing all electrical openings through fire-rated walls and floors.

6. Hardware, such as inserts, bolts, etc., associated with concrete housekeeping pads and/or for mounting and securing electrical equipment.

7. Perform all tests, setup, adjustments, and furnish all certificates of approval.

8. Provide all work of every description detailed in these specifications or shown on the Drawings, including connections for all equipment, and all other labor and material as may be needed to make the work of this section complete and acceptable to the *OWNER*.

9. Provide instructions and training for *OWNER'S* personnel.

10. Coordinate scheduled outages with the *OWNER*.

11. Pay all relevant fees.

12. Excavation and backfill for electrical work (inside and outside). All concrete work required for pads (including housekeeping pads), underground conduits and conduit bases.

13. Prime and finish painting, where required, for new and relocated electrical equipment and installation of components.

14. Demolition work as described in these specifications and as shown on the Drawings.

15. Furnish motor control panels, individual starters and motor control devices, unless specifically indicated otherwise.

16. Electrical work in connection with equipment specified or furnished under other sections of the Specifications including:

    a. Mechanical heating, ventilating and air conditioning equipment.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

****END OF SECTION****

SECTION 26 05 03
(16180)
EQUIPMENT WIRING SYSTEMS

PART I - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Electrical connections to equipment specified under other Sections or furnished by *OWNER*.

B. Related work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 26 05 19: Wire and Cable*

3. *Section 26 05 26: Grounding and Bonding for Electrical Systems*

4. *Section 26 05 33: Raceway and Boxes for Electrical Systems*

5. *Section 26 27 26: Wiring Devices*

C. References:

1. NEMA WD 1 - General Purpose Wiring Devices

2. NEMA WD 6 - Wiring Devices-Dimensional Requirements.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Manufacturer's product data:

1. Complete list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 COORDINATION

A. Comply with requirements of *Section 01 31 13, Project Coordination*.

B. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.

C. Determine connection locations and requirements.

D. Sequence rough-in of electrical connections to coordinate with installation of equipment.

E. Sequence electrical connections to coordinate with start-up of equipment.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other essential characteristics inherent in the named product.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable Manufacturers - Cords and Caps:

1. Bryant

2. Hubbell

3. ITT Royal

4. Or equivalent.

2.02 CORDS AND CAPS

A. Straight-blade attachment plug: NEMA WD 1.

B. Locking-blade attachment plug: NEMA WD 5.

C. Attachment plug configuration: Match receptacle configuration to outlet provided for equipment.

D. Cord construction: Oil-resistant thermoset insulated Type SO multiconductor flexible cord with identified equipment grounding conductor, suitable for extra hard usage in damp locations.

E. Cord size: Suitable for connected load of equipment and rating of branch circuit overcurrent protection.

2.03 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Review equipment submittals prior to installation and electrical rough-in. Verify location, size, and type of connections. Coordinate details of equipment connections with supplier and installer.

3.03 DEMOLITION OF EXISTING WORK

A. Remove exposed abandoned equipment wiring connections, including abandoned connections above accessible ceiling finishes.

B. Disconnect abandoned utilization equipment and remove wiring connections. Remove abandoned components when connected raceway is abandoned and removed. Install blank cover for abandoned boxes and enclosures not removed.

C. Extend existing equipment connections using materials and methods [compatible with existing electrical installations, or] as specified.

3.04 INSTALLATION

A. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

B. Make conduit connections to equipment using flexible conduit. Use liquid-tight flexible conduit with watertight connectors in damp or wet locations.

C. Install pre-finished cord set where connection with attachment plug is indicated or specified, or provide cable and attachment plug with suitable strain-relief clamps.

D. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

E. Install receptacle outlet to accommodate connection with attachment plug.

F. Make wiring connections in control panel or in wiring compartment or pre-wired equipment in accordance with manufacturer's instructions. Provide interconnecting wiring as indicated or required.

G. Install disconnect switches, controllers, control stations, and control devices such as limit switches and temperature switches as indicated or as required by vendors of equipment furnished in other Specification sections. Connect with conduit and wiring as indicated or required.

3.05 ADJUSTING

A. Cooperate with utilization equipment installers and field service personnel during checkout and starting of equipment to allow testing and balancing and other startup operations. Provide personnel to operate electrical system and checkout wiring connection components and configurations.

3.06 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Remove and dispose of all debris.

PART 4 - PAYMENT

4.01 EQUIPMENT WIRING SYSTEMS

A. Quantity and Payment: No separate payment shall be made for this item. Include all costs for *EQUIPMENT WIRING SYSTEMS* in the prices bid for the various related items of work as designated in the Proposal.

****END OF SECTION****

SECTION 26 05 19
(16120)
WIRE AND CABLE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Building wire.

2. Cable.

3. Wiring connections and terminations.

B. Related work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 26 05 26: Grounding and Bonding for Electrical Systems*

3. *Section 26 05 33: Raceways and Boxes for Electrical Systems*

4. *Section 26 05 53: Electrical Identification*

C. References:

1. NEMA WC 70/ICEA S-95-658-1999 – Standard for Non-shielded Power Cable Rated 2000 Volts or Less for Distribution of Electrical Energy.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required to demonstrate compliance with the specified requirements.

C. Shop drawings showing precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provisions in construction to accommodate the work of this section.

D. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other essential characteristics inherent in the named product.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers:

1. Belden Cable Company
2. General Cable Company
3. Okonite Cable Company
4. Triangle - PWC Inc.
5. Or equivalent.

2.02 BUILDING WIRE

A. Single conductor power cable:

1. Power cable 250 kcmil and larger.

a. Conductor: 250 kcmil and larger soft copper conductor 98% conductivity, Class B stranding.

b. Insulation: Crosslinked Polyethylene, 600 volt, 90°C rated.

c. Jacket: None.

d. U.L. Type: XHHW-USE.

e. Identification (minimum): Conductor size, voltage rating, UL listing, and manufacturer.

f. Application: Cable used as an underground service entrance cable and as power feeders from switchboards and the emergency generator. Cables will be installed in cable tray, underground ducts and exposed conduit.

2. Power cable #4 AWG to #4/0 AWG:

a. Conductor: Soft drawn copper conductor 98% conductivity, Class B stranding.

b. Insulation: Crosslinked polyethylene, 600 volt rated 90°C dry, 75°C wet.

c. Jacket: None

d. UL Type: XHHW - USE.

e. Identification (minimum): Conductor size, voltage rating, UL listing, and manufacturer.

f. Application: Power feeders, including ground conductors, from switchboards, motor control centers, motor starters and panelboards to motors and power utilization appliances, via underground and exposed conduits.

3. Power cable #14 AWG to #6 AWG:

a. Conductor: Soft drawn copper. Class B stranding.

b. Insulation: Crosslinked Polyethylene, 600 volt, 90°C dry, 75°C wet.

c. Jacket: None.

d. UL Type: XHHW, XHHW-2.

e. Identification (minimum): Conductor size, voltage rating, UL listing, and manufacturer.

f. Application: Power feeders from motor starters and panelboards to motors, lighting, and power utilizing appliances, via underground and exposed conduit systems.

2.03 METALLIC SHEATHED CABLE #12 TO #6 AWG

A. Conductor: Soft drawn copper. #12 through #6 Class B stranding.

B. Insulation: PVC, 600 Volt, 90°C.

C. Jacket: None.

D. Armor: Interlocked steel tape.

E. UL Type: AC

F. Identification (minimum): Conductor, size, voltage rating, UL listing, manufacturer.

G. Application: Power feeders from panelboard to motor starters, lighting and power utilization appliances when concealed above ceiling and in walls.

2.04 SPLICES AND TERMINALS

A. Twist-on wire connectors:

1. Wire connectors shall have an insulated case and a fixed square wire spring to assure gripping action on conductors.

2. Connectors shall be rated 600 volts.

B. Mechanical split bolt connectors shall be Bundy Type KS Service or equal manufactured from high strength copper alloy.

C. Compression type sleeve connectors:

1. Wire sizes #22 AWG to #8 AWG. Sleeves shall be T&B STA-KON or equal nylon insulated butt type splices with insulation support. Splices shall be manufactured from high conductivity electrolytic copper and shall be color coded by wire size.

2. Wires sizes #6 AWG and larger. Sleeves shall be T&B or equal compression sleeves manufactured from high conductivity wrought copper with electro tin plate finish.

3. Compression type splices are to be used on stranded wire only.

D. Compression type terminals:

1. Wire sizes #16 to #8 AWG. Terminals shall be T&B STA-KON or equal nylon insulated ring tongue terminals with insulation support.

2. Wire sizes #6 AWG and larger. Terminals shall be T&B or equal compression type terminals with a one-hole tongue manufactured from high conductivity wrought copper with electro tin plate finish.

3. Compression type terminals are to be used on stranded wire only.

E. Heat-shrink splice materials:

1. Heat-shrink materials shall be used for both insulating splices and for maintaining moisture and flame resistance of power cables. Material shall be Raychem Type WCSF or equal, sized to match conductors being spliced.

2.05 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General wiring methods:

1. Use no wire smaller than #12 AWG for power and lighting circuits, and no wire smaller than #14 AWG for control circuits.

2. Use #10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 75 feet, and for 20 ampere, 277 volt branch circuit home runs longer than 200 feet.

3. Place an equal number of conductors for each phase of a circuit in same raceway or cable.

4. Splice only in junction or outlet boxes.

5. Neatly train and lace wiring inside boxes, equipment, and panelboards.

6. Make conductor lengths equal for parallel circuits.

B. Wiring installation in raceways:

1. Pull all conductors into a raceway at the same time. Use UL listed wire-pulling lubricant for pulling #4 AWG and larger wires.

2. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.

3. Completely and thoroughly swab new raceway systems before installing conductors.

C. Cable installation:

1. Provide protection for exposed cables where subject to damage.

2. Support cables above accessible ceilings; do not rest on ceiling tiles. Use spring metal clips or plastic cable ties to support cables from structure. Include bridle rings or drive rings.

3. Use suitable cable fittings and connectors.

4. Install cable per manufacturer's instructions.

D. Wiring connections and terminations:

1. Splice only in accessible junction boxes, and only when unavoidable.

2. Splices shall be made in accordance with manufacturer's instructions.

3. Use solderless pressure connectors with insulating covers for solid copper wire splices and taps, #10 AWG and smaller. Tape connector in wet areas.

4. Use split-bolt connectors for copper wire taps, #8 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150 percent of the insulation value of conductor.

5. Use butt-type compression sleeve connectors for in-line splices of stranded wire. Tape connector in wet areas.

6. Thoroughly clean wires before installing lugs and connectors.

7. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.

8. Terminate spare conductors with electrical tape.

9. Splices in underground cables and splices installed in underground manholes shall be avoided. If unavoidable, splices shall be made with long barrel compression type butt splices. Each splice shall be insulated using a Raychem WCSF, or equal, heat-shrink sleeve. All splices shall be supported and not allowed to lay in the bottom of handholes and manholes. Splices shall not be allowed in conduits or ducts.

10. Use insulated butt-type splices for stranded wires #22 AWG to #8 AWG. Use long barrel type two way compression connectors for butt splices of

#6 AWG and larger cables. Insulate each splice with 600 volt rated heat-shrink tubing, or tape splice with electrical tape to 150 percent of the insulation value of conductor. Provide heat-shrink tubing for cables with overall jacket to maintain jacket integrity.

11. Use compression type one-hole terminals for connection to motors for stranded wire #12 AWG and larger. Connect the terminals of the motor to the cable terminals of the feeder cable using stainless steel nuts, bolts and lockwashers. Insulate the connection using 600 volt heat-shrink sleeves or tape to 150% of conductor insulation value. Use two-hole terminals for larger cable sizes if two-hole terminals are provided with the motor leads.

3.03 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Remove and dispose of all construction debris.

3.04 FIELD QUALITY CONTROL

A. Upon completion of this portion of the work and prior to acceptance by the *OWNER*, make all required tests and adjustments for free and smooth operation.

B. Secure all approvals from agencies having jurisdiction.

C. Field inspection and testing will be performed under provisions of this specification.

D. Inspect wire and cable for physical damage and proper connection.

E. Torque test conductor connections and terminations to manufacturer's recommended values.

F. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.

PART 4 - PAYMENT

4.01 WIRE AND CABLE

A. Quantity and Payment: No separate payment shall be made for this item. Include all costs for *WIRE AND CABLE* in the prices bid for the various related items of work as designated in the Proposal.

****END OF SECTION****

SECTION 26 05 26
(16450)
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Power system grounding.

2. Electrical equipment and raceway grounding and bonding.

B. Related work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 26 05 19: Wire and Cable*

3. *Section 26 05 33: Raceways and Boxes for Electrical Systems*

4. *Section 26 24 16: Panelboards*

C. References:

1. ANSI/NFPA 70 National Electrical Code Article 250 “Grounding”.

1.02 SYSTEM DESCRIPTION

A. Maintain the integrity and continuity of the existing grounding system throughout the construction period.

B. Ground each separately-derived system neutral to facility ground system.

C. Ground each electrical component ground connection point to the facility grounding system.

D. Bond together system and equipment neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway

systems, grounding conductor in raceways and cables, receptacle ground connectors, ground rods and plumbing systems. Bond transformer secondary neutral to transformer enclosure.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required to demonstrate compliance with the specified requirements.

C. Shop drawings:

1. Show precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provisions in construction to accommodate the work of this section.

2. Indicate location of system grounding electrode connections, and routing of grounding electrode conductor.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.06 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other essential characteristics inherent in the named product.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 MATERIALS

A. Ground rods: Copper-encased steel, ¾-inch diameter, minimum length 10 feet.

B. Ground wire: Soft drawn copper, Class B stranding, green colored PVC insulation. Buried ground wires shall be uninsulated.

C. Grounding clamps: Ground rods and grounding clamps shall be cast, high-copper content bronze alloy.

2.03 OTHER MATERIALS

A All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Provide a separate, insulated equipment grounding conductor in feeder and branch circuits. Terminate each end on a grounding lug, bus, or bushing.

B. Connect equipment grounding conductors to existing ground loop using exothermal welds. Verify the integrity of the ground loop or grounding conductor connections to the ground rods. Where loose, corroded or otherwise high-resistance or faulty connections are detected, repair or replace connections to restore integrity of grounding system.

C. Use minimum 6 AWG copper conductor for communications service grounding conductor and for instrumentation system grounding conductor. Leave 10 feet slack conductor at terminal cabinet.

D. Size grounding conductors in accordance with the National Electrical Code.

E. Connections to reinforcing steel, structural steel and buried ground conductors shall be made using exothermal welds.

3.03 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Remove and dispose of all debris.

3.04 TESTS

A. Upon completion of this portion of the work and prior to acceptance by the *OWNER*, make all required tests and adjustments for free and smooth operation.

B. Secure all approvals from agencies having jurisdiction.

C. Field quality control:

1. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

2. Measure ground resistance from system neutral connection at service entrance to convenient ground reference point using suitable ground testing equipment. Resistance shall not exceed 5 ohms.

PART 4 - PAYMENT

4.01 GROUNDING & BONDING FOR ELECTRICAL SYSTEMS

A. Quantity and Payment: No separate payment shall be made for this item. Include all costs for *GROUNDING & BONDING FOR ELECTRICAL SYSTEMS* in the prices bid for the various related items of work as designated in the Proposal.

****END OF SECTION****

SECTION 26 05 29
(16190)
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Conduit and equipment supports.

2. Fastening hardware.

3. Electrical equipment backboards.

B. Related work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 26 05 33: Raceways and Boxes for Electrical Systems*

3. *Section 26 24 16: Panelboards*

C. References:

1. MFMA-1 - Metal Framing Manufacturers Association Standard

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required to demonstrate compliance with the specified requirements.

C. Shop drawings showing precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provisions in construction to accommodate the work of this section.

D. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other essential characteristics inherent in the named product.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

2.02 ELECTRICAL MOUNTING CHANNEL SYSTEMS

A. Stainless steel: Stainless steel channel and accessories shall be of AISI Type 304 or Type 316 stainless steel.

B. Dimensions: Metal framing channel shall be cold formed from 12-gauge steel. All channels shall have a nominal overall width of 1⅝" and have a ⅞" slot face

opening. Standard lengths are to be 10 and 20 foot. All testing and tolerancing shall be in accordance with the latest MFMA-1 Standard.

C. Hardware: Corrosion resistant. Stainless steel in accordance with ASTM A153.

2.03 PLYWOOD BACKBOARDS

A. Material: ¾" thick, A-D, Group 1, interior. Refer to drawings for size of backboard, or as required.

2.04 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Coordinate size, shape and location of concrete pads with *Section 03 30 00, Concrete*.

B. Load capability of the supporting system shall be determined by the Contractor for present and future, if indicated, equipment and the system shall be designed to

accommodate determined loads. However, as a minimum, the support channels shall be minimum 12-gauge with a minimum section width of 1⅝ inches deep.

C. Provide all anchor bolts, steel bracing, and accessories required for a sound installation that shall withstand the stresses of the environment, wind loading, and equipment operation and maintenance.

D. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using expansion anchors, beam clamps or spring steel clips as appropriate.

E. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchors on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.

F. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.

G. Do not use powder-actuated anchors.

H. Do not drill structural steel members.

I. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.

J. In wet locations install free-standing electrical equipment on concrete housekeeping pads.

K. Install surface-mounted cabinets, panelboards, motor control enclosures and disconnect switches with a minimum of four anchors each.

L. Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboard in stud walls.

M. Use stainless steel unistrut for all locations.

N. Finish paint sides and edges of termiation backboards with two coats of durable black enamel under provisions of *Section 09 90 00, Painting* prior to installation. Fasten backboard to wall using electrical mounting channels.

3.03 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Remove and dispose of all debris.

PART 4 - PAYMENT

4.01 SUPPORTING DEVICES

A. Quantity and Payment: No separate payment shall be made for this item. Include all costs for *SUPPORTING DEVICES* in the prices bid for the various related items of work as designated in the Proposal.

****END OF SECTION****

SECTION 26 05 33
(16111)
RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Rigid metal conduit and fittings.
2. Electrical metallic tubing and fittings.
3. Outlet boxes.
4. Pull and junction boxes.

B. Related work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.
2. *Section 26 05 03: Equipment Wiring Systems*
3. *Section 26 05 19: Wire and Cable*
4. *Section 26 05 26: Grounding and Bonding for Electrical Systems*
5. *Section 26 05 29: Hangers and Supports for Electrical Systems*
6. *Section 26 05 53: Electrical Identification*

C. References:

1. ANSI C80.1 - Rigid Steel Conduit, Zinc-Coated.
2. ANSI C80.3 - Electrical Metallic Tubing, Zinc-Coated.
3. ANSI C80.5 – Rigid Aluminum Conduit.

4. ANSI/NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.

5. NEMA RN 1 - PVC Externally-Coated Galvanized Rigid Steel Conduit and Electrical Metallic Tubing.

6. NEMA TC 2 - Electrical Plastic Tubing (EPT) and Electrical Plastic Conduit (EPC-40 and EPC-80).

7. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Manufacturer's product data:

1. Complete list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required to demonstrate compliance with the specified requirements.

1.03 QUALITY ASSURANCE

A. Qualifications of Workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other essential characteristics inherent in the named product.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 RIGID METAL CONDUIT

A. Manufacturers:

1. Wheatland Tube Company
2. Allied Tube Conduit
3. Republic Conduit
4. Or equivalent.

B. Rigid Aluminum Conduit: ANSI C80.5.

C. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit. Furnish aluminum fittings with steel conduit.

2.03 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:

1. Wheatland Tube Company
2. Allied Tube and Conduit
3. Republic Conduit
4. Or equivalent

B. Product Description: ANSI C80.3; galvanized tubing.

C. Fittings and Conduit Bodies: NEMA FB 1; steel compression type.

2.04 WIREWAY

A. Acceptable Manufacturers:

1. Carlon Electrical Products
2. Hubbell Wiring Devices
3. Thomas & Betts Corp.
4. Walker Systems Inc.
5. The Wiremold Co.
6. Or equivalent.

B. Product Description: General purpose type wireway.

C. Knockouts: Manufacturer's standard.

D. Size: Length as indicated on Drawings or as field determined to be required during construction.

E. Cover: Hinged cover with full gaskets.

F. Connector: Slip-in.

G. Fittings: Lay-in type with removable top, bottom, and side; captive screws.

H. Finish: Rust inhibiting primer coating with gray enamel finish.

2.05 OUTLET BOXES

A. Acceptable manufacturers:

1. Carlon Electrical Products
2. Hubbell Wiring Devices
3. Thomas & Betts Corp.
4. Walker Systems Inc.
5. The Wiremold Co.
6. Or equivalent.

B. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.

C. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish ½-inch male fixture studs where required.

D. Nonmetallic Outlet Boxes: NEMA OS 2.

E. Wall Plates for Finished Areas: As specified in *Section 26 27 26, Wiring Devices*.

F. Wall Plates for Unfinished Areas: Furnish gasketed cover.

2.06 PULL AND JUNCTION BOXES

A. Acceptable manufacturers:

1. Carlon Electrical Products
2. Hubbell Wiring Devices
3. Thomas & Betts Corp.
4. Walker Systems Inc.
5. The Wiremold Co.

6. Or equivalent.

B. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

2.07 OTHER MATERIALS

A All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 EXISTING CONDITIONS

A. Remove exposed abandoned raceway, including abandoned raceway above accessible ceiling finishes. Cut raceway flush with walls and floors and patch surfaces.

B. Remove concealed abandoned raceway to its source.

C. Disconnect abandoned outlets and remove devices. Remove abandoned outlets when raceway is abandoned and removed. Install blank cover for abandoned outlets not removed.

D. Maintain access to existing boxes and other installations remaining active and requiring access. Modify installation or provide access panel.

E. Extend existing raceway and box installations using materials and methods [compatible with existing electrical installations, or] as specified.

F. Clean and repair existing raceway and boxes to remain or to be reinstalled.

3.03 CONDUIT SIZING, ARRANGEMENT, AND SUPPORT

A. Size conduit in accordance with the latest issue of the National Electrical Code unless a larger size is shown on the drawings. Use ¾-inch minimum size where exposed and 1" minimum size where buried below grade or in concrete slab.

B. Arrange conduit to maintain working clearance in compliance with National Electrical Code, Paragraphs 110.26 through 110.34, and to present a neat appearance.

C. Route exposed conduit parallel or perpendicular to walls, building lines and/or adjacent piping.

D. Maintain a minimum 6-inch clearance between conduit and piping. Maintain 12-inch clearance between conduit and heat sources such as flues, steam pipes, or heating appliances.

E. Arrange conduit supports to prevent distortion of conduit alignment by wire-pulling operations. Fasten conduit using galvanized straps, lay-in adjustable hangers, clevis hangers, or bolted split stamped galvanized hangers.

F. Group conduit in parallel runs where practical and provide conduit rack constructed of galvanized steel channel "Unistrut" in accordance with *Section 26 05 29, Hangers and Supports for Electrical Systems*.

G. Do not fasten conduit with wire or perforated pipe straps. Remove all wire used for temporary conduit support during construction, before conductors are pulled.

H. Support conduit at a maximum of 8 feet on center.

I. Provide a short length (approximately 36") of flexible liquid-tight metal conduit at motors or other equipment as required to accommodate vibration, for ease of adjustment and future maintenance.

J. Conduits shall be supported independently of electrical enclosures. Physical stresses caused by vibration or thermal expansion shall not be transmitted to or from electrical enclosures or rotating equipment.

K. Where conduits are utilized to carry/enclose cables exiting a cable-tray, each conduit shall be rigidly and permanently attached to the top of the cable-tray side rail, and a suitable bending radius provided. Conduit connections through the bottom or side rails of the cable tray are unacceptable.

L. Conduits shall enter field equipment enclosures through the back, side or bottom (not top) via weatherproof hubs. Conduit entry shall be near the wiring terminal point and not obstruct access to, or removal of, components. Top entry of conduit is permitted with prior written approval, and only if a vapor seal is provided directly above the weatherproof hub.

M. Conduits may enter pull or terminal boxes at any location except through a removable cover. Provide adequate protection against moisture accumulation and dripping on exposed terminals.

N. Each end of all conduit runs terminating in a NEMA 1 general purposed or NEMA 3R raintite sheet-metal box or cabinet shall be provided with a galvanized or sherardized lock nut inside and outside of the box and with an approved insulated bushing. Where grounding requirements dictate, provide a grounding bushing inside of the box or cabinet.

O. Each end of all conduit runs terminating in a NEMA 4, NEMA 12 or NEMA 13 sheet metal box or cabinet shall be provided with a watertight hub.

3.04 CONDUIT INSTALLATION

A. Cut each conduit square using a saw or pipe-cutter; ream conduit to de-burr cut ends. Field-cut threads shall be of the same type and length as factory-cut threads. No “running threads” shall be permitted. For galvanized conduit, apply a zinc-base paint on the threads prior to assembly.

B. Bring conduit to the shoulder of fittings and couplings and fasten securely. All conduit connections shall be arranged and installed to be electrically continuous, and to provide a positive electrical ground.

C. Use conduit hubs for fastening conduit to cast boxes, and for fastening conduit to sheet-metal boxes in damp or wet locations.

D. Install no more than the equivalent of three 90-degree bends in any run of conduit. Where more bends would be required, provide a pull box. In long conduit runs, pull boxes or expansion fittings with ground straps shall be provided every 125 feet.

E. Use conduit bodies to make sharp changes in direction, such as around beams.

F. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2-inch. Where possible, conduit bends shall be of the long radius type, machine made, without kinks, flattening, or crushing. Field bends shall be made only where unavoidable. Field bends shall be made by means of mechanical benders designed to produce radii required by the National Electrical Code.

G. Avoid moisture traps where possible. Where unavoidable, provide a junction box with a drain fitting at each conduit low point. Slope all conduit toward conduit system low point for complete drainage.

H. Each complete run of conduit shall be thoroughly cleaned, and no cable or wire shall be pulled until the run is completely free of water and other foreign matter. After cleaning, each conduit shall be sealed and capped with a galvanized or brass fitting and conduit bushing, or by means of plastic caps or other approved methods until wire or cable is to be pulled. The intent is to protect installed conduit against the entrance of dirt or moisture during construction. Permanently cap all spare conduits.

I. Provide #12 AWG insulated conductor or suitable pull string in each empty conduit, except for sleeves and nipples.

J. Install expansion fittings with grounding jumper where conduit crosses building expansion joints. Also, install expansion fittings in straight runs of 125 feet or more and at 125-foot intervals in runs exceeding 250 feet in unheated areas.

K. Where conduit penetrates fire-rated walls or floors, seal the opening around each conduit with UL listed foamed silicone elastomer compound. Seal the conduit openings to prevent vapors from entering the building via the conduit.

L. Route conduit through roof openings for piping and ductwork where possible; otherwise, route through roof jack in accordance with Drawing details.

M. Use PVC-coated rigid steel factory elbows for bends in PVC conduit runs longer than 100 feet, or in PVC conduit runs, which have more than two bends regardless of length.

N. Wipe PVC conduit clean and dry before joining. Apply full even coat of cement to entire area that will be inserted into fitting. Let joint cure for 20 minutes minimum before applying stress to the joint.

O. Repair nicks, scratches, abrasions and/or other damage to PVC-coated conduit using appropriate products offered by the conduit manufacturer for the intended purpose.

P. Where corrosive or potentially hazardous vapors are present, provide approved cable seals in all conduits entering panels, control stations and all other electrical equipment to prevent migration of detrimental vapors into electrical enclosures.

Q. Fittings or boxes shall be installed where necessary for pulling, even though not shown on the drawings. Conduit systems shall have a sufficient number of supports to provide a rigid installation. Conduits may be bolted or clamped to building members or structural framework. Welding of conduits or conduit fittings directly to structural steel shall not be permitted. Any galvanizing or paint on conduit, conduit fittings, or boxes damaged during installation shall be repaired by the Contractor.

3.05 INSTALLATION - WIREWAY

A. Bolt auxiliary gutter to wall using two-piece hangers. Install level.

B. Gasket each joint in oil-tight gutter.

C. Mount raintight gutter in horizontal position only.

3.06 COORDINATION OF BOX LOCATIONS

A. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.

B. Electrical box locations shown on *Contract Drawings* are approximate unless dimensioned. Verify location of outlets in offices and work area prior to rough-in.

C. Locate and install boxes to allow access.

D. Locate and install to maintain headroom and to present a neat appearance.

3.07 OUTLET BOX INSTALLATION

A. Do not install boxes back-to-back in walls. Provide minimum 6-inch separation, except provide minimum 24-inch separation in acoustic-rated walls.

B. Locate boxes in masonry walls to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat openings for boxes.

C. Provide knockout closures to unused openings.

D. Support boxes independently of conduit except for cast boxes that connect to two (2) rigid metal conduits, both supported within 12-inches of box.

E. Use multiple-gang boxes where more than one device is mounted together, do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.

F. Install boxes in walls without damaging wall insulation.

G. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.

H. Position outlets to locate luminaries as shown on reflected ceiling plans.

I. In inaccessible ceiling areas, position outlets and junction boxes within 6-inches of recessed luminaries, to be accessible through luminaries ceiling opening.

J. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes.

K. Align wall-mounted outlet boxes for switches, thermostats, and similar devices.

L. Provide cast outlet boxes in exterior locations, exposed to the weather, and wet locations.

3.08 PULL AND JUNCTION BOXES

A. Locate pull boxes and junction boxes above accessible ceilings or in unfinished areas.

B. Support pull and junction boxes independent of conduit.

C. Refer to pull box schedule on drawings for box identification and enclosure type.

3.09 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Remove and dispose of all debris.

PART 4 - PAYMENT

4.01 RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

A. Quantity and Payment: No separate payment shall be made for this item. Include all costs for *RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS* in the prices bid for the various related items of work as designated in the Proposal.

****END OF SECTION****

SECTION 26 05 53
(16195)
ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Wire and cable markers.

2. Conduit labels.

3. Nameplates and labels.

B. Related work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 26 05 03: Equipment Wiring Systems*

3. *Section 26 05 19: Wire and Cable*

4. *Section 26 05 33: Raceways and Boxes for Electrical Systems*

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required to demonstrate compliance with the specified requirements.

C. Include schedule for nameplates and tape labels.

D. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other essential characteristics inherent in the named product.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Manufacturers:

1. 3M Products
2. W. H. Brady
3. Or equivalent

2.02 WIRE AND CABLE MARKERS

A. The alpha-numeric coding on both ends of each individual 600 Volt conductor size #6 AWG and smaller (including neutrals) shall be made using 3M printable markers catalog number PLP-WHT Series with vinyl flexible overlap or equivalent, in addition to color coding.

B. The alpha-numeric coding on both ends of each individual 600 Volt conductor size #4 through #1/0 AWG shall be made using W. H. Brady Series 3420 wire markers or equivalent (minimum six characters) in addition to color coding "A", "B", and "C" Phase throughout.

C. The alpha-numeric coding on both ends of each individual 600 Volt conductor size #2/0 through #500 MCM shall be made using W. H. Brady Series 3430 wire

markers or equivalent (minimum six characters) in addition to color coding "A", "B", and "C" Phase.

D. All 5 kV power wires shall be color-coded on both ends with orange electrical tape. Each phase shall be marked with one, two, or three bands of orange tape (Phase A, B, C) and with W. H. Brady Series 3430 wire markers or equivalent (minimum six characters).

E. All 15 kV power wires shall be color-coded on both ends with yellow electrical tape. Each phase shall be marked with one, two, or three bands of yellow tape (Phase A, B, C) and with W. H. Brady Series 3440 wire markers or equivalent (minimum six characters).

F. All 35 kV cables shall be color-coded on both ends with red electrical tape. Each phase shall be marked with one, two, or three bands of red tape (Phase A, B. C.) and with W. H. Brady Series 3440 wire markers or equivalent.

2.03 CONDUIT/LABELS

A. All raceways labels shall be multiple part chemical resistant, non-adhesive, tags as manufactured by ALMETEK INDUSTRIES, INC., "MINI-TAGS" Catalog #SV-5. Tag holders shall be black polyvinyl chloride (PVC). Tag characters shall be yellow medium density, polyethylene with black characters. Tag holders shall be vertical style and fastened to each raceway using two (2) black, ultra-violet (UV) protected, self-locking, nylon ties as manufactured by Thomas and Betts, "TYRAP", or equivalent.

2.04 NAMEPLATES AND LABELS

A. Nameplates shall be made of laminated sheet plastic, 1/16-inch thick, engraved to provide black letters on a white background. The nameplates shall be made of laminated sheet plastic, 1/16-inch thick, engraved to provide black letters on a white background. The nameplates shall be fastened in place with stainless steel screws and adhesive backing. Nameplate information shall be as called out on the Contract Drawings specified herein and approved by the Engineer. The Contractor shall provide a sample and submit for approval a list of legends for nameplates he proposes to use.

B. Panel voltage hazard labels by W. H. Brady Series 96157 or equivalent.

2.05 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. General:

1. Degrease and clean surfaces to receive nameplates and tape labels.

2. Install nameplates and tape labels parallel to equipment lines.

3. Secure nameplates to equipment fronts using aluminum, rivets. Secure nameplate to inside face of recessed panelboard doors in finished locations. Use of screws or adhesive is unacceptable.

4. Embossed tape will not be permitted for identification of electrical equipment other than individual wall switches, receptacles, control device stations and instruments.

5. All tags and/or nameplates shall be located in a position to be readable after completion of the installation of the equipment. Final nameplate wording will be as approved by the *ENGINEER*.

6. Provide and install nameplates for all equipment installed, and all equipment circuits modified. If a source is changed for any electrical

equipment, nameplates and wire markers shall be modified for every circuit, equipment, receptacle, or device affected.

B. Wire identification:

1. All power, control, and instrumentation wire and cable installed shall be clearly and permanently labeled within six (6") inches of all electrical terminations, splices, and connections using pre-printed alpha-numeric vinyl cloth marking tags. All labeling shall conform to the alpha-numeric system approved by the Engineer during construction. Labeling shall indicate the field identification number of all wire and cable and the phase of all power connectors.

2. Provide wire markers on each conductor in panelboard gutters, pull boxes, outlet and junction boxes, and at load connection. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on schematic and interconnection diagrams for control wiring.

3. All wire and cable furnished, installed and/or terminated under this Contract shall be externally color-coded and at all termination points, contain an alpha-numeric coding for each phase, neutral, and/or grounding conductor installed. This coding shall be used consistently throughout the power distribution system installed under this Contract.

4. All 480V power wiring phases shall be color-coded brown, orange, yellow (A, B, C) along their entire length not concealed in the conduit system.

5. All 240/120V power wires shall be color-coded black, red, white (A, B, N) along their entire length not concealed in the conduit system.

6. Terminal strips shall be clearly and permanently marked with waterproof ink or indelible pencil. Each wire shall be marked consistently throughout the entire system, using wherever possible the notation of the wires given on the manufacturer's wiring diagrams, Contractor's working drawings, as shown on the Contract Drawings and as approved by the Engineer. Each wire shall be labeled at both termination points. All wire numbers shall appear on as-built drawings before these drawings will be accepted.

7. The entire length of exposed ground conductors and the entire exposed portion in junction boxes, FD boxes, and other enclosures (not concealed by the conduit system) shall be marked with green tape along the entire length.

8. All ground wires shall be color-coded green.

C. Conduit Identification:

1. Under this Contract, the Contractor shall clearly and permanently label as specified in this Section all electrical raceways installed under *Section 25 05 33, Raceway and Boxes for Electrical Systems*, and shown on the Contract Drawings. Labels shall be installed at all raceway termination points.

D. Nameplate engraving schedule:

1. Provide nameplates to identify all electrical distribution and control equipment, and loads served. Letter height: ⅛-inch for individual switches and loads served, ¼-inch for distribution and control equipment identification.

2. The Contractor shall furnish and install nameplates on all junction boxes, motor starters, ventilation equipment, unit heaters, control panels, transformers, panelboards, pushbuttons, indicating lights, disconnect switches, circuit breakers and any other electrical equipment installed and/or connected to under this Contract as specified herein.

3. All junction and pull boxes shall have the words “JUNCTION BOX” or “PULL BOX” on the nameplate with the individual box number listed below these words, e.g., (JBX-1) and shall be two (2") inches high by four (4") inches wide.

4. All variable frequency drives, motor starters, circuit breakers, panelboards, transformers, capacitors, disconnects, control panel and control station/pilot devices shall have the individual name as listed on the Contract Drawings and shall be one (1") inch high by three (3") inches wide.

5. All other miscellaneous equipment and motors shall have the individual name listed (as directed by the Engineer) on a one (1") inch high by two (2") inch wide nameplate.

6. Identify all panels, load centers, disconnect switches, motor starters and motor control centers with voltage rating using Brady labels.

3.03 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Remove and dispose of all debris.

PART 4 - PAYMENT

4.01 ELECTRICAL IDENTIFICATION

A. Quantity and Payment: No separate payment shall be made for this item. Include all costs for *ELECTRICAL IDENTIFICATION* in the prices bid for the various related items of work as designated in the Proposal.

****END OF SECTION****

SECTION 26 12 16
(16461)
DRY TYPE TRANSFORMERS

PART 1 – GENERAL

1.01 DESCRIPTION

A. Work included:

1. Dry type two winding transformers.

B. Related work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 26 05 19: Wire and Cable*

3. *Section 26 05 26: Grounding and Bonding for Electrical Systems*

4. *Section 26 05 33: Raceway and Boxes for Electrical Systems*

5. *Section 26 05 53: Electrical Identification*

6. *Section 26 24 16: Panelboards*

C. References:

1. ANSI/NEMA ST 20 – Dry Type Transformers for General Applications.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required to demonstrate compliance with the specified requirements.

3. Include outline and support point dimensions of enclosures and accessories, unit weight, voltage, KVA, and impedance ratings and characteristics, loss data, efficiency at 25, 50, 75 and 100 percent rated load, sound level, tap configurations, insulation system type, and rated temperature rise.

C. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage:

1. Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use.

2. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

3. Store in warm, dry location with uniform temperature. Cover ventilating openings to keep dust out.

4. Handle transformers using only lifting eyes and brackets provided for that purpose. Protect units against entrance of rain, sleet, or snow if handled in inclement weather.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provide as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-startup during the warranty period.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other essential characteristics inherent in the named product.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable manufacturers:

1. ASEA Brown Boveri (ABB)
2. Eaton/Cutter-Hammer
3. General Electric Company
4. Square D
5. Or equivalent.

2.02 DRY TYPE TWO WINDING TRANSFORMERS

A. Dry type transformers: ANSI/NEMA ST 20; factory-assembled, air cooled dry type transformers; ratings as shown on the Drawings, Square D, Class 7431 "Energy Saving Watch Dogs" or energy efficient equivalent.

B. Insulation system and average winding temperature rise for rated KVA as follows:

Transformer kVA Rating	Insulation Class	Temperature Rise (degrees °C)
1-10	185	115
15-50	220	150
75 & Up	220	150

D. Case temperature shall not exceed 35 degrees C rise above ambient at its warmest point.

E. Winding taps, transformers less than 15 KVA: Two 5 percent below rated voltage full-capacity taps on primary winding.

F. Winding taps, transformers 15 KVA and larger: Two 2½% above rated voltage and four 2½% below rated voltage. All taps to be full capacity rated ST 20.

G. Sound levels: ANSI/NEMA ST 20 maximum sound levels are as follows:

KVA Rating	Sound Level
0-9	40 dB
10-50	45 dB
51-150	50 dB

G. Basic impulse level: 10 kV.

H. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.

I. Mounting: Transformers 30 kVA and less shall be suitable for wall, floor, or trapeze mounting; transformers larger than 30 kVA shall be suitable for floor or trapeze mounting. Mounting brackets shall be by the transformer manufacturer.

J. Coil conductors: Continuous windings with terminations brazed or welded. Windings shall be copper.

K. Enclosure: ANSI/NEMA ST 20; Type 1. Provide lifting eyes or brackets.

L. Isolate core and coil from enclosure using vibration-absorbing mounts.

M. Nameplates: Include transformer connection data and overload capacity based on rated allowable temperature rise.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Set transformer plumb and level.

B. Use flexible conduit, 2 ft. minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.

3.03 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Remove and dispose of all debris.

3.04 TESTS

A. Upon completion of this portion of the work and prior to acceptance by the *OWNER*, make all required tests and adjustments for free and smooth operation.

B. Secure all approvals from agencies having jurisdiction.

C. Field quality control:

1. Check for damage and tight connections prior to energizing transformer.

2. Measure primary and secondary voltages and make appropriate tap adjustments.

PART 4 - PAYMENT

4.01 DRY TYPE TRANSFORMERS

A. Quantity and Payment: No separate payment shall be made for this item. Include all costs for *DRY TYPE TRANSFORMERS* in the prices bid for the various related items of work as designated in the Proposal.

****END OF SECTION****

SECTION 26 24 16
(16470)
PANELBOARDS

PART 1 – GENERAL

1.01 DESCRIPTION

A. Work included:

1. Service entrance, lighting and appliance branch circuit panelboards.

B. Related work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 26 05 19: Wire and Cable*

3. *Section 26 05 26: Grounding and Bonding for Electrical Systems*

4. *Section 26 05 29: Hangers and Supports for Electrical Systems*

5. *Section 26 05 33: Raceways and Boxes for Electrical Systems*

6. *Section 26 05 53: Electrical Identification*

C. References:

1. NEMA AB 1 – Molded Case Circuit Breakers

2. NEMA PB 1 – Panelboards

3. NEMA PB 1.1 – Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required to demonstrate compliance with the specified requirements.

3. Include outline and support point dimensions, voltage, main bus ampacity, integrated short-circuit ampere rating, circuit-breaker arrangement and sizes.

C. Shop drawings showing precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provisions in construction to accommodate the work of this section.

D. Manufacturer's recommended installation procedures.

E. Submit project record documents under provisions of *Section 01 78 39, Project Record Documents*.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-startup during the maintenance period.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other essential characteristics inherent in the named product.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable Manufacturers:

1. Siemens

2. Square D

3. Or equivalent.

2.02 BRANCH CIRCUIT PANELBOARDS

A. Lighting and appliance branch circuit panelboards: NEMA PB1; circuit breaker type.

B. Enclosure: NEMA PB 1; Type 1 or Type 12 as shown on Drawings.

C. Cabinet size: 6 inches deep; 20 inches wide.

D. Provide flush or surface cabinet front with concealed trim clamps, concealed hinge and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

E. Provide panelboards with copper bus, ratings as scheduled on Drawings. Provide copper ground bus in all panelboards.

F. Minimum integrated short-circuit rating: 42,000 amperes rms symmetrical for 480 volt panelboards and 120/208 volt panelboards or per the drawings.

G. Molded case circuit breakers: NEMA AB 1 bolt-on type thermal-magnetic trip circuit breakers, with common trip handle for all multiple-pole breakers. Provide circuit breakers UL listed as Type SWD for lighting circuits and HACR for HVAC equipment. Provide UL Class A ground-fault interrupter circuit breakers where indicated on drawings.

H. Panelboard shall be provided with a main circuit breaker, and shall be rated as service entrance equipment. Refer to panel schedule drawing(s) for voltage and continuous current ratings.

2.03 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their

respective kinds, and a selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Install panelboards plumb and in conformance with NEMA PB 1.1.

B. Height: 6 feet (to top of enclosure).

C. Provide filler plates for unused spaces in panelboards.

D. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance loads.

3.03 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Remove and dispose of all debris.

3.04 TESTS

A. Upon completion of this portion of the work and prior to acceptance by the *OWNER*, make all required tests and adjustments for free and smooth operation.

B. Secure all approvals from agencies having jurisdiction.

C. Field quality control:

1. Measure steady-state load currents at each panelboard feeder. Should the load imbalance at any panelboard exceed 20 percent, rearrange circuits in the panelboard to balance the loads within 20 percent. Take care to maintain proper phasing for multi-wire branch circuits.

2. Visual and mechanical inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of circuit breaker connections.

PART 4 - PAYMENT

4.01 PANELBOARDS

A. Quantity and Payment: No separate payment shall be made for this item. Include all costs for *PANELBOARDS* in the prices bid for the various related items of work as designated in the Proposal.

****END OF SECTION****

SECTION 26 27 26
(16141)
WIRING DEVICES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Wall switches.

2. Receptacles.

3. Device plates and box covers.

B. Related work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 26 05 19: Wire and Cable*

3. *Section 26 05 26: Grounding and Bonding for Electrical Systems*

4. *Section 26 05 33: Raceway and Boxes for Electrical Systems*

5. *Section 26 05 53: Electrical Identification*

C. References:

1. NEMA WD 1 - General-Purpose Wiring Devices.

2. NEMA WD 5 - Specific-Purpose Wiring Devices.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples.*

B. Manufacturer's product data:

1. Complete list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required to demonstrate compliance with the specified requirements.

3. Show configurations, finishes and dimensions.

C. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the warranty period.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other essential characteristics inherent in the named product.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 WALL SWITCHES

A. Acceptable manufacturers:

1. Bryant
2. Hubbell

3. Leviton
4. Or equivalent.

B. Wall switches for lighting circuits:

1. NEMA WD1; Industrial specification grade AC general use snap switch with toggle handle, back and side wired, rated 20 amperes and 120-277 volts AC. Handle: Color: Brown, Ivory or per drawings. Leviton Catalog Nos. 1221-2 (single pole) and 1222-2 (double pole) or equivalent.

2. Switches shall be Specification Grade.

2.03 RECEPTACLES

A. Acceptable manufacturers:

1. Bryant
2. Hubbell
3. Leviton
4. Or equivalent.

B. Receptacles:

1. Convenience and straight-blade receptacles: NEMA WD 1.

2. Locking-blade receptacles: NEMA WD 5.

3. Convenience receptacle configuration: NEMA WD 1 Type 5-20R; Industrial specification grade, steel strap, back and side wired, duplex rated 20A, 125V. Face color: Brown, Ivory or per drawings. Leviton Catalog #5362 or equivalent.

4. Specific-use receptacle configuration: NEMA WD 1 or WD 5 Type as indicated on Drawings; brown plastic face.

5. GFCI Receptacles: NEMA WD 1 Type 5-20R; Duplex convenience receptacle hospital grade, feed-through, rated 20A, 120VAC with integral ground fault current interrupter. Face color: Brown, Ivory, or per drawings. Leviton Catalog #6898-HG or equivalent.

6. Receptacles shall be Specification Grade.

2.04 WALL PLATES

A. Acceptable manufacturers:

1. Bryant
2. Crouse Hinds
3. Hubbell
4. Leviton
5. Raco
6. Or equivalent.

B. Wall plates:

1. Decorative cover plate: Smooth stainless steel, or plastic with color matching switch or receptacle.

2. Weatherproof cover plate: Gasketed cast aluminum or rust-inhibiting iron alloy with hinged gasketed device covers.

3. Unfinished areas: Galvanized steel.

2.05 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Install wall switches 48 inches above floor, “OFF” position down.

B. Install convenience receptacles 24 inches above floor, or 6 inches above counters; with grounding pole on top, or as indicated on drawings.

C. Install specific-use receptacles at heights shown on *Contract Drawings*.

D. Install decorative plates on switches, receptacles, and blank outlets in finished areas, using jumbo sizes plates for outlets installed in masonry walls.

E. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface-mounted outlets.

F. Install devices and wall plates flush and level.

G. Install gasketed weather-protective plates on exterior outlets, and any outlets subject to outdoor weather conditions.

H. Install weather-protective, rust-inhibiting, cast-iron, gasketed, alloy plates in hard service areas.

I. Colors of switches and receptacles shall be brown when used with dark colored walls, ivory when used with light colored walls or per drawings.

3.03 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Remove and dispose of all debris.

PART 4 - PAYMENT

4.01 WIRING DEVICES

A. Quantity and Payment: No separate payment shall be made for this item. Include all costs for *WIRING DEVICES* in the prices bid for the various related items of work as designated in the Proposal.

****END OF SECTION****

SECTION 26 51 00
(16510)
INTERIOR LIGHTING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Interior luminaires and accessories.

B. Related work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 26 05 26: Grounding and Bonding for Electrical Systems*.

3. *Section 26 05 33: Raceway and Boxes for Electrical Systems*.

C. References:

1. ANSI C82.1 – Specifications for Fluorescent Lamp Ballasts.

2. ANSI C82.4 – Specifications for High-Intensity – Discharge Lamp Ballasts (Multiple Supply Test).

3. NEMA LE 2 – H-1-D Lighting System Noise Criterion (LS-NC) Ratings.

1.02 SYSTEM DESCRIPTION

A. See Contract Drawings for lighting system details.

1.03 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

3. Include outline drawings, lamp and ballast data, support points, weights, and accessory information for each luminaire type.

C. Manufacturer's recommended installation procedures.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage:

1. Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use.

2. Store in strict accordance with *Section 01620* and the manufacturer's recommendations as approved by the *ENGINEER*.

3. Handle metal poles carefully to prevent warping, breakage or damage to finish.

1.06 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-startup during the warranty period.

1.07 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to instruction of *OWNER'S* personnel.

1.08 SPARE PARTS AND MAINTENANCE MATERIALS

A. Comply with requirements of *Section 01 78 45, Spare Parts and Maintenance Materials*.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other essential characteristics inherent in the named product.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable Manufacturers:

1. Refer to lighting fixture schedule and this specification.

2.02 INTERIOR LUMINAIRES AND ACCESSORIES

A. Provide luminaires in accordance with the lighting plans and lighting fixture schedule.

B. Exit signs: Stencil face, 6-inch high red letters on white background, directional arrows as indicated, mounting type as scheduled. Coordinate exit sign and emergency light power supplies.

2.03 OTHER MATERIALS

A. All other material, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Install luminaires in accordance with the lighting plans and lighting fixture schedule.

B. Support surface-mounted luminaires directly from building structure. Support acoustical ceiling fixtures from structure using two steel wires attached at diagonally opposite corners.

C. Install recessed luminaires to permit removal from below. Use plaster frames or install grid clips as required.

D. Ground each luminaire in accordance with the drawings, specifications and the National Electrical Code.

E. Circuiting: Multi-phase branch lighting circuits shall be permitted to share a common neutral only where there is a maximum of one phase conductor from each of the three phases "A", "B", and "C". That is, if one lighting branch circuit contains two ungrounded conductors of the same phase (e.g.: circuits 1 and 7 of a three-phase lighting panel), each circuit shall be provided a separate dedicated neutral conductor. Under no circumstances shall the ampacity rating of the neutral be exceeded.

3.03 ADJUSTING AND CLEANING

A. Align luminaires and clean lenses and diffusers at completion of work. Clean paint splatters, dirt, and debris from installed luminaires, including lamps.

B. Clean luminaires at completion of work.

C. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

D. Remove and dispose of all debris.

3.04 LUMINAIRE SCHEDULE

A. As scheduled on drawings.

PART 4 - PAYMENT

4.01 LIGHTING FIXTURES

A. Quantity and Payment: No separate payment shall be made for this item. Include all costs for *LIGHTING FIXTURES* in the prices bid for the various related items of work as designated in the Proposal.

****END OF SECTION****

SECTION 26 52 00
(16535)
EMERGENCY LIGHTING

PART 1 – GENERAL

1.01 DESCRIPTION

A. Work included:

1. Emergency lighting units.

2. Emergency exit signs.

B. Related work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 26 05 19: Wire and Cable*

C. References:

1. Conform to the Uniform Construction Code for the State of New Jersey and NJAC 5:23-3.16 et. seq. as applicable.

2. NFPA 101 – Life Safety Code

3. NEMA WD1 – General Purpose Wiring Devices

4. National Electrical Code (NEC).

D. Payment:

1. No separate payment shall be made for this item. Include all costs for *EMERGENCY LIGHTING* in the prices bid for the various related items of work as designated in the Proposal.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrate compliance with the specified requirements.

C. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

D. Regulatory requirements:

1. Conform to local building code and NFPA 101 for installation requirements.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. Manufacturer's standard performance guarantees or warranties that extend beyond a one-year period shall be provided. Standard performance guarantee or warranty shall contain an agreement to repair or replace damaged materials or equipment that fail within the warranty period.

C. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-startup during the warranty period.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other essential characteristics inherent in the named product.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable Manufacturers:

1. As scheduled on Drawings.
2. Or equivalent.

2.02 EMERGENCY LIGHTING UNITS

A. Emergency lighting unit: Self-contained unit with rechargeable storage batteries, charger, and lamps. (Refer to lighting fixture schedule.)

B. Unit housing: Impact resistant thermoplastic with a UL-94, V-0 flame rating.

C. Provide a push-to-test switch to transfer unit from normal supply to battery supply. Switch shall spring return to the “Normal” position.

D. Electrical connection: Provide threaded hub for conduit connection: 3/4" unless otherwise noted.

E. Support bracket: Steel with enamel finish.

F. Remote heads: Provide double remote heads with white finish; 1 watt minimum each; LED voltage to match battery voltage.

G. Provide terminals for connections to remote heads and exit signs.

2.03 EXIT SIGNS

A. Stencil face, 6-inch high red letters on white background, directional arrows as indicated, mounting type as scheduled. Coordinate exit sign and emergency light power supplies.

2.04 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Install units plumb and level.

B. Aim directional lamp heads as indicated and/or as directed by *ENGINEER*.

C. Wire to "Normal" lighting circuit for the area. Connect branch circuit at panelboard circuit breaker ahead of all switching devices.

D. Install battery units on support brackets fastened to the building structure. The batteries and chargers shall be accessible from below by lifting ceiling tiles.

E. Size wiring to remote heads and exit signs in accordance with the National Electrical Code and the manufacturer's recommendations.

3.03 CLEANING

A. Comply with requirements of *Section 01 74 14, Cleaning*.

B. Remove and dispose of all debris.

3.04 TESTS

A. Upon completion of this portion of the work and prior to acceptance by the *OWNER*, make all required tests and adjustments for free and smooth operation.

B. Secure all approvals from agencies having jurisdiction.

****END OF SECTION****

SECTION 26 56 23
(16511)
AREA LIGHTING

PART 1 – GENERAL

1.01 DESCRIPTION

A. Work included:

1. Exterior luminaires and accessories.

B. Related work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 26 05 19: Wire and Cable*

3. *Section 26 05 25: Grounding and Bonding for Electrical Systems*

4. *Section 26 05 33: Raceways and Boxes for Electrical Systems*

C. References:

1. ANSI C82.4 – Specifications for High Intensity – Discharge Lamp Ballasts (Multiple Supply Type).

2. NEMA LE 2 –H-I-D Lighting System Noise Criterion (LS-NC) Ratings.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required to demonstrate compliance with the specified requirements.

3. Include outline drawings, lamp and ballast data, support points, weights, and accessory information for each luminaire type.

C. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The *CONTRACTOR* and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-startup during the maintenance period.

1.06 OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided in accordance with *Section 01 78 23, Operation and Maintenance Data*.

B. Manuals in final form shall be available a minimum of five (5) working days prior to the instruction of the *OWNER'S* personnel.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other essential characteristics inherent in the named product.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

C. Acceptable Manufacturers:

1. Refer to lighting fixture schedule and this specification.

2.02 EXTERIOR LUMINAIRES AND ACCESSORIES

A. Provide luminaires in accordance with the lighting plans and lighting fixture schedule.

B. Enclosures: Provide complete with gaskets to form weatherproof assembly and UL labeled for wet locations.

2.03 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with he original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Install luminaires in accordance with the lighting plans and lighting fixture schedule.

B. Switch:

1. Provide hand-off-auto switch mounted on pole to control light. Hand position shall turn light on, off position shall turn light off, and auto position shall place light under control of photocell.

3.03 ADJUSTING AND CLEANING

A. Align luminaires and clean lens and diffusers at completion of work. Clean paint splatters, dirt, and debris from installed luminaires.

B. Touch-up luminaires and pole finish at completion of work.

C. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

D. Remove and dispose of all debris.

PART 4 - PAYMENT

4.01 EXTERIOR LIGHTING FIXTURES

A. Quantity and Payment: No separate payment shall be made for this item. Include all costs for *EXTERIOR LIGHTING FIXTURES* in the prices bid for the various related items of work as designated in the Proposal.

****END OF SECTION****

(02110)
CLEARING SITE

PART 1 - GENERAL

1.01 SUMMARY

A. Work included:

1. Removal and resetting of street and road signs, mail boxes and other structures as shown, or as directed by the *ENGINEER*.

2. Removal and disposal of all trees, brush, weeds, roots, matted leaves, small structures, debris, and other objectionable material, vegetation, and growth. This work also includes trimming of trees branches and shrubs.

3. Removal and disposal of culverts, and other structures; pipe, inlets, and manholes; sidewalks, driveways, curbs, and gutters and existing electrical material and equipment together with backfilling the existing holes remaining after removal of such items.

4. Removal and disposal of structures and all other obstructions which are designated for removal by the *ENGINEER* during construction and for which payment is not otherwise provided in the Contract.

B. Related Work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 01 57 13: Temporary Soil Erosion and Sediment Control Measures*

3. *Section 31 23 00: Excavating, Filling and Grading*

C. References:

1. New Jersey State Highway Department Standard Specifications for Road and Bridge Construction, 2019, and all amendments thereto (Standard Specifications).

a. Section 201: Clearing Site

b. Section 917: Landscaping Materials

2. New Jersey Administrative Code:

a. N.J.A.C. 5:23-8.1(c) (pertaining to educational facilities and public buildings as defined in N.J.A.C. 5:23-8.2).

b. N.J.A.C. 7:26; Solid Waste Rule.

3. Code of Federal Regulations:

a. 29 CFR 1926; Safety and Health Regulations for Construction.

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Submit receipts for disposal of all materials.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Tree paint: "Treekote" as manufactured by Walter E. Clark & Sons, Inc., Corinth, TX, 940-321-2596 or equivalent.

2.02 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protection: Roads, structures, pavement areas, grass or landscaping to, remain shall be protected by *CONTRACTOR* in a manner approved by the *ENGINEER*.

B. Prior to performing any excavation work, contact New Jersey One Call at 1-800-272-1000 for a utility mark-out.

3.02 CONSTRUCTION

A. Clearing Site shall conform to Section 201 of the Standard Specifications, and as designated on Plans or as directed by the *ENGINEER*, except that Paragraph of said Section entitled, "Demolition" shall not apply to this Contract.

B. Clear the project site within the limits of construction shown on the Plans, or as directed by the *ENGINEER*. [N.J.A.C. 7:22-10.11(d)]

C. Repair all injuries to bark, trunk, limbs and roots of remaining plants by properly dressing, cutting, bracing, and painting using approved tree surgery methods, tools and equipment.

D. Trees, shrubs, and other landscape features within the limits of construction that do not interfere with the Project shall not be removed but shall be protected during the progress of the Work.

E. Clear designated areas of brush, weeds, roots, debris, and other unsuitable material.

F. Trim tree branches overhanging proposed structures and pavements.

1. Trim tree branches overhanging roadways, driveways, or other paved areas to height of sixteen feet.

G. Remove designated trees as follows:

1. Where there is to be new sidewalk or paving, trees shall be ground down to 6" below bottom of new construction and the void filled with Soil Aggregate I-13.

2. Where there is no sidewalk or paving, trees shall be ground down to 6" below finished grade and the void backfilled with topsoil seeded as specified in *Section 32 92 19*.

H. Remove and reset existing structures.

I. Remove and reset mailboxes to locations approved by their *OWNERS* and the *ENGINEER* so as to be accessible to Mailman without his having to leave the mail vehicle.

J. Remove and reset street signs as directed by *OWNER*.

K. Remove existing structures required for construction of roadways, driveways or other paved areas. Notify property owners forty-eight (48) hours prior to removal of privately owned structures.

1. Coordinate removal of privately owned structures with individual property owners.

2. Remove privately owned structures desired to be retained by property owner in a manner, which will minimize damage. If desired, property owner shall be given opportunity to remove said structures himself, provided this work is completed within time limit which will not conflict with *CONTRACTOR'S* operations.

3. Upon removal, property owner shall be given opportunity to remove privately owned structures from the project site.

4. Coordinate this work with *ENGINEER*.

5. This work shall be subject to approval of *ENGINEER*.

L. Grade all grubbed and cleared areas as specified in *Section 31 23 00, Excavating, Filling and Grading*.

3.03 CLEANING

A. Dispose of accumulated waste materials as specified in *Section 01 74 00, Cleaning and Restorations*.

PART 4 - PAYMENT

4.01 SITE CLEARING

A. There shall be no separate measurement and no separate payment for Clearing Site, include all costs for *CLEARING SITE* in the price bid in the Proposal for related items of work.

****END OF SECTION****

SECTION 31 23 00
(02220)
EXCAVATING, FILLING AND GRADING

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included:

1. Stripping, storage and redistribution of topsoil.

2. Excavating for footings and foundations.

3. Filling and backfilling to attain indicated grades.

4. Rough and finish grading of the site.

5. Furnishing and installing broken stone subbase material for slabs, foundations and structures.

6. Furnishing and installing Dense Graded Aggregate subbase material for pavements and other structures.

7. Disposal of excess material.

8. Testing Services.

9. Any additional work as may be specified in the Statement of Work.

B. Related Work:

1. Other sections of the *Specifications*, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 01 57 13: Temporary Soil Erosion and Sediment Control Measures*

3. *Section 31 10 00: Clearing Site*

C. References:

1. New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction, 2019, and all amendments thereto (Standard Specifications):

   a. Section 204: Borrow Excavation

   b. Sections 301: Subbase

   c. Subsection 901.03: Aggregate, Coarse

   d. Subsection 901.03.01: Broken Stone

   e. Subsection 901.03.02: Washed Gravel

   f. Subsection 901.10: Dense Graded Aggregate

   g. Subsection 901.11: Soil Aggregates

3. American Society for Testing and Materials (ASTM):

   a. D-698: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.

   b. D-1556: Density and Unit Weight of Soil in Place by the Sand-Cone Method.

   c. D-1557: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.

   d. D-4254: Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.

   e. D-2166: Unconfined Compressive Strength of Cohesive Soil.

   f. D-2922: Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth).

1.02 DEFINITIONS

A. Excavation: Removal and disposal of all material encountered when establishing required grade elevations, including pavements and other obstructions visible on the ground surface, and underground structures and utilities indicated to be demolished and removed.

B. Unauthorized excavation: Removal of materials beyond specified subgrade elevations without approval of *ENGINEER*.

1.03 SUBMITTALS

A. Comply with the provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. All materials shall be accompanied by a delivery ticket indicating the name and address of the supplier and the origin of the material.

C. All materials shall be free of contaminates or hazardous materials and substances that may be harmful to human, animal, plant or aquatic life and meets any applicable NJDEP regulations regarding the material composition. Recycled materials shall be accompanied by a certification from the supplier that the material meets the above requirements.

D. Every load of incoming fill material shall meet current NJDEP Residential Direct Contact Soil Remediation Standards and be certified by the Generator/Agent as clean fill consistent with NJDEP regulations at N.J.A.C. 7:26D-4.2 and N.J.A.C. 7:26E-2. Delivery slips showing and certifying that the material meets this criteria shall be provided for each load of material entering the site.

E. Test reports:

1. One optimum moisture, maximum density curve for each type of soil encountered, including a complete test report as specified in ASTM D-1557.

2. Field Density test reports.

3. Report of actual Unconfined Compressive Strength and/or results of bearing tests for each stratum encountered at footing subgrades. The report shall be prepared in accordance with ASTM D-2166.

4. Test reports on all borrow material and select backfill material in accordance with the following standards:

a. Particle Size Analysis of Soils: ASTM D-422.

b. Liquid Limit, Plastic Limit and Plasticity Index of Soils: ASTM D-4318.

5. Submit test reports as specified in the Specification Section entitled, "Testing Laboratory Services".

1.04 QUALITY ASSURANCE

A. Requirements of regulatory agencies:

1. All excavations shall be in compliance with Federal Occupational Safety and Health Act and rules and regulations of State of New Jersey Department of Labor and Workforce Development, "Construction Safety Act," N.J.S.A. 34:5-166, et seq.

2. Comply with the requirements of the High Voltage Proximity Act; N.J.S.A. 34:6-47.1.

3. Excavation work shall be in compliance with applicable requirements of other governing authorities having jurisdiction.

1.05 DELIVERY, STORAGE AND HANDLING

A. Transport materials from outside project limits in accordance with General Conditions, paragraph entitled, "Operations and Storage Areas."

1.06 PROJECT CONDITIONS

A. Site information: Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that *OWNER* will not be responsible for interpretations or conclusions drawn there from by *CONTRACTOR*. Data are made available for the convenience of *CONTRACTOR*.

B. Prior to performing any excavation work, contact New Jersey One Call at 1-800-272-1000 for a utility mark-out.

C. Existing utilities:

1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult the Utility Owner immediately for directions. Cooperate with *OWNER* and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of Utility Owner.

2. Do not interrupt existing utilities serving facilities occupied and used by *OWNER* or others, except when permitted in writing by *ENGINEER* and then only after acceptable temporary utility services have been provided.

C. Weather conditions: Do not place, spread, roll or fill material during freezing, raining, or otherwise unfavorable weather conditions. Do not resume work until conditions are favorable as determined by the *ENGINEER*.

PART 2 - PRODUCTS

2.01 GENERAL

A. General: All fill and backfill materials shall be subject to the approval of the *ENGINEER*.

B. Notifications:

1. For approval of borrow materials, notify the *ENGINEER* at least five (5) working days in advance of intention to import material, designate the proposed borrow area, and perform sampling and testing at *CONTRACTOR'S* expense, if directed by the *ENGINEER*, to prove the quality and suitability of the material.

2. For approval of on-site materials, notify the *ENGINEER* at least five (5) working days in advance of placing material and perform sampling and testing at the Contractor's expense to prove the quality and suitability of the material.

C. All materials provided shall be free of contaminates or hazardous materials and substances that may be harmful to human, animal, plant or aquatic life and shall meet any applicable NJDEP regulations regarding the material composition.

2.02 MATERIALS

A. On-Site Fill and Backfill:

1. On-site material may be used for fill and backfill subject to the approval of the *ENGINEER*, and only in accordance with the following:

a. Topsoil: Topsoil excavated from on-site may be used to conduct topsoil construction providing that the excavated topsoil complies with the requirements described in *Section 32 92 19, Seeding*. The

OWNER makes no representation that the topsoil on-site is suitable for reuse. The Contractor shall remove excess excavated topsoil from the site unless otherwise shown on the drawings.

b. On-site materials used for structural filling and backfilling shall be free from deleterious substances, stumps, brush, weeds, roots, sod, rubbish, garbage and matter that may decay, and shall conform to the requirements for Soil Aggregate I-13 of Subsection 901.11 of the Standard Specifications.

c. Other material excavated from the site may be used for general filling and backfilling that is not beneath or within ten feet (10') horizontally of any tank, structure, footing or foundation, under paved areas, behind retaining walls or in trenches, subject to the approval of the *ENGINEER*, and to the following requirements:

(1) Free from deleterious substances, stumps, brush, weeds, roots, sod, rubbish, garbage and matter that may decay.

(2) Free of large rocks or lumps that, in the opinion of the *ENGINEER*, may create voids or prevent proper compaction.

B. Borrow material:

1. All borrow material shall meet current NJDEP Residential Direct Contact Soil Remediation Standards and be certified by the Generator/Agent as clean fill consistent with NJDEP regulations at N.J.A.C. 7:26D-4.2 and N.J.A.C. 7:26E-2.

2. General fill and Backfill (Non-Structural):

a. Free from deleterious substances, stumps, brush, weeds, roots, sod, rubbish, garbage and matter that may decay, and conforming to the requirements for Soil Aggregate I-13, of Subsection 901.11 of the Standard Specifications, except as modified by the supplemental requirements below:

(1) Containing no rocks or lumps over four inches in greatest dimension.

(2) Composed of soil aggregate, or soil aggregate and rock. The portion passing the four-inch sieve shall contain not more than twelve percent (12%) by weight of material passing the number 200 sieve. When composed of soil

aggregate and rock, the proportion of soil aggregate shall not be less than that required to fill all the rock voids.

b. General fill material may be used for:

(1) Backfill of demolition work that is not beneath or within ten feet (10') horizontally of any tank, structure, footing or foundation or behind retaining walls.

(2) General filling and backfilling that is not beneath or within ten feet (10') horizontally of any tank, structure, footing or foundation or behind retaining walls. General fill may be used under exterior paved areas and in trenches, however, that are not within ten feet (10') horizontally of foundations.

3. Trench Backfill, Structural Fill and Backfill Material:

a. Shall conform to the requirements specified for on-site fill material except as modified by the supplemental requirements below:

b. Backfill material shall be Soil Aggregate designation I-13 unless otherwise designated on the Plans. Soil Aggregate backfill materials, when designated, shall conform to Subsection 901.11 of the Standard Specifications.

c. Backfill material shall be 15:1 or 20:1 sand/cement dry mix when designated on the Plans.

4. Broken stone material:

a. Broken stone subbase material under slabs, foundations and structures shall conform to Subsection 901.03.01 of the Standard Specifications and meeting the gradations specified in Table 901.03-1. Size shall be #57 unless otherwise shown on the Plans.

b. Trench stabilization material for bedding shall conform to the above requirements. Size shall be #57 unless otherwise shown on the Plans.

5. Dense Graded Aggregate:

a. Dense Graded Aggregate for bituminous and concrete pavements and other structures shall conform to the requirements in Subsection 901.10 of the Standard Specifications except that

"Blast Furnace Slag or Reclaimed Asphalt Pavement (RAP) shall not be used".

b. Dense Graded Aggregate for Stone Paving shall conform to the above requirements except that blast furnace slag or Recycled Asphalt (RAP) shall not be used.

2.03 OTHER MATERIALS

A. All other materials, not specifically described for a complete and proper installation, shall be as selected by the *CONTRACTOR* and approved by the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine the areas and conditions under which excavating, filling and grading are to be performed and notify the *ENGINEER*, in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 PREPARATION

A. Prior to commencement of work, establish location and extent of all utilities in the work areas. Maintain, protect as required existing utilities that pass through the work area.

B. Prior to excavation in pavement areas, cut existing pavement vertically with sharp tool on a straight line to the limits of excavation shown on Plans or as directed by the *ENGINEER*. Maintain cut straight and neat, or recut and dress as directed by the *ENGINEER*.

C. Protection of persons and property:

1. Barricade open excavations occurring as part of this work and post with warning lights as required to protect persons on the site. Operate warning lights as recommended by authorities having jurisdiction.

2. Protect trees, shrubs, lawns and other features remaining as part of final landscaping.

3. Protect structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

4. Refer to paragraphs of General Conditions regarding protection of vegetation and structures.

5. In the event of damage, immediately make all repairs and replacements to the approval of the *ENGINEER* at no cost to the *OWNER*.

3.03 CONSTRUCTION

A. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shut-off of services if lines are active.

B. Use of explosives: The use of explosives is not permitted unless approved by the *ENGINEER*.

C. Dust control:

1. Use all means necessary to control dust on and near the work if such dust is caused by the *CONTRACTOR'S* operations during performance of the work or if resulting from the conditions in which the *CONTRACTOR* leaves the site.

2. Thoroughly moisten all surfaces as required to prevent dust being a nuisance to the public, neighbors and concurrent performance of other work on the site.

D. Excavation:

1. Unauthorized excavation: Unauthorized excavation, including remedial work directed by the *ENGINEER*, shall be at the *CONTRACTOR'S* expense. Under footings, foundation bases, retaining walls, and other structures, fill unauthorized excavation by removing all loosened material and extending the indicated bottom elevation of the footing or base to the excavation bottom, without altering the required top elevation. Lean concrete fill may be used to bring subgrade elevations to proper positions when acceptable to the *ENGINEER*. Under pipes, fill unauthorized excavation by removing all loosened material and providing broken stone material as required to attain a firm and unyielding subgrade and/or foundation and to attain required grade elevations to the approval of the *ENGINEER*.

2. Additional excavation:

   a. When excavation has reached required subgrade elevations, notify the *ENGINEER* who will make an inspection of conditions.

   b. If unsuitable bearing materials are encountered at the required subgrade elevations, carry excavations deeper and replace the excavated material as directed by the *ENGINEER*.

   c. Removal of unsuitable material and its replacement as directed will be paid on the basis of contract conditions relative to changes in work if payment has not been provided for in the *PROPOSAL*.

3. Stability of excavations:

   a. Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space.

   b. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

4. Shoring and bracing:

   a. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers and cross-braces, in good serviceable condition.

   b. Establish requirements for trench shoring and bracing to comply with local codes and authorities having jurisdiction.

   c. Maintain shoring and bracing in excavations regardless of time period excavations will be open.

   d. Brace, sheet, and support trench walls in such a manner that they will be safe and that the ground alongside the excavation will not slide or settle, and that all existing improvements of every kind, whether on public or private property, will be fully protected from damage.

   e. In the event of damage to such improvements, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

f. Arrange bracing, sheeting and shoring so as to not place stress on any portion of the completed work until the general construction thereof has proceeded far enough to provide sufficient strength.

g. Exercise care in the drawing and removal of sheeting, shoring, bracing and timbering to prevent collapse and caving of the excavation faces being supported.

5. Dewatering:

a. Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.

b. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

c. Convey water removed from excavations and rainwater to collecting or run-off areas. Establish and maintain temporary drainage ditches and other diversions outside excavation limits for each structure. Do not use trench excavations as temporary drainage ditches.

6. Material storage:

a. Stockpile satisfactory excavated materials where directed until required for use as backfill or fill. Place, grade and shape stockpiles for proper drainage.

b. Only environmentally suitable stockpile sites may be used for the purposes of staging or storing materials, equipment and suitable trench backfill material. Environmentally suitable sites must be level, and devoid of mature stands of natural vegetation. Drainage facilities and features, wetlands, vernal habitats and stream corridors are not environmentally suitable sites. [N.J.A.C. 7:22-10.11(l)1]

c. The boundary of the stockpile area shall be clearly marked by hay bales, silt fencing or another appropriate method. Where fill is to be stored in excess of 10 days, a suitable means of protecting excavated material from wind and water erosion shall be

employed. Erosion control methods may include one or more of the following: mulching, sprinkling, silt fencing, hay baling and stone covering. [N.J.A.C. 7:22-10.11(l)2]

d. Locate and retain soil materials away from edge of excavations.

e. Dispose of excess soil material and waste materials as herein specified. Excavated material unsuitable for backfilling shall be kept separate from other materials excavated, and disposed of. Materials suitable for backfilling shall not be disposed of until completion of filling or backfilling operations.

7. Excavation for structures:

a. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 feet, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction and for inspection.

b. In excavating for footings and foundations, take care not to disturb bottom excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive concrete.

8. Excavation for pavements: Cut surface under pavements to comply with cross-sections, elevations and grades as shown.

9. Cold weather protection: Protect excavation bottoms against freezing when atmospheric temperature is less than thirty-five degrees (35°).

E. Backfill, fill and compaction:

1. General:

a. Place acceptable material in layers to required subgrade elevations.

b. Fills: Use material obtained from on-site excavation, except use borrow material when specified and/or shown on the Plans or as directed by the *ENGINEER*.

c. Backfilling: Use material obtained from on-site excavation, except use select backfill when specified and/or shown where indicated on Plans or as directed by the *ENGINEER*. Backfill above top of

pipe, with material free from stones, rock fragments, dirt clogs or frozen material greater than two inches (2") in largest dimension.

d. Do not provide borrow material until all acceptable excavated materials on the site have been utilized in the work.

e. Place the various types of materials in the areas as designated on the Plans, or as directed by the *ENGINEER*.

2. Backfill excavation as promptly as work permits, but not until completion of the following:

a. Acceptance by *ENGINEER* of construction below finish grade including, where applicable, damp proofing, waterproofing and perimeter insulation.

b. Inspection, testing, approval and recording locations of underground utilities.

c. Removal of concrete formwork.

d. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.

e. Removal of trash and debris.

f. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

3. Backfilling prior to approvals:

a. Should any of the work be so enclosed or covered up before it has been approved, uncover all such work at no additional cost to the *OWNER*.

b. After the work has been completely tested, inspected and approved, make all repairs and replacements necessary to restore the work to the condition in which it was found at the time of uncovering, all at no additional cost to the *OWNER*.

4. Ground surface preparation prior to filling:

a. Remove vegetation, debris, unsatisfactory soil materials, obstructions and deleterious materials from existing ground surface to a depth of not less than four inches (4") and not more than six inches (6") prior to placement of fills. Plow, strip or break-up sloped surfaces steeper than one (1) vertical to four (4) horizontal to a depth of not less than six inches (6") so that fill material will bond with existing surface.

b. When existing ground surface has a density less than that specified under "Compaction," for the particular area classification, break up the ground surface, pulverize, moisture-condition to the optimum moisture content, and compact to required depth and percentage of maximum density.

5. Placement and compaction:

a. Place backfill materials in layers not more than six inches (6") in loose depth.

b. Control soil compaction during construction providing minimum percentage of density specified for each area classification listed below.

c. Building and pavement areas are defined, for the purpose of this Paragraph, as extending a minimum of five feet (5') beyond the building and/or pavement.

d. Compact soil to not less than the following percentages of maximum dry density for soils which exhibit a well-defined moisture density relationship determined in accordance with ASTM D-1557; and not less than the following percentages of relative density determined in accordance with ASTM D-4254, for soils which will not exhibit a well-defined moisture-density relationship.

(1) Structures: Compact top twelve inches (12") of subgrade and each layer of backfill or fill material at 95 percent (95%) maximum dry density or 90 percent (90%) relative dry density.
(2) Building Areas: Compact top twelve inches (12") of subgrade and each layer of backfill or fill material at 95 percent (95%) maximum dry density or 90 percent (90%) relative dry density.

(3) Lawn or Unpaved Areas: Compact top six inches (6") of subgrade and each layer of backfill or fill material at 90 percent (90%) maximum dry density.

(4) Walkways: Compact top six inches (6") of subgrade and each layer of backfill or fill material at 95 percent (95%) maximum dry density or 90 percent (90%) relative dry density.

(5) Pavement Areas: Compact top twelve inches (12") of subgrade and each layer of backfill or fill material at 95 percent (95%) maximum dry density or 90 percent (90%) relative dry density.

(6) Subbase Materials: Compact each layer of subbase material to 95 percent (95%) of maximum dry density.

(7) Trench Stabilization Materials: Compact each layer of material to 95 percent (95%) of maximum dry density.

e. Moisture control:

(1) Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, to prevent free water appearing on surface during or subsequent to compaction operations.

(2) Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

(3) Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by disking, harrowing or pulverizing until moisture content is reduced to a satisfactory value.

f. Puddling or jetting will not be permitted.

g. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice, or other unsuitable materials.

h. Place backfill and fill materials evenly adjacent to structures, to required elevations. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around structure to approximately same elevation in each lift.

i. Compact backfill to height of two feet (2') above top of pipe using approved flat-faced mechanical tampers. Compact backfill more than two feet (2') above top of pipe using approved vibratory mechanical tampers.

F. Grading:

1. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.

2. Grading outside building lines:

   Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes, and as follows:

   a. Lawn or unpaved areas: Finish area to receive topsoil to within not more than 0.10 feet above or below the required subgrade elevations.

   b. Walks: Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 0.10 feet above or below the required subgrade elevation.

   c. Pavement: Shape surface of areas under pavement line, grade and cross-section, with finish surface not more than ½ inch above or below the required subgrade elevation.

3. Grading surface of materials under building slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of ½ inch when tested with a ten-foot (10') straightedge.

4. Compaction: After grading, compact subgrade surfaces to the depth and percentage of maximum density for each area classification.

5. Treatment after grading:

   a. After grading is completed and the *ENGINEER* has finished his inspection, permit no further excavating, filling or grading except with the approval of and inspection of the *ENGINEER*.

   b. Use all means necessary to prevent erosion of freshly graded areas during construction and until such time as permanent drainage and erosion control measures have been installed.

6. Subgrade preparation: All subgrade preparation shall be performed in accordance with the applicable Sections of the Standard Specifications except as may be modified by this Specification Section.

G. Dense Graded Aggregate subbase course:

1. General:

a. Subbase Course consists of placing dense graded aggregate subbase material in layers of specified thickness over subgrade surface to support pavements and structures, as shown on Plans.

b. Provide subbase course in accordance with Section 301 of the Standard Specifications, except as otherwise modified by this Specification Section.

2. Grade control: During construction, maintain lines and grades including crown and cross-slope of subbase course.

3. Placing:

a. Prior to placing subbase course under bituminous concrete or other non-portland cement concrete surfaces, apply an herbicide to the subgrade material. The type of herbicide and the method of application shall be approved by the *ENGINEER* prior to beginning this work.

b. Place subbase course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase material during placement operations.

c. When a compacted subbase course is shown to be eight inches (8") or less, place material in a single layer. When shown to be more than eight inches (8") thick, place material in equal layers, except no single layer shall be more than eight inches (8") in thickness when compacted.

d. Spread, shape and compact all subbase course material deposited on the subgrade during the same day.

H. Broken (crushed) stone subbase course:

1. General: Broken Stone Subbase Course consists of placing material in layers of specified thickness, over subgrade surface to support structures as shown on the Plans.

2. Placing: Place Broken Stone Subbase Course as specified for Dense Graded Aggregate Subbase Course.

3.04 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Remove waste materials, including excess excavated material, trash and debris, and dispose of it off the Owner's property.

B. Excavated material unsuitable for backfill as set forth in N.J.A.C. 7:14-2.13, considered to be solid waste pursuant to N.J.A.C. 7:26-1.6 and meeting the requirements for I.D.27 shall be removed from the construction site and disposed of at a sanitary landfill approved and licensed by NJDEP. [N.J.A.C. 7:22-10.11(e)1]

3.05 FIELD QUALITY CONTROL

A. Quality control testing during construction: Allow testing service to inspect and approve subgrades and fill layers before further construction work is performed.

1. Perform field density tests in accordance with ASTM D-1556 (Sand Cone Method), or ASTM D-2922 (Nuclear Method).

2. Footing subgrades: For each strata of soil on which footings will be placed, conduct at least one (1) test to verify required design bearing capacities. Test shall be performed by a qualified soils Engineer licensed in the State of New Jersey. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata, when acceptable to *ENGINEER*.

3. Number of field density tests shall be provided in accordance with the following minimum test schedule:

a. Minimum Compaction Testing Frequency

Location	Frequency
Buildings and structures	1 test group[a] for every 5,000 square feet
Road	1 test group[a] for every 300 linear feet of road

Parking Lots	1 test group[a] for every 10,000 square feet
Unpaved areas	1 test group[a] for every 20,000 square feet
Pipe Trench	1 test group for every 300 linear feet

[a] one test group consists of compaction tests on each layer of fill and backfill material.

b. One test whenever there is a definite suspicion of a change in the quality of moisture control or effectiveness of compaction.

4. Take all tests at locations as directed by the *ENGINEER*.

B. If in the opinion of *ENGINEER* based on testing service reports, subgrade or fills that have been placed are below specified density, provide additional compaction and testing as directed by the *ENGINEER* at no expense to the *OWNER*. This shall include compaction and testing at areas initially tested and at other locations as directed.

C. Additional requirements for testing are described in the Specification Section entitled, "Testing Laboratory Services."

3.06 PROTECTION

A. Protection of graded areas:

1. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

2. Repair and re-establish grades in settled, eroded and rutted areas to specified tolerances.

B. Reconditioning compacted areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape and compact to required density prior to further construction.

PART 4 - PAYMENT

4.01 EXCAVATION, FILLING AND GRADING

A. No separate measurement or payment shall be made for this item. All work including earthwork for piping and structures shall be paid for under the prices submitted for the various related items of work listed in the *PROPOSAL*. The costs for the work of this section shall include line-cutting existing pavements

whenever encountered; stripping and storage of topsoil; excavation of all materials encountered of whatever nature; dewatering; shoring and bracing; stripping of surfaces; placing and compacting excess materials in fill areas; disposal of unsuitable or surplus materials; trench excavation; backfilling; site grading including shaping and dressing of slopes and other surfaces; compaction; subgrade and subbase preparation; testing; and all other incidental or necessary work.

****END OF SECTION****

SECTION 32 92 19
(02933)
SEEDING

PART 1 _ GENERAL

1.01 DESCRIPTION

A. Work included:

1. Restoration of all grass areas disturbed by Contractors operations.

2. Preparation of subgrade.

3. Furnishing and placing (Certified Clean) topsoil.

4. Seeding.

5. Fertilizing.

6. Mulching.

7. Maintenance.

B. Related Work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 31 23 00: Excavating, Filling and Grading*

C. References:

1. New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction, 2019, and all amendments thereto (Standard Specifications).

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required to demonstrate compliance with the specified requirements.

3. Manufacturer’s descriptive literature and printed application instructions for erosion control mulching blanket.

C. Delivery slips:

1. Delivery slips showing and certifying that the material meets the current NJDEP Residential Direct Contact Soil Remediation Standards for clean fill consistent with NJDEP regulations at N.J.A.C. 7:26D-4.2 and N.J.A.C. 7:26E-2.

2. Accompany all shipments of topsoil with delivery slip showing the product weight and name of supplier.

3. Each shipment of grass seed mixture shall be accompanied by a certified weight slip and an analysis of the composition, purity, and germination of the seed mixture, certified by the seed house and furnished at the time of delivery. All tags and labels shall comply with N.J.S.A. 4:8-17.15.

4. Each shipment of fertilizer shall be accompanied by a certified analysis of the composition in compliance with the requirements of P.L. 2010, c. 112 (N.J.S.A.58:10A-61, et. seq.).

5. Submit delivery slip to *ENGINEER* at end of each working day.

D. Test reports:

1. Submit results of test report for pH analysis of soil, and when ground limestone is required, the total amount of magnesium and calcium oxides required.

E. Submit copy of Professional Fertilizer Applicators’ license.

F. Manufacturer's recommended installation procedures.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Fertilizer shall be applied by or under the supervision of a Professional Fertilizer Applicator certified in accordance with the requirements of P.L. 2010, c. 112 (N.J.S.A.58:10A-61, et. seq.).

2. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

3. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

4. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in

strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 PROJECT CONDITIONS

A. Environmental requirements:

1. Plant seed on unfrozen soil. Soil shall be friable condition at time of seeding.

2. Do not perform seeding when wind exceeds 15 mph.

3. Do not seed between calendar dates from May 15th to August 15th, and from October 15th to March 1st, except when weather and soil conditions are favorable as determined by *ENGINEER*.

4. Do not apply synthetic plastic emulsion binder or vegetable based gel binder during rain or freezing weather.

B. Perform mulching only after preceding related work is accepted.

C. Restrict foot and vehicular traffic from mulched areas to end of maintenance period.

D. Disturbed areas that will be exposed in excess of 10 days shall be temporarily seeded and/or mulched until proper weather conditions exist for establishment of a permanent vegetative cover. [N.J.A.C. 7:22-10.11(c) 3]

1.06 GUARANTEE

A. If a satisfactory stand of lawn and grass has not been produced, the Contractor shall renovate and reseed the lawn and unsatisfactory portions thereof immediately, or if after September 1, during the next planting season. If a satisfactory stand of lawn and grass develops by July 1 of the following year, it will be accepted. If it is not accepted, a complete replanting will be required during the planting season meeting all of the requirements specified under CONSTRUCTION METHODS.

B. A satisfactory stand is defined as a section of lawn that has:

1. No bare spots larger than one (1) square foot.

2. Not more than five (5) percent of total area with bare spots larger than one-half (½) square foot.

3. Not more than ten (10) percent of total area with bare spots larger than 6 inches square.

PART 2 _ PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 TOPSOIL

A. Every load of incoming fill material shall meet current NJDEP Residential Direct Contact Soil Remediation Standards and be certified by the Generator/Agent as clean fill consistent with NJDEP regulations at N.J.A.C. 7:26D-4.2 and N.J.A.C. 7:26E-2. Delivery slips showing and certifying that the material meets this criteria shall be provided for each load of material delivered to the site.

B. Topsoil shall not contain stones, lumps, roots, or similar objects larger than 2 inches in any dimension and shall have not less than a 5.8 pH value. When the topsoil has less than a 5.8 pH value, it shall be increased by applying pulverized limestone at a rate necessary to attain a 6.5 pH value. When the topsoil has greater than a 7.0 pH value, it shall be decreased to attain a 6.8 pH value. The method to decrease the soil pH shall be submitted for approval before work.

C. Unacceptable Topsoil Sources.

1. Material stripped from the following sources shall not be considered suitable for use as topsoil:

a. Soils having less than 4.1 pH value or greater than 7.0.

b. Chemically contaminated soils.

c. Areas from which the original surface has been stripped and/or covered over such as borrow pits, open mines, demolition sites, dumps, and sanitary landfills.

d. Wet excavation.

2. Topsoil furnished from sources outside the limits of the Project shall have a minimum organic content of not less than 2.75 percent by weight. When the organic content is less than 2.75 percent, it shall be increased by adding peat conforming to Subsection 917.02.02 at a rate necessary to attain this minimum organic content. The organic content of soils will be determined according to AASHTO T 194 except that the sample is to be taken from oven-dried soil passing a No. 10 sieve. The organic content of all topsoil used for planting shall conform to the requirements specified above.

D. Gradation of Topsoil Sources:

1. The gradation of the topsoil furnished from sources outside the limits of the Project will be determined using the Bouyoucos Hydrometer Analysis conforming to AASHTO T 88. The gradation of the topsoil shall be within the following:

a. Not more than 20 percent of the material submitted from an off-site sample shall be retained on a No. 10 sieve.

b. If more than one-half of the sand is smaller than 20 mils:

	Percent
Sand (80 mils to 2 mils)	40 - 80
Silt (2 mils to 0.2 mils)	0 - 30
Clay (0.2 mils and smaller)	0 - 30

c. If more than one-half of the sand is larger than 20 mils:

	Percent		
Sand (80 mils to 2 mils)	40 – 80	or	40 - 75
Silt (2 mils to 0.2 mils)	0 – 30	or	0 - 30
Clay (0.2 mils and smaller)	15 – 30	or	0 – 30

2. Material outside these ranges is not suitable for use as topsoil.

2.03 SOIL CONDITIONERS

A. Fertilizer: Conforming to Subsection 917.02 of the Standard Specifications and the requirements of P.L. 2010, c. 112 (N.J.S.A.58:10A-61, et. seq.).

B. Organic material: Conforming to Subsection 917.02 of the Standard Specifications.

C. Lime: Conforming to Subsection 917.02 of the Standard Specifications.

2.04 HAY OR STRAW MULCH

A. Hay:

1. Use clean timothy, redtop, or native grasses approved by the *ENGINEER*.

2. Not ground or chopped into short pieces.

B. Salt hay:

1. Use clean salt meadow grasses approved by *ENGINEER*.

2. Not ground or chopped into short pieces.

C. Straw:

1. Threshed, unrotted stalks of rye, barley, or wheat; relatively free from seeds, noxious weeds, and other foreign material.

2. Not ground or chopped into short pieces.

D. Hay and straw mulch binder materials:

1. Vegetable based gels:

a. Materials which can be classified as naturally occurring powder based hydrophyllic additives formulated to provide gels, which when applied under satisfactory curing conditions, will form membraned networks of water insoluble polymers. Physiologically harmless and not having phytotoxic or crop damaging properties.

2. High polymer synthetic plastic emulsion:

a. Miscible with all normally available water when diluted to any proportion. No longer soluble or dispersible in water after adequate drying, but tacky until grass seed has germinated.

Physiologically harmless, and not having any phytotoxic or crop damaging properties.

2.05 SEED MIXTURE

A. Seed mixture shall be as shown on the drawings.

B. Use clean, dry, new crop seed, use certified seed.

2.06 WATER: POTABLE

2.07 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the Contractor subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that clearing, earthwork, grading and other preceding work affecting ground surface have been completed.

B. Verify that trees, shrubs, and other plants to remain as part of final landscaping have been identified.

C. Assure that area to be topsoiled is cleared, shaped, dressed, and approved by *ENGINEER*.

D. Verify that soil is unfrozen and within allowable moisture content.

E. Do not proceed with topsoiling, seeding or mulching until conditions are satisfactory.

3.02 INSTALLATION

A. Preparation of Subgrade: After rough grading is completed and before topsoil is spread, thoroughly scarify ground to minimum depth of eight (8) inches with a toothed ripping machine by running in two (2) directions at right angles over the entire surface to be planted.

B. Topsoiling:

1. Topsoil shall be replaced with adequate amounts of topsoil material to restore the disturbed area to its original, pre-disturbance grade and depth of topsoil but not less than 5". [N.J.A.C. 7:22-10.11(e) 2]

2. Spread topsoil over the prepared rough grade using a rubber-tired tractor with grader blade or equivalent not weighing more than 3½ tons.

3. Place an even layer that will produce a prescribed compacted thickness of five (5") inches unless otherwise indicated.

4. Provide required topsoil from approved sources located outside project limits if quantity of topsoil obtained from stripping is insufficient for the project requirements.

5. Rake the topsoiled area to a uniform grade so that all areas drain, as indicated on the grading plan.

6. Lightly compact with a cultipacker before planting grass.

7. Remove stones, lumps, roots, and other objects larger than one (1) inch in any dimension from graded topsoil surface.

C. Liming and fertilizing:

1. Apply lime uniformly at the rate of 135 lbs per 1,000 square feet with a mechanical spreader to the entire area for grass, or at the rate determined from soil test.

2. Apply commercial fertilizer at the rate of 12 lbs per 1,000 square feet distributing uniformly with a mechanical spreader, or at rate determined from soil test.

D. Seeding:

1. Time of Seeding: Conduct seeding under favorable weather conditions during seasons which are normal for such work as given in the New Jersey Soil Erosion and Sediment Control Standards, 2014, Revised 2017.

2. Broadcast half of seed with mechanical seeder.

3. Broadcast remaining half of seed at right angles to first seeding pattern, using same broadcast method.

4. Apply seed at the rate indicated on the drawings.

5. Cover seed to depth of 1/8 inch by raking or other method approved by *ENGINEER*.

6. Roll seeded area with roller weighing maximum of 150 pounds per foot of width.

7. Water seeded area until water penetrates to a depth of 3 to 4 inches.

8. Finished seeded areas shall be smooth, even, and to prescribed lines and contour.

E. Mulching:

1. Apply straw mulch to seeded areas within five (5) days of seed application. [N.J.A.C. 7:22-10.11(e) 3]

2. Leave all mulch in place and allow to disintegrate, except remove excessive amounts of straw when directed by the *ENGINEER*.

3. Spread hay or straw uniformly in layer 1 to 1½ inches thick, loose measurement.

4. Bind mulch in place using vegetable based gels or synthetic emulsion.

5. In areas where pedestrian traffic would make use of binder objectionable, *ENGINEER* may direct spreading of small quantities of topsoil on the mulch as an alternative method of securing the mulch in place.

3.03 LAWN ESTABLISHMENT

A. Watering:

1. Keep soil moist during seed germination period.

2. Method of watering shall provide equal distribution and coverage to all areas seeded.

3. Contractor shall water area to a depth of 2" once a week until final acceptance.

B. Mowing: Mow unacceptable weedy areas in fertilized and seeded areas as directed by *ENGINEER* if, prior to the establishment of a satisfactory stand of grass, an excess amount of weed growth becomes established. Mow at Contractor's expense.

C. Relime, refertilize, reseed and remulch as directed by the *ENGINEER*, all seeded areas which become eroded or otherwise disturbed; or which require mowing of weedy areas in order to establish acceptable turf.

D. Relime, refertilize, reseed and remulch as directed by *ENGINEER*, spots larger than one square foot not having uniform stand of grass practically weed free, and not containing plants in reasonable proportion to the various kinds of seed in the grass seed mixture.

E. Perform all lawn establishment work in accordance with the specifications without additional compensation.

F. Establishment period to extend until acceptance of project by *ENGINEER*.

3.04 MAINTENANCE

A. Maintenance Period: Begin maintenance immediately after each portion of lawn is planted and continue until project acceptance.

B. Maintenance Operations: Water to keep surface soil moist. Repair washed out areas by filling with topsoil, liming, fertilizing, and seeding. Replace mulch on banks when washed or blown away. Repair fence, mow to 2 inches after grass reaches 3 inches in height, and mow frequently enough to keep grass from exceeding 3½ inches.

3.05 CLEANING

A. Immediately clean spills, soil, and conditioners on paved and finished areas

B. Distribute, stockpile, or haul topsoil in excess of the quantity required for the project as directed by the *ENGINEER*

C. Dispose of protective barricades and warning signs at termination of maintenance period.

PART 4 - PAYMENT

4.01 TOPSOILING, FERTILIZING AND SEEDING

A. No separate measurement or payment will be made for providing topsoiling, fertilizing and seeding as specified and shown on Plans. Include all costs for this work in the various related items of work listed in the Proposal.

****END OF SECTION****

SECTION 32 93 00
(02950)
LANDSCAPE PLANTING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Planting of landscaping materials as indicated on drawings.

2. Restoration of existing landscaped areas.

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 31 23 00: Excavating, Filling and Grading*

1.02 REFERENCES

A. New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction, 2019, and all amendments thereto (Standard Specifications):

1. Section 811: Planting

2. Section 917.02: Fertilizer

3. Section 917.08: Plant Materials

B. American National Standards Institute:

1. ANSI Z60.1 American Standard for Nursery Stock

C. American Joint Committee on Horticulture Nomenclature:

1. Standardized Plant Names, Second Edition.

1.03 SUBMITTALS

A. Submittals:

1. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

2. Submit inspection certificates indicating that plant materials conform to State and Federal regulations regarding diseases and infestation.

3. Test reports: Topsoil analysis.

C. Samples:

1. Mulch: 1 cubic foot packed in sample bag.

D. Maintenance Instruction: Prior to end of the maintenance period, furnish three (3) copies of written maintenance instructions to *ENGINEER* for maintenance and care of installed plants through their full growing season.

1.04 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection:

1. Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

2. Protect plant material from wind, drought, unusual weather or vandalism.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage:

1. Deliver all materials to the job site in their original nursery containers with all labels intact and legible at time of use. Store in strict accordance with the nursery recommendations as approved by the *ENGINEER*.

2. Preparation for delivery:

a. Balled and Burlapped (B&B) plants:

(1) Dig and prepare for shipment in manner that will not damage roots, branches, shape and future development after replanting.
(2) Ball with firm, natural balls of soil.
(3) Wrap ball firmly with burlap or strong cloth and tie.
(4) Ball sizes shall conform to Section 909.05.

b. Balled and Platformed (BP) plants:

(1) Ball and wrap in same manner as B&B plants.
(2) Bind securely to strong platforms.

3. Delivery:

a. Deliver fertilizer to site in original unopened containers bearing manufacturer's guaranteed chemical analysis, name, trade name, trademark, and conformance to this specification.

b. Do not deliver more plant materials than can be planted in one (1) day.

c. Deliver plants with legible identification labels:

(1) Label plantings.
(2) State correct plant name and size indicated on plant list.
(3) Use durable waterproof labels with water resistant ink which will remain legible for at least 60 days.

d. Protect during delivery to prevent damage to root ball or dessication of leaves.

e. Notify *ENGINEER* of delivery schedule in advance so plant material may be inspected upon arrival at job site.

f. Remove unacceptable plant material immediately from job site.

4. Storage:

a. Balled and burlapped plant stock:

(1) Deliver direct from nursery.
(2) Heel-in immediately upon delivery if not to be planted within four (4) hours.

b. Protect roots of plant material from drying or other possible injury.

c. Store plants in shade and protect from weather.

d. Maintain and protect plant material not to be planted within four (4) hours.

5. Handling:

a. Do not drop plants.

b. Do not pick up container or balled plants by stems or trunks.

1.06 PROJECT CONDITIONS

A. Planting season:

1. Plant broadleaf and coniferous evergreen trees, shrubs, vines, and ground covers between August 15th and September 15th and between April 15th and May 15th. Plant deciduous trees, shrubs, vines and perennials between October 15th and November 15th and between March 15th and May 15th

These planting seasons may be extended or shortened according to prevailing weather and soil conditions, as directed by the *ENGINEER*.

2. For all planting during an extension of the spring planting season, the plant material shall be moved with roots balled; the trunk, branches and foliage shall be sprayed with an antidesiccant with shall be mixed and applied according to the directions of the manufacturer; and the trees and shrubs shall be trimmed and thinned to reduce the amount of foliage and help balance the loss of roots due to transplanting.

3. The Contractor shall assume all extra risk or cost of planting when it is performed out of the regular prescribed seasons.

B. Perform actual planting only when weather and soil conditions are suitable in accordance with locally accepted practice.

1.07 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the warranty shall accompany the materials submittal.

B. The *CONTRACTOR* shall be responsible for all costs of warranty repair work including removal and replacement during the warranty period.

C. Guarantee new or existing moved plant material through one full growing season after all plants are installed.

D. Replacement plants under this guarantee shall be guaranteed for one full growing season from date of installation.

E. Repair damage to other plants or lawns during plant replacements at no cost to the *OWNER*.

1.08 SCHEDULING

A. Install trees, shrubs, ground cover plants and other landscaping materials before lawns are installed.

PART 2 _ PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 PLANT MATERIALS

A. Conforming to Section 917.08, except as supplemented or modified herein.

B. Well-formed and shaped, true to type, and free from disease, insects, and defects such as knots, sun-scald, windburn, injuries, abrasion or disfigurement.

C. Trees shall have a naturally grown single leader (trunk) not created by pruning.

D. Street trees and pathway trees shall be free of branching to a height of 7'.

E. True to botanical and common name and variety: American Joint Committee on Horticulture Nomenclature, Standardized Plant Names.

F. All plant materials shall conform to State and Federal laws relating to inspection for diseases and infestation, and inspection certificates shall be filed with the ENGINEER.

G. Nursery Grown Stock:

1. Conforming to ANSI Z60.1 and NJDOT Standard Specifications.

2. Grown within the same U.S.D.A. Plant Hardiness Zone as the project.

3. Container grown stock:

   a. Grown in container for minimum 180 days before delivery.

   b. Not root-bound or with root system hardened off.

4. Use only ground cover plants well-established in removable containers, integral containers, or formed homogeneous soil sections.

2.03 PLANTING SOIL

A. Topsoil shall not contain stones, lumps, roots, or similar objects larger than 2 inches in any dimension and shall have not less than a 5.8 pH value. When the topsoil has less than a 5.8 pH value, it shall be increased by applying pulverized limestone at a rate necessary to attain a 6.5 pH value. When the topsoil has greater than a 7.0 pH value, it shall be decreased to attain a 6.8 pH value. The method to decrease the soil pH shall be submitted for approval before work.

B. Unacceptable Topsoil Sources.

1. Material stripped from the following sources shall not be considered suitable for use as topsoil:

a. Soils having less than 4.1 pH value or greater than 7.0.

b. Chemically contaminated soils.

c. Areas from which the original surface has been stripped and/or covered over such as borrow pits, open mines, demolition sites, dumps, and sanitary landfills.

d. Wet excavation.

2. Topsoil furnished from sources outside the limits of the Project shall have a minimum organic content of not less than 2.75 percent by weight. When the organic content is less than 2.75 percent, it shall be increased by adding peat conforming to Subsection 917.02.02 at a rate necessary to attain this minimum organic content. The organic content of soils will be determined according to AASHTO T 194 except that the sample is to be taken from oven-dried soil passing a No. 10 sieve. The organic content of all topsoil used for planting shall conform to the requirements specified above.

C. Gradation of Topsoil Sources:

1. The gradation of the topsoil furnished from sources outside the limits of the Project will be determined using the Bouyoucos Hydrometer Analysis conforming to AASHTO T 88. The gradation of the topsoil shall be within the following:

a. Not more than 20 percent of the material submitted from an off-site sample shall be retained on a No. 10 sieve.

b. If more than one-half of the sand is smaller than 20 mils:

Percent

Sand (80 mils to 2 mils)	40 - 80
Silt (2 mils to 0.2 mils)	0 - 30
Clay (0.2 mils and smaller)	0 - 30

c. If more than one-half of the sand is larger than 20 mils:

	Percent
Sand (80 mils to 2 mils)	40 – 80 or 40 - 75
Silt (2 mils to 0.2 mils)	0 – 30 or 0 - 30
Clay (0.2 mils and smaller)	15 – 30 or 0 – 30

2. Material outside these ranges is not suitable for use as topsoil.

2.04 FERTILIZER

A. Section 917.02, except as supplemented or modified herein.

B. Chemical Type:

1. Commercial fertilizer, uniform in composition, free flowing, conforming to state and federal laws, and suitable for application with equipment designed for that purpose.

2. Contain following minimum percentages of plant food by weight:

a. 10 available nitrogen

b. 10 available phosphorus

c. 10 available potash.

2.05 TOP MULCH

A. Ground pine bark.

2.06 WRAPPING MATERIAL

A. Two (2) thicknesses of creped paper cemented together with bituminous material.

B. Width of wrapping material: 8 to 10 inches.

C. Twine for tying: Lightly tarred medium or coarse sisal yarn.

2.07 GUYING AND STAKING MATERIAL

A. Stakes for tree support:

1. Construction grade white cedar.

2. Minimum nominal size: 2 inches x 2 inches or 2½ inch in diameter x 9 feet long and pointed at one end.

3. Cross braces or stakes: Nominal 1 inch x 4 inch boards.

B. Guying wire: Annealed, galvanized iron or steel 14 gauge wire.

C. Hose:

1. Type: New or used 2-ply reinforced rubber or plastic.

2. Minimum Size: 3/4-inch.

2.08 WATER

A. Quality: Potable.

B. Source: To be provided by the Contractor.

2.09 LANDSCAPE STONE

A. Landscape stone shall be uncrushed, conforming to Subsection 901.03.02 of the Standard Specifications and meeting the gradations specified in Table 901.03-1. Size and color shall be as shown on the Plans.

2.10 LANDSCAPE EDGING

A. Edging shall be ("Sure-Loc" steel) ("Sure-Edge" aluminum) landscape edging as manufactured by Sure-Loc Corporation of Holland, MI, 1-800-787-3562 or equal. Sections shall be ¼" thick by 5" high (steel) by length as required and have a black, baked on enamel finish (steel) finish. Sections shall include an interlocking connection system to connect adjacent sections. Stakes shall be furnished by the manufacturer and be 12" long.

B. Belgian Block:

1. New Belgian block shall meet the requirements of ASTM-615.

2. New Belgian block shall generally measure 4" x 6" x 12".

2.11 ROOT BARRIER

A. Root barrier shall be "Shawtown SM", 18" high as manufactured by NDS, Inc., Lindsey, CA, (800-726-1994) or equal.

2.12 LANDSCAPE FABRIC

A. Fabric shall be woven, needle punched or non-woven and treated for protection against deterioration due to ultraviolet radiation. Fabric shall be minimum 99 percent opaque to prevent photosynthesis and seed germination from occurring, yet allowing air, water and nutrients to pass thru to the roots. Minimum weight shall be 4 ounces per square yard with a minimum thickness of 20 mils with a 20-year (minimum) guarantee.

B. Fabric shall be Dewitt medium weight fabric, or equivalent.

2.13 SOURCE QUALITY CONTROL

A. Furnish plant materials certified by State of Federal Department of Agriculture to be free from hazardous insects or apparent disease.

B. Topsoil inspection:

1. Take representative soil samples from area under consideration and furnish to the *ENGINEER*.

2. Test soil samples for pH, alkalinity, total soluble salts, porosity, sodium content, and organic matter.

2.14 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Verify final grades have been established prior to beginning planting operations, mulching, constructing tree wells.

D. Inspect trees and shrubs for injury, insect infestation and for improper pruning.

E. Do not begin planting or wrapping of trees until deficiencies are corrected or plants replaced.

3.02 PREPARATION

A. Stake out locations for plants. Establish mulch restoration limits.

B. Do not begin excavation until stake out of plant locations and mulching limits are acceptable to *ENGINEER*.

3.03 EXCAVATION FOR PLANTING

A. Pits and Trenches:

1. Shape:

   a. Vertical sides and flat bottom.

   b. Plant pits to be square of circular.

2. Size:

   a. For Trees:

1. Depth: Minimum two feet (2') from finish grade and increased as necessary to accommodate ball or roots and at least six inches (6") compacted topsoil below ball.

2. Width or diameter: 1½ feet (1½') greater than diameter of ball.

b. For Shrubs:

1. Depth: Minimum 16 inches (16") increased as necessary to accommodate ball and at least six inches of topsoil below ball.

2. Minimum width of diameter: One foot (1') greater than diameter of ball.

B. Planting beds:

1. Remove existing soil from planting beds to a depth of six inches (6") and replace with planting soil, if soil from bed cannot be made acceptable by adding organic materials as nutrients.

2. Bring beds to smooth, even surface conforming to established grades after full settlement has occurred.

C. Disposal of excess soil:

1. Use acceptable excess excavated topsoil to form watering basins around plants, where specified, or waste over nearby low or rough lawn areas as directed.

2. Dispose of unacceptable or unused excess soil as directed by the *ENGINEER*.

3.04 PLANTING

A. General:

1. Center plant in pit or trench.

2. Face for best effect.

3. Set plant plumb and hold rigidly in position until soil has been tamped firmly around ball or roots.

4. Use only planting soil for backfill.

5. Place sufficient planting soil under plant to bring top of root ball level to finish grade of surrounding ground.

6. Backfill pit or trench with planting soil in 9-inch layers and water each layer thoroughly to settle soil.

7. After soil settles fill pit with planting soil, water and leave pit surface even with finish grade of surrounding ground.

8. Watering Basin:

   a. Construct a topsoil berm four inches (4") above finish grade, forming a watering basin with a level bottom around each plant.

   b. Size: Diameter of the planting pit.

   c. Do not construct watering basins for plant material transplanted from box-grown stock.

B. Balled plants:

1. Place in pit on planting soil material that has been hand-tamped prior to placing plant.

2. Place with burlap intact so location of ground line at top of ball is same as at nursery.

3. Cut burlap or cloth, ropes, wires, and other wrapping materials and remove from top one-half (½) of ball.

4. Do not pull wrapping from under ball.

5. Do not plant if ball is cracked or broken before or during planting process.

C. Container-grown plants:

1. Can removal:

   a. Cut cans on two (2) sides with an acceptable can cutter.

   b. Do not injure root ball.

c. Do not cut cans with spade or ax.

d. Do not cut sides on knockout cans.

e. Carefully remove plants without injury or damage to root ball.

f. After removing plant, superficially cut edge-root with knife on three (3) sides.

2. Box removal:

a. Remove bottom of plant boxes before planting.

b. Remove sides of box without damage to root ball after positioning plant and partially backfilling.

3. Dig planting holes to accommodate root balls.

4. Hand place plants which are in containers less than one (1) gallon in size.

5. Hand backfill and hand tamp leaving slight depression around bases of plants.

6. Cover root ball with maximum ¼-inch of planting soil.

D. Fertilizer application:

1. Plants shall be fertilized before they are mulched, except that trees and shrubs not fertilized before June 1 shall be mulched but not fertilized until after October 1 of the same year. Fertilizer shall be applied at the following rates:

a. Trees: 1½ pounds per inch of caliper.

b. Shrubs: ½ pound per foot of height.

c. Vines, ground covers and perennials: ½ pound per plant.

2. Rake back mulch and work fertilizer into upper two inches (2") of soil.

3. Water until root structure of plant is wet.

4. Replace mulch in same manner as originally placed within two (2) days after fertilizing.

E. Watering: Water when soil moisture is below optimum level for best plant growth.

3.05 MULCHING

A. Mulch planting pits, trenches, and areas within two (2) days after planting.

B. Cover watering basin or bed evenly with two inches (2") of mulch material.

C. Water thoroughly immediately after mulching.

D. Hose down planting area with fine spray to wash mulch from leaves of plants.

3.06 GUYING AND STAKING OF TREES

A. Stake trees on plant list:

1. Stake installation:

a. Drive stakes perpendicularly into ground at edge of root ball.

b. Number of stakes/caliper of tree: three (3).

2. Tying and cross-bracing:

a. For trees 2½ inches caliper or under:

(1) Place stake toward prevailing wind.

(2) Tie tree with double strand of guy wire run through an acceptable length of rubber hose.

(3) Cross sheathed guy wire once between stake and tree to prevent direct contact between stake and tree.

3.07 PRUNING

A. New plant material:

1. Prune minimum necessary to remove injured twigs and branches, deadwood and suckers.

2. Remove ⅓ to ¼ branching structure to compensate for loss of roots during transportation.

3.08 WRAPPING

A. Wrap plants promptly after planting.

B. Spirally wrap from bottom to top to height of second branch.

C. Overlap wrapping approximately two inches (2").

D. Tie wrapping securely in place.

3.09 CLEANING

A. Sweep and wash paved surfaces.

B. Remove planting debris from project site.

3.10 PLANT ESTABLISHMENT PERIOD AND REPLACEMENTS

A. The acceptability of the plant material furnished and planted as specified will be determined at the end of a period of establishment during which all possible means shall be employed to preserve the plants in a healthy growing condition. Planting will be determined as established two years from the date of acceptance of the planting. The dates of planting acceptance are June 1 for the spring planting and December 1 for the fall planting. Care during the establishment period shall include watering, weeding, spraying with insecticides or fungicides, pruning, and repairing and adjusting guys and stakes.

B. All plants that are not alive and healthy at the end of the plant establishment period shall be replaced in kind, quantity, and size with acceptable live, healthy plants installed as originally specified. The *ENGINEER* may permit substitute varieties of plants to be used.

C. Replacement planting shall conform to the requirements for initial planting except as follows:

1. Existing wood chips shall be removed and may be reused if salvageable and conforming to Subsection 917.04.

2. Backfilling may be made with excavated material that does not contain wood chips or other objectionable material.

3. Replacement plantings shall be made at no cost to the State.

4. Replacement of evergreen materials shall be performed from March 1 to May 1 and from August 15 to December 1. Replacement of deciduous material shall be performed from March 1 to May 1 and from October 15 to December 1.

5. All stakes, guys, and guy wires shall be removed two weeks before the conclusion of the one-year plant establishment period.

6. At the conclusion of the two (2) year plant establishment period, all weeds, debris, and damaged plant material shall be removed and disposed of. Holes resulting from the theft of plants shall be filled. Treat all planting beds with a pre-emergence herbicide.

3.13 FINAL INSPECTION AND ACCEPTANCE

A. Request final inspection for acceptance upon completion of all work.

B. Replace rejected material with acceptable plant material as soon as possible within acceptable planting dates.

PART 4 - PAYMENT

4.01 LANDSCAPE PLANTINGS

A. Quantity: No separate measurement shall be made for this item.

B. Payment: Payment will be made for the lump sum price bid in the *PROPOSAL* for the item *LANDSCAPING,* which price shall include cost of all plants; planting mixture; mulch; staking and guying; excavation; backfill; fertilizer; limestone; and all else necessary or required, complete as specified and shown on the Plans.

****END OF SECTION****

SECTION 33 40 00
(02722)
STORM SEWER SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Storm drainage piping.

2. Area drains

3. Connection to existing downspouts

4. Cleaning of existing inlet and pipes

B. Related work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 31 23 00: Excavating, Filling and Grading*

C. References:

1. American Society for Testing and Materials (ASTM):

a. ASTM C-270: Mortar for Unit Masonry.

b. ASTM C-443: Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

c. ASTM C-913: Precast Concrete Water and Wastewater Structures.

d. ASTM C-923: Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.

e. ASTM D1785; Specification for Poly (vinyl chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120.

2. American Association of State Highway and Transportation Officials:

   a. AASHTO M105: Standard Specification for Gray Iron Castings.

   b. AASHTO M252: Standard Specification for Corrugated Polyethylene Drainage Pipe.

   c. AASHTO M294: Standard Specification for Corrugated Polyethylene Pipe, 300- to 1200-mm Diameter

3. New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction, 2019, and all amendments thereto (Standard Specifications):

   a. Section 601: Pipe

   b. Section 602: Drainage Structures

1.02 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Submit NJDOT *Certificate of Compliance* conforming to Subsection 106.07 of the Standard Specifications for all materials and assemblies specified herein.

C. Submit a plan for hot and cold weather concreting as required by Subsection 504.03.02C of the Standard Specifications. Include the method that will be used to ensure that the temperature of the concrete is between 50ºF and 90ºF during mixing and placing.

D. Submit sample concrete delivery slip.

E. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section including but not limited to:

   a. Concrete Accessories

   b. Admixtures

   c. Joint systems and fillers

2. Specifications and other data required that demonstrate compliance with the specified requirements.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the method and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

1.05 WARRANTY AND WARRANTY REPAIRS

A. Warranties shall be provided as specified in *Section 01 78 36, Guarantees*. A copy of the manufacturer's warranty shall accompany the shop drawing submittal.

B. The Contractor and/or equipment manufacturer shall be responsible for all costs of warranty repair work including removal, shipping, reinstallation and re-start-up during the maintenance period.

1.06 PROJECT CONDITIONS

A. Utility castings shall be, at all times during construction, set and reset as necessary, at an elevation which is at or near the currently existing surface.

B. Castings shall only be raised or lowered to the final proposed elevation(s) immediately prior to final paving operations.

C. If it is necessary to leave a raised or lowered casting overnight, it shall be adequately marked by a lighted barricade and/or such other means as deemed appropriate in the interest of the protection of public health and safety.

D. Bituminous fillets, if used, shall extend a minimum of 2 feet beyond edge of casting and be removed immediately prior to paving.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by, the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 CORRUGATED POLYETHYLENE PIPE

A. Acceptable Manufacturers (Polyethylene Pipe):

1. Advanced Drainage Systems
Columbus, Ohio
(614) 457-3051

2. Or equivalent.

B. Sizes 3" - 10": A.A.S.H.T.O. Designation M252.

1. Type S: Corrugated outside with smooth interior liner.
2. Type SP: Type S with Class 1 or 2 perforations.

C. Sizes 12" - 60": A.A.S.H.T.O. Designation M294.

1. Type S: Corrugated outside with smooth interior liner.
2. Type SP: Type S with Class 1 or 2 perforations.

D. Type S and SP pipe and fittings shall have rubber gasket silt tight joints. Pipe and fittings not having rubber gasket sand tight joints shall be rejected and removed from the site within 24 hours. Butyl-Rubber tape shall not be used.

E. Filter wrap shall be of spun-bonded 100% nylon and shall be factory applied to the tubing.

2.03 PVC PIPE

A. Pipe shall conform to ASTM D1785:

1. Schedule 40, 80 or 120 as shown.

2. PVC compounds shall be Class 12454-B, 12454-C or 14333-D conforming to ASTM D-1784.

3. Pipe shall be marked in accordance with ASTM D-1785 and bear the mark of the testing agency that verified the suitability of the material for Potable Water Service.

B. Fittings for use with ASTM D1785, Schedule 40, 80, 120 pressure pipe:

1. Glued or threaded fittings:

   a. Socket fittings conforming to ASTM D2466 for Schedule 40 PVC pipe.

   b. Socket fittings conforming to ASTM D2467 for Schedule 80 PVC pipe.

   c. Threaded fittings conforming to ASTM D2464 for Schedule 80 pipe.

2. Gasketed fittings:

   a. Fittings for iron pipe size pipe shall be manufactured in one piece of injection molded PVC compound meeting ASTM D1784. Fittings shall be Class 200 and conform to requirements of DR 21. Fittings shall be designed to withstand a minimum of 630 psi quick burst pressure at 73 degrees F., tested in accordance with ASTM D1599. Bell shall be gasketed joint conforming to ASTM 3139 with gaskets conforming to ASTM F477. (Push-on joint) (or) (Mechanical Joint) Ductile Iron Fittings meeting AWWA C153 shall be allowed as alternative when PVC sizes are not available.

2.04 CONCRETE

A. Cast-in-place concrete for drainage structures shall conform to Section 602 of the Standard Specifications and shall be “Class B” as shown in Table 903.03.06-1 (NJDOT, 2019).

2.05 AREA DRAIN

A. Materials for brick or concrete block inlets shall conform to Subsection 602.02.01 of the Standard Specifications, except as modified herein

B. Pre-cast concrete inlets shall conform to ASTM C913.

C. Ladder rungs:

   1. Conforming to ASTM C478 and AASHTO M199.

   2. Manhole steps shall be made of polypropylene plastic over ½" steel reinforcing. Manhole steps shall be Model No. 004-500 or No. 004-501 as manufactured by MA Industries, Peachtree City, Georgia, or equivalent.

D. Joint construction shall be in accordance with ASTM C443. Water tightness shall be provided by either an all weather butyl material conforming to ASTM C990 and as approved by the engineer or a rubber gasket conforming to ASTM C443. Gasket for precast inlet sections shall conform to ASTM C443 or AASHTO M198.

E. Rubber gasket pipe to structure seal for pre-cast inlets shall conform to ASTM C923 and be cast integrally in structure wall.

F. Non-shrink mortar for pipe to structure seal for masonry inlets shall be as approved by *ENGINEER* before construction.

2.05 CASTINGS

A. Castings shall conform to Section 603 of the Standard Specifications and be as shown on the drawings.

B. Heavy duty frame and grate shall be Pattern No. 2815 as manufactured by the Campbell Foundry Company or equivalent. US-1A to be cast in grate.

2.06 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the Contractor subject to the approval of the *ENGINEER*.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Examination of polyethylene pipe:

1. The following information shall be clearly marked on the pipe and regularly spaced at intervals not exceeding 10 ft.:

    a. Specification Designation (AASHTO).

    b. Manufacturers Identification Symbol.

    c. Pipe class or strength.

    d. Nominal size.

    e. The plant designation code.

    f. The pipe shall be tagged with the date of manufacture.

2. Examine pipe for defects prior to placement in trench. Defective pipe or pipe not meeting specifications shall be rejected and removed from the site within 24 hours of discovery. The following shall be considered defects and shall be cause for immediate rejection of pipe:

    a. The inside and outside surfaces shall be glossy or semi-matte and be free of chalking, sticky or tacky material.

    b. The pipe shall be free of cracks, holes, blisters, voids, foreign inclusions, or other defects visible to the naked eye and which may affect wall integrity.

    c. The surface shall be free of excessive bloom. Bloom or chalking may be signs of extended exposure to the direct rays of the sun.

    d. Pipe supplied with filter wrap is delivered in a protective wrapping. If protective wrapping is damaged, pipe shall be rejected.

D. Examination of PVC Pipe:

1. Check pipe for following information, which shall be clearly marked on each pipe section:

    a. Pipe type and SDR number.

    b. Nominal pipe size.

    c. The PVC cell classification, for example 12454-B.

d. Name or trademark of manufacturer.

e. The ASTM Specification designation.

2. Check fittings for the following markings:

a. The ASTM Specification designation.

b. Manufacturer's name or trademark.

c. Nominal size.

d. The material designation PVC, PSM.

3. Inspect pipe for defects prior to placement in trench. The pipe and fittings shall be free from visible cracks, holes, foreign inclusions or other injurious defects.

E. Assure that all materials are of the type specified and are not defective. Unmarked pipe, defective pipe or fittings that cannot be repaired in field to satisfaction of the *ENGINEER*, or pipe and materials not meeting Specifications requirements shall be removed from the site as directed by the *ENGINEER*.

F. Begin work only when unsatisfactory conditions are corrected.

3.02 EXCAVATION FOR TRENCHES

A. Dig trenches to the uniform width required for the particular item to be installed, sufficiently wide to provide ample working room.

1. Maximum trench width to a point one foot above the outside top of pipe shall be the pipe outer diameter plus sixteen inches.

2. Maximum trench width at ground surface shall be as required for depth of pipe.

B. Excavate trenches to the depth indicated or required. Carry the depth of trenches for piping to establish the indicated flow lines and invert elevations.

C. Trenches for pipes shall not be opened more than the number of linear feet of pipe that can be placed and backfilled in one day.

D. Grub roots and stumps within six inches of outside surface of pipe bottom and sides to minimum depth of six inches below bottom of trench.

E. Install pipe bedding of material approved for initial backfill in accordance with the details shown on the Plans and as specified herein.

3.03 INSTALLATION – GENERAL

A. General: Install the work of this section in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

B. Lay pipe only in the presence of the *ENGINEER*. *ENGINEER* may order removal and relaying of pipe not so laid.

C. Fine grade trench bottom so that pipe is supported for its full length.

D. Lay pipe to lines and grades shown on the Drawings. Face socket end of pipe in direction of pipe laying.

E. Do not lay pipe on unsuitable material, in wet trench, or in same trench with another pipe or utility.

F. General procedure for joining pipe:

1. Join pipe up to twenty-four inches (24") in diameter when installed on non-granular and firm bedding, by means of a bar and wood block.

2. Join larger diameter pipe, or where bedding is granular material, using mechanical pipe pullers.

3. DO NOT USE EXCAVATING EQUIPMENT TO SHOVE PIPE SECTIONS TOGETHER.

4. Hold pipe securely and in proper alignment when joining.

5. Do not disturb previously made joints. Check completed piping to assure joints are intact. Insure backfilling is accomplished without disturbing pipe position.

6. Do not allow earth, stones, or other debris to enter pipe or fittings.

G. Plastic marking tape shall be placed directly above all new plastic sewer lines at a depth of 2.5 feet below the final ground elevation. The tape shall be laid flat in a continuous manor without kinks, knots or other irregularities which may interfere with the proper performance of the tape.

3.04 INSTALLATION - POLYETHYLENE PIPE

A. Place pipe sections on select backfill material and complete joints in accordance with the pipe manufacturer's printed instruction as submitted to the *ENGINEER*.

B. The pipe when placed shall lay level and straight. Extra care must be used in handling in cold weather.

C. Place select backfill material around sides of pipe and tamp without disturbing pipe position.

D. Place additional select backfill material over top of pipe to required elevation.

E. Underdrain installation shall conform to Plan detail.

3.05 INSTALLATION – PVC PIPE

A. Place pipe sections on select backfill material and complete joints in accordance with the pipe manufacturer's printed instruction as submitted to the *ENGINEER*.

B. The pipe when placed shall lay level and straight. Extra care must be used in handling in cold weather.

C. Backfill and compaction:

1. Initial backfill:

a. Initial backfill material shall be soil aggregate designation I-8 conforming to the requirements of Subsection 901.09, Table 901.2 of the Standard Specifications, or stone crushings to conform with AASHTO designation M-43 (ASTM designation D448), size No. 8, ⅛" to ⅜" clean, free flowing and shall meet all ASTM C-33 requirements for quality and soundness.

b. Install initial backfill material as shown on the plan details for the type of Pipe being used.

c. When required material shall be placed under the pipe haunch to provide adequate side support. Material shall be installed entire trench width and shall be tamped and rodded to insure full contact with pipe at haunch up to the spring line.

d. Little or no tamping of the initial backfill directly over the pipe shall be done.

2. Final backfill: See Specification section entitled *Excavating, Filling and Grading*.

3.06 INSTALLATION –AREA DRAIN

A. General:

1. The general method of construction shall conform to Section 603 of the Standard Specifications. The area drain shall be constructed as shown on the Drawings.

B. Area Drain:

1. Concrete block shall be laid with broken joints. All horizontal joints, and all keyways of vertical joints shall be filled with 1:2 cement-sand mortar. All horizontal joints shall be not more than ⅜-inch wide. The outside wall shall be plastered with a minimum of ½- inch thickness of 1:2 cement-sand mortar, troweled to a smooth finish.

2. To provide temporary drainage at such inlets as the *ENGINEER* may direct, omit one or more blocks in whichever course or courses of the structure as the *ENGINEER* may determine during construction. Prior to construction of base and pavement courses at inlets where blocks are temporarily omitted, place the required blocks and complete the inlet walls.

3. Inlets shall be constructed as follows:

a. Inside inlet dimensions: As shown on Plan details.

b. Base: 4,000 psi air entrained concrete, 8 inches thick; place on a bedding of ¾- inch size stone, 8-inches in thickness.

c. Walls: 6-inches thick.

d. The inlet walls at pipe openings shall be sealed with non-shrink mortar.

e. Steps: Place 12-inches on center; and firmly embedded in the inlet wall.

f. Grate: Set to the required finished grade elevation, and firmly bedded in 1:2 cement-sand mortar.

g. All construction methods shall be subject to approval of the *ENGINEER*.

4. The construction of the inlets shall include all construction necessary to connect the inlets to the existing or proposed storm drainage pipe.

C. Setting castings:

1. Frames shall be well set in mortar, making a watertight joint, and shall be adjusted so that the rim is approximately ¼- inch above finished grade. Cover and frame shall have a shop coat of asphaltic pitch and shall have a field coat of similar paint after the frame is set in final position. Steps shall be provided in the manhole as shown on the Drawings.

2. If castings are to be set in concrete or cement mortar, all anchors or bolts shall be in place and position before the concrete or mortar is placed. The casting shall not be disturbed until the mortar or concrete has set.

3. When castings are to be placed upon previously constructed masonry, the bearing surface of masonry shall be brought to line and grade and present an even bearing surface in order that the entire face or back of the casting will come in contact wit the masonry. Castings shall be set in mortar beds or anchored to the masonry as indicated.

3.07 CLEANING OF EXISTING STORM SEWER

A. All jetting shall be against the flow of the sewer unless otherwise directed. Should any obstruction be encountered, the balance of the line shall be cleaned from the opposite direction.

B. Each section of line, structure to structure, shall be cleaned to the extent that no further material is observed being dislodged from the pipe.

C. All dislodged material shall be collected by a screening device or other approved device in the downstream manhole.

D. Should there be evidence of roots in the screened material or other obvious indicators, the Contractor shall employ the use of a sectional sewer rodder and root cutting device. The equipment shall be inserted against the flow and cutter attached at upstream manhole. All root cutting shall be with the flow.

E. The Contractor shall keep a log of all lines cleaned. He shall note the conditions encountered in each line with particular emphasis on obstruction and locations of these obstructions.

F. Contractor shall note the conditions of each structure.

G. Remove waste materials, trash and debris, and legally dispose of it off the *OWNER'S* property.

H. Material considered to be solid waste pursuant to N.J.A.C. 7:26-1.6 and meeting the requirements for I.D.27 shall be removed from the construction site and disposed of at a sanitary landfill approved and licensed by N.J.D.E.P. [N.J.A.C. 7:22-10.11(e)1]

3.08 FIELD QUALITY CONTROL

A. *ENGINEER* will lamp all installed pipe between manholes, inlets, or other structures. Drainage lines shall meet the following standards to pass the lamping inspection.

B. Barrel of pipe shall have no vertical deflection, and at least seventy-five percent of barrel shall be visible in the horizontal direction.

C. Deflection testing:

1. Perform deflection tests on the complete installation of plastic piping within 30 calendar days of installation by means of one of the following methods prior to the acceptance of construction.

   a. "Go-No-Go" mandrel properly sized.

   b. Calibrated television.

2. Maximum allowable deflection (reduction in vertical inside diameter) shall be as follows:

Pipe conforming to:	Max Allowable Deflection
AASHTO M252	7½%
AASHTO M294	7½%
ASTM D1785	5%

D. Pipe not meeting these requirements shall be re-laid and re-lamped until compliance is achieved at no additional cost to *OWNER*.

3.09 CLEANING

A. Comply with requirements of *Section 01 74 00, Cleaning and Restorations*.

B. Remove and dispose of all debris.

PART 4 - PAYMENT

4.01 YARD PIPING

A. Quantity and Payment: No separate measurement shall be made for the work of this section. Include all costs for this work in the price bid for the item *YARD PIPING* as designated in the Proposal. This work shall include trenching, backfilling and compacting as elsewhere specified; pipe and fittings; interconnection to existing structures, and all other items required to prevent movement of pipes under pressure and to prevent leakage or blowout; repairing leaks, provide adaptors and all fittings for which separate payment is not provided for in the proposal section of the Contract Documents, restoration of disturbed areas and all other work as required for a complete installation.

****END OF SECTION****

SECTION 33 51 05
(15485)
NATURAL GAS SERVICE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work included:

1. Natural gas service and piping system expansion

2. Coordination with Utility Company for permanent natural gas service.

B. Related Work:

1. Other sections of the specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

2. *Section 09 90 00: Painting*

3. *Section 22 05 29: Hangers and Supports for Plumbing Piping*

4. *Section 31 23 00: Excavating, Filling and Grading*

C. Payment:

1. Unless otherwise noted in the Proposal Section, no separate payment shall be made for this item.

2. Include all costs for this work in the prices bid for the various related items of work as designated in the Proposal.

1.02 DESIGN REQUIREMENTS

A. Refer to Contract Drawing P-4 for design requirements and additional information.

1.03 COORDINATION

A. Coordinate with Public Service Electric & Gas Company and arrange for expansion of the existing gas service.

B. Contact the following regarding this work:

1. PSE&G Marketing:

Mr. Matt O'Donnel
Route 130 & Dunns Mills Road
Bordentown, NJ 08505
1-800-832-0076

1.04 SUBMITTALS

A. Comply with provisions of *Section 01 33 23, Shop Drawings, Product Data and Samples*.

B. Manufacturer's product data:

1. Complete materials list of all materials proposed to be furnished and installed under this section.

2. Specifications and other data required that demonstrates compliance with the specified requirements.

C. Shop drawings showing precise dimensions of the work of this section, and all other data needed to ensure proper and adequate provisions to accommodate the work of this section.

D. Submit utility company prepared drawings.

1.05 QUALITY ASSURANCE

A. Qualifications of manufacturer:

1. Products used in the work of this section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the *ENGINEER*.

B. Qualifications of workmen:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar

with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the *ENGINEER* will make no allowance for lack of skill on the part of workmen.

C. Basis of acceptance:

1. The manufacturer's installation instructions will provide the basis for acceptance or rejection of the work performed under this section.

1.06 PRODUCT DELIVERY STORAGE AND HANDLING

A. Comply with provisions of *Section 01 66 00, Storage and Protection*.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the *ENGINEER* and at no additional cost to the *OWNER*.

D. Delivery and storage:

1. Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use.

2. Store in strict accordance with the manufacturer's recommendations as approved by the *ENGINEER*.

3. Deliver and store valves in original shipping containers with all tags and labels intact.

PART 2 - PRODUCTS

2.01 GENERAL

A. Products: Whenever materials or equipment are described using a certain brand, make, supplier, manufacturer or by specification, such naming shall be regarded as a standard and be intended to convey function, design features, general style, type, materials of construction, character and quality of material or equipment, serviceability and other described essential characteristics.

B. Other materials may be considered by the *ENGINEER* in accordance with the provisions of *Section 01 25 13, Substitutions*.

2.02 NATURAL GAS PIPING, BURIED

A. Polyethylene pipe: ASTM D2513, SDR 11.5. Fittings: ASTM D2683 or ASTM D2513 socket type. Joints: Fusion welded.

2.03 NATURAL GAS PIPING, ABOVE GRADE

A. Steel pipe: ASTM A53 or A120, Schedule 40 black. Fittings: ANSI/ASME B16.3, malleable iron, or ASTM A234, forged steel welding type. Joints: Screwed for pipe two inches and under; ANSI/AWS D1.1 welded, for pipe over two inches.

2.04 FLANGES, UNIONS, AND COUPLINGS

A. Pipe size 2-inches and under: 150 psig (kPA) malleable iron unions for threaded ferrous piping.

B. Pipe size over 2-inches: 150 psig forged steel slip-on flanges for ferrous piping; neoprene gaskets for gas service.

2.05 GAS COCKS

A. Up to 2-inches: Bronze body, bronze tapered plug, non-lubricated, teflon packing, threaded ends.

B. Over 2-inches: Cast iron body and plug, non-lubricated, teflon packing, flanged ends.

2.06 OTHER MATERIALS

A. All other materials, not specifically described but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and as selected by the *CONTRACTOR* subject to the approval of the *ENGINEER*.

B. Provide anodeless adapter for meter connections.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Verify that work may be completed in strict accordance with the original design and with the manufacturer's recommendations as approved by the *ENGINEER*.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Provide steel brackets and supports for piping, meter, regulator and valves supplied by gas company.

B. Install piping and metering equipment to avoid interference with owners facilities equipment being serviced.

C. Ream pipe and tube ends. Remove burrs.

D. Remove scale and dirt, on inside and outside, before assembly.

E. Prepare piping connections to equipment with flanges or unions.

F. Route piping in orderly manner and maintain gradient.

G. Install piping to conserve space and not interfere with use of space.

H. Group piping whenever practical at common elevations.

I. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Pipe passing through exterior walks shall be wrapped

with two layers of Type 15 unperforated roofing felt conforming to ASTM D226. Pipe passing through exterior walls shall be provided with sleeves and the annular space packed with non-combustible and waterproof material.

J. Provide clearance access to valves and fittings.

K. Establish elevations of buried piping outside the building to ensure not less than four (4) feet of cover.

L. Prepare pipe, fittings, supports, and accessories for finish painting. Refer to *Section 09 90 00, Painting*.

M. Excavate and backfill in accordance with *Section 31 23 00, Excavating, Filling and Grading*.

N. Install valves with stems upright or horizontal, not inverted.

O. Use grooved mechanical couplings and fasteners only in accessible locations.

P. Install unions downstream of valves and at equipment or apparatus connections.

Q. Install valves for shut-off and to isolate equipment.

R. Finish painting is specified in *Section 09 90 00, Painting*.

3.03 CLEANING

A. Clean exposed surface of all grease, dirt and other foreign materials.

B. Touch up all marred or abraded surfaces in accordance with manufacturer's directions.

3.04 TESTS

A. Upon completion of this portion of the work and prior to acceptance by the *OWNER*, make all required tests and adjustments for proper operation.

B. Secure all approvals from agencies having jurisdiction.

****END OF SECTION****

APPENDIX “A”

HAZARDOUS MATERIALS
TEST REPORTS

AHERA Consultants INCORPORATED

Bulk Sampling Report

BUILDING INSPECTED:

Kennedy Center
Area Highlighted in Green on Attached Map
429 John F Kennedy Way
Willingboro, NJ 08046

CLIENT:

Alaimo Group
200 High Street
Mount Holly, NJ 08060

DATE OF INSPECTION:

March 3, 2026

_____

This Information is to be used strictly for the above referenced Client.
It shall not be used for bidding purposes and is not a design document for abatement.

AHERA #: 25-6764

E-mail: ahera@aherainc.com
URL: http://www.aherainc.com

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Oceanville, NJ 08231-0385
PHONE: 609.652.1833
FAX: 609.652.1140

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SECTION II	SURVEY METHODS
SECTION III	ANALYSIS/ PROCEDURES
SECTION IV	ASBESTOS BULK SAMPLE LOG
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ATTACHMENT A	LABORATORY RESULTS

Section I — Introduction

AHERA Consultants, Inc. has been retained by the Alaimo Group to perform an asbestos impact assessment and subsequent bulk sampling at the Kennedy Senior Center area highlighted in green on attached map located at 429 John F Kennedy Drive in Willingboro, NJ in order to determine asbestos content.

The purpose of the asbestos bulk sampling was to identify asbestos containing materials (ACM's) to determine if asbestos containing materials are present.

A physical inspection and associated collection of bulk material samples for asbestos content and analysis was performed on March 3, 2026 by John Smoyer, a USEPA Accredited asbestos building inspector.

Section II — Survey Methods

A visual inspection of the green area was conducted for suspect asbestos containing building materials (ACBM). Bulk material samples were collected in compliance with 40 CFR, Part 763.86.

Bulk samples were collected from the material(s):

- **Window Glazing**
- **CMU Block Mortar**
- **Door/Window Caulk**
- **4" Cove Base & Mastic**
- **Frame Caulk to Brick**
- **Green Terrazzo Flooring**
- **4" Pipe Fitting Insulation**
- **6" Pipe Wrap**
- **6" Pipe Fitting Insulation**
- **Tectum Decking**
- **Fiberglass Batt Insulation Paper**

The scope of our survey did not include "Non-Accessible Areas" i.e. encroachment through interior architectural enclosures, nor the dismantlement of mechanical equipment.

If, during the course of construction, renovation, demolition or other activity which may encounter any suspect materials not identified in this report are encountered; construction activities should cease, and an accredited inspector called to survey and sample the area.

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Section III — Analysis / Procedure

Bulk sampling of suspect ACBM was accomplished by extracting several representative pieces of the material in question and transferring them into individual airtight plastic sample containers. Identification numbers were assigned and recorded on field data collection sheets / Chain of Custody forms.

During the survey & bulk sample collection activity, USEPA 40 CFR, Part 763, the Asbestos Hazard Emergency Response Act (AHERA) protocol was utilized.

All bulk samples were delivered to an independent laboratory and analysis for asbestos content was performed via "New Jersey Protocol" Polarized Light Microscopy (PLM) / Transmission Electron Microscopy (TEM) in accordance with N.J.A.C. 8:60 and 12:120 via EPA 600/R-93/116[1]

[1](It is recommended that all samples analyzed by PLM whose results indicate that a sample contains less than one percent asbestos be subsequently analyzed via Transmission Electron Microscopy (TEM) (Method for the Determination of Asbestos in Bulk Building Materials EPA/600/R-93/116, July 1993) to confirm / refute asbestos content).

Section IV — (*ND = No Asbestos Detected) — Bulk Sample Results/Homogenous Identification

Sample ID	Room Functional Space # / Location	Description of Material	Analysis Method	Asbestos Content	Location
6764-A01	Window Wall Adj. Meeting Room #5 Courtyard Side Door	Window Glazing	PLM	2% Chrysotile	Throughout on original windows
6764-A02	Window Wall Adj. Meeting Room #5 Courtyard Side Door	Window Glazing	PLM	Positive Stop	Throughout on original windows
6764-A03	Vest #1	CMU Block Mortar	PLM TEM	None Detected None Detected	Throughout Building
6764- A04	Vest #2	CMU Block Mortar	PLM	None Detected	Throughout Building
6764-A05	Courtyard Window Wall	Door/Window Caulk to Frame	PLM	3% Chrysotile	Throughout on original windows
6764-A06	Courtyard Window Wall	Door/Window Caulk to Frame	PLM	Positive Stop	Throughout on original windows
6764-A07-Cove Base	Divider Doorway (L)	4" Cove Base	PLM	None Detected	Throughout Building
6764-A07-Mastic	Divider Doorway (L)	Mastic	PLM TEM	None Detected None Detected	Throughout Building
6764-A08-Cove Base	Divider Doorway (R)	4" Cove Base	PLM	None Detected	Throughout Building
6764-A08-Mastic	Divider Doorway (R)	Mastic	PLM	None Detected	Throughout Building
6764-A09	Divider Doorway (R)	Frame Caulk to Brick	PLM	3% Chrysotile	Divider Doorway
6764-A10	Divider Doorway (L)	Frame Caulk to Brick	PLM	Positive Stop	Divider Doorway
6764-A11	Hall Vestibule #1 Adj. MR5	Mottled Green Terrazzo Flooring	PLM TEM	None Detected 6.9% Chrysotile	Throughout Building
6764-A12	Hall Vestibule #1 Adj Library A	Mottled Green Terrazzo Flooring	PLM	None Detected	Throughout Building
6764-A13	Vest #1	4" Pipe Fitting Insulation	PLM	None Detected	Throughout Building

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6764-A14	Vest #1	4" Pipe Fitting Insulation	PLM	None Detected	Throughout Building
6764-A15	Vest #2	4" Pipe Fitting Insulation	PLM	10% Chrysotile	Vestibule #2
6764-A16-Insulation	Vest #1	6" Pipe Fitting Insulation	PLM	None Detected	Throughout Building
6764-A16-Wrap	Vest #1	Pipe Wrap	PLM	None Detected	Throughout Building
6764-A17	Vest #1	6" Pipe Fitting Insulation	PLM	None Detected	Throughout Building
6764-A18	Vest #2	6" Pipe Fitting Insulation	PLM	None Detected	Throughout Building
6764-A19	Vest #1	Tectum Decking	PLM TEM	None Detected None Detected	Throughout Building
6764-A20	Vest #2	Tectum Decking	PLM	None Detected	Throughout Building
6764-A21	Vest #2	Fiberglass Batt Insulation Paper	PLM	None Detected	Throughout Building
6764-A22	Vest #2	Fiberglass Batt Insulation Paper	PLM	None Detected	Throughout Building
Assumed	Vest #2	9x9 Grey Floor Tile & Mastic	PLM	Previously sampled 5-8% Chyrsotile-Tile 1.4-8.2% Chrysotile-M	Various Areas in Building (Vest 2 for this section.)

Section V — Conclusion / Actions Required

Incorporate the results of this assessment into your facilities asbestos management plan so that the information can be utilized in future investigations.

All actions taken in regard to asbestos containing materials (ACM) should be in compliance with any applicable federal, state and local regulations or codes that may apply to handling i.e., clean-up, removal, enclosure, disposal etc.

If the subject facility is an educational facility, NJ county government building, daycare or public facility who leases to any of the aforementioned entities, then asbestos abatement activities are regulated by the New Jersey Asbestos Hazard Abatement Sub code (N.J.A.C. 5:23-8, the "Sub code" or Subchapter 8). The Sub code imposes procedural and organizational requirements on asbestos abatement projects. Among these are the requirements that each abatement project be managed / monitored by an authorized Asbestos Safety Control Monitor (ASCM) firm (such as AHERA Consultants, Inc.).

Materials testing positive for asbestos during this inspection that may require abatement prior to renovations:

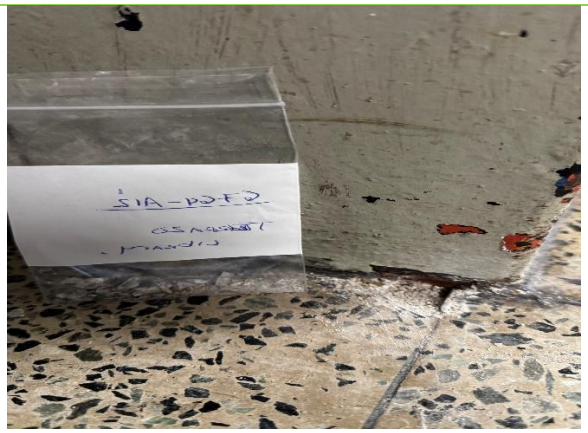
Material(s)	Homogenous ID

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Window Glazing	 001
Door / Window Caulk to Frame	 002
Frame Caulk to Brick	 003
4" Pipe Fitting Insulation **Fittings of all sizes that are exposed shall be assumed to be asbestos. Total of 8 fittings. Exposed fitting had an additional tan coating that tested positive.**	

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	 004
Green Terrazzo Floor	 005
9 x 9 Grey Floor Tile & Mastic **Assumed based on previous test in other areas of building.**	 006

Section VI — Laboratory Results

See attached laboratory sample analysis results.

END OF REPORT

AHERA Consultants INCORPORATED

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EMSL Analytical, Inc.

200 Route 130 North Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.EMSL.com / cinnasblab@EMSL.com

EMSL Order ID: 042603751
Customer ID: AHER50
Customer PO:
Project ID:

Attn: John Smoyer
Ahera Consultants, Inc.
PO Box 385
Oceanville, NJ 08231-0385

Phone: (609) 652-1833
Fax: (609) 652-1140
Collected: 3/ 3/2026
Received: 3/03/2026
Analyzed: 3/07/2026

Proj: 25-6764 / Willingboro-Kennedy Center / 429 John F Kennedy Way, Willingboro, NJ 08046

Summary Test Report for Asbestos Analysis of Bulk Materials in Accordance with N.J.A.C. 8:60 and 12:120

Client Sample ID: 6764-A01 ***Lab Sample ID:*** **042603751-0001**

Sample Description: Window Wall Adj. Meeting Room #5 Courtyard Side Door/White/Gray Window Glazing

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/03/2026	Gray/White	0.0%	98.0%	**2% Chrysotile**	

Client Sample ID: 6764-A02 ***Lab Sample ID:*** **042603751-0002**

Sample Description: Window Wall Adj. Meeting Room #5 Courtyard Side Door/White/Gray Window Glazing

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/03/2026			Positive Stop (Not Analyzed)		

Client Sample ID: 6764-A03 ***Lab Sample ID:*** **042603751-0003**

Sample Description: Vest #1/Gray CMU Block Mortar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/03/2026	Gray	0.0%	100.0%	None Detected	
TEM Grav. Reduction	3/07/2026	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 6764-A04 ***Lab Sample ID:*** **042603751-0004**

Sample Description: Vest #2/Gray CMU Block Mortar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/04/2026	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 6764-A05 ***Lab Sample ID:*** **042603751-0005**

Sample Description: Courtyard Window Wall/Gray Door/Window Caulk to Frame

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/03/2026	Gray	0.0%	97.0%	**3% Chrysotile**	

Client Sample ID: 6764-A06 ***Lab Sample ID:*** **042603751-0006**

Sample Description: Courtyard Window Wall/Gray Door/Window Caulk to Frame

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/03/2026			Positive Stop (Not Analyzed)		

Client Sample ID: 6764-A07-Cove Base ***Lab Sample ID:*** **042603751-0007**

Sample Description: Divider Doorway (L)/Black 4" Cove Base

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/03/2026	Black	0.0%	100.0%	None Detected	

EMSL Analytical, Inc.
200 Route 130 North Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.EMSL.com / cinnasblab@EMSL.com

EMSL Order ID: 042603751
Customer ID: AHER50
Customer PO:
Project ID:

Summary Test Report for Asbestos Analysis of Bulk Materials in Accordance with N.J.A.C. 8:60 and 12:120

Client Sample ID: 6764-A07-Mastic ***Lab Sample ID:*** **042603751-0007A**
Sample Description: Divider Doorway (L)/Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/03/2026	Brown/Tan	0.0%	100.0%	None Detected	
TEM Grav. Reduction	3/07/2026	Brown/Tan	0.0%	100.0%	None Detected	

Client Sample ID: 6764-A08-Cove Base ***Lab Sample ID:*** **042603751-0008**
Sample Description: Divider Doorway (R)/Black 4" Cove Base

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/04/2026	Black	0.0%	100.0%	None Detected	

Client Sample ID: 6764-A08-Mastic ***Lab Sample ID:*** **042603751-0008A**
Sample Description: Divider Doorway (R)/Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/04/2026	Brown/Tan	0.0%	100.0%	None Detected	

Client Sample ID: 6764-A09 ***Lab Sample ID:*** **042603751-0009**
Sample Description: Divider Doorway (R)/Gray Frame Caulk to Brick

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/03/2026	Gray	0.0%	97.0%	**3% Chrysotile**	

Client Sample ID: 6764-A10 ***Lab Sample ID:*** **042603751-0010**
Sample Description: Divider Doorway (L)/Gray Frame Caulk to Frame

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/03/2026				Positive Stop (Not Analyzed)	

Client Sample ID: 6764-A11 ***Lab Sample ID:*** **042603751-0011**
Sample Description: Hall Vestibule #1 Adj MR5/Mottled Green Terrazo Flooring

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/03/2026	White/Black/Green	0.0%	100.0%	None Detected	
TEM Grav. Reduction	3/07/2026	White/Black/Green	0.0%	93.1%	**6.9% Chrysotile**	

Client Sample ID: 6764-A12 ***Lab Sample ID:*** **042603751-0012**
Sample Description: Hall Vestibule #1 Adj Library A/Mottled Green Terrazo Flooring

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/04/2026	White/Black/Green	0.0%	100.0%	None Detected	

Client Sample ID: 6764-A13 ***Lab Sample ID:*** **042603751-0013**
Sample Description: Vest #1 /Gray 4" Pipe Fitting Insulation

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/03/2026	Gray	45.0%	55.0%	None Detected	

EMSL Analytical, Inc.
200 Route 130 North Cinnaminson, NJ 08077
Phone/Fax: (800) 220-3675 / (856) 786-5974
http://www.EMSL.com / cinnasblab@EMSL.com

EMSL Order ID: 042603751
Customer ID: AHER50
Customer PO:
Project ID:

Summary Test Report for Asbestos Analysis of Bulk Materials in Accordance with N.J.A.C. 8:60 and 12:120

Client Sample ID: 6764-A14 ***Lab Sample ID:*** **042603751-0014**
Sample Description: Vest #1/Gray 4" Pipe Fitting Insulation

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/03/2026	Gray	45.0%	55.0%	None Detected	

Client Sample ID: 6764-A15 ***Lab Sample ID:*** **042603751-0015**
Sample Description: Vest #2 /Gray 4" Pipe Fitting Insulation

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/04/2026	Tan	40.0%	50.0%	**10% Chrysotile**	

Client Sample ID: 6764-A16-Insulation ***Lab Sample ID:*** **042603751-0016**
Sample Description: Vest #1/Gray 6" Pipe Fitting Insulation

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/03/2026	Gray	60.0%	40.0%	None Detected	

Client Sample ID: 6764-A16-Wrap ***Lab Sample ID:*** **042603751-0016A**
Sample Description: Vest #1/Gray 6" Pipe Wrap

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/03/2026	White	95.0%	5.0%	None Detected	

Client Sample ID: 6764-A17 ***Lab Sample ID:*** **042603751-0017**
Sample Description: Vest #1/Gray 6" Pipe Fitting Insulation

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/03/2026	Gray/Tan	45.0%	55.0%	None Detected	

Client Sample ID: 6764-A18 ***Lab Sample ID:*** **042603751-0018**
Sample Description: Vest #2 /Gray 6" Pipe Fitting Insulation

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/04/2026	Gray	45.0%	55.0%	None Detected	

Client Sample ID: 6764-A19 ***Lab Sample ID:*** **042603751-0019**
Sample Description: Vest #1/Gray Brown Tectum Decking

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/03/2026	Gray/White	10.0%	90.0%	None Detected	
TEM Grav. Reduction	3/07/2026	Gray/White	0.0%	100.0%	None Detected	

Client Sample ID: 6764-A20 ***Lab Sample ID:*** **042603751-0020**
Sample Description: Vest #2/Gray Brown Tectum Decking

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/04/2026	Gray/White	30.0%	70.0%	None Detected	

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EMSL Order ID: 042603751
Customer ID: AHER50
Customer PO:
Project ID:

Summary Test Report for Asbestos Analysis of Bulk Materials in Accordance with N.J.A.C. 8:60 and 12:120

Client Sample ID: 6764-A21 ***Lab Sample ID:*** **042603751-0021**

Sample Description: Vest #2/Black Fiberglass Batt Insulation Paper

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/03/2026	Black/Yellow	55.0%	45.0%	None Detected	

Client Sample ID: 6764-A22 ***Lab Sample ID:*** **042603751-0022**

Sample Description: Vest #2/Black Fiberglass Batt Insulation Paper

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/04/2026	Brown/Yellow	70.0%	30.0%	None Detected	

Analyst(s):

Amiri Lewis	PLM (14)
Gregory Barry	TEM Grav. Reduction (4)
Russell Hayden	PLM (8)

Reviewed and approved by:

Samantha Sweeney

Samantha Sweeney, Laboratory Manager
or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This is a summary report; official reports are available on LabConnect or upon request and relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 "Interim Method") but augmented with procedures outlined in the 1993 ("final") version of the method. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ NVLAP Lab Code 101048-0, AIHA LAP, LLC-IHLAP Lab 100194, PA ID# 68-00367, LA #04127

Initial report from: 03/04/202608:01:52

OrderID: 042603751

042603751

CHAIN OF CUSTODY

Client:	AHERA Consultants, Inc.	**Project #:**	25-6764
Address:	PO Box 385	**Project Name:**	Willingboro-Kennedy Center
	Oceanville, NJ 08231-0385		Willingboro Township
Phone:	(609) 652 - 1833		429 John F Kennedy Way
E-Mail:	AHERA@AHERAINC.COM		Willingboro, NJ 08046
Fax:	(609) 652 - 1140	**Contact:**	John Smoyer

TYPE:

ASBESTOS			LEAD			OTHER
[X] AIR	[ ] SOIL		[ ] AIR	[ ] SOIL		
[ ] BULK	[ ] DUST		[ ] BULK	[ ] PAINT		
[ ] WATER	[ ] OTHER		[ ] WATER	[ ] OTHER		

ANALYSIS METHOD:

[ ] PCM:	NIOSH 7400	[X] PLM:	BULK ASBESTOS EPA600	[ ] TEM:	AHERA
[ ] PCM:	OSHA	[ ] PLM:	POINT COUNTING	[ ] TEM:	NIOSH 7402
[ ] PCM:	OTHER	[ ] PLM:	OTHER	[ ] TEM:	EPA LEVEL II
		[ ] PLM:	EPA NOB (gravimetric reduction)	[ ] TEM:	ASBESTOS IN WATER

[ ] AAS:	LEAD IN DRINKING WATER	[ ] TEM:	BULK ANALYSIS
[ ] AAS:	LEAD IN PAINT	[ ] TEM:	MICROVAC DUST
[ ] AAS:	OTHER LEAD	[ ] TEM:	EPA NOB (gravimetric reduction)
[ ] AAS:	OTHER METALS		
[ ] AAS:	NIOSH 7082 (lead in air)	[ ] TOTAL DUST:	EPA/OSHA

RECEIVED EMSL CINNAMINSON, NJ 2026 MAR -3 P 3:54

TURN AROUND TIME:

[ ] 5 DAY [ ] 72 HOUR [ ] 48 HOUR [X] 24 HOUR [ ] 6 HOUR

SAMPLE NUMBERS:

CLIENT SAMPLE NUMBERS: 6764-01 TO 6764-22 TOTAL: 22

RELINQUISHED:		**DATE:** 3-3-2026	**TIME:**
RECEIVED:	Kentell T. WI	**DATE:** 3/3/26	**TIME:** 3:55pm
SAMPLE LOG-IN:		**DATE:**	**TIME:**
ANALYZED:		**DATE:**	**TIME:**
REVIEWED:		**DATE:**	**TIME:**
ARCHIVED:		**DATE:**	**TIME:**
RELEASED:		**DATE:**	**TIME:**

22 DT

AHERA Consultants INCORPORATED
PO Box 385
Oceanville, NJ 08231-0385
Phone: 609.652.1833
Fax: 609.652.1140
E-mail: ahera@aherainc.com

OrderID: 042603751

042603751

BULK MATERIAL SAMPLING LOG

RECEIVED
EMSE
CINNAMINSON, NJ
2026 MAR -3 P 3:54

CLIENT: AHERA Consultants, Inc.
ADDRESS: PO Box 385
Oceanville, NJ 08231-0385
PHONE: (609) 652 - 1833
FAX: (609) 652 - 1140
PROJECT #: 25-6764-A
CONTACT: John Smoyer

DATE: 3/3/2026
PROJECT: Willingboro-Kennedy Center
Bulk Sampling
429 John F Kennedy Way, Willingboro, NJ 08046
CLIENT: Willingboro Township
1 Rev. Dr. Martin Luther King Jr. Drive
Willingboro, NJ 08046
ANALYSIS: PLM EPA 600
TURNAROUND 24 TAT

OTHER INSTRUCTIONS: **STOP EACH SET AT FIRST POSITIVE.**

SAMPLE #	HOMG #	COLOR	MATERIAL TYPE	FUNC SPACE #	LOCATION DESCRIPTION	NOTES
6764-A01		WHITE/ GRAY	WINDOW GLAZING		WINDOW WALL ADJ. MEETING ROOM #5 COURTYARD SIDE	DOOR
6764-A02		WHITE/ GRAY	WINDOW GLAZING		(SAME AS ABOVE)	WINDOW
6764-A03		GRAY	CMU BLOCK MORTAR		VEST #1	
6764-A04		GRAY	CMU BLOCK MORTAR		VEST #2	
6764-A05		GRAY	DOOR / WINDOW CAULK TO FRAME		COURTYARD WINDOW WALL	
6764-A06		GRAY	DOOR/WINDOW CAULK TO FRAME		COURTYARD WINDOW WALL	
6764-A07		BLACK	4" COVE BASE & MASTIC		DIVIDER DOORWAY (L)	
6764-A08		BLACK	4" COVE BASE & MASTIC		DIVIDER DOORWAY (R)	
6764-A09		GRAY	FRAME CAULK TO BRICK		DIVIDER DOORWAY (R)	30' x 9'
6764-A10		GRAY	FRAME CAULK TO FRAME		DIVIDER DOORWAY (L)	
6764-A11		MOTTLED GREEN	TERRAZO FLOORING		HALL VESTIBULE #1 ADJ MR5	
6764-A12		MOTTLED GREEN	TERRAZO FLOORING		HALL VESTIBULE #1 ADJ LIBRARY A	
6764-A13		GRAY	4" PIPE FITTING INSULATION		VEST #1 (12) F	
6764-A14		GRAY	4" PIPE FITTING INSULATION		VEST #1 "	
6764-A15		GRAY	4" PIPE FITTING INSULATION		VEST #2 (6) F	
6764-A16		GRAY	6" PIPE FITTING INSULATION		VEST #1 (2) F	
6764-A17		GRAY	6" PIPE FITTING INSULATION		VEST #1 "	
6764-A18		GRAY	6" PIPE FITTING INSULATION		VEST #2 (2) F	

AHERA Consultants INCORPORATED
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Oceanville, NJ 08231-0385
Phone: 609.652.1833
Fax: 609.652.1140
E-mail: ahera@aherainc.com

OrderID: 042603751

042603751

BULK MATERIAL SAMPLING LOG

RECEIVED
EMSL
CINNAMINSON, NJ
2026 MAR -3 P 3:54

CLIENT: AHERA Consultants, Inc.
ADDRESS: PO Box 385
Oceanville, NJ 08231-0385
PHONE: (609) 652 - 1833
FAX: (609) 652 - 1140
PROJECT #: 25-6764
CONTACT: John Smeyer

DATE: 3/3/2026
PROJECT: Willingboro-Kennedy Center
Bulk Sampling
429 John F Kennedy Way, Willingboro, NJ 08046
CLIENT: Willingboro Township
1 Rev. Dr. Martin Luther King Jr. Drive
Willingboro, NJ 08046
ANALYSIS: PLM EPA 600
TURNAROUND 24 TAT ~~EPA 600~~

OTHER INSTRUCTIONS: **STOP EACH SET AT FIRST POSITIVE.**

SAMPLE #	HOMG #	COLOR	MATERIAL TYPE	FUNC SPACE #	LOCATION DESCRIPTION	NOTES
6764-A19	~~GRAY BROWN~~	GRAY BROWN	TECTUM DECKING		~~BOTTOM~~ VEST #1	
6764-A20	6	GRAY BROWN	TECTUM DECKING		VEST #2	
6764-A21		BLACK	FIBERGLASS BATT INSUL. PAPER		VEST #2	
6764-A22		BLACK	FIBERGLASS BATT INSULATION PAPER		VEST #2	

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Phone: 609.652.1833
Fax: 609.652.1140
E-mail: ahera@aherainc.com

Christy, Sherry 042603751

From: Info/AHERA <ahera@aherainc.com>
Sent: Thursday, March 5, 2026 10:04 AM
To: Christy, Sherry; EMSL Lab - Cinnaminson Asbestos
Cc: Info/AHERA
Subject: RE: EMSL report, COC for order(s) 042603751 (042603751 - 25-6764 / Willingboro-Kennedy Center / 429 John F Kennedy Way, Willingboro, NJ 08046)

[EXTERNAL E-MAIL]

Please take the following to TEM NOB with 48 HR TAT, If any are insufficient material please use like sample for analysis.

042603751-0003, 0007A, 0011, 0019

Thanks

Dominique Bicho

AHERA Consultants, Inc.

PO Box 385, Oceanville, NJ 08231-0385

W: (609) 652 1833

F: (609) 652 1140

dominiquebicho@aherainc.com

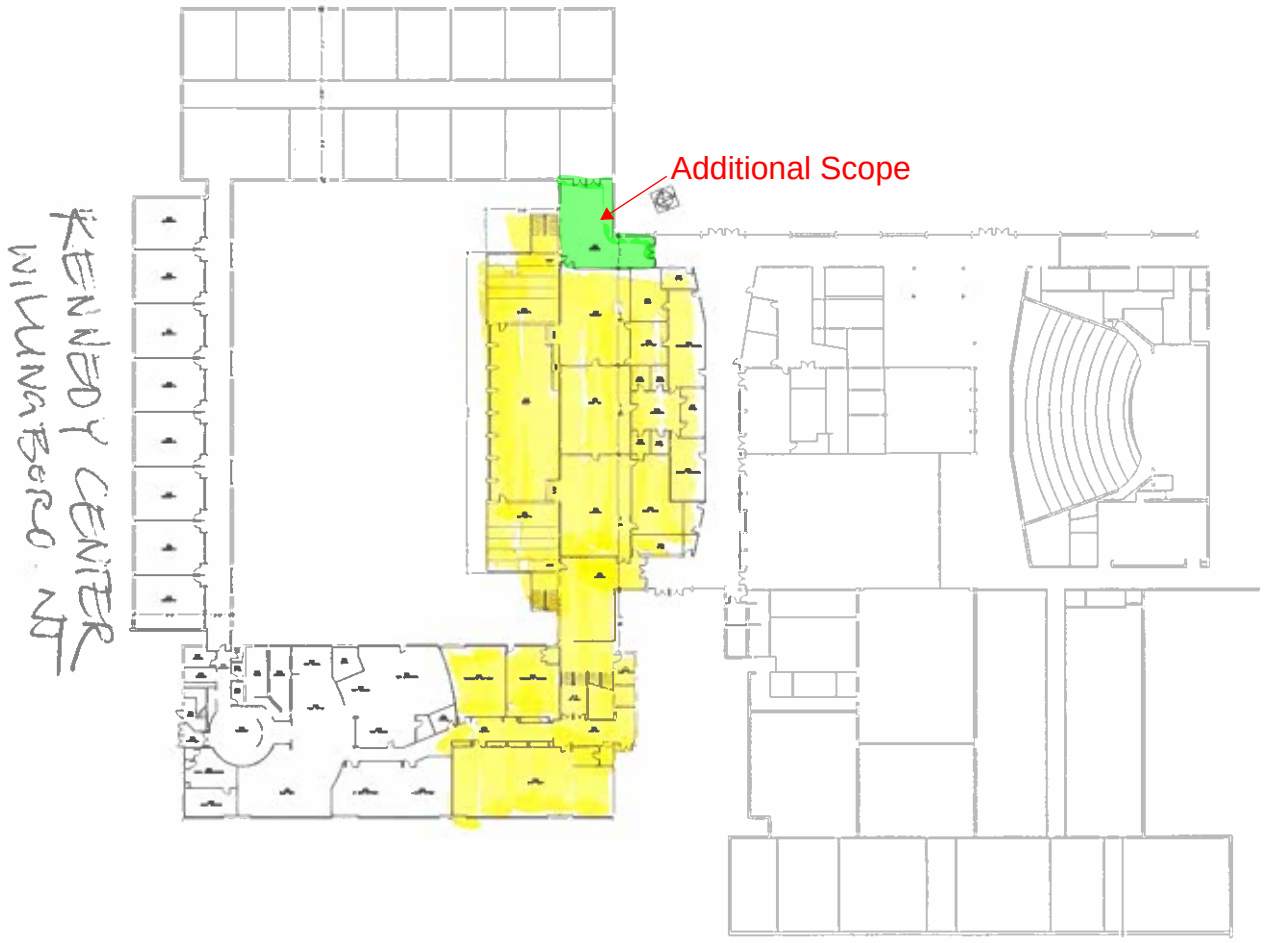
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From: EMSL (Cinnaminson) <cinnasblab@EMSL.com>
Sent: Wednesday, March 4, 2026 9:29 AM
To: Info/AHERA <ahera@aherainc.com>
Subject: EMSL report, COC for order(s) 042603751 (042603751 - 25-6764 / Willingboro-Kennedy Center / 429 John F Kennedy Way, Willingboro, NJ 08046)


Additional Scope
KENNEDY CENTER
WILLIAMSBURG, VA

181 US Hwy 46
Mine Hill, NJ 07803
(908) 654-8068
(800) 783-0567
Fax 908-654-8069

LEAD-BASED PAINT EVALUATION REPORT
INSPECTION

Performed At:
Kennedy Center
429 John F Kennedy Way
Willingboro, NJ, 08046

Performed For:
AHERA Consultants, Inc.
Donna D'Errico
PO Box 385
Oceanville, NJ, 08231

Prepared By:
LEW Environmental Services, LLC.
181 US Hwy 46
Mine Hill, NJ 07803

Phone (908) 654-8068
Fax (908) 654-8069

Inspection Date: 03/03/2026
Project Number: 4335

Table of Contents

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CONTROLLING LEAD-BASED PAINT **5**
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Appendices

Appendix A Floor Plan
Appendix B Lead-Based Paint Evaluation Report
Appendix C Photographs (If Applicable)
Appendix D Lab Support Documents (If Applicable)

Contact Information

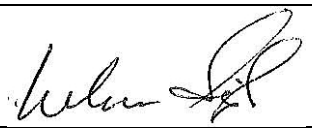
Site

Name	Kennedy Center
Street Address	429 John F Kennedy Way, Willingboro, NJ, 08046

Client

Name	AHERA Consultants, Inc.
Contact	Donna D'Errico
Street	PO Box 385, Oceanville, NJ, 08231
Phone Number	(609) 577-8802

Site Evaluator

Site Evaluator	Neheru Singh
Certification Number	NJDOH 027180
Instrumentation	Viken Pb200i Serial #2130
Signature	
Date	March 10, 2026

Firm

Organization:	LEW Environmental Services, LLC.
Certification #:	NJDCA 00015
Street:	181 US Hwy 46
City, State & Zip:	Mine Hill, NJ 07803
Phone Number:	908-654-8068
Web Address:	www.lewcorp.com

Background

Renovations are slated for a section of the Kennedy Center in Willingboro, NJ. AHERA consultants has requested lead-based paint testing via XRF of the areas highlighted in GREEN on the floor plan provided on 5/2/25.

LEW Environmental Services proposes to perform lead-based paint testing of the of the areas highlighted in GREEN on the floor plan.

Executive Summary

On 03/03/2026 Neheru Singh of LEW Environmental Services, LLC. performed lead-based paint testing at Kennedy Center 429 John F Kennedy Way, Willingboro, NJ, 08046. All painted surfaces were tested in the green highlighted areas as directed by client. The lead-based paint inspection sampling protocol that was applied to the areas tested follows "Inspections in Single-Family Housing" Chapter 7 of the HUD Guidelines (2012 revision) and the protocol as referenced in USEPA 40 CFR Part 745.227(b). Of the 38 readings taken, **0** were positive for lead-based paint. See Appendix B Lead Paint Inspection Report for the complete set of X-Ray Fluorescence data.

The unit A-Wall pertains to the wall that is in the same plane or closest to the street address of the property.

The tables below indicate the location of the lead-based paint found. Each positive reading applies to all similar components in the same room equivalent (room, hall, stairwell, building exterior, etc.) For a lead-based paint free certification, the lead must be stripped or the leaded component replaced and confirmation achieved. Enclosure and encapsulation are not acceptable methods for a lead-based paint free certification.

Green Highlighted Hallways: Components with Lead Based Paint

Room Equivalent	Component	Substrate	Value($^{mg}/_{cm^2}$)
NONE			

Paint Chips (if applicable)

Sample number	Location	Measurement	Actionable
NONE COLLECTED			

EPA 40 CFR 745.227(h) states lead-based paint is present on any surface that is tested and found to contain lead equal to or in excess of 1.0 milligrams per square centimeter or equal to or in excess of 0.5% by weight. Local thresholds may be lower than this Federal standard. For example, NYC defines LBP as equal to or in excess of 0.5 milligrams per square centimeter

Regulatory Requirements

Required Disclosure

A summary of this lead-based paint evaluation report must be provided to new lessees (tenants). A complete copy of this report must be provided to purchasers and owners of this property and it must be made available to new tenants under federal law (24 CFR PART 35 AND 40 CFR PART 745) before they become obligated under a lease or sales contract. Landlords (lessors) and sellers are also required to distribute an educational pamphlet approved by the U.S. Environmental Protection Agency and include standard warning language in their leases or sales contracts to ensure that parents have the information they need to protect their children from lead-based paint hazards."

Should the recipient of this report receive federal subsidy they are responsible to comply with all requirements of 24 CFR Part 35 Requirements for the Notification, Evaluation and Reduction of Lead-Based Paint Hazards in Federally Owned Residential Property and Housing Receiving Federal Assistance; Final Rule which, are applicable to the type of program they are participating in and the dollar amount of subsidy being received. If this property or any of its tenants receives financial federal assistance, the results of the evaluation or hazard reduction activities must be provided by the designated party (client) to the owner of the referenced property and the occupants within 15 calendar days of the date when the designated party receives this report, or makes the presumption that lead-based paint hazards do exist.

Required Training for Workers

Should the lead-based paint and lead hazard reduction activities be part of a program which receives federal subsidy or a New Jersey multifamily building, all persons performing "Interim Controls" or "Standard Treatments" must be trained in accordance with 29 CFR 1926.59 and be supervised by an individual who successfully completed one of the following courses:

1. A lead-based paint abatement supervisors course accredited in accordance with 40 CFR 745.225
2. A lead-based paint abatement worker course accredited in accordance with 40 CFR 745.225
3. The lead-based paint Maintenance Training Program, "Work Smart, Work Wet, and Work Clean to Work Lead Safe", prepared by the National Environmental Training Association for EPA and HUD
4. "The Remodeler's and Renovator's Lead-Based Paint Training Program," prepared by HUD and the National Association of the Remodeling Industry
5. Another course approved by HUD for this purpose after consultation with EPA.

In accordance with Section 35.1340 all Lead-Based Paint and Lead Hazard reduction activities, which are not exempt (see regulations) require Lead Dust Wipe Clearance testing by a 1) certified lead inspector, 2) certified risk assessor or 3) a dust wipe sampling technician whose work is reviewed by a certified risk assessor.

If a renovation at the property is to occur, all work should comply with 40 CFR 745 Subpart E-Residential Property Renovation.

Controlling Lead-Based Paint

There are different options available for controlling lead-based paint. Each option has its own associated costs and benefits both short and long term. In most cases, a combination of the options can be implemented to reduce the possibility of lead contamination. LEW Environmental Services, LLC. strongly suggests that each option is thoroughly contemplated before beginning any activity.

Components that are found to be positive for lead-based paint should be checked for deterioration. Lead-based paint in deteriorated condition is considered a paint-lead hazard. Those components should be address as soon as possible using lead safe work practices at a minimum. However, if any components are found to test positive for lead based paint, they should be considered for future component removal or paint stripping.

Abatement for Lead-Based Paint Free Certification

Component Removal

Component removal is a permanent solution to the issue of potential exposure of lead. It requires taking the old lead-based painted component out and replacing it with a new non-lead painted component. The cost associated with this option depends mostly on the cost of the replacement component. Since labor is most often the more costly aspect of controlling lead issues, many owners choose component removal over more labor intensive methods. Components often chosen for removal are wood trim, windows, most doors, and exterior railings. Plaster and drywall ceilings and walls, fire rated doors, and wood porch components should also be considered.

Paint Stripping

Paint stripping is a permanent solution to the issue of potential exposure of lead. The paint can be removed either in-place or by an off-site processing facility. In-place removal can be mechanical or chemical. In-place paint stripping has the issue of proper disposal of the hazardous waste generated.

Mechanical stripping scrapes the paint off the substrate. Most times dry scraping is prohibited, but sanding or scraping can be done in conjunction with engineering controls to reduce airborne and settled lead dust. Power tools used to remove the paint must be equipped with a HEPA filtered shroud. Wetting a surface and hand scraping is also permitted. The components most often chosen for hand scraping are window and door jambs. Power tools are better equipped to handle lager surface areas.

Chemical stripping in-place uses strong chemicals to soften the paint for easier removal from the substrate. The chemicals are either very acidic or very basic, so proper training and protection for the worker is imperative. Generally, the chemicals must remain in- place overnight, so maintaining a secure worksite separate from occupants is mandatory.

Off site facilities use much stronger chemicals to remove the lead-based paint from the component. Components often chosen for off-site paint removal are intricate metal pieces. Sometimes this method is used for intricate wood work, but the stronger chemicals soften the wood and can drive lead into the wood while removing the paint.

Abatement to Control Lead-Based Paint Hazards

Enclosure

Enclosure is the option of sealing off the lead-based painted component by sealing it in with another building material. Such materials would include, but are not limited to; sheet rock, paneling, vinyl or aluminum siding and radiator covers, etc. Enclosure is not a permanent solution; and, if the enclosure material ever becomes disturbed, the lead-based paint is exposed. Depending on the building material used for enclosure, this can be an affordable option. Depending on the enclosure option taken it is possible that no lead abatement procedures need to be followed; but, of course, consult a professional before beginning.

Encapsulation

Encapsulation is the process of using an encapsulant-type of product that is applied over the lead-painted component. There are currently many different types of encapsulants on the market, and they come in many different forms. Some encapsulants are like stucco, some are like a two-part epoxy, some are like a heavy latex paint, and some are like a cement or plaster. Different types of encapsulants have different life expectancies and some come in different colors. None of the encapsulants are guaranteed forever, although some do come with a life or 10 to 20 year guarantee. To be considered a true lead abatement method according to the American Society of Testing Materials (ASTM) the encapsulant must meet their longevity criteria of at a minimum twenty (20) years. This option is not a permanent solution; and if the encapsulant ever becomes disturbed, the lead-based paint is exposed. Encapsulation is typically the least expensive option and has currently been accepted at the federal level as a viable and affordable option for lead abatement or in-place management, assuming the encapsulant meets the ASTM requirements for encapsulants.

Interim Control Options

An In-Place Management program is an on going set of measures designed to temporarily reduce human exposure or possible exposure and accessibility to lead-based paint hazards. Such measures include specialized cleaning, repairs, maintenance, paint stabilization, painting, temporary containment, and management and resident education programs. Monitoring, conducted by owners, and reevaluations conducted by professionals, are integral elements of interim controls. Interim controls include dust removal; paint film stabilization; treatment of friction and impact surfaces; installation of soil coverings, such as grass or sod; ground covering plants so as not to allow for easy accessibility, and land-use controls

Unlike Abatement, Interim Controls are considered to be temporary repairs and are not to be used as permanent solutions to lead-based hazards. Interim controls strategies are a very effective and cost saving program to substantially reduce the potential for lead poisoning. However, interim controls programs will only work and prove effective if reevaluation is continually performed. Reevaluation is the combination of a visual assessment and collection of environmental samples by a certified risk assessor on an on-going basis to determine if a previously implemented lead-based hazard control measure is still effective and if the dwelling remains lead-safe.

LEW Environmental Services, LLC. strongly suggests that HEPA vacuuming and Lead-Specific Cleaning detergent/LEDIZOLV wash downs should continue on a routine basis and a continual visual inspection/assessment and sample collection should be performed at least every 1 to 3 years, or until the dust levels continually remain below actionable levels.

Procedures & Methodology

Location Conventions

When reviewing Appendix A “Floor Plan” and Appendix B “Lead-Based Paint Evaluation Report”, you will notice that the letters A, B, C, and D are used to identify the location of specific components. The key to correct orientation is the location of the “A” wall, which is depicted on the floor plan or in the Executive Summary. The “B” wall, “C” wall, and “D” wall run clockwise from the “A” wall. The Lead-Based Paint Evaluation Report lists this information under the “Wall” column. The “Location” column uses numbering of replicated components starting with “1” at left and continuing sequentially to right respectively to describe the location of the component while facing the wall identified.

Paint Testing

X-Ray Fluorescence

X-Ray Fluorescence (XRF) paint testing is performed to detect the presence of lead on painted surfaces. The XRF instrument is state-of-the art equipment. XRF testing is usually the preferred method of testing, because it is non-destructive, quantitative and can be performed on the spot with acceptable accuracy. LEW Environmental Services, LLC. ’s evaluators follow the manufacturer’s suggested use and the Performance Characteristic Sheet of the XRF instrument being used. The results of the XRF testing are the basis for drawing conclusions and making recommendations in the report.

All LEW Environmental Services, LLC. ’s evaluators follow 40 CFR 745 and the HUD Guidelines for testing lead using an XRF instrument. All federal, state and city regulations are followed when applicable. The evaluator will test one of each and every different type of testing combination (component) in each room being surveyed. Each XRF reading is assigned an exclusive sample reference number and a measurement that is stored in the instrument. Each sample reference number location is logged on the XRF instrument for future reference, testing location, and report generation. The above described testing format is followed unless otherwise not practical or if the evaluator’s judgment decides to test in a different systematic approach.

It should be noted that detected lead levels below current levels still could create lead dust or lead-contaminated soil hazards if the paint is turned into dust by abrasion, scraping, or sanding leading to possible elevated blood lead levels. Lead poisoning is a cumulative affect. Should a child or an adult inhale or ingest sufficient quantities of low

concentrations of leaded paint, dust, or soil, it will accumulate in the body's systems and could eventually cumulate to an elevated blood level of concern.
Any untested building components should be considered lead-based paint until tested.

Substrate Correction

X-Ray Fluorescence (XRF) readings are sometimes subject to systematic biases as a result of interference from substrate material beneath the paint. The magnitude and direction of bias depends on the substrate, the specific XRF instrument being used, and other factors such as temperature and humidity. Results can be biased in either the positive or negative direction and may be quite high. Consequently, the XRF Performance Characteristic Sheet is consulted to determine the requirements for XRF substrate correction conditions.

XRF results are corrected for substrate bias by subtracting a correction value determined by randomly selecting two housing units to be used to collect substrate measurements for all substrates within the development that need corrections and use the results from those two units to perform substrate correction calculations in all tested units within the development or building. The substrate correction value is obtained by using the specific XRF instrument(s) that is/are being used at the site. The correction value is an average of six XRF readings taken over red NIST SRM (1.02mg/cm^2) paint film, with three readings taken from two test locations that have been scraped visually clean of their paint coating. The red NIST SRM 1.02mg/cm^2 is then subtracted from the average of the six readings; the result is the Substrate Correction value. The substrate correction value is then subtracted from the XRF measurement on the specific testing combinations that falls within the substrate correction range according to the Performance Characteristic Sheets requirements. According to the Performance Characteristic Sheet for the XRF instrument once a substrate correction value is applied should it be needed the final Lead-Based Paint measurement should be either Positive or Negative.

Calibration Check Readings

In addition to the manufacturer's recommended warm up and quality control procedures, LEW Environmental Services, LLC. collects quality control readings as recommended in the HUD Guidelines. Quality control for XRF instrumentation instruments involves readings to check calibration.

For each XRF instrument, one set of XRF calibration check readings are recommended at least every four hours. The first is a set of three nominal-time or source decay corrected time XRF calibration check readings to be taken before the inspection begins for the day. The second occurs either after the day's inspection work has been completed, or at least every four hours, whichever occurs first. LEW Environmental Services, LLC. 's XRF calibration check readings are taken on the Standard Reference Material (SRM) paint film nearest to 1.0 mg/cm^2 within the National Institute of Standards and Technology (NIST) SRM Used or the XRF manufacturer's factory supplied SRM film. Three readings are collected on the SRM. The average of the three readings on the SRM must be within the acceptable plus and minus tolerances for proper calibration as detailed in the Performance Characteristic Sheet (PCS). All calibration checks are taken with the SRM film positioned at least several inches away from any potential source of lead.

Three readings are taken each time calibration check readings are made, the readings are taken using the nominal time that is specified in the Performance Characteristic Sheet. The average of the readings are compared to the known value and if the average value is within the acceptable calibration check tolerance specified in the XRF Performance Characteristic Sheet the instrument is considered in control. If the average readings are not within the calibration check tolerance the instrument is not used until the instrument is brought back into control.

Paint Chips

Paint chips are taken for confirmation of lead based paint, or as a solution to inconclusive measurement recorded by the use of XRF testing. Paint chips are typically not taken unless absolutely necessary. On components that are right on the XRF action level, a paint chip is the only other way to get a conclusive determination as to the level of lead in the paint and if the component should be considered as actionable or not. Paint chips, when taken, are usually taken from an inconspicuous areas and tape and/or paint is placed over the removed paint location.

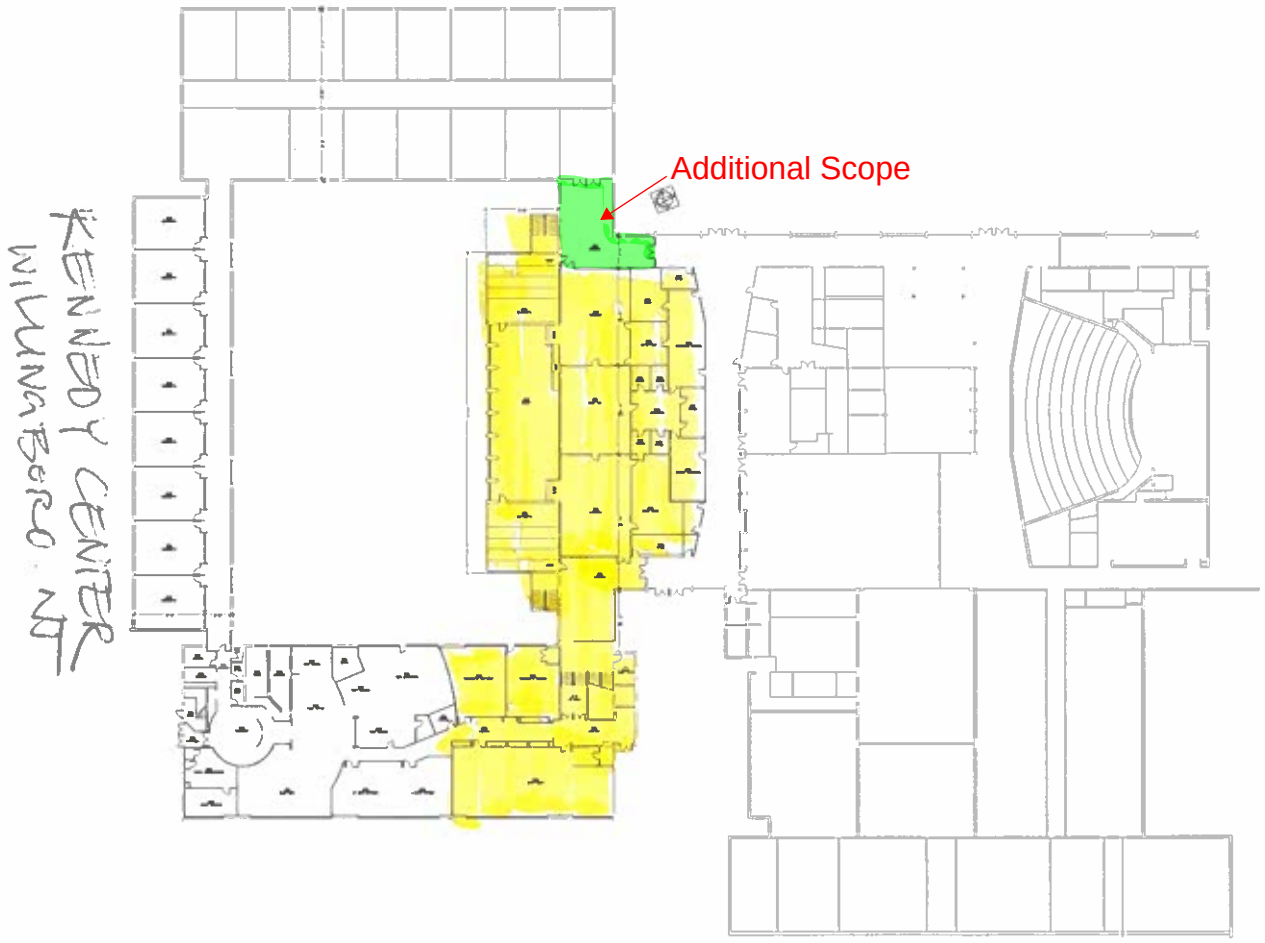
When the inspector collects paint-chip samples for analysis, they are analyzed by a laboratory recognized under the EPA's National Lead Laboratory Accreditation Program (NLLAP). Paint-chip samples contain all layers of paint (not just

peeled layers) and must always include the bottom layer. If results will be reported in mg/cm², including a small amount of substrate with the sample will not significantly bias results. Substrate material should not, however, be included in samples reported in weight percent. Paint from 4 square inches (25 square centimeters) should provide a sufficient quantity for laboratory analysis. Smaller surface areas may be used, if the laboratory indicates that a smaller sample is acceptable.

Current action levels for lead in paint:

PAINT CHIP ACTION LEVELS BY PERCENT WEIGHT	0.5% OR 5000 parts per million
PAINT CHIP ACTION LEVELS BY WEIGHT PER AREA	Same as XRF action levels, may be state dependent

Appendix A Floor Plan


Additional Scope
KENNEDY CENTER
WILLIAMSBURG, VA

Appendix B Lead-Based Paint Evaluation Report

Company	LEW Corporation
XRF Make	Heuresis
Model	Pb200i
Serial Num.	2129
Lead concentration units: mg/cm2	
Total Readings:	38
Action Level	1
Mode	Action Level
Analytic Mode	Paint

All Readings

Job Id	Reading #	Concentration	Result	Calibration	RTA Present	Date	Time	User	Analytic Mode	Site Address	Area	Unit #	Room	Structure	Member	Substrate	Wall	Location
3031127	4597	0.9		TRUE	FALSE	3/3/2026	11:27 AM	Neheru Singh	Paint	429 JFK Way								
3031127	4598	0.9		TRUE	FALSE	3/3/2026	11:27 AM	Neheru Singh	Paint	429 JFK Way								
3031127	4599	0.9		TRUE	FALSE	3/3/2026	11:28 AM	Neheru Singh	Paint	429 JFK Way								
3031127	4600	0		TRUE	FALSE	3/3/2026	11:28 AM	Neheru Singh	Paint	429 JFK Way								
3031127	4601	0		TRUE	FALSE	3/3/2026	11:28 AM	Neheru Singh	Paint	429 JFK Way								
3031127	4602	0		TRUE	FALSE	3/3/2026	11:28 AM	Neheru Singh	Paint	429 JFK Way								
3031127	4603	0.1	Negative	FALSE	FALSE	3/3/2026	11:29 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 1	Door	---	Wood	B	1
3031127	4604	0.1	Negative	FALSE	FALSE	3/3/2026	11:29 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 1	Door	---	Metal	C	1
3031127	4605	0.4	Negative	FALSE	FALSE	3/3/2026	11:29 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 1	Door	Buck	Metal	C	1
3031127	4606	0.6	Negative	FALSE	FALSE	3/3/2026	11:30 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 1	Door	Buck	Metal	C	2
3031127	4607	0.1	Negative	FALSE	FALSE	3/3/2026	11:30 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 1	Door	---	Metal	C	2
3031127	4608	0	Negative	FALSE	FALSE	3/3/2026	11:31 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 1	Window	Frame	Metal	C	2
3031127	4609	0.8	Negative	FALSE	FALSE	3/3/2026	11:31 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 1	Support Column		Metal	C	1
3031127	4610	0.1	Negative	FALSE	FALSE	3/3/2026	11:32 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 1	Door	---	Metal	D	1
3031127	4611	0.6	Negative	FALSE	FALSE	3/3/2026	11:32 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 1	Door	Buck	Metal	D	1
3031127	4612	0.5	Negative	FALSE	FALSE	3/3/2026	11:32 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 1	Door	Buck	Metal	A	1
3031127	4613	0.1	Negative	FALSE	FALSE	3/3/2026	11:32 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 1	Door	---	Metal	A	1
3031127	4614	0.1	Negative	FALSE	FALSE	3/3/2026	11:33 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 1	Window	Frame	Metal	A	1
3031127	4615	0	Negative	FALSE	FALSE	3/3/2026	11:33 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 1	Room	Wall	Concrete	A	1
3031127	4616	0.2	Negative	FALSE	FALSE	3/3/2026	11:33 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 1	Room	Wall	Concrete	B	1
3031127	4617	0	Negative	FALSE	FALSE	3/3/2026	11:34 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 1	Room	Wall	Concrete	C	1
3031127	4618	0.2	Negative	FALSE	FALSE	3/3/2026	11:34 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 1	Room	Wall	Concrete	D	1
3031127	4619	0.1	Negative	FALSE	FALSE	3/3/2026	11:34 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 1	Support Column		Metal	D	1
3031127	4620	0	Negative	FALSE	FALSE	3/3/2026	11:35 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 2	Door	---	Metal	A	1
3031127	4621	0.3	Negative	FALSE	FALSE	3/3/2026	11:36 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 2	Door	Buck	Metal	A	1
3031127	4622	-0.1	Negative	FALSE	FALSE	3/3/2026	11:36 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 2	Stair	Railing	Wood	A	1
3031127	4623	0.1	Negative	FALSE	FALSE	3/3/2026	11:37 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 2	Stair	Newel Post	Metal	A	1
3031127	4624	0.2	Negative	FALSE	FALSE	3/3/2026	11:37 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 2	Stair	Newel Post	Metal	A	2
3031127	4625	-0.1	Negative	FALSE	FALSE	3/3/2026	11:37 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 2	Stair	Railing	Wood	A	2
3031127	4626	0.1	Negative	FALSE	FALSE	3/3/2026	11:38 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 2	Stair	Stringer	Metal	A	2
3031127	4627	0.1	Negative	FALSE	FALSE	3/3/2026	11:38 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 2	Stair	Risers	Metal	A	2
3031127	4628	0.1	Negative	FALSE	FALSE	3/3/2026	11:38 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 2	Door	---	Metal	A	2
3031127	4629	0.1	Negative	FALSE	FALSE	3/3/2026	11:38 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 2	Door	Buck	Metal	A	2
3031127	4630	0.3	Negative	FALSE	FALSE	3/3/2026	11:39 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 2	Support Column		Metal	B	1
3031127	4631	0	Negative	FALSE	FALSE	3/3/2026	11:39 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 2	Window	Frame	Metal	C	1
3031127	4632	0.5	Negative	FALSE	FALSE	3/3/2026	11:40 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 2	Door	Buck	Metal	C	1
3031127	4633	0	Negative	FALSE	FALSE	3/3/2026	11:40 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 2	Door	---	Metal	C	1
3031127	4634	0.6	Negative	FALSE	FALSE	3/3/2026	11:41 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 2	Support Column		Metal	D	1
3031127	4635	0.3	Negative	FALSE	FALSE	3/3/2026	11:42 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 2	Door	Lintel	Metal	C	1
3031127	4636	0.2	Negative	FALSE	FALSE	3/3/2026	11:42 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 2	Room	Wall	Concrete	D	1
3031127	4637	0.2	Negative	FALSE	FALSE	3/3/2026	11:43 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 2	Room	Wall	Concrete	C	1
3031127	4638	0.2	Negative	FALSE	FALSE	3/3/2026	11:43 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 2	Room	Wall	Concrete	B	1

Job Id	Reading #	Concentration	Result	Calibration	RTA Present	Date	Time	User	Analytic Mode	Site Address	Area	Unit #	Room	Structure	Member	Substrate	Wall	Location
3031127	4639	0.2	Negative	FALSE	FALSE	3/3/2026	11:43 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 2	Room	Wall	Concrete	A	1
3031127	4640	0.1	Negative	FALSE	FALSE	3/3/2026	11:44 AM	Neheru Singh	Paint	429 JFK Way	Unit		Hallway 2	Room	Ceiling	Wood	A	1
3031127	4641	0.9		TRUE	FALSE	3/3/2026	11:45 AM	Neheru Singh	Paint	429 JFK Way								
3031127	4642	0.9		TRUE	FALSE	3/3/2026	11:46 AM	Neheru Singh	Paint	429 JFK Way								
3031127	4643	0.9		TRUE	FALSE	3/3/2026	11:46 AM	Neheru Singh	Paint	429 JFK Way								
3031127	4644	0.1		TRUE	FALSE	3/3/2026	11:46 AM	Neheru Singh	Paint	429 JFK Way								
3031127	4645	0.1		TRUE	FALSE	3/3/2026	11:46 AM	Neheru Singh	Paint	429 JFK Way								
3031127	4646	0		TRUE	FALSE	3/3/2026	11:47 AM	Neheru Singh	Paint	429 JFK Way								

Company	LEW Corporation
XRF Make	Heuresis
Model	Pb200i
Serial Num.	2129

Lead concentration units: mg/cm2

Total Readings:	38	Total Positives	0
Action Level	1		
Mode	Action Level		
Analytic Mode	Paint		

Actionables

Job Id	Reading #	Concentration	Result	Calibration	RTA Present	Date	Time	User	Analytic Mode	Site Address	Area	Unit #	Room	Structure	Member	Substrate	Wall	Location
No Actionables																		

Appendix C Photographs (if applicable)

LEW Environmental Services, LLC. is not responsible for the quality of the pictures, nor the clarity, content or the detail.

Appendix D Lab Support Documents (if applicable)

Asbestos Bulk Sampling Report

BUILDING INSPECTED:

Kennedy Center
Various Rooms
429 John F Kennedy Way
Willingboro, NJ 08046

CLIENT:

Alaimo Group
200 High Street
Mount Holly, NJ 08060

DATE OF INSPECTION:

03/18/2025

This Information is to be used strictly for the above referenced School District.
It shall not be used for bidding purposes and is not a design document for abatement.

AHERA #: 25-6764

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Table of Contents

Section I	Introduction
Section II	Survey Methods
Section III	Analysis/ Procedures
Section IV	Asbestos Bulk Sample Log
Section V	Conclusion/Action Required
Section VI	Original Sample Results / Functional Space Map

Section I — Introduction

AHERA Consultants, Inc. has been retained by the Alaimo Group to conduct a building assessment and subsequent bulk sampling of specific areas at the Kennedy Senior Center located at 429 John F Kennedy Drive in Willingboro, NJ in order to determine building component asbestos content.

The purpose of the assessment was to identify asbestos containing materials (ACM's) to facilitate an upcoming planned renovation in the areas highlighted on the floor plan provided. Discussions were had, and information was conveyed to our team regarding the scope of the planned renovations and additions to the building by the Alaimo Group.

Two USEPA accredited asbestos building inspectors, Mr. Domenic D'Errico, CIEC and Mr. John Smoyer, utilized the information gathered from Alaimo Group.

Section II — Survey Methods

A visual inspection of the building was conducted for suspect asbestos containing building materials (ACBM) within the highlighted area. Bulk material samples were collected in compliance with 40 CFR, Part 763.86.

Bulk samples were collected from the material(s):

- **Gray 9 x 9 Floor Tiles & Mastic (001, 001A)**
- **Light Brown Cove Base & Glue (002, 002A)**
- **Gray CMU Block Mortar (003)**
- **White 2 x 4 Drop Ceiling Tile w/Pinhole & Fissure (004)**
- **White Fiberglass Pipe Run Cementitious Packing Joint (005)**
- **White 2 x 4 Drop Ceiling Tile w/Pinhole (006)**
- **Yellow/Black Carpet Glue Mastic Mix (007, 007A)**
- **White Sheetrock (008)**
- **White Joint Compound (008A)**
- **White Cementitious Pipe Elbow (009)**
- **Dark Brown Cove Base & Glue (010, 010A)**
- **Blue Cove Base & Glue (011, 011A)**
- **Tan Caulk – Interior Windowpanes (012)**
- **Gray Door Surround Mortar (013)**
- **Gray Exterior Window Caulk (014)**
- **White Window Glaze (015)**
- **Tan Brick Mortar (016)**
- **Tan Ceramic Floor Tile / Mortar / Grout (017, 017A, 017B)**
- **White Ceramic Wall Tile / Glue (018, 018A)**
- **White Cementitious Roof Drain Elbow (019)**
- **White 2 x 4 Drop Ceiling Tile w/ Large Fissures (020)**

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- **Gray 12 x 12 Floor Tiles & Mastic (021, 021A)**
- **White Sheetrock (022)**
- **White Joint Compound (022A)**
- **White Textured Drop Ceiling Tiles (023)**
- **Tan 12 x 12 Floor Tiles & Mastic (024, 024A)**
- **White Sheet Vinyl (025)**

The scope of our survey did not include "Non-Accessible Areas" i.e. encroachment through interior architectural enclosures, nor the dismantlement of mechanical equipment.

If, during the course of construction, renovation, demolition or other activity which may encounter any suspect materials not identified in this report are encountered; construction activities should cease, and an accredited inspector called to survey and sample the area.

Section III — Analysis / Procedure

Bulk sampling of suspected ACBM was accomplished by extracting a representative piece of the material in question and transferring it into individual airtight plastic sample containers. Identification numbers were assigned and recorded on field data collection sheets / Chain of Custody forms.

During the survey & bulk sample collection activity, USEPA 40 CFR, Part 763, the Asbestos Hazard Emergency Response Act (AHERA) protocol was utilized.

All bulk samples were delivered to an independent laboratory and analysis for asbestos content was performed via "New Jersey Protocol" Polarized Light Microscopy (PLM) / Transmission Electron Microscopy (TEM) in accordance with N.J.A.C. 8:60 and 12:120 via EPA 600/R-93/116[1]

[1](Note: It is recommended that all samples analyzed by PLM whose results indicate that a sample contains less than one percent asbestos be subsequently analyzed via Transmission Electron Microscopy (TEM) (Method for the Determination of Asbestos in Bulk Building Materials EPA/600/R-93/116, July 1993) to confirm / refute asbestos content).

Section IV — (*NAD = No Asbestos Detected) — Bulk Sample Results/Homogenous Identification

Homg ID#	Sample ID#	Material	Color	Analysis Method	Asbestos Content	Locations
001 001A	318-01-FT 318-01-M 318-02-FT 318-02-M 318-20-FT 318-20-M 318-21-FT 318-21-M 318-43-FT 318-43	9 x 9 Floor Tiles & Mastic Note: Under Carpet in some areas	Gray	PLM EPA 600 PLM EPA 600 TEM Grav. Red.	5 - 8% Chrysotile (TILE) 1.4-8.2% Chrysotile (MASTIC)	1 – Under Carpet 4/6 – Under Carpet, Some exposed 5 – Under Carpet 13 17 14 9 & 11 under carpet and on wood risers
002 002A	318-03-CB 318-03-G 318-22-CB 318-22-G	Cove Base & Glue	Light Brown	PLM EPA 600 PLM EPA 600 TEM Grav. Red.	NAD (Cove Base) NAD (Mastic) NAD	Various Locations Throughout Areas
003	318-04 318-05 318-16	CMU Block Mortar	Gray	PLM EPA 600 TEM Grav. Red.	NAD <0.72% Chrysotile	Throughout Areas

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004	318-06 318-25	2 x 4 Drop Ceiling Tile w/ Pinhole & Fissure	White	PLM EPA 600 TEM Grav. Red.	NAD NAD	Throughout Areas
005	318-07 318-08	Cementitious Packing Joint on Fiberglass Run – Note: Appears Randomly Located	White	PLM EPA 600	NAD	2
006	318-09 318-19	2 x 4 Drop Ceiling Tile w/Pinhole	White	PLM EPA 600 TEM Grav. Red.	NAD NAD	Throughout Areas
007 007A	318-10-G 318-10-M 318-11-G 318-11-M	Mastic/Glue mix under Carpet	Yellow / Black	PLM EPA 600 PLM EPA 600 TEM Grav. Red. TEM Grav. Red.	NAD NAD 0.29% Chrysotile Insufficient mat.	Carpeted areas without floor tiles , 2, 3 – Not seen in 7,8, or 10 but may exist under carpet
008	318-12 318-13	Sheetrock	White	PLM EPA 600	NAD	Throughout Areas
008A	318-14 318-15	Joint Compound	White	PLM EPA 600 TEM Grav. Red.	NAD NAD	Througout Areas
009	318-17 318-18 318-26 318-27	Cementitious Pipe Elbow	White	PLM EPA 600	NAD	Various Locations
010 010A	318-23-CB 318-23-G 318-24-CB 318-24-G	Original Cove Base & Glue	Dark Brown	PLM EPA 600 TEM EPA NOB	NAD (Cove) 2% Chrysotile (Glue)	Various Locations, 5, 6D, 6A, 6B, 6C
011	318-28-CB 318-28-G 318-29-CB 318-29-G	Blue Cove Base & Glue	Blue	PLM EPA 600 TEM EPA NOB	NAD NAD	7,8
012	318-30 318-31	Interior Window Wall Caulk Seam	Tan	PLM EPA 600	4% Chrysotile	8,3
013	318-32 318-33	Mortar Joint Around Window Wall/Door Surround	Gray	PLM EPA 600	2% Chrysotile	8,3
014	318-34 318-35 318-36	Exterior Window Caulk	Gray	PLM EPA 600	4% Chrysotile	Window Locations Throughout
015	318-37 318-38 318-39	Window Glaze	White	PLM EPA 600	3% Chrysotile	Window Locations Throughout
016	318-40 318-41 318-42	Brick Mortar	Tan	PLM EPA 600 TEM Grav. Red.	None Detected None Detected	10
017 017A 017B	318-44-T 318-44-Gr 318-44-Gl 318-45-T 318-45-Gr 318-45-GL 318-46-T 318-46-Gr 318-46-GL	Ceramic Floor Tiles, Mortar Grout, Glue	Tan/ Yellow	PLM EPA 600 TEM Grav. Red.	 2% Chrysotile (Glue)	16
018	318-47-C	Ceramic Wall Tile / Glue	White	PLM EPA 600	None Detected	16

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018A	318-47-G 318-48-C 318-48-G			TEM Grav. Red	None Detected	
019	318-49 318-50 318-51	Roof Drain 90° Elbow	White	PLM EPA 600	None Detected	17
020	318-52 318-53 318-54	2 x 4 Drop Ceiling Tiles with Large Fissures	White	PLM EPA 600 TEM Grav. Red.	None Detected None Detected	18
021 021A	318-55-FT 318-55-M 318-56-FT 318-56-M 318-57-FT 318-57-M	12 x 12 Floor Tiles & Mastic	Gray	PLM EPA 600 TEM Grav. Red	None Detected None Detected	18
022	318-58 318-60	Sheetrock – Renovated Area	White	PLM EPA 600	None Detected	18, 19, 20, 21
022A	318-59 318-61	Joint Compound – Renovated Area	White	PLM EPA 600 TEM Grav. Red.	None Detected None Detected	18, 19, 20, 21
023	318-62 318-63	Textured Drop Ceiling Tile – Newer	White	PLM EPA 600 TEM Grav. Red.	None Detected None Detected	19, 22
024 024A	318-64-FT 318-64-M 318-65-FT 318-65-M	12 x12 Floor Tile & Mastic	Tan	PLM EPA 600 TEM Grav. Red.	None Detected <0.23% Chrysotile (Mastic)	19,21
025	318-66 318-67	Sheet Vinyl Floor	White	PLM EPA 600	None Detected	22, 20
026	No Sample Taken	Black Expansion Gasket Above Drop Ceiling	Black	Not Sampled	Assumed Positive	14

*(NAD=No Asbestos Detected)

Section V — Conclusion / Actions Required

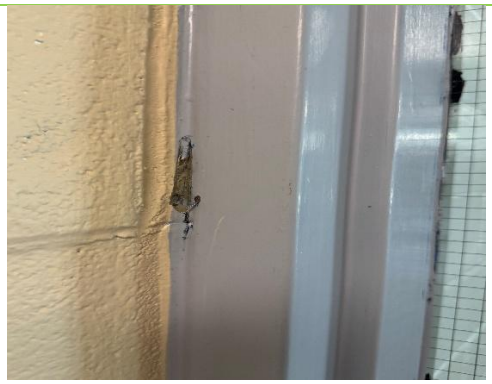
Incorporate these sample results into your files so that the information can be utilized in future investigations.

All actions taken regarding asbestos containing materials (ACM) should follow all applicable federal, state and local regulations or codes that may apply to handling i.e., clean-up, removal, enclosure, disposal etc.

If the subject facility is an educational facility, NJ county government building, daycare or public facility who leases to any of the entities, then asbestos abatement activities are regulated by the New Jersey Asbestos Hazard Abatement Sub code (N.J.A.C. 5:23-8, the "Sub code" or Subchapter 8). The Sub code imposes procedural and organizational requirements on asbestos abatement projects. Among these are the requirements that each abatement project be managed / monitored by an authorized Asbestos Safety Control Monitor (ASCM) firm (such as AHERA Consultants, Inc.).

Materials that tested positive for asbestos content and may require abatement prior to renovations or demolition:

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E-mail: ahera@comcast.net

Material(s)	Homogenous ID
9 x 9 Gray Floor Tiles & Mastic – Some Under Carpet	 001, 001A
Original Cove Base Glue – Dark Brown	010A
Tan Interior Window Wall Caulk / Seam	 012
Gray Mortar Joint Around Doors / Window Wall	013
Exterior Window Caulk & Glaze	014, 015
Ceramic Floor Tiles, Grout, Glue	017B
Black Expansion Gasket on Duct	 026 – <u>Assumed Positive – Sample only when feasible</u>

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Materials testing less than 1% asbestos content:

Material(s)	Homogenous ID
CMU Block Mortar	 003
Black Mastic / Glue Mix under carpet	 007A
Mastic associated with Tan 12 x 12 Floor Tiles	024A

Following, please find the OSHA compliance standard for materials containing <1% asbestos:

OSHA Compliance includes but is not limited to:

- 29 CFR 1926.1101(g)(1)(ii), which requires: wet methods, or wetting agents, to control employee exposures during asbestos handling, mixing, removal, cutting, application, and cleanup, except where employers demonstrate that the use of wet methods is infeasible due to, for example, the creation of electrical hazards, equipment malfunction, and, in roofing, except as provided in paragraph (g)(8)(ii)2 of this section;
- 29 CFR 1926.1101(g)(1)(iii), which requires: prompt clean-up and disposal of wastes and debris contaminated with asbestos in leak-tight containers except in roofing operations, where the procedures specified in paragraph (g)(8)(ii)3 of this section apply;
- 29 CFR 1926.1101(g)(3)(i), which prohibits: high-speed abrasive disc saws that are not equipped with point-of-cut ventilator or enclosures with HEPA filtered exhaust air;
- 29 CFR 1926.1101(g)(3)(ii), which prohibits: compressed air used to remove asbestos, or materials containing asbestos, unless the compressed air is used in conjunction with an enclosed ventilation system designed to capture the dust cloud created by the compressed air; and
- 29 CFR 1926.1101(g)(3)(iv), which prohibits: employee rotation as a means of reducing employee exposure to asbestos.

Section VI — Laboratory Results & Functional Space Map

See attached laboratory sample analysis results.

END OF REPORT

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Customer ID: AHER50
Customer PO:
Project ID:

Attn: info
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Phone: (609) 652-1833
Fax: (609) 652-1140
Collected: 3/18/2025
Received: 3/18/2025
Analyzed: 3/24/2025

Proj: 25-6764 / Willingboro Twp. / Willingboro-Kennedy Center / 429 John F. Kennedy Way, Willingboro, NJ 08046

Summary Test Report for Asbestos Analysis of Bulk Materials in Accordance with N.J.A.C. 8:60 and 12:120

Client Sample ID: 318-01-FT **Lab Sample ID:** **042505075-0001**
Sample Description: Under Carpet/Gray 9x9 FT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Gray	0.0%	95.0%	**5% Chrysotile**	

Client Sample ID: 318-01-Mastic **Lab Sample ID:** **042505075-0001A**
Sample Description: Under Carpet/Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Black	0.0%	100.0%	None Detected	
TEM Grav. Reduction	3/24/2025	Black	0.0%	91.8%	**8.2% Chrysotile**	

Client Sample ID: 318-02-FT **Lab Sample ID:** **042505075-0002**
Sample Description: Under Carpet/Gray 9x9 FT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025				Positive Stop (Not Analyzed)	

Client Sample ID: 318-02-Mastic **Lab Sample ID:** **042505075-0002A**
Sample Description: Under Carpet/Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Black	0.0%	100.0%	None Detected	

Client Sample ID: 318-03-Cove Base **Lab Sample ID:** **042505075-0003**
Sample Description: Wall along Floor/Lt Brown Cove Base

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 318-03-Glue **Lab Sample ID:** **042505075-0003A**
Sample Description: Wall along Floor/Glue

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 318-04 **Lab Sample ID:** **042505075-0004**
Sample Description: Wall - above DCT/Gray CMU Block Mortar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Gray	0.0%	100.0%	None Detected	

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Client Sample ID: 318-05 ***Lab Sample ID:*** **042505075-0005**
Sample Description: Wall - above DCT/Gray CMU Block Mortar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Gray	0.0%	100.0%	None Detected	
TEM Grav. Reduction	3/24/2025	Gray	0.0%	100.0%	**<0.72% Chrysotile**	

Client Sample ID: 318-06 ***Lab Sample ID:*** **042505075-0006**
Sample Description: Ceiling/White 2x2 Pinhole w/Fissure DCT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Tan/White	70.0%	30.0%	None Detected	
TEM Grav. Reduction	3/24/2025	Tan/White	0.0%	100.0%	None Detected	

Client Sample ID: 318-07 ***Lab Sample ID:*** **042505075-0007**
Sample Description: Above DCT/White Fiberglass Pipe Run Packing

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	White	60.0%	40.0%	None Detected	

Client Sample ID: 318-08 ***Lab Sample ID:*** **042505075-0008**
Sample Description: Above DCT/White Fiberglass Pipe Run Packing

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	White	80.0%	20.0%	None Detected	

Client Sample ID: 318-09 ***Lab Sample ID:*** **042505075-0009**
Sample Description: Ceiling/White 2x4 Pinhole DCT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Tan/White	80.0%	20.0%	None Detected	
TEM Grav. Reduction	3/24/2025	Tan/White	0.0%	100.0%	None Detected	

Client Sample ID: 318-10-Glue ***Lab Sample ID:*** **042505075-0010**
Sample Description: Floor/Yellow Carpet Glue

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Yellow	0.0%	100.0%	None Detected	
TEM Grav. Reduction	3/24/2025	Yellow	0.0%	100.0%	**<0.29% Chrysotile**	Result includes a small amount of inseparable attached material

Client Sample ID: 318-10-Mastic ***Lab Sample ID:*** **042505075-0010A**
Sample Description: Floor/Black Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Black	0.0%	100.0%	None Detected	
TEM Grav. Reduction	3/24/2025				Insufficient Material	

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Client Sample ID: 318-11-Glue **Lab Sample ID:** **042505075-0011**
Sample Description: Floor/Yellow Carpet Glue

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Yellow	0.0%	100.0%	None Detected	

Client Sample ID: 318-11-Mastic **Lab Sample ID:** **042505075-0011A**
Sample Description: Floor/Black Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Black	0.0%	100.0%	None Detected	

Client Sample ID: 318-12 **Lab Sample ID:** **042505075-0012**
Sample Description: Wall/White Sheetrock

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	White	15.0%	85.0%	None Detected	

Client Sample ID: 318-13 **Lab Sample ID:** **042505075-0013**
Sample Description: Wall/White Sheetrock

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	White	18.0%	82.0%	None Detected	

Client Sample ID: 318-14 **Lab Sample ID:** **042505075-0014**
Sample Description: Wall/White Joint Compound

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	White	0.0%	100.0%	None Detected	

Client Sample ID: 318-15 **Lab Sample ID:** **042505075-0015**
Sample Description: Wall/White Joint Compound

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	White	0.0%	100.0%	None Detected	
TEM Grav. Reduction	3/24/2025	White	0.0%	100.0%	None Detected	

Client Sample ID: 318-16 **Lab Sample ID:** **042505075-0016**
Sample Description: Wall/Gray CMU Block Mortar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 318-17 **Lab Sample ID:** **042505075-0017**
Sample Description: Above DCT - Supply/White Pipe Elbow

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	White	48.0%	52.0%	None Detected	

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Client Sample ID: 318-18 ***Lab Sample ID:*** **042505075-0018**
Sample Description: Above DCT - Return/White Pipe Elbow

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Gray	70.0%	30.0%	None Detected	

Client Sample ID: 318-19 ***Lab Sample ID:*** **042505075-0019**
Sample Description: Ceiling/White 2x4 Pinhole DCT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Tan/White	60.0%	40.0%	None Detected	

Client Sample ID: 318-20-FT ***Lab Sample ID:*** **042505075-0020**
Sample Description: Floor/Gray 9x9 FT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Gray	0.0%	92.0%	**8% Chrysotile**	

Client Sample ID: 318-20-Mastic ***Lab Sample ID:*** **042505075-0020A**
Sample Description: Floor/Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Black	0.0%	100.0%	None Detected	
TEM Grav. Reduction	3/24/2025	Black	0.0%	98.6%	**1.4% Chrysotile**	

Client Sample ID: 318-21-FT ***Lab Sample ID:*** **042505075-0021**
Sample Description: Floor/Gray 9x9 FT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025				Positive Stop (Not Analyzed)	

Client Sample ID: 318-21-Mastic ***Lab Sample ID:*** **042505075-0021A**
Sample Description: Floor/Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Black	0.0%	100.0%	None Detected	

Client Sample ID: 318-22-Cove Base ***Lab Sample ID:*** **042505075-0022**
Sample Description: Wall along Floor/Lt Brown Cove Base

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 318-22-Glue ***Lab Sample ID:*** **042505075-0022A**
Sample Description: Wall along Floor/Glue

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Brown	0.0%	100.0%	None Detected	
TEM Grav. Reduction	3/24/2025	Brown	0.0%	100.0%	None Detected	

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Client Sample ID: 318-23-Cove Base **Lab Sample ID:** **042505075-0023**
Sample Description: Wall along Floor/Dk Brown Cove Base

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 318-23-Glue **Lab Sample ID:** **042505075-0023A**
Sample Description: Wall along Floor/Glue

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Brown	0.0%	98.0%	**2% Chrysotile**	Result includes a small amount of inseparable attached material

Client Sample ID: 318-24-Cove Base **Lab Sample ID:** **042505075-0024**
Sample Description: Wall along Floor/Dk Brown Cove Base

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Brown	0.0%	100.0%	None Detected	

Client Sample ID: 318-24-Glue **Lab Sample ID:** **042505075-0024A**
Sample Description: Wall along Floor/Glue

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025			Positive Stop (Not Analyzed)		

Client Sample ID: 318-25 **Lab Sample ID:** **042505075-0025**
Sample Description: Ceiling/White Pinhole w/Fissure DCT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Tan/White	80.0%	20.0%	None Detected	

Client Sample ID: 318-26 **Lab Sample ID:** **042505075-0026**
Sample Description: Above DCT - Supply/White Pipe Elbow

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	White	38.0%	62.0%	None Detected	

Client Sample ID: 318-27 **Lab Sample ID:** **042505075-0027**
Sample Description: Above DCT - Return/White Pipe Elbow

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Gray/White	60.0%	40.0%	None Detected	

Client Sample ID: 318-28-Cove Base **Lab Sample ID:** **042505075-0028**
Sample Description: Wall along Floor/Blue Cove Base

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Gray	0.0%	100.0%	None Detected	

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Client Sample ID: 318-28-Glue **Lab Sample ID:** **042505075-0028A**
Sample Description: Wall along Floor/Glue

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Brown/White	0.0%	100.0%	None Detected	Result includes a small amount of inseparable attached material

Client Sample ID: 318-29-Cove Base **Lab Sample ID:** **042505075-0029**
Sample Description: Wall along Floor/Blue Cove Base

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 318-29-Glue **Lab Sample ID:** **042505075-0029A**
Sample Description: Wall along Floor/Glue

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Yellow	0.0%	100.0%	None Detected	
TEM Grav. Reduction	3/24/2025	Yellow	0.0%	100.0%	None Detected	

Client Sample ID: 318-30 **Lab Sample ID:** **042505075-0030**
Sample Description: Window Wall - Interior Corridor/Tan Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Tan	0.0%	96.0%	**4% Chrysotile**	

Client Sample ID: 318-31 **Lab Sample ID:** **042505075-0031**
Sample Description: Window/Wall - Interior Corridor/Tan Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025				Positive Stop (Not Analyzed)	

Client Sample ID: 318-32 **Lab Sample ID:** **042505075-0032**
Sample Description: Window/Wall - Door/Gray Mortar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Gray	0.0%	98.0%	**2% Chrysotile**	

Client Sample ID: 318-33 **Lab Sample ID:** **042505075-0033**
Sample Description: Window/Wall - Door/Gray Mortar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025				Positive Stop (Not Analyzed)	

Client Sample ID: 318-34 **Lab Sample ID:** **042505075-0034**
Sample Description: Ext. Window/Gray Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Gray	0.0%	96.0%	**4% Chrysotile**	

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Client Sample ID: 318-35 ***Lab Sample ID:*** **042505075-0035**
Sample Description: Ext. Window/Gray Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025				Positive Stop (Not Analyzed)	

Client Sample ID: 318-36 ***Lab Sample ID:*** **042505075-0036**
Sample Description: Ext. Window/Gray Caulk

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025				Positive Stop (Not Analyzed)	

Client Sample ID: 318-37 ***Lab Sample ID:*** **042505075-0037**
Sample Description: Window Wall Ext/White Window Glaze

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	White	0.0%	97.0%	**3% Chrysotile**	

Client Sample ID: 318-38 ***Lab Sample ID:*** **042505075-0038**
Sample Description: Window Wall Ext/White Window Glaze

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025				Positive Stop (Not Analyzed)	

Client Sample ID: 318-39 ***Lab Sample ID:*** **042505075-0039**
Sample Description: Window Wall Ext/White Window Glaze

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025				Positive Stop (Not Analyzed)	

Client Sample ID: 318-40 ***Lab Sample ID:*** **042505075-0040**
Sample Description: Along Window Wall/Tan Brick Mortar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Tan	0.0%	100.0%	None Detected	

Client Sample ID: 318-41 ***Lab Sample ID:*** **042505075-0041**
Sample Description: Along Window Wall/Tan Brick Mortar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Tan	0.0%	100.0%	None Detected	
TEM Grav. Reduction	3/24/2025	Tan	0.0%	100.0%	None Detected	

Client Sample ID: 318-42 ***Lab Sample ID:*** **042505075-0042**
Sample Description: Along Window Wall/Tan Brick Mortar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Tan	0.0%	100.0%	None Detected	

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Project ID:

Summary Test Report for Asbestos Analysis of Bulk Materials in Accordance with N.J.A.C. 8:60 and 12:120

Client Sample ID: 318-43 ***Lab Sample ID:*** **042505075-0043**
Sample Description: Floor Riser/Gray 9x9 under Carpet

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Gray/Black	0.0%	95.0%	**5% Chrysotile**	

Client Sample ID: 318-44-Tile ***Lab Sample ID:*** **042505075-0044**
Sample Description: Floor Restroom/Tan Ceramic Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	White	0.0%	100.0%	None Detected	

Client Sample ID: 318-44-Grout ***Lab Sample ID:*** **042505075-0044A**
Sample Description: Floor Restroom/Grout

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Gray	0.0%	100.0%	None Detected	
TEM Grav. Reduction	3/24/2025	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 318-44-Glue ***Lab Sample ID:*** **042505075-0044B**
Sample Description: Floor Restroom/Glue

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Yellow	0.0%	100.0%	None Detected	
TEM Grav. Reduction	3/24/2025	Yellow	0.0%	98.0%	**2.0% Chrysotile**	

Client Sample ID: 318-45-Tile ***Lab Sample ID:*** **042505075-0045**
Sample Description: Floor Restroom/Tan Ceramic Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	White	0.0%	100.0%	None Detected	

Client Sample ID: 318-45-Grout ***Lab Sample ID:*** **042505075-0045A**
Sample Description: Floor Restroom/Grout

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 318-45-Glue ***Lab Sample ID:*** **042505075-0045B**
Sample Description: Floor Restroom/Glue

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Yellow	0.0%	100.0%	None Detected	

Client Sample ID: 318-46-Tile ***Lab Sample ID:*** **042505075-0046**
Sample Description: Floor Restroom/Tan Ceramic Tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	White	0.0%	100.0%	None Detected	

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EMSL Order ID: 042505075
Customer ID: AHER50
Customer PO:
Project ID:

Summary Test Report for Asbestos Analysis of Bulk Materials in Accordance with N.J.A.C. 8:60 and 12:120

Client Sample ID: 318-46-Grout **Lab Sample ID:** **042505075-0046A**
Sample Description: Floor Restroom/Grout

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 318-46-Glue **Lab Sample ID:** **042505075-0046B**
Sample Description: Floor Restroom/Glue

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	White/Yellow	0.0%	100.0%	None Detected	

Client Sample ID: 318-47-Ceramic **Lab Sample ID:** **042505075-0047**
Sample Description: Wall Tile/White Ceramic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	White	0.0%	100.0%	None Detected	

Client Sample ID: 318-47-Glue **Lab Sample ID:** **042505075-0047A**
Sample Description: Wall Tile/Glue

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Yellow	0.0%	100.0%	None Detected	
TEM Grav. Reduction	3/24/2025	Yellow	0.0%	100.0%	None Detected	

Client Sample ID: 318-48-Ceramic **Lab Sample ID:** **042505075-0048**
Sample Description: Wall Tile/White Ceramic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	White	0.0%	100.0%	None Detected	

Client Sample ID: 318-48-Glue **Lab Sample ID:** **042505075-0048A**
Sample Description: Wall Tile/Glue

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Yellow	0.0%	100.0%	None Detected	

Client Sample ID: 318-49 **Lab Sample ID:** **042505075-0049**
Sample Description: Above DCT/White Roof Drain 90' elbow

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	White	65.0%	35.0%	None Detected	

Client Sample ID: 318-50 **Lab Sample ID:** **042505075-0050**
Sample Description: Above DCT/White Roof Drain 90' elbow

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	White	75.0%	25.0%	None Detected	

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EMSL Order ID: 042505075
Customer ID: AHER50
Customer PO:
Project ID:

Summary Test Report for Asbestos Analysis of Bulk Materials in Accordance with N.J.A.C. 8:60 and 12:120

Client Sample ID: 318-51 ***Lab Sample ID:*** **042505075-0051**
Sample Description: Above DCT/White Roof Drain 90' elbow

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	White	60.0%	40.0%	None Detected	

Client Sample ID: 318-52 ***Lab Sample ID:*** **042505075-0052**
Sample Description: Hallway Ceiling/White 2x4 Lg Fissure DCT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Tan/White	65.0%	35.0%	None Detected	

Client Sample ID: 318-53 ***Lab Sample ID:*** **042505075-0053**
Sample Description: Hallway Ceiling/White 2x4 Lg Fissure DCT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Tan/White	0.0%	100.0%	None Detected	

Client Sample ID: 318-54 ***Lab Sample ID:*** **042505075-0054**
Sample Description: Hallway Ceiling/White 2x4 Lg Fissure DCT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	White	80.0%	20.0%	None Detected	
TEM Grav. Reduction	3/24/2025	White	0.0%	100.0%	None Detected	

Client Sample ID: 318-55-FT ***Lab Sample ID:*** **042505075-0055**
Sample Description: Hallway/Gray 12x12 FT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Gray	0.0%	100.0%	None Detected	
TEM Grav. Reduction	3/24/2025	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 318-55-Mastic ***Lab Sample ID:*** **042505075-0055A**
Sample Description: Hallway/Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Yellow	0.0%	100.0%	None Detected	
TEM Grav. Reduction	3/24/2025	Yellow	0.0%	100.0%	None Detected	

Client Sample ID: 318-56-FT ***Lab Sample ID:*** **042505075-0056**
Sample Description: Hallway/Gray 12x12 FT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 318-56-Mastic ***Lab Sample ID:*** **042505075-0056A**
Sample Description: Hallway/Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Yellow	0.0%	100.0%	None Detected	

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Summary Test Report for Asbestos Analysis of Bulk Materials in Accordance with N.J.A.C. 8:60 and 12:120

Client Sample ID: 318-57-FT **Lab Sample ID:** **042505075-0057**
Sample Description: Hallway/Gray 12x12 FT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 318-57-Mastic **Lab Sample ID:** **042505075-0057A**
Sample Description: Hallway/Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Yellow	0.0%	100.0%	None Detected	

Client Sample ID: 318-58 **Lab Sample ID:** **042505075-0058**
Sample Description: Hallway Wall/White Sheetrock

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	White	13.0%	87.0%	None Detected	

Client Sample ID: 318-59 **Lab Sample ID:** **042505075-0059**
Sample Description: Hallway Wall/White Joint Compound

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	White	0.0%	100.0%	None Detected	
TEM Grav. Reduction	3/24/2025	White	0.0%	100.0%	None Detected	

Client Sample ID: 318-60 **Lab Sample ID:** **042505075-0060**
Sample Description: Creative Arts Room/White Sheetrock

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	White	18.0%	82.0%	None Detected	

Client Sample ID: 318-61 **Lab Sample ID:** **042505075-0061**
Sample Description: Creative Arts Room/White Joint Compound

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	White	0.0%	100.0%	None Detected	

Client Sample ID: 318-62 **Lab Sample ID:** **042505075-0062**
Sample Description: Creatice Arts Ceiling/White Textured New DCT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Tan/White	90.0%	10.0%	None Detected	
TEM Grav. Reduction	3/24/2025	Tan/White	0.0%	100.0%	None Detected	

Client Sample ID: 318-63 **Lab Sample ID:** **042505075-0063**
Sample Description: Hallway Ceiling/White Textured New DCT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	White	80.0%	20.0%	None Detected	

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Summary Test Report for Asbestos Analysis of Bulk Materials in Accordance with N.J.A.C. 8:60 and 12:120

Client Sample ID: 318-64-FT **Lab Sample ID:** **042505075-0064**
Sample Description: Creative Arts Room Floor/Tan 12x12 FT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Tan	0.0%	100.0%	None Detected	
TEM Grav. Reduction	3/24/2025	Tan	0.0%	100.0%	None Detected	

Client Sample ID: 318-64-Mastic **Lab Sample ID:** **042505075-0064A**
Sample Description: Creative Arts Room Floor/Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Yellow	0.0%	100.0%	None Detected	
TEM Grav. Reduction	3/24/2025	Yellow	0.0%	100.0%	**<0.23% Chrysotile**	

Client Sample ID: 318-65-FT **Lab Sample ID:** **042505075-0065**
Sample Description: Creative Arts Room Floor/Tan 12x12 FT

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Tan	0.0%	100.0%	None Detected	

Client Sample ID: 318-65-Mastic **Lab Sample ID:** **042505075-0065A**
Sample Description: Creative Arts Room Floor/Mastic

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	Yellow	0.0%	100.0%	None Detected	

Client Sample ID: 318-66 **Lab Sample ID:** **042505075-0066**
Sample Description: Hallway Floor/White Sheet Vinyl

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	White	0.0%	100.0%	None Detected	

Client Sample ID: 318-67 **Lab Sample ID:** **042505075-0067**
Sample Description: Hallway Floor/White Sheet Vinyl

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	3/19/2025	White	0.0%	100.0%	None Detected	

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Customer ID:	AHER50
Customer PO:	
Project ID:	

Summary Test Report for Asbestos Analysis of Bulk Materials in Accordance with N.J.A.C. 8:60 and 12:120

Analyst(s):

Amiri Lewis	PLM (29)
Megan Bosch	PLM (54)
Michelle Quach	TEM Grav. Reduction (20)

Reviewed and approved by:

Samantha Rundstrom, Laboratory Manager
or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This is a summary report; official reports are available on LabConnect or upon request and relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 "Interim Method") but augmented with procedures outlined in the 1993 ("final") version of the method. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ NVLAP Lab Code 101048-0, AIHA LAP, LLC-IHLAP Lab 100194, PA ID# 68-00367, LA #04127

Initial report from: 03/20/202509:05:46

OrderID: 042505075

042505075

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CINNAMINSON, NJ
25 MAR 18 PM 2:49

CHAIN OF CUSTODY

Client: AHERA Consultants, Inc.
Address: PO Box 385
Oceanville, NJ 08231-0385
Phone: (609) 652 - 1833
E-Mail: AHERA@AHERAINC.COM
Fax: (609) 652 - 1140

Project #: 25-6764
Project Name: Willingboro-Kennedy Center
Willingboro Township
429 John F Kennedy Way
Willingboro, NJ 08046
Contact: DOM D'ERRICO

TYPE:

ASBESTOS		LEAD		OTHER
[ ] AIR	[ ] SOIL	[ ] AIR	[ ] SOIL	_____
[X] BULK	[ ] DUST	[ ] BULK	[ ] PAINT	_____
[ ] WATER	[ ] OTHER	[ ] WATER	[ ] OTHER	_____

ANALYSIS METHOD:

[ ] PCM:	NIOSH 7400	[X] PLM:	BULK ASBESTOS EPA600	[ ] TEM:	AHERA
[ ] PCM:	OSHA	[ ] PLM:	POINT COUNTING	[ ] TEM:	NIOSH 7402
[ ] PCM:	OTHER	[ ] PLM:	OTHER	[ ] TEM:	EPA LEVEL II
		[ ] PLM:	EPA NOB (gravimetric reduction)	[ ] TEM:	ASBESTOS IN WATER

[ ] AAS:	LEAD IN DRINKING WATER	[ ] TEM:	BULK ANALYSIS
[ ] AAS:	LEAD IN PAINT	[ ] TEM:	MICROVAC DUST
[ ] AAS:	OTHER LEAD	[ ] TEM:	EPA NOB (gravimetric reduction)
[ ] AAS:	OTHER METALS		
[ ] AAS:	NIOSH 7082 (lead in air)	[ ] TOTAL DUST:	EPA/OSHA

TURN AROUND TIME:

[ ] 5 DAY [X] 72 HOUR [ ] 48 HOUR [ ] 24 HOUR [ ] 6 HOUR _____

SAMPLE NUMBERS:

CLIENT SAMPLE NUMBERS: _____ TO _____ TOTAL: _____

RELINQUISHED:	_____	DATE: 3/18/25	TIME: _____
RECEIVED:	_____	DATE: 3/19/25	TIME: 25Gp
SAMPLE LOG-IN:	_____	DATE: _____	TIME: _____
ANALYZED:	_____	DATE: _____	TIME: _____
REVIEWED:	_____	DATE: _____	TIME: _____
ARCHIVED:	_____	DATE: _____	TIME: _____
RELEASED:	_____	DATE: _____	TIME: _____

AHERA Consultants INCORPORATED

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BULK MATERIAL SAMPLING LOG

CLIENT: AHERA Consultants, Inc.
ADDRESS: PO Box 385
Oceanville, NJ 08231-0385
PHONE: (609) 652 - 1833
FAX: (609) 652 - 1140
PROJECT #: 25-6764
CONTACT:

DATE: 3/18/25
PROJECT: Willingboro-Kennedy Center
Bulk Sampling
429 John F Kennedy Way, Willingboro, NJ 08046
CLIENT: Willingboro Township
1 Rev. Dr. Martin Luther King Jr. Drive
Willingboro, NJ 08046
ANALYSIS: PLM
TURNAROUND EPA 600

OTHER INSTRUCTIONS: **STOP EACH SET AT FIRST POSITIVE.**

SAMPLE #	HOMG #	COLOR	MATERIAL TYPE	FUNC SPACE #	LOCATION DESCRIPTION	NOTES
318-01	001	GRAY	9X9 F.T./MASTIC	1	UNDER CARPET	
318-02	001	GRAY	9X9 F.T./MASTIC	1	UNDER CARPET	
318-03	002	LT BROWN	COVE BASE/GLUE	1	WALL Along FLOOR	
318-04	003	GRAY	CMU BLOCK MORTAR	1	WALL - ABOVE DCT	
318-05	003	GRAY	CMU BLOCK MORTAR	1	WALL - ABOVE DCT	
318-06	004	WHITE	2X4 DCT PINHOLE W/FISSURE	1	CEILING	
318-07	005	White	FIBERGLASS PIPE RUN PACKING	2	ABOVE DCT	
318-08	005	White	FIBERGLASS PIPE RUN PACKING	2	ABOVE DCT	
318-09	006	White	2X4 DCT PINHOLE	2	CEILING	
318-10	007	YELLOW/BLACK	CARPET GLUE/MASTIC	2	FLOOR	
318-11	007	YELLOW/BLACK	CARPET GLUE/MASTIC	2	FLOOR	
318-12	008	white	SHEETROCK	2	WALL	
318-13	008	white	SHEETROCK	3	WALL	
318-14	008A	White	JOINT COMPOUND	2	WALL	
318-15	008A	white	JOINT COMPOUND	3	WALL	
318-16	003	GRAY	CMU BLOCK MORTAR	3	WALL	
318-17	009	White	PIPE ELBOW	3	ABOVE DCT - SUPPLY	
318-18	009	white	PIPE ELBOW	3	ABOVE DCT - RETURN	

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BULK MATERIAL SAMPLING LOG

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PHONE: (609) 652 - 1833
FAX: (609) 652 - 1140
PROJECT #: 25-6764
CONTACT:

DATE: 3/18/25
PROJECT: Willingboro-Kennedy Center
Bulk Sampling
429 John F Kennedy Way, Willingboro, NJ 08046
CLIENT: Willingboro Township
1 Rev. Dr. Martin Luther King Jr. Drive
Willingboro, NJ 08046
ANALYSIS: PLM
TURNAROUND EPA 600

OTHER INSTRUCTIONS: **STOP EACH SET AT FIRST POSITIVE.**

SAMPLE #	HOMG #	COLOR	MATERIAL TYPE	FUNC SPACE #	LOCATION DESCRIPTION	NOTES
318-19	006	White	2x4 DCT - Pinhole	3	Ceiling	
318-20	001	GRAY	9x9 F.T./MASTIC	6A	FLOOR	
318-21	001	GRAY	9x9 F.T./MASTIC	6D	FLOOR	
318-22	002	LT. BROWN	Cove BASE/GLUE	6	WALL ALONG FLOOR	
318-23	010	DK BROWN	COVEBASE/GLUE	6D	WALL Along FLOOR	ORIG
318-24	010	DK BROWN	COVEBASE/GLUE	6A	WALL Along FLOOR	ORIG
318-25	004	White	DCT Pinhole W/FISSURE	6D	CEILING	
318-26	009	White	PIPE Elbow	8	Above DCT - Supply	
318-27	009	White	PIPE Elbow	8	Above DCT - RETURN	
318-28	011	BLUE	COVEBASE/GLUE	7	WALL ALONG FLOOR	
318-29	011	BLUE	COVEBASE/GLUE	8	WALL ALONG FLOOR	
318-30	012	TAN	CAULK	8	WINDOW WALL - INTERIOR CORRIDOR	
318-31	012	TAN	CAULK	8	WINDOW/DOOR WALL - INTERIOR CORRIDOR	
318-32	013	GRAY	MORTAR	8	WINDOW WALL-DOOR	
318-33	013	GRAY	MORTAR	8	WINDOW WALL-DOOR	
318-34	014	GRAY	CAULK	9	Ext. WINDOW	
318-35	014	GRAY	CAULK	9	" "	
318-36	014	GRAY	CAULK	9	" "	

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PROJECT #: 25-6764
CONTACT:

DATE: 3/18/25
PROJECT: Willingboro-Kennedy Center
Bulk Sampling
429 John F Kennedy Way, Willingboro, NJ 08046
CLIENT: Willingboro Township
1 Rev. Dr. Martin Luther King Jr. Drive
Willingboro, NJ 08046
ANALYSIS: PLM
TURNAROUND EPA 600

OTHER INSTRUCTIONS: **STOP EACH SET AT FIRST POSITIVE.**

SAMPLE #	HOMG #	COLOR	MATERIAL TYPE	FUNC SPACE #	LOCATION DESCRIPTION	NOTES
318-37	015	White	WINDOW GLAZE	9	WINDOW WALL EXT.	
318-38	015	White	" "	9	" " "	
318-39	015	White	" "	9	" " "	
318-40	016	TAN	BRICK MORTAR	10	ALONG WINDOW WA	
318-41	016	"	" "	10	" " "	
318-42	016	"	" "	10	" " "	
318-43	001	GRAY	9X9 UNDER CARPET	11	FLOOR RISER	
318-44	017	TAN	CERAMIC TILE/GROUT/GLUE	16	FLOOR RESTROOM	
318-45	017	TAN	" " "	16	" "	
318-46	017	TAN	" " "	16	" "	
318-47	018	White	CERAMIC / GLUE	16	WALL TILE	
318-48	018	"	" "	16	WALL TILE	
318-49	019	White	ROOF DRAIN 90° ELBOW	17	ABOVE DCT	
318-50	019	"	" " "	17	" "	
318-51	019	"	" " "	17	" "	
318-52	020	White	2X4 DCT. 4g FISSURE	18	HALLWAY CEILING	
318-53	020	"	" " "	18	" "	
318-54	020	"	" " "	18	" "	

PO Box 385
Oceanville, NJ 08231-0385
Phone: 609.652.1833
Fax: 609.652.1140
E-mail: ahera@aheraInc.com

OrderID: 042505075

RECEIVED
EMSL
CAMINSON, NJ
25 MAR 28 P12:49

042505075

BULK MATERIAL SAMPLING LOG

CLIENT: AHERA Consultants, Inc.
ADDRESS: PO Box 385
Oceanville, NJ 08231-0385
PHONE: (609) 652 - 1833
FAX: (609) 652 - 1140
PROJECT #: 25-6764
CONTACT:

DATE: 3/18/25
PROJECT: Willingboro-Kennedy Center
Bulk Sampling
429 John F Kennedy Way, Willingboro, NJ 08046
CLIENT: Willingboro Township
1 Rev. Dr. Martin Luther King Jr. Drive
Willingboro, NJ 08046
ANALYSIS: PLM
TURNAROUND EPA 600

OTHER INSTRUCTIONS: **STOP EACH SET AT FIRST POSITIVE.**

SAMPLE #	HOMG #	COLOR	MATERIAL TYPE	FUNC SPACE #	LOCATION DESCRIPTION	NOTES
318-55	021	GRAY	12X12 F.T./MASTIC	18	HALLWAY	
318-56	021	"	" "	18	HALLWAY	
318-57	021	"	" "	18	HALLWAY	
318-58	022	White	SHEETROCK	18	HALLWAY WALL	
318-59	022A	"	JOINT COMPOUND	18	HALLWAY WALL	
318-60	022	"	SHEETROCK	19	CREATIVE ARTS RM	
318-61	022A	"	JOINT COMPOUND	19	CREATIVE ARTS RM	
318-62	023	White	TEXTURED DCT-NEW	19	CREATIVE ARTS CEILING	
318-63	023	"	" " "	22	HALLWAY CEILING	
318-64	024	TAN	12X12 F.T./MASTIC	19	CREATIVE ARTS RM FLOOR	
318-65	024	"	" " "	19	" " "	
318-66	025	White	SHEET VINYL	22	HALLWAY FLOOR	
318-67	025	"	" "	22	" "	

AHERA Consultants INCORPORATED
PO Box 385
Oceanville, NJ 08231-0385
Phone: 609.652.1833
Fax: 609.652.1140
E-mail: ahera@aherainc.com

Lead Paint Remediation Sales Lead Form

Project Information	
Project Number	2997
Site Name	Kennedy Center
Site Address	429 John F Kennedy Way, Willingboro, NJ, 08046
Client Name	AHERA Consultants, Inc.
Client Contact	Donna D'Errico
Client Phone Number	(609) 577-8802
Client Email	donna@aherainc.com
Inspector:	Nyire Edmonds-Grant

To be filled out by Inspector

☐ No lead paint found.

☑ Lead paint found but remediation NOT recommended.

☐ Lead paint found and recommended remediation.

To be filled out by Administration

Date Report was Mailed: _____

Mailed via:

☐ USPS 1st Class ☐ FedEx 2 Day ☐ FedEx Overnight

181 US Hwy 46
Mine Hill, NJ 07803
(908) 654-8068
(800) 783-0567
Fax 908-654-8069

LEAD-BASED PAINT EVALUATION REPORT
PAINT TESTING

Performed At:
Kennedy Center
429 John F Kennedy Way,
Willingboro, NJ, 08046

Performed For:
AHERA Consultants, Inc.
Donna D'Errico
PO Box 385, Oceanville, NJ, 08231

Prepared By:
LEW Environmental Services, LLC.
181 US Hwy 46
Mine Hill, NJ 07803

Phone (908) 654-8068
Fax (908) 654-8069

Inspection Date: 03/18/2025
Project Number: 2997

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APPENDIX C PHOTOGRAPHS (IF APPLICABLE)
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Contact Information

Site

Name	Kennedy Center
Street Address	429 John F Kennedy Way, Willingboro, NJ, 08046

Client

Name	AHERA Consultants, Inc.
Contact	Donna D'Errico
Street	PO Box 385, Oceanville, NJ, 08231
Phone Number	(609) 577-8802

Site Evaluator

Site Evaluator	Nyire Edmonds-Grant
Certification Number	NJDHSS 013579
Instrumentation	Viken Pb200i Serial #1323
Signature	
Date	3/24/2025

Firm

Organization:	LEW Environmental Services, LLC.
Certification #:	NJDCA 00015
Street:	181 US Hwy 46
City, State & Zip:	Mine Hill, NJ 07803
Phone Number:	908-654-8068
Web Address:	www.lewcorp.com

Background

Renovations are slated for a section of the Kennedy Center in Willingboro, NJ. AHERA consultants has requested lead-based paint testing via XRF of the areas highlighted on the floor plan provided on 2/7/25.

LEW Environmental Services proposes to perform lead-based paint testing of the painted surfaces to be disturbed during the renovation project.

Executive Summary

On 03/18/2025 Nyire Edmonds-Grant of LEW Environmental Services, LLC. performed lead-based paint testing at Kennedy Center 429 John F Kennedy Way, Willingboro, NJ, 08046. LEW Environmental completed lead-based paint testing via XRF of the areas highlighted on the floor plan by AHERA consultants. The lead-based paint inspection sampling protocol that was applied to the areas tested follows "Inspections in Single-Family Housing" Chapter 7 of the HUD Guidelines (2012 revision) and the protocol as referenced in USEPA 40 CFR Part 745.227(b). Of the 194 readings taken, 01 were positive for lead-based paint. See Appendix B Lead Paint Inspection Report for the complete set of X-Ray Fluorescence data.

The Kennedy Center unit A-Wall pertains to the wall that is in the same plane or closest to the street address of the property.

The tables below indicate the location of the lead-based paint found. Each positive reading applies to all similar components in the same room equivalent (room, hall, stairwell, building exterior, etc.) For a lead-based paint free certification, the lead must be stripped or the leaded component replaced and confirmation achieved. Enclosure and encapsulation are not acceptable methods for a lead-based paint free certification.

Kennedy Center Components with Lead Based Paint

Room Equivalent	Component	Substrate	Value($^{mg}/_{cm^2}$)
Room 6	**Door Frame**	**Wood**	**1.4**
NONE			

EPA 40 CFR 745.227(h) states lead-based paint is present on any surface that is tested and found to contain lead equal to or in excess of 1.0 milligrams per square centimeter or equal to or in excess of 0.5% by weight. Local thresholds may be lower than this Federal standard. For example, NYC defines LBP as equal to or in excess of 0.5 milligrams per square centimeter

Regulatory Requirements

Required Disclosure

A summary of this lead-based paint evaluation report must be provided to new lessees (tenants). A complete copy of this report must be provided to purchasers and owners of this property and it must be made available to new tenants under federal law (24 CFR PART 35 AND 40 CFR PART 745) before they become obligated under a lease or sales contract. Landlords (lessors) and sellers are also required to distribute an educational pamphlet approved by the U.S. Environmental Protection Agency and include standard warning language in their leases or sales contracts to ensure that parents have the information they need to protect their children from lead-based paint hazards."

Should the recipient of this report receive federal subsidy they are responsible to comply with all requirements of 24 CFR Part 35 Requirements for the Notification, Evaluation and Reduction of Lead-Based Paint Hazards in Federally Owned Residential Property and Housing Receiving Federal Assistance; Final Rule which, are applicable to the type of program they are participating in and the dollar amount of subsidy being received. If this property or any of its tenants receives financial federal assistance, the results of the evaluation or hazard reduction activities must be provided by the designated party (client) to the owner of the referenced property and the occupants within 15 calendar days of the date when the designated party receives this report, or makes the presumption that lead-based paint hazards do exist.

Required Training for Workers

Should the lead-based paint and lead hazard reduction activities be part of a program which receives federal subsidy or a New Jersey multifamily building, all persons performing "Interim Controls" or "Standard Treatments" must be trained in accordance with 29 CFR 1926.59 and be supervised by an individual who successfully completed one of the following courses:

1. A lead-based paint abatement supervisors course accredited in accordance with 40 CFR 745.225
2. A lead-based paint abatement worker course accredited in accordance with 40 CFR 745.225
3. The lead-based paint Maintenance Training Program, "Work Smart, Work Wet, and Work Clean to Work Lead Safe", prepared by the National Environmental Training Association for EPA and HUD
4. "The Remodeler's and Renovator's Lead-Based Paint Training Program," prepared by HUD and the National Association of the Remodeling Industry
5. Another course approved by HUD for this purpose after consultation with EPA.

In accordance with Section 35.1340 all Lead-Based Paint and Lead Hazard reduction activities, which are not exempt (see regulations) require Lead Dust Wipe Clearance testing by a 1) certified lead inspector, 2) certified risk assessor or 3) a dust wipe sampling technician whose work is reviewed by a certified risk assessor.

If a renovation at the property is to occur, all work should comply with 40 CFR 745 Subpart E-Residential Property Renovation.

Controlling Lead-Based Paint

There are different options available for controlling lead-based paint. Each option has its own associated costs and benefits both short and long term. In most cases, a combination of the options can be implemented to reduce the possibility of lead contamination. LEW Environmental Services, LLC. strongly suggests that each option is thoroughly contemplated before beginning any activity.

Components that are found to be positive for lead-based paint should be checked for deterioration. Lead-based paint in deteriorated condition is considered a paint-lead hazard. Those components should be address as soon as possible using lead safe work practices at a minimum. However, if any components are found to test positive for lead based paint, they should be considered for future component removal or paint stripping.

Abatement for Lead-Based Paint Free Certification

Component Removal

Component removal is a permanent solution to the issue of potential exposure of lead. It requires taking the old lead-based painted component out and replacing it with a new non-lead painted component. The cost associated with this option depends mostly on the cost of the replacement component. Since labor is most often the more costly aspect of controlling lead issues, many owners choose component removal over more labor intensive methods. Components often chosen for removal are wood trim, windows, most doors, and exterior railings. Plaster and drywall ceilings and walls, fire rated doors, and wood porch components should also be considered.

Paint Stripping

Paint stripping is a permanent solution to the issue of potential exposure of lead. The paint can be removed either in-place or by an off-site processing facility. In-place removal can be mechanical or chemical. In-place paint stripping has the issue of proper disposal of the hazardous waste generated.

Mechanical stripping scrapes the paint off the substrate. Most times dry scraping is prohibited, but sanding or scraping can be done in conjunction with engineering controls to reduce airborne and settled lead dust. Power tools used to remove the paint must be equipped with a HEPA filtered shroud. Wetting a surface and hand scraping is also permitted. The components most often chosen for hand scraping are window and door jambs. Power tools are better equipped to handle lager surface areas.

Chemical stripping in-place uses strong chemicals to soften the paint for easier removal from the substrate. The chemicals are either very acidic or very basic, so proper training and protection for the worker is imperative. Generally, the chemicals must remain in- place overnight, so maintaining a secure worksite separate from occupants is mandatory.

Off site facilities use much stronger chemicals to remove the lead-based paint from the component. Components often chosen for off-site paint removal are intricate metal pieces. Sometimes this method is used for intricate wood work, but the stronger chemicals soften the wood and can drive lead into the wood while removing the paint.

Abatement to Control Lead-Based Paint Hazards

Enclosure

Enclosure is the option of sealing off the lead-based painted component by sealing it in with another building material. Such materials would include, but are not limited to; sheet rock, paneling, vinyl or aluminum siding and radiator covers, etc. Enclosure is not a permanent solution; and, if the enclosure material ever becomes disturbed, the lead-based paint is exposed. Depending on the building material used for enclosure, this can be an affordable option. Depending on the enclosure option taken it is possible that no lead abatement procedures need to be followed; but, of course, consult a professional before beginning.

Encapsulation

Encapsulation is the process of using an encapsulant-type of product that is applied over the lead-painted component. There are currently many different types of encapsulants on the market, and they come in many different forms. Some encapsulants are like stucco, some are like a two-part epoxy, some are like a heavy latex paint, and some are like a cement or plaster. Different types of encapsulants have different life expectancies and some come in different colors. None of the encapsulants are guaranteed forever, although some do come with a life or 10 to 20 year guarantee. To be considered a true lead abatement method according to the American Society of Testing Materials (ASTM) the encapsulant must meet their longevity criteria of at a minimum twenty (20) years. This option is not a permanent solution; and if the encapsulant ever becomes disturbed, the lead-based paint is exposed. Encapsulation is typically the least expensive option and has currently been accepted at the federal level as a viable and affordable option for lead abatement or in-place management, assuming the encapsulant meets the ASTM requirements for encapsulants.

Interim Control Options

An In-Place Management program is an on going set of measures designed to temporarily reduce human exposure or possible exposure and accessibility to lead-based paint hazards. Such measures include specialized cleaning, repairs, maintenance, paint stabilization, painting, temporary containment, and management and resident education programs. Monitoring, conducted by owners, and reevaluations conducted by professionals, are integral elements of interim controls. Interim controls include dust removal; paint film stabilization; treatment of friction and impact surfaces; installation of soil coverings, such as grass or sod; ground covering plants so as not to allow for easy accessibility, and land-use controls

Unlike Abatement, Interim Controls are considered to be temporary repairs and are not to be used as permanent solutions to lead-based hazards. Interim controls strategies are a very effective and cost saving program to substantially reduce the potential for lead poisoning. However, interim controls programs will only work and prove effective if reevaluation is continually performed. Reevaluation is the combination of a visual assessment and collection of environmental samples by a certified risk assessor on an on-going basis to determine if a previously implemented lead-based hazard control measure is still effective and if the dwelling remains lead-safe.

LEW Environmental Services, LLC. strongly suggests that HEPA vacuuming and Lead-Specific Cleaning detergent/LEDIZOLV wash downs should continue on a routine basis and a continual visual inspection/assessment and sample collection should be performed at least every 1 to 3 years, or until the dust levels continually remain below actionable levels.

Procedures & Methodology

Location Conventions

When reviewing Appendix A “Floor Plan” and Appendix B “Lead-Based Paint Evaluation Report”, you will notice that the letters A, B, C, and D are used to identify the location of specific components. The key to correct orientation is the location of the “A” wall, which is depicted on the floor plan or in the Executive Summary. The “B” wall, “C” wall, and “D” wall run clockwise from the “A” wall. The Lead-Based Paint Evaluation Report lists this information under the “Wall” column. The “Location” column uses numbering of replicated components starting with “1” at left and continuing sequentially to right respectively to describe the location of the component while facing the wall identified.

Paint Testing

X-Ray Fluorescence

X-Ray Fluorescence (XRF) paint testing is performed to detect the presence of lead on painted surfaces. The XRF instrument is state-of-the art equipment. XRF testing is usually the preferred method of testing, because it is non-destructive, quantitative and can be performed on the spot with acceptable accuracy. LEW Environmental Services, LLC. ’s evaluators follow the manufacturer’s suggested use and the Performance Characteristic Sheet of the XRF instrument being used. The results of the XRF testing are the basis for drawing conclusions and making recommendations in the report.

All LEW Environmental Services, LLC. ’s evaluators follow 40 CFR 745 and the HUD Guidelines for testing lead using an XRF instrument. All federal, state and city regulations are followed when applicable. The evaluator will test one of each and every different type of testing combination (component) in each room being surveyed. Each XRF reading is assigned an exclusive sample reference number and a measurement that is stored in the instrument. Each sample reference number location is logged on the XRF instrument for future reference, testing location, and report generation. The above described testing format is followed unless otherwise not practical or if the evaluator’s judgment decides to test in a different systematic approach.

It should be noted that detected lead levels below current levels still could create lead dust or lead-contaminated soil hazards if the paint is turned into dust by abrasion, scraping, or sanding leading to possible elevated blood lead levels. Lead poisoning is a cumulative affect. Should a child or an adult inhale or ingest sufficient quantities of low

concentrations of leaded paint, dust, or soil, it will accumulate in the body's systems and could eventually cumulate to an elevated blood level of concern.
Any untested building components should be considered lead-based paint until tested.

Substrate Correction

X-Ray Fluorescence (XRF) readings are sometimes subject to systematic biases as a result of interference from substrate material beneath the paint. The magnitude and direction of bias depends on the substrate, the specific XRF instrument being used, and other factors such as temperature and humidity. Results can be biased in either the positive or negative direction and may be quite high. Consequently, the XRF Performance Characteristic Sheet is consulted to determine the requirements for XRF substrate correction conditions.

XRF results are corrected for substrate bias by subtracting a correction value determined by randomly selecting two housing units to be used to collect substrate measurements for all substrates within the development that need corrections and use the results from those two units to perform substrate correction calculations in all tested units within the development or building. The substrate correction value is obtained by using the specific XRF instrument(s) that is/are being used at the site. The correction value is an average of six XRF readings taken over red NIST SRM (1.02mg/cm^2) paint film, with three readings taken from two test locations that have been scraped visually clean of their paint coating. The red NIST SRM 1.02mg/cm^2 is then subtracted from the average of the six readings; the result is the Substrate Correction value. The substrate correction value is then subtracted from the XRF measurement on the specific testing combinations that falls within the substrate correction range according to the Performance Characteristic Sheets requirements. According to the Performance Characteristic Sheet for the XRF instrument once a substrate correction value is applied should it be needed the final Lead-Based Paint measurement should be either Positive or Negative.

Calibration Check Readings

In addition to the manufacturer's recommended warm up and quality control procedures, LEW Environmental Services, LLC. collects quality control readings as recommended in the HUD Guidelines. Quality control for XRF instrumentation instruments involves readings to check calibration.

For each XRF instrument, one set of XRF calibration check readings are recommended at least every four hours. The first is a set of three nominal-time or source decay corrected time XRF calibration check readings to be taken before the inspection begins for the day. The second occurs either after the day's inspection work has been completed, or at least every four hours, whichever occurs first. LEW Environmental Services, LLC. 's XRF calibration check readings are taken on the Standard Reference Material (SRM) paint film nearest to 1.0 mg/cm^2 within the National Institute of Standards and Technology (NIST) SRM Used or the XRF manufacturer's factory supplied SRM film. Three readings are collected on the SRM. The average of the three readings on the SRM must be within the acceptable plus and minus tolerances for proper calibration as detailed in the Performance Characteristic Sheet (PCS). All calibration checks are taken with the SRM film positioned at least several inches away from any potential source of lead.

Three readings are taken each time calibration check readings are made, the readings are taken using the nominal time that is specified in the Performance Characteristic Sheet. The average of the readings are compared to the known value and if the average value is within the acceptable calibration check tolerance specified in the XRF Performance Characteristic Sheet the instrument is considered in control. If the average readings are not within the calibration check tolerance the instrument is not used until the instrument is brought back into control.

Paint Chips

Paint chips are taken for confirmation of lead based paint, or as a solution to inconclusive measurement recorded by the use of XRF testing. Paint chips are typically not taken unless absolutely necessary. On components that are right on the XRF action level, a paint chip is the only other way to get a conclusive determination as to the level of lead in the paint and if the component should be considered as actionable or not. Paint chips, when taken, are usually taken from an inconspicuous areas and tape and/or paint is placed over the removed paint location.

When the inspector collects paint-chip samples for analysis, they are analyzed by a laboratory recognized under the EPA's National Lead Laboratory Accreditation Program (NLLAP). Paint-chip samples contain all layers of paint (not just

peeled layers) and must always include the bottom layer. If results will be reported in mg/cm², including a small amount of substrate with the sample will not significantly bias results. Substrate material should not, however, be included in samples reported in weight percent. Paint from 4 square inches (25 square centimeters) should provide a sufficient quantity for laboratory analysis. Smaller surface areas may be used, if the laboratory indicates that a smaller sample is acceptable.

Current action levels for lead in paint:

PAINT CHIP ACTION LEVELS BY PERCENT WEIGHT	0.5% OR 5000 parts per million
PAINT CHIP ACTION LEVELS BY WEIGHT PER AREA	Same as XRF action levels, may be state dependent

Appendix A Floor Plan

KENNEDY CENTER
WILLIAMSBURG, VA

Appendix B Lead-Based Paint Evaluation Report

Company	LEW Corporation
XRF Make	Heuresis
Model	Pb200i
Serial Num.	1833
Lead concentration units: mg/cm2	
Total Readings:	181
Action Level	1
Mode	Action Level
Analytic Mode	Lead Paint

All Readings

Job Id	Reading #	Concentration	Result	Calibration	RTA Present	Date	Time	User	Analytic Mode	Site Address	Area	Unit #	Room	Structure	Member	Substrate	Wall	Location
Kennedy	Kennedy Center	1		TRUE	FALSE	3/18/2025	3:04 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ								
Kennedy	Kennedy Center	1		TRUE	FALSE	3/18/2025	3:05 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ								
Kennedy	Kennedy Center	1		TRUE	FALSE	3/18/2025	3:06 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ								
Kennedy	Kennedy Center	0		TRUE	FALSE	3/18/2025	3:08 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ								
Kennedy	Kennedy Center	0		TRUE	FALSE	3/18/2025	3:08 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ								
Kennedy	Kennedy Center	0		TRUE	FALSE	3/18/2025	3:09 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ								
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	3:11 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Security	Door	---	Wood	A	
Kennedy	Kennedy Center	0.5	Negative	FALSE	FALSE	3/18/2025	3:11 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Security	Door	Jamb	Metal	A	
Kennedy	Kennedy Center	0.4	Negative	FALSE	FALSE	3/18/2025	3:13 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Security	Door	Casing	Metal	A	
Kennedy	Kennedy Center	0.5	Negative	FALSE	FALSE	3/18/2025	3:14 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Security	Door	Casing	Metal	B	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	3:16 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Security	Door	---	Metal	B	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	3:17 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Security	Door	Casing	Wood	C	
Kennedy	Kennedy Center	0.2	Negative	FALSE	FALSE	3/18/2025	3:18 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Security	Door	Casing	Wood	D	
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	3:18 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Security	Door	---	Wood	D	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	3:19 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Security	Room	Wall	Concrete	D	
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	3:20 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Security	Room	Wall	Concrete	C	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	3:21 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Security	Room	Wall	Concrete	B	
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	3:22 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Security	Room	Wall	Concrete	A	
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	3:24 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 2	Room	Wall	Drywall	A	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	3:25 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 2	Room	Wall	Drywall	B	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	3:25 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 2	Room	Wall	Drywall	C	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	3:26 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 2	Room	Wall	Drywall	D	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	3:27 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 2	Door	---	Wood	B	
Kennedy	Kennedy Center	0.6	Negative	FALSE	FALSE	3/18/2025	3:28 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 2	Door	Jamb	Metal	B	
Kennedy	Kennedy Center	0.5	Negative	FALSE	FALSE	3/18/2025	3:30 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 2	Door	Casing	Metal	B	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	3:31 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 2	Door	---	Wood	B	2
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	3:33 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 3	Door	---	Wood	D	2
Kennedy	Kennedy Center	0.2	Negative	FALSE	FALSE	3/18/2025	3:34 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 3	Door	Casing	Metal	D	2
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	3:35 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 3	Window	Casing	Metal	D	2
Kennedy	Kennedy Center	0.3	Negative	FALSE	FALSE	3/18/2025	3:36 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 3	Door	Casing	Metal	B	2
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	3:37 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 3	Door	---	Metal	B	2
Kennedy	Kennedy Center	0.5	Negative	FALSE	FALSE	3/18/2025	3:38 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 3	Door	Jamb	Metal	B	2
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	3:40 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 3	Room	Wall	Drywall	A	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	3:40 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 3	Room	Wall	Drywall	B	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	3:41 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 3	Room	Wall	Drywall	C	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	3:42 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 3	Room	Wall	Drywall	D	
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	3:46 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 5	Room	Wall	Drywall	B	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	3:47 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 5	Room	Wall	Drywall	C	
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	3:48 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 5	Room	Wall	Drywall	D	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	3:49 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 5	Room	Wall	Concrete	D	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	3:50 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 5	Closet	Door	Wood	B	
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	3:51 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 5	Closet	Door Casing	Wood	B	
Kennedy	Kennedy Center	0.3	Negative	FALSE	FALSE	3/18/2025	3:52 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 5	Door	Jamb	Wood	B	
Kennedy	Kennedy Center	0.3	Negative	FALSE	FALSE	3/18/2025	3:53 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 5	Door	Casing	Metal	B	
Kennedy	Kennedy Center	0.2	Negative	FALSE	FALSE	3/18/2025	3:54 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 5	Door	---	Metal	B	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	3:55 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 5	Door	---	Wood	A	
Kennedy	Kennedy Center	0.4	Negative	FALSE	FALSE	3/18/2025	3:56 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 5	Door	Jamb	Metal	A	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	3:57 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 5	Door	Casing	Metal	A	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	3:58 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Door	Casing	Metal	B	
Kennedy	Kennedy Center	0.4	Negative	FALSE	FALSE	3/18/2025	3:59 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Door	Jamb	Metal	B	

Job Id	Reading #	Concentration	Result	Calibration	RTA Present	Date	Time	User	Analytic Mode	Site Address	Area	Unit #	Room	Structure	Member	Substrate	Wall	Location
Kennedy	Kennedy Center	0.2	Negative	FALSE	FALSE	3/18/2025	4:00 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Door	---	Metal	B	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	4:02 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Room	Wall	Concrete	A	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	4:02 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Room	Wall	Concrete	B	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	4:03 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Room	Wall	Concrete	C	
Kennedy	Kennedy Center	1.4	Positive	FALSE	FALSE	3/18/2025	4:05 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Door	Frame	Wood	D	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	4:07 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Door	Metal	A	1
Kennedy	Kennedy Center	0.3	Negative	FALSE	FALSE	3/18/2025	4:08 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Door Jamb	Metal	A	1
Kennedy	Kennedy Center	0.2	Negative	FALSE	FALSE	3/18/2025	4:09 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Door Casing	Metal	A	1
Kennedy	Kennedy Center	0.2	Negative	FALSE	FALSE	3/18/2025	4:11 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Wall	Concrete	A	1
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	4:12 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Wall	Concrete	A	1
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	4:13 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Wall	Concrete	A	1
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	4:14 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Door	Metal	A	2
Kennedy	Kennedy Center	0.5	Negative	FALSE	FALSE	3/18/2025	4:15 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Door Jamb	Metal	A	2
Kennedy	Kennedy Center	0.3	Negative	FALSE	FALSE	3/18/2025	4:16 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Door Casing	Metal	A	2
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	4:17 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Wall	Concrete	A	2
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	4:18 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Wall	Concrete	A	2
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	4:18 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Wall	Concrete	A	2
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	4:19 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Wall	Concrete	A	2
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	4:21 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Door	Metal	C	1
Kennedy	Kennedy Center	0.5	Negative	FALSE	FALSE	3/18/2025	4:22 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Door Jamb	Metal	C	1
Kennedy	Kennedy Center	0.4	Negative	FALSE	FALSE	3/18/2025	4:23 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Door Casing	Metal	C	1
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	4:24 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Wall	Concrete	C	1
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	4:25 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Wall	Concrete	C	1
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	4:26 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Wall	Concrete	D	1
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	4:27 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Wall	Concrete	D	1
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	4:28 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Door	Concrete	B	2
Kennedy	Kennedy Center	0.5	Negative	FALSE	FALSE	3/18/2025	4:29 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Door Jamb	Metal	B	2
Kennedy	Kennedy Center	0.5	Negative	FALSE	FALSE	3/18/2025	4:30 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Door Casing	Metal	B	2
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	4:31 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Wall	Concrete	B	2
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	4:32 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Wall	Concrete	B	2
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	4:33 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Wall	Concrete	B	2
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	4:33 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Wall	Concrete	B	2
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	4:35 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Wall	Concrete	B	2
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	4:35 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Wall	Concrete	B	2
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	4:36 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Wall	Concrete	B	2
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	4:37 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Wall	Concrete	B	2
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	4:38 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Door	Concrete	B	2
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	4:40 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Door Casing	Metal	B	2
Kennedy	Kennedy Center	0.3	Negative	FALSE	FALSE	3/18/2025	4:41 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Door Casing	Metal	B	2
Kennedy	Kennedy Center	0.5	Negative	FALSE	FALSE	3/18/2025	4:42 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Closet	Door Jamb	Metal	B	2
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	4:44 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 7	Room	Wall	Drywall	A	2
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	4:45 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 7	Room	Wall	Drywall	C	2
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	4:46 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 7	Room	Wall	Drywall	D	2
Kennedy	Kennedy Center	0.2	Negative	FALSE	FALSE	3/18/2025	4:47 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 7	Room	Wall	Concrete	B	2
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	4:48 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 7	Door	---	Wood	B	2
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	4:49 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 7	Door	Casing	Wood	A	
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	4:50 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 7	Door	Jamb	Wood	A	
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	4:51 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 7	Door	Jamb	Wood	C	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	4:52 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 7	Door	Casing	Wood	C	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	4:53 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 7	Door	---	Wood	C	
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	4:54 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 7	Window	Sill	Wood	D	
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	4:55 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 7	Window	Casing	Wood	D	
Kennedy	Kennedy Center	0.8	Negative	FALSE	FALSE	3/18/2025	4:57 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 7	Window	Casing	Metal	A	
Kennedy	Kennedy Center	0.7	Negative	FALSE	FALSE	3/18/2025	5:00 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 8	Door	Casing	Metal	A	
Kennedy	Kennedy Center	0.4	Negative	FALSE	FALSE	3/18/2025	5:02 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 8	Door	---	Metal	A	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	5:02 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 8	Room	Wall	Concrete	B	
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	5:03 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 8	Room	Wall	Concrete	D	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	5:04 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 8	Room	Wall	Drywall	D	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	5:06 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 9	Room	Wall	Concrete	A	
Kennedy	Kennedy Center	0.3	Negative	FALSE	FALSE	3/18/2025	5:06 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 9	Room	Wall	Concrete	B	
Kennedy	Kennedy Center	0.2	Negative	FALSE	FALSE	3/18/2025	5:07 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 9	Room	Wall	Concrete	C	

Job Id	Reading #	Concentration	Result	Calibration	RTA Present	Date	Time	User	Analytic Mode	Site Address	Area	Unit #	Room	Structure	Member	Substrate	Wall	Location
Kennedy	Kennedy Center	0.3	Negative	FALSE	FALSE	3/18/2025	5:09 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 9	Room	Wall	Concrete	D	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	5:10 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 9	Door	---	Metal	B	
Kennedy	Kennedy Center	0.5	Negative	FALSE	FALSE	3/18/2025	5:11 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 9	Door	Casing	Metal	B	
Kennedy	Kennedy Center	0.6	Negative	FALSE	FALSE	3/18/2025	5:12 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 9	Door	Casing	Metal	C	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	5:14 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 9	Door	---	Metal	C	
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	5:15 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 10	Room	Wall	Concrete	A	
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	5:16 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 10	Room	Wall	Concrete	C	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	5:18 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 10	Room	Wall	Drywall	B	
Kennedy	Kennedy Center	0.2	Negative	FALSE	FALSE	3/18/2025	5:19 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 11	Room	Wall	Concrete	A	
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	5:20 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 11	Room	Wall	Concrete	B	
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	5:21 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 11	Room	Wall	Concrete	C	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	5:22 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 11	Room	Wall	Concrete	D	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	5:23 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 11	Door	---	Metal	B	
Kennedy	Kennedy Center	0.3	Negative	FALSE	FALSE	3/18/2025	5:24 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 11	Door	Casing	Metal	B	
Kennedy	Kennedy Center	0.5	Negative	FALSE	FALSE	3/18/2025	5:37 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 11	Door	Casing	Metal	A	
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	5:39 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 11	Door	---	Metal	A	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	5:41 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 12	Door	---	Metal	A	
Kennedy	Kennedy Center	0.5	Negative	FALSE	FALSE	3/18/2025	5:42 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 12	Window	Casing	Metal	C	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	5:44 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 12	Room	Wall	Drywall	A	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	5:45 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 12	Room	Wall	Drywall	D	
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	5:46 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 12	Room	Wall	Concrete	B	
Kennedy	Kennedy Center	0.2	Negative	FALSE	FALSE	3/18/2025	5:48 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 13	Room	Wall	Concrete	B	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	5:49 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 13	Room	Wall	Concrete	B	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	5:50 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 13	Room	Wall	Concrete	C	
Kennedy	Kennedy Center	0.2	Negative	FALSE	FALSE	3/18/2025	5:50 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 13	Room	Wall	Concrete	D	
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	5:51 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 13	Room	Wall	Concrete	A	
Kennedy	Kennedy Center	0.4	Negative	FALSE	FALSE	3/18/2025	5:55 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 13	Door	---	Metal	A	
Kennedy	Kennedy Center	0.5	Negative	FALSE	FALSE	3/18/2025	5:55 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 13	Door	Casing	Metal	A	
Kennedy	Kennedy Center	0.4	Negative	FALSE	FALSE	3/18/2025	5:57 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 13	Door	---	Metal	A	
Kennedy	Kennedy Center	0.8	Negative	FALSE	FALSE	3/18/2025	6:00 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 13	Door	Casing	Metal	A	
Kennedy	Kennedy Center	0.7	Negative	FALSE	FALSE	3/18/2025	6:02 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 13	Door	Casing	Metal	D	2
Kennedy	Kennedy Center	0.8	Negative	FALSE	FALSE	3/18/2025	6:04 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 13	Door	Jamb	Metal	D	2
Kennedy	Kennedy Center	0.4	Negative	FALSE	FALSE	3/18/2025	6:05 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 13	Door	---	Metal	D	2
Kennedy	Kennedy Center	0.2	Negative	FALSE	FALSE	3/18/2025	6:07 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 14	Door	---	Metal	C	2
Kennedy	Kennedy Center	0.5	Negative	FALSE	FALSE	3/18/2025	6:08 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 14	Door	Casing	Metal	C	2
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	6:09 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 14	Window	Casing	Metal	C	2
Kennedy	Kennedy Center	0.7	Negative	FALSE	FALSE	3/18/2025	6:12 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 14	Room	Wall	Concrete	B	2
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	6:13 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 14	Room	Wall	Concrete	A	2
Kennedy	Kennedy Center	0.3	Negative	FALSE	FALSE	3/18/2025	6:14 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 14	Room	Wall	Concrete	D	2
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	6:16 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 15	Door	---	Wood	C	2
Kennedy	Kennedy Center	0.4	Negative	FALSE	FALSE	3/18/2025	6:17 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 15	Door	Jamb	Metal	C	2
Kennedy	Kennedy Center	0.4	Negative	FALSE	FALSE	3/18/2025	6:18 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 15	Door	Casing	Metal	C	2
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	6:20 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 16	Room	Wall	Concrete	B	2
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	6:21 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 16	Room	Wall	Concrete	D	2
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	6:22 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 16	Room	Wall	Concrete	C	2
Kennedy	Kennedy Center	0.5	Negative	FALSE	FALSE	3/18/2025	6:24 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 16	Closet	Door Casing	Concrete	C	2
Kennedy	Kennedy Center	0.6	Negative	FALSE	FALSE	3/18/2025	6:25 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 16	Closet	Door Jamb	Concrete	C	2
Kennedy	Kennedy Center	0.2	Negative	FALSE	FALSE	3/18/2025	6:26 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 16	Closet	Wall	Concrete	C	2
Kennedy	Kennedy Center	0.2	Negative	FALSE	FALSE	3/18/2025	6:27 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 16	Closet	Wall	Concrete	C	2
Kennedy	Kennedy Center	0	Negative	FALSE	FALSE	3/18/2025	6:28 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 16	Closet	Wall	Concrete	C	2
Kennedy	Kennedy Center	0.3	Negative	FALSE	FALSE	3/18/2025	6:28 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 16	Closet	Wall	Concrete	C	2
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	6:30 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 17	Door	---	Metal	A	2
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	6:31 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 17	Door	Casing	Metal	A	2
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	6:32 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 17	Door	---	Metal	C	2
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	6:33 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 17	Door	Casing	Metal	C	2
Kennedy	Kennedy Center	0.2	Negative	FALSE	FALSE	3/18/2025	6:34 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 17	Room	Wall	Concrete	A	2
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	6:37 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 17	Room	Wall	Concrete	B	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	6:38 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 17	Room	Wall	Concrete	C	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	6:39 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 17	Room	Wall	Drywall	D	
Kennedy	Kennedy Center	0.2	Negative	FALSE	FALSE	3/18/2025	6:40 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 18	Room	Wall	Drywall	A	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	6:42 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 18	Room	Wall	Drywall	B	

Job Id	Reading #	Concentration	Result	Calibration	RTA Present	Date	Time	User	Analytic Mode	Site Address	Area	Unit #	Room	Structure	Member	Substrate	Wall	Location
Kennedy	Kennedy Center	0.2	Negative	FALSE	FALSE	3/18/2025	6:43 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 18	Room	Wall	Drywall	C	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	6:45 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 18	Room	Wall	Drywall	D	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	6:46 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 18	Door	Casing	Metal	A	
Kennedy	Kennedy Center	0.2	Negative	FALSE	FALSE	3/18/2025	6:47 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 19	Door	---	Wood	A	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	6:48 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 19	Door	---	Wood	A	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	6:50 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 19	Door	Casing	Metal	C	
Kennedy	Kennedy Center	0.2	Negative	FALSE	FALSE	3/18/2025	6:51 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 19	Room	Wall	Drywall	C	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	6:52 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 19	Room	Wall	Drywall	B	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	6:53 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 19	Room	Wall	Drywall	D	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	6:54 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 20	Room	Wall	Drywall	C	
Kennedy	Kennedy Center	0.2	Negative	FALSE	FALSE	3/18/2025	6:55 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 20	Room	Wall	Drywall	B	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	6:56 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 20	Room	Wall	Drywall	A	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	6:57 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 20	Room	Wall	Drywall	D	
Kennedy	Kennedy Center	0.2	Negative	FALSE	FALSE	3/18/2025	6:58 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 20	Door	Casing	Metal	C	
Kennedy	Kennedy Center	0.1	Negative	FALSE	FALSE	3/18/2025	6:59 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 20	Door	---	Wood	C	
Kennedy	Kennedy Center	1.1		TRUE	FALSE	3/18/2025	7:01 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ								
Kennedy	Kennedy Center	1		TRUE	FALSE	3/18/2025	7:03 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ								
Kennedy	Kennedy Center	1.1		TRUE	FALSE	3/18/2025	7:04 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ								
Kennedy	Kennedy Center	0		TRUE	FALSE	3/18/2025	7:06 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ								
Kennedy	Kennedy Center	0.1		TRUE	FALSE	3/18/2025	7:07 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ								
Kennedy	Kennedy Center	0.1		TRUE	FALSE	3/18/2025	7:08 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ								

Company	LEW Corporation
XRF Make	Heuresis
Model	Pb200i
Serial Num.	1833
Lead concentration units: mg/cm2	
Total Readings:	181
Total Positives	1
Action Level	1
Mode	Action Level
Analytic Mode	Lead Paint

Actionables

Job Id	Reading #	Concentration	Result	Calibration	RTA Present	Date	Time	User	Analytic Mode	Site Address	Area	Unit #	Room	Structure	Member	Substrate	Wall	Location
Kennedy	Kennedy Center	1.4	Positive	FALSE	FALSE	3/18/2025	4:05 PM	Nyire Edmonds-Grant	Lead Paint	429 John F Kennedy Way Willingboro, NJ	Unit	Kennedy Center	Room 6	Door	Frame	Wood	D	

Appendix C Photographs (if applicable)

LEW Environmental Services, LLC. is not responsible for the quality of the pictures, nor the clarity, content or the detail.

Appendix D Lab Support Documents (if applicable)