Fairfax County PUBLIC SCHOOLS
ENGAGE • INSPIRE • THRIVE

HVAC SYSTEM UPGRADES

AT

FLINT HILL ELEMENTARY SCHOOL

2444 FLINT HILL ROAD

VIENNA, VA 22181

INVITATION FOR BID #MMB-024-22

INTENT

It is the intent of this contract to remove unit ventilators in the classrooms, boilers, chiller and all associated equipment. Install three (3) roof mounted makeup air units at the specified locations and VRF systems for all the classrooms. The work shall include all associated demolition, rigging, piping, equipment, roofing, ductwork, ceiling, structural work, electrical equipment, controls, insulation, patching, painting and related work as shown on the project drawings and as detailed in these specifications to provide a complete and fully operational installation.

FEDERAL FUNDING

Potential bidders are advised that this procurement will be funded by means of a grant provided to Fairfax County Public Schools from the Elementary and Secondary School Emergency Relief Fund (ESSER II) pursuant to the Coronavirus Response and Relief Supplemental Appropriations Act, 2021 Public Law 116-260, enacted on December 27, 2020 (CRRSA). Consequently, the successful bidder will be required to comply with all federal requirements relating to use of ESSER II funding, including but not limited to payment of local prevailing wages in accordance with the Davis-Bacon Act, as amended (40 U.S.C. §§ 3141-3148).

FAIRFAX COUNTY PUBLIC SCHOOLS
OFFICE OF FACILITIES MANAGEMENT
5025 SIDEBURN ROAD
FAIRFAX, VA 22032-2637
(703) 764-2457

In the event of inclement weather that closes the Fairfax County Public Schools Central or Administrative Offices, bids will be due and opened at the same time, the following business day that offices are open. To confirm closing, visit us online at www.fcps.edu.

FAIRFAX COUNTY PUBLIC SCHOOLS
Flint Hill Elementary School

Fairfax County PUBLIC SCHOOLS
ENGAGE • INSPIRE • THRIVE

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INVITATION FOR BID
(FOR PROJECT FUNDED BY FEDERAL GRANT)

1. NOTICE AND INVITATION

The Fairfax County School Board (the "Owner") hereby invites qualified bidders who are properly licensed in the Commonwealth of Virginia to submit bids for HVAC System Upgrades at Flint Hill Elementary School (the "Project"). The Project generally consists of Install three (3) roof mounted makeup air units at the specified locations and VRF systems for all the classrooms at the specified location. The work includes all associated demolition rigging, piping, equipment, electrical equipment, controls, insulation, patching, painting and related work as shown on the project drawings and as detailed in the specifications to provide a complete and fully operational installation.

2. FEDERAL FUNDING

Potential bidders are advised that this procurement will be funded by means of a grant awarded to the Owner from the Elementary and Secondary School Emergency Relief Fund (ESSER II) pursuant to the Coronavirus Response and Relief Supplemental Appropriations Act, 2021 Public Law 116-260, enacted on December 27, 2020 (CRRSA). Bidders are further advised that the federal stimulus funding process under CRRSA is still evolving and that new requirements for compliance with CRRSA and ESSER II may still be forthcoming from federal government and the Owner. Consequently, the successful bidder will be required to comply with all federal requirements relating to CRRSA and use of ESSER II funding that are now in effect or that may be announced during performance of any contract awarded hereunder.

3. PREVAILING WAGE OBLIGATIONS

The successful bidder will be required to pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in a wage determination made by the Secretary of Labor and set forth here: https://sam.gov/wage-determination/VA20210178/5. The decision to award a contract or subcontract must be conditioned upon the acceptance of this wage determination.

4. RECEIPT OF BIDS – NOT APPLICABLE

Bids shall be submitted to Owner in duplicate, and in the manner described in the Instructions to Bidders, **on or before 2:00 p.m. on January 27, 2022**. Bids shall be delivered, and time stamped in **Room 16, Sideburn Support Center, 5025**

Sideburn Road, Fairfax, VA 22032 on or before the hour and date designated, at which time they will be opened and read aloud in public.

5. LUMP SUM

Bids will be considered on a lump sum basis for the entire work described on the drawings and in the specifications.

6. DRAWINGS/SPECIFICATIONS

Drawings and specifications may be examined and one (1) set obtained at the Office of Facilities Management, Room 14, 5025 Sideburn Road, Fairfax, VA 22032-6009.

7. MINORITY/SMALL BUSINESS

Minority contractors and small business enterprises are invited and encouraged to submit bids.

8. COMPLETION TIME

The Contractor shall substantially complete the project within the time specified GENERAL CONDITIONS Item Number 16. Failure to complete this project within these specified dates without written agreement by FCPS Office of Facilities Management may result in the enforcement of liquidated damages or ineligibility to be awarded contracts on future FCPS Office of Facilities Management projects, or both.

END OF SECTION

INSTRUCTIONS TO BIDDERS
(FOR PROJECT FUNDED BY FEDREAL GRANT)

1. QUALIFICATIONS OF BIDDER:

If a contract is for one hundred twenty thousand dollars ($120,000.00) or more, or if the total value of all construction removal, repair or improvements undertaken by the bidder within any twelve (12) month period is seven hundred fifty thousand dollars ($750,000.00) or more, the bidder is required under Title 54, Chapter 11, Code of Virginia (1950) as amended, to show evidence of being licensed as "Class A Contractor." **(Non-Virginia licenses are not acceptable.)** If a contract is seventy-five hundred dollars ($7,500.00) or more but less than one hundred twenty thousand dollars ($120,000.00) the bidder is required to show evidence of being licensed as a "Class B Contractor." The bidder shall place on the outside of the envelope containing the bid and shall place in over his signature whichever of the following notations is appropriate:

"Licensed Class A Virginia Contractor No. _____"

"Licensed Class B Virginia Contractor No. _____"

The Code of Virginia *does not allow an unlicensed contractor to submit a bid* where the resultant contract will require a license.

2. LICENSE REQUIREMENT:

All firms doing business in Fairfax County shall obtain a license as required by Chapter 4, Article 7, of The Code of the County of Fairfax, Virginia, as amended, entitled "Business, Professional and Occupational Licensing (BPOL) Tax." Questions concerning the BPOL tax should be directed to the Office of Assessments, telephone (703) 222-8234

3. REGISTRATION OF BUSINESS ENTITY:

Authorization to Transact Business in Virginia: By submitting a bid in response to this solicitation, the bidder represents and warrants as follows: (a) it has authorization to transact business in the Commonwealth of Virginia as a domestic or foreign business entity if so required by Title 13.1 or Title 50 of the Code of Virginia, or as otherwise required by law; and (b) it shall not allow its existence to lapse or its certification of authority or registration to transact business in Virginia, if so required under Title 13.1 or Title 50 of the Code of Virginia, to be revoked or cancelled at any time during the term of this Contract.

Certificate of Authority: Any foreign business entity transacting business in Virginia shall secure a certificate of authority as required by Title 13.1 or Title 50

of the Code of Virginia, from the State Corporation Commission, Post Office Box 1197, Richmond, Virginia 23209. The Commission may be reached at (804) 371-9733 or (800) 552-7945.

4. MANDATORY PRE-BID MEETING: NOT APPLICABLE

A mandatory pre-bid meeting will be held January 17, 2022* at 9:00 a.m. at **Flint Hill Elementary School**, 2444 Flint Hill Road, Vienna, Virginia 22181. Contractors shall meet in the Lobby of the buildings front entrance to sign the meeting roster. **NO ONE WILL BE ADMITTED AFTER 9:05 A.M.**

**All individuals attending the meeting will be required to wear a face covering. In the event of inclement weather on the date of the Mandatory Pre-Bid meeting that delays opening or closes the Fairfax County Public Schools Central or Administrative Offices, the meeting will be rescheduled by Addendum.*

The purpose of the pre-bid meeting is to provide potential Bidders an opportunity to ask questions and obtain clarification about any aspect of this Invitation for Bid. Any changes or clarifications resulting from this pre-bid meeting will be issued in a written addendum.

It is important that all Bidders have a clear understanding of the specifications, scope of work, and requirements of this solicitation. Attendance at the pre-bid meeting will be a prerequisite for submitting a Bid; attendance will be evidenced by the Contractor's signature on the meeting roster. Bidders who do not attend the pre-bid meeting will not be permitted to submit a Bid. If a Bidder submits a Bid and did not attend the mandatory pre-bid meeting, the Bid will not be considered.

5. BIDDER'S QUESTIONS:

All contact between prospective Bidders and the Owner with respect to this solicitation will be formally held at scheduled meetings or will be conducted in writing through the Owner's Office of Facilities Management. Except as expressly authorized herein, communications between prospective bidders, their agents and/or representatives and any representative of the Owner concerning interpretation of all or any portion of this solicitation are prohibited and may not be relied upon for any purpose. No interpretation of the meaning of these documents will be made to any bidder orally.

Any question or request for an interpretation must be in writing and submitted to the Owner by U.S. Mail, commercially recognized overnight delivery service, or hand delivery during business hours addressed as follows:

Angela C. Mylechraine, CPPB, VCO, Contract Administrator
Fairfax County Public Schools

Department of Facilities and Transportation Services
Office of Facilities Management
5025 Sideburn Road, Room 16
Fairfax, Virginia 22032
Telephone Number: (703) 764-2457
Email: acmylechrain@fcps.edu

In order to be eligible for consideration, a question or request for interpretation must be received on or before the date that is three (3) days before the date established for the submission of bids.

6. ADDENDA:

Any and all such responses, interpretations and any supplemental instructions will be returned in writing to the prospective bidder requesting such interpretation, or will be in the form of written addenda which, if issued, will be not later than two (2) days prior to the date fixed for submission of bids.

It shall be the responsibility of each bidder to monitor the Owner's website for Addenda issued at the following URL: https://www.fcps.edu/get-involved/doing-business-fcps/facilities-management-current-solicitations Notwithstanding any provision to the contrary, the failure of any bidder to monitor the Owner's website or to otherwise receive any addenda shall neither constitute grounds for withdrawal of a bid nor relieve such bidder from any responsibility for incorporation of the provisions of any addenda into its bid as submitted. All addenda so issued shall become part of the Contract Documents.

7. BID SECURITY:

Bids $100,000 or above shall be accompanied by a certified or cashier's check, cash escrow, or a bidder's bond in an amount not less than five percent (5%) of the amount of the bid, made payable to the Fairfax County Public Schools, Fairfax, Virginia. No other form of bid security is acceptable. The bidder's bond shall be issued by a surety company licensed to conduct business in Virginia and shall be on the form herein provided. Said check, escrow, or bond shall be given as a guarantee that the bidder will enter into a contract if awarded the work and, in case of refusal or failure to enter into said contract, the check, escrow, or bond will be declared forfeited to the Owner.

8. CONTRACT SECURITY:

A. For contracts $100,000 or above, the successful bidder, simultaneously with execution of the Contract, shall furnish a Performance Bond and a Payment Bond each in an amount equal to one hundred percent (100%) of the Contract price. Bonds shall be on the forms herein provided and shall be issued by a surety company licensed to conduct business in

Virginia. The Owner reserves the right to request documentation from the surety company as to its financial capabilities, past experience, etc. In the event that the Contractor's surety company becomes insolvent, bankrupt or in any way is incapable of providing the services and/or security of the Performance and Payment Bonds, the Contractor shall within ten (10) days furnish a new Payment and a new Performance Bond to the Owner from a surety licensed to conduct business in Virginia. Any additional cost in securing new bonding will be the responsibility of the Contractor.

B. In lieu of a payment or performance bond, a bidder may furnish a certified check, cashier's check, or cash escrow in the face amount required for the bond.

C. The Contractor shall have the option to require all subcontractors furnishing labor and materials under this Contract in excess of two thousand five hundred dollars ($2,500.00) to furnish to the successful bidder a payment bond in the amount of fifty percent (50%) of the work sublet to the Contractor.

9. BIDS:

A. In order to be eligible for consideration, bids shall be made in accordance with the following instructions:

1. Before submitting a bid, each bidder shall become familiar with the requirements of the Contract Documents and shall include in its bid prices a sum sufficient to cover the cost of all items and services described herein.

2. Bids shall be made upon the Bid Form prepared and furnished by the Owner, a copy of which is bound herein. Bids must contain a bid for each of the items shown on the bid form. Failure to complete all requested prices shall be cause for rejection of the bid. The signatures of all persons shall be in longhand. The completed form shall be without erasures, exceptions, or alterations.

3. Bidders are required to submit with their completed Bid Forms the Bid Bond (or other authorized bid security) and all attachments to the Bid Form. Failure to provide all required documentation with the Bidder's response to this IFB may result in rejection of the Bid. In addition, a Bidder's failure to sign the Bid Form (or any attachment) or Bidder's taking exception to the terms of any of the Contract Documents may result in rejection of its Bid.

4. Bids shall not contain any recapitulation of the work to be done, and alternate bids will not be considered unless called for. No oral, telegraphic bids or modifications will be considered.

5. Bids shall be time-stamped in **Room 16, Sideburn Support Center, 5025 Sideburn Road, Fairfax, VA 22032**, on or before the day and hour set for the opening of bids, enclosed in an opaque sealed envelope and bearing the title of the work, name of the bidder, and the bidder's Virginia Class A Contractor's License number. Bids may be modified or withdrawn by bidders prior to, but not later than, the time fixed for the opening of same.

6. It is the sole responsibility of each bidder to deliver its bid timely and to the precise location indicated as the place for receipt and opening of bids. Accordingly, bids which are transmitted via US Mail, commercial courier, or overnight delivery service to the Owner are not guaranteed to be brought timely to the attention of the Owner's official who is responsible for opening the bids for this project.

10. OPENING OF BIDS:

Bids will be opened and read aloud at the time and place set forth in the Invitation for Bid. Bidders, or their representative, and other interested persons may be present at the opening of the bids.

11. WITHDRAWAL OF BIDS:

A. A bidder may withdraw his bid from consideration if the price bid was substantially lower than the other bids due solely to a mistake therein, provided the bid was submitted in good faith, and the mistake was a clerical mistake as opposed to a judgment mistake, and was actually due to an unintentional arithmetic error or an unintentional omission of a quantity of work, labor or materials made directly in the completion of a bid, which unintentional arithmetic error or unintentional omission can be clearly shown by objective evidence drawn from inspection of original work papers, documents and materials used in the preparation of the bid sought to be withdrawn. The bidder must give notice in writing of his claim of right to withdraw his bid within two (2) business days after the conclusion of the bid opening procedure. Any claim of a bidder for withdrawal shall be governed by Section 2.2-4330(B)(1) of the Code of Virginia, as amended.

B. No bid may be withdrawn when the result would be the awarding of this Contract to another bidder in which the ownership of the withdrawing bidder is more than five percent (5%).

C. If a bidder is permitted to withdraw a bid under this section, he may not thereafter, for compensation, supply any material or labor, or perform any subcontract or other work agreement for the person or firm to whom the Contract is ultimately awarded, or otherwise benefit directly or indirectly, from the performance of the project for which the withdrawn bid was submitted.

12. REJECTION OF BIDS:

The Owner reserves the right to accept or reject any or all bids, and/or to waive any informality which does not affect the price, quality, quantity or delivery scheduling for the goods, services or construction being procured in any one or all bids received.

13. AWARD OF CONTRACT:

A. The Contract will be awarded, if at all, to the lowest responsive and responsible bidder complying with these instructions and the Invitation for bid. The responsibility of bidders will be considered in making the award.

B. Bids shall be made upon the Bid Form prepared and furnished by the Owner, a copy of which is bound herein. Bids must contain a bid for the base bid and unit prices shown on the bid form. Failure to complete all requested prices shall be cause for rejection of the bid. Bids shall be stated both in writing and in figures. The signatures of all persons shall be in longhand. The complete form shall be without erasures or alternations.

Bids will be evaluated on the basis of a firm fixed price and award will be made to the lowest responsive and responsible bidder complying with all provisions of the Invitation for bid.

C. Unless cancelled or rejected, a responsive bid from the responsible bidder shall be accepted as submitted, except that if a bid from the responsive and responsible bidder exceeds available funds, then the Owner may negotiate with such responsive and responsible bidder to obtain a contract price that is within available funds.

Negotiation may be undertaken when there is insufficient time to re-advertise with a modified specification and/or there are not clearly definable elements of the specifications, which can be removed to permit a re-advertisement or it is otherwise in the best interest of the Owner to negotiate.

If negotiation is undertaken, the Owner may negotiate changes in the solicitation with the lowest responsive and responsible bidder to obtain a satisfactory price within available funds. If a satisfactory price cannot be

agreed upon, then the negotiation shall be terminated, and the solicitation cancelled.

D. The Owner reserves the right to require any one or more bidders to submit the items specified in Subsection I below. Bidders are advised that it is the Owner's intention not to award a contract hereunder to any bidder whose past performance shows his firm to be generally late in performance of contracts or services. The ability of the lowest bidder with to provide the required bonds will not in and of itself establish the responsibility of the bidder.

E. The Owner reserves the right to defer award of Contract for a period of forty-five (45) calendar days after due date of bids. Bid prices shall be binding for forty-five (45) calendar days following bid-opening date, unless extended by mutual consent of all parties.

F. A "responsive bidder" shall mean a bidder who has submitted a bid, which conforms, in all material respects, to the requirements of the bidding documents.

G. A "responsible bidder" shall mean a bidder who has the capability, in all respects, to perform fully the Contract requirements and the moral and business integrity and reliability, which will assure good faith performance. In determining responsibility, the following criteria will be considered:

1. The ability, capacity, and skill of the bidder to perform the Contract or provide the service required;

2. The ability of the bidder to perform the Contract or provide the service promptly, or within the time specified, without delay or interference;

3. The character, integrity, reputation, judgment, experience and efficiency of the bidder;

4. The quality of the bidder's performance on previous contracts or services;

5. The previous and existing compliance by the bidder with laws and ordinances relating to contracts or services;

6. The sufficiency or the financial resources and ability of the bidder to perform the Contract or provide the service.

7. The quality, availability and adaptability of the goods or services to the particular use required;

8. When the bidder is in arrears to the Owner or the County, or has defaulted on a project for the Owner or the County, or is delinquent on taxes and assessments to the County or on amounts due the Owner;

9. Such other information as may be deemed by the Owner as having a bearing on the decision to award the Contract, including, but not limited to:

   a. The ability, experience and commitment of the bidder properly to plan, schedule, coordinate, and execute the work under the Contract.

   b. Whether the bidder has ever been debarred from bidding or found ineligible for bidding on any other projects.

H. The purpose of subparagraph G, above, is to enable the Owner to select the bid which is in its best interests

I. The Owner reserves the right to require from any one or more bidders the following:

1. Upon request of Owner, Bidders agree to submit references within one (1) business day after the opening of the bid;

2. A list of a minimum of five (5) projects completed by the bidder within the last two (2) years that are similar in size and scope to the services described herein; and

3. Financial statements indicating current financial status, prepared in accordance with generally accepted accounting principles, by a C.P.A. licensed to do business in Virginia.

J. Notice of intention to award a contract, as well as the award of the contract, will be posted on the website of the Owner's website at the following URL: https://www.fcps.edu/school-board/school-board-meetings While the school division staff may communicate procurement results to bidders or offerors, each bidder or offeror has the responsibility to monitor the website for its own purposes.

14. PROTEST OF AWARD OR DECISION TO AWARD:

A. Any bidder may protest the award or the decision to award this Contract by submitting a protest in writing to Fairfax County Public Schools (FCPS) Superintendent or Designee, no later than ten (10) days after the award or the announcement of the decision to award, whichever occurs first;

however, that no protest shall lie for a claim that the selected bidder is not a responsible bidder.

The written protest must include the basis for the protest and the nature of the relief sought. The Owner's Division Superintendent or Designee shall issue a decision in writing within ten (10) days after receipt of the protest, stating the reasons for the action taken.

This written decision shall be final unless the bidder appeals within ten (10) days after receipt of the written decision by instituting legal action as provided in the Code of Virginia.

B. If, prior to the award, it is determined that the decision to award is arbitrary and capricious, then the sole relief shall be as hereinafter provided:

1. Where the award has been made but performance has not yet begun, the performance may be declared void by the School Board.

2. Where the award has been made and performance has begun, the Owner may declare the Contract void upon a finding that the action is in the best interest of the School Board.

3. Where a contract is declared void, the performing contractor shall be compensated for the cost of performance at the rate specified in the Contract up to the time of declaration. In no event shall the performing contractor be entitled to lost profits.

C. Pending final determination of a protest, the validity of the award shall not be affected by the fact that protest has been filed.

D. An award need not be delayed for the period allowed a bidder to protest, but in the event of a timely protest, no further action to award this Contract will be taken unless the Owner's Division Superintendent or Designee makes a written determination that proceeding without delay is necessary to protest the public interest or that the bid offer will expire.

15. APPEAL OF DETERMINATION OF NON-RESPONSIVENESS OR NON-RESPONSIBILITY:

A. Any bidder who, despite having the lowest bid, is determined not to be a responsive or responsible bidder for this Contract shall be notified in writing by the Owner. The written notice shall state the basis for the determination, and this determination shall be final unless the bidder appeals within ten (10) days after receipt of the notice by instituting legal action as provided in the Code of Virginia. The bidder may not institute legal action until all statutory requirements have been met.

B. If it is determined that the Owner's decision was arbitrary and capricious, or otherwise in error, and this Contract has yet to be awarded, the sole relief available to the bidder shall be a finding that the Bidder is a responsive and responsible bidder for this Contract.

C. If the award has already been made and performance has begun, then the Owner may declare the Contract void upon a finding that this action is in its best interests. Where a contract is declared void, the performing contractor shall be compensated for the cost of performance up to the time of such declaration. In no event shall the performing contractor be entitled to lost profits.

16. SUBSTITUTIONS:

Unless otherwise provided in the bid documents, the name of a certain brand, make, or manufacturer is intended to restrict bidders to the specific brand, make, or manufacturer specified. Substitute materials proposed as equal to materials specified shall be submitted in writing to the Owner by the bidder with full substantiating data for evaluation no later than ten (10) days prior to bid opening; substitute materials shall not be considered for evaluation after this time period. Proposed substitute materials which equal or exceed the performance standard of the specified materials in the sole judgment of the Owner will be included in an "Approved Substitute Materials Bulletin" to be issued prior to the bid opening date.

For purposes of this solicitation and any resulting contract, the Owner's designation of any one or more manufacturers, subcontractors and/or suppliers as "pre-approved" shall signify only that such manufacturers, subcontractors and suppliers previously have submitted work samples to the Owner that satisfied the Owner's requirements. The Owner's designation of any one or more manufacturers, subcontractors and/or suppliers as "pre-approved" shall in no event be deemed or construed to be a representation or warranty on the part of the Owner of any such manufacturer's, subcontractor's or supplier's capability of or capacity for (in terms of financial wherewithal, personnel and equipment availability, managerial ability, product quality or otherwise) performing or furnishing any portion of the Work in accordance with the requirements of this solicitation. Each bidder shall conduct such independent investigation into the qualifications, experience and abilities of its selected manufacturers, subcontractors and suppliers, as it deems appropriate under the circumstances.

17. FORM OF CONTRACT:

The Contract Documents are defined in the General Conditions to consist of "The Standard Construction Contract Agreement between Owner and Contractor, the Conditions of the Contract (General Conditions), the Supplemental Terms and

Conditions, the Drawings, the Specifications, the Bid Form (including all attachments), the Invitation for Bid, the Instructions to Bidders, all Addenda issued prior to execution of the Contract, and all Modifications thereto."

18. VIRGINIA FAIR EMPLOYMENT ACT:

The Contractor shall comply with the Virginia Fair Employment Act.

19. SMALL, MINORITY AND WOMEN-OWNED BUSINESS ENTERPRISES:

A. The Fairfax County Human Rights Ordinances and relevant Federal and State Laws, orders and regulations require Fairfax County to ensure that its procurement practices are non-discriminatory and promote equality of opportunity for Small, Minority and Women-Owned Business Enterprises.

B. Small Business/Organization is an independently owned and operated business which, together with affiliates, has 250 or fewer employees or average annual gross receipts of $10 million or less averaged over the previous three years.

C. Minority Business is a business concern that is at least 51 percent owned by one or more minority individuals or in the case of a corporation, partnership or limited liability company or other entity, at least 51 percent of the equity ownership interest in the corporation, partnership or limited liability company or other entity is owned by one or more minority individuals and both the management and daily business operations are controlled by one or more minority individuals. Such individuals shall include Asian American, African American, Hispanic American, Native American, Eskimo or Aleut.

D. Woman-Owned Business is a business concern that is at least 51 percent owned by one or more women who are U.S. citizens or legal resident aliens, or in the case of a corporation, partnership or limited liability company or other entity, at least 51 percent of the equity ownership interest is owned by one or more women who are U.S. citizens or legal resident aliens, and both the management and daily business operations are controlled by one or more women who are U.S. citizens or legal resident aliens.

20. FAILURE TO EXECUTE CONTRACT:

In the event that the successful bidder fails or refuses to execute the Contract within fifteen (15) days after he has received notice of the acceptance of his Bid, such bidder shall forfeit the bid security (which was submitted in form of Certified or Cashier's Check, cash escrow, or bid bond) with his Bid, as liquidated damages for such failure or refusal. The amount of such forfeiture will not exceed

the lesser of: (a) the face amount of the bid security; and (b) the difference between the bid for which the bid security was provided and the next low bid for the Project.

21. SAFETY RESOLUTION:

Safety: The Contractor shall abide by, and shall be subject to, the Fairfax County Construction Resolution, as adopted by the Fairfax County Board of Supervisors on December 8, 2003, and as excepted and modified below:

A. It shall be required that each bid submitted for a contractor for construction, alteration, and/or repairs, or any other construction, shall include a list of all the following actions which have become final in the three years prior to the bid submission.

1. Willful violations, violations for failure to abate, or repeated violations, for which the bidder was cited by (a) the United States Occupational Safety and Health Administration; (b) the Virginia Occupational Safety and Health Administration; or (c) the occupational safety and health plan for any other state; or

2. Three (3) or more serious construction safety violations for which the bidder was cited by the (a) United States Occupational Safety and Health Administration; (b) the Virginia Occupational Safety and Health Administration; or (c) the occupational safety and health plan from any other state.

3. Termination of a contract between the Contractor and the County by the purchasing agent of his designee for safety violations.

B. If the bidder has not received or been the subject of any such violations in the three years prior to the bid submission, then the bidder shall so indicate by certification of Safety Violations. The bidder will also be indicated on this form each state in which work was performed in the three (3) years prior to the bid submission.

C. No construction contract, as discussed above, may be bid on by any bidder or Contractor who has been the subject of any citations for the type and number of violations listed in Paragraph A, above, which have become final within three (3) years prior to bid submission.

1. Notwithstanding the language of Paragraph C, above, any bidder or Contractor who has been the subject of a violation, as described in Paragraph A(1), which has become final within three (3) years prior to bid submission, may bid, after a mandatory waiting period of

twelve (12) months from the date the violation became final, if the bidder or Contractor satisfactorily passes eligibility evaluation.

2. Notwithstanding the language of Paragraph C, any bidder or Contractor who has been the subject of the type and number of violations as described in Paragraph A (2), which have become final within three (3) years prior to bid submission, may bid, after a mandatory waiting period of twelve (12) months from the date the last such violation became final, if the bidder or Contractor satisfactorily passes an eligibility evaluation.

3. Notwithstanding the language of Paragraph C, above, any bidder or Contractor who has previously been terminated from a County contract, as described in Paragraph A(3), within three (3) years prior to the bid submission, may bid, after a mandatory waiting period of twelve (12) months from the date of termination, if the bidder or Contractor satisfactorily passes an eligibility evaluation.

D. Prior to bidding on a project under the provisions of Paragraph C above, a Contractor may request that a determination be made regarding its eligibility to submit a bid on a contract under the terms of this resolution. However, this request for determination and any subsequent adjudication process must be completed prior to submitting a bid on any project and the request for determination must be received no later than twenty-one (21) days before bids are due, unless otherwise stated in the Advertisement for Bid.

E. No Contractor or Subcontractor contracting for any part of the contract work shall require any laborer, mechanic, or other person employed in the performance of the Contract to work in surroundings or under working conditions which are hazardous or dangerous to his safety, as determined under construction safety standards promulgated by the U.S. Department of Labor, or the Virginia Department of Labor and Industry.

F. No Contractor awarded a County construction contract shall knowingly employ or contract with any person, company, or corporation for services pursuant to that contract if such person, company or corporation could not have been awarded such contract due to the restrictions above.

G. The Contractor shall also certify in writing that all safety related information provided in accordance with the Safety Resolution and contract requirements are complete, accurate and truthful.

H. The failure to provide information requested pursuant to this Resolution or the failure to conform to the certification requirements of this Resolution shall be grounds for disqualifying a prospective bidder.

22. COMPLIANCE WITH LAWS

The successful bidder shall be required to comply with all local, state, and federal laws, rules, regulations and ordinances (collectively, the "Laws and Regulations") applicable to the contract and to the work contemplated hereby. Each and every provision of Laws and Regulations required to be included in this IFB shall be deemed to be inserted herein, and any contract resulting from this IFB shall be read and enforced as though such provisions were included herein and if, through mistake or otherwise, any such provision of Laws and Regulations is not included or is not correctly included, then upon application of either party the Contract shall forthwith be physically amended to make such insertion.

23. CANCELLATION, REJECTION OF BIDS; WAIVER OF INFORMALITIES

The Owner reserves the right to cancel this solicitation, to accept or reject any or all bids submitted hereunder, or to waive any informality in any one or all bids received.

24. PREFERENCE FOR DOMESTIC GOODS

Pursuant to Section 2CFR § 200.322, the following regulation applies to the award of any contract under this IFB:

A. As appropriate and to the extent consistent with law, the Owner should, to the greatest extent practicable in the award and performance of this Contract, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this section must be included in all subawards including all contracts and purchase orders for work or products under this award.

B. For purposes of this section: (1) "Produced in the United States" means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States. (2) "Manufactured products" means items and construction materials composed in whole or in part of nonferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber.

25. ASHRAE SPECIFICATIONS

The Work to be performed must comply with the following standards of the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE):

(1) ASHRAE-90 A-1980 (Sections 1-9).

(2) ASHRAE-90 B-1975 (Sections 10-11).

(3) ASHRAE-90 C-1977 (Section 12).

END OF SECTION

BID FORM
(For Project Funded with Federal Grant)

_____
Name of Contractor

_____
Address

_____
Date

TO: FAIRFAX COUNTY SCHOOL BOARD
FAIRFAX COUNTY PUBLIC SCHOOLS
DEPARTMENT OF FACILITIES AND TRANSPORTATION SERVICES
OFFICE OF FACILITIES MANAGEMENT
5025 Sideburn Road, Room 16
Fairfax, Virginia 22032

Gentlemen:

The undersigned, having examined the Documents, Drawings, and Specifications entitled:

HVAC System Upgrades
at
Flint Hill Elementary School

which comprise the Contract Documents and having visited the site and examined all conditions affecting the work, hereby proposes and agrees to furnish all labor, materials, and equipment to perform all operations necessary to complete the entire work in strict accordance with the Contract Documents for the following amount (set forth in words and figures):.

BASE BID AMOUNT FOR FLINT HILL ELEMENTARY SCHOOL:

_____ Dollars $_____

The undersigned agrees to bid and to use only one Manufacturer from the Owner's approved list and shall furnish and install only the following Manufacturer's product:

*MANUFACTURER:_____

1. **Certain Agreements of the Bidder.** The undersigned Bidder hereby makes the following representations, warranties and covenants to the Owner, which representations, warranties and covenants are intended to be relied upon by the Owner in making an award of the above-referenced Contract:

   (a) Bidder has included in its bid all costs due to the Commonwealth of Virginia and County of Fairfax Sales and Use Taxes.

   (b) The undersigned bidder is cognizant of Conflict of Interest provisions in the Virginia Code and specified in General Conditions, Paragraph 2.

   (c) The undersigned bidder agrees, if awarded the Contract, to perform Substantial and Final Completion of the Work on or before the respective Substantial and Final Completion Dates established in Summary of Work.

   (d) The Owner reserves the right to accept or reject any or all bids or to waive any informality in any one or all bids received.

   (e) The undersigned bidder acknowledges receipt of any and all Addenda which may have been issued by the Owner, and acknowledges that the cost, if any, of revisions set forth therein has been included in the bidder's prices.

   (f) The Owner reserves the right to defer award of Contract for a period of forty-five (45) days after due date of bids and the undersigned agrees that this Bid Form will remain open and binding during such period of time.

   (g) The undersigned bidder hereby acknowledges that time is of the essence to the Contract and agrees to commence the Work in compliance with the response times established in accordance herewith and to fully complete the Project within the specified time, including normal inclement weather delays. The undersigned hereby covenants and agrees to achieve timely completion of all Work described herein and to comply with all emergency and non-emergency response times established pursuant to the Contract.

2. **Minority or small business firm's information**. Please check the following information relevant to your firm: (See Instructions to Bidders, Paragraph 19, for definitions)

   Virginia Small Business and Supplier Diversity Certification Number: _____

SWaM Certification Type:

Minority Business Firm	Yes___	No ____
Small Business Firm	Yes___	No ____
Women-Owned Firm	Yes___	No ____

The above information is requested for statistical purposes only. All bidders tendering responses will receive equal consideration for award.

3. **Safety**: The successful bidder shall abide by, and shall be subject to, the Fairfax County Construction Resolution, as adopted by the Fairfax County Board of Supervisors on December 8, 2003, and as modified and excerpted in the Instruction to Bidders (see Paragraph 21 the "Safety Resolution").

Bidder's disclosure pursuant to the Safety Resolution (as stated above):

_____

_____

(additional pages may be attached, as necessary for a complete response by the bidder)

4. **Incorporation by Reference**: This solicitation and any contract awarded hereunder are subject to all Laws and Regulations (as defined in the Instructions to Bidders).

5. **List of public jurisdictions** (States and District of Columbia) in which Bidder performed work in the 3 years prior to bid submission:

_____

_____

(additional pages may be attached, as necessary for a complete response by the bidder)

6. **Bidder Affirmations and Certifications**: By signing this Bid, the undersigned bidder hereby confirms, certifies, and agrees as follows:

(a) the undersigned has not received or been the subject of safety violations in the three (3) years prior to this Bid Submission and is in compliance with the requirements of Item 11 above.

(b) neither the undersigned Bidder nor any employee of the Bidder who will have direct contact with students has been convicted of a felony or any offense involving the sexual molestation or physical or sexual abuse or rape of a child;

(c) unless expressly disclosed in an attachment to this Bid on the Bidder's letterhead stationery, neither the undersigned Bidder nor any employee of the Bidder who will have direct contact with students has been convicted of a crime of moral turpitude;

(d) the undersigned does not and shall not during the performance of the contract for goods and services in the Commonwealth of Virginia; knowingly employ an unauthorized alien as defined in the Federal Immigration Reform and Control Act of 1986;

(e) the Owner reserves the right to accept or reject any proposed subcontractor or supplier; and

(f) the undersigned affirms the certifications and agreements set forth in Attachments A-1 through A-4 to this Bid Form, each of which will be signed by a duly-authorized representative of Bidder and submitted to the Owner with this Bid Form.

The undersigned Bidder acknowledges and agrees that it will be deemed to have made each of the above certifications effective as of Bidder's execution of this Bid Form and upon acceptance of any Purchase Order, Task Order or Notice to Proceed issued to Bidder by the Owner under any contract awarded in response to this IFB.

_____
Contractor

_____ _____
Address Email Address

_____ _____
Telephone Number Facsimile Number

_____ _____
Principal's Name (Signature) Title

_____	_____
Principal's Name (Printed)	Virginia Contractors License No.
	_____
	Virginia State Corporation Commission Identification Number (or attach an explanation as to why such is not required pursuant to Virginia Code § 2.2-4311.2)

Fairfax County Business/Professional/Occupation License Number (BPOL #): _____

END OF SECTION

CERTIFICATION REGARDING DEBARMENT OR SUSPENSION

The following certification is required to be submitted by each Bidder with its Bid Form:

1. The Bidder certifies, to the best of its knowledge and belief, that neither the Bidder nor its Principals are suspended, debarred, proposed for debarment, or declared ineligible for the award of contracts from the United States federal government procurement or nonprocurement programs, or are listed in the *List of Parties Excluded from Federal Procurement and Nonprocurement Programs* issued by the General Services Administration.

2. "Principals," for the purposes of this certification, means officers, directors, owners, partners, and persons having primary management or supervisory responsibilities within a business entity (e.g., general manager, plant manager, head of a subsidiary, division, or business segment, and similar positions).

3. The Offeror shall provide immediate written notice to Fairfax County Public Schools' Division Superintendent if, at any time prior to award, the Bidder learns that this certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

4. This certification is a material representation of fact upon which reliance will be placed when making the award. If it is later determined that the Bidder rendered an erroneous certification, in addition to other available remedies, the Fairfax County School Board may terminate the contract resulting from this solicitation for default.

Printed Name of Representative: _____

Signature/Date: _____/_____

Company Name: _____

Address: _____

City/State/Zip: _____

SSN or TIN No: _____

Certification Regarding Ethics in Public Contracting

In submitting this Bid, and signing below, Bidder certifies the following in connection with its Bid and any resulting contract:

Check one:

☐ 1. I have not given any payment, loan, subscription, advance, deposit of money, services or anything of more than nominal or minimal value to any public employee or official have official responsibility for a procurement transaction.

☐ 2. I have given a payment, loan, subscription, advance, deposit of money, services or anything of more than nominal or minimal value to a public employee or official have official responsibility for a procurement transaction, but I received consideration in substantially equal or greater value in exchange.

If 2 is selected, please complete the following:

Recipient: _____

Date of Gift: _____

Description of the gift and its value:

_____

_____

_____

Description of the consideration received in exchange and its value:

_____

_____

_____

Printed Name of Bidder Representative: _____

Signature/Date: _____ /

Company Name: _____

Company Address: _____

City/State/Zip: _____

ACKNOLWEDGEMENT OF CERTAIN CONTRACT PROVISIONS REQUIRED FOR PROJECT FUNDED WITH FEDERAL GRANT

In addition to other provisions required by the Federal agency or Owner, the Bidder acknowledges and agrees that any contract entered into hereunder will contain all contract provisions set forth in Appendix II to 2 C.F.R. Part 200 available for review here: https://tinyurl.com/34tyfu5n. The federally-required contract provisions include but are not limited to the following:

(A) **Remedies for Contractor Breach**. For contracts in excess of simplified acquisition threshold, currently set at $250,000, the contract will address administrative, contractual, or legal remedies for breach or violation of contract terms by the contractor, including associated penalties as appropriate.

(B) **Termination for Cause and Convenience**. For contracts in excess of $10,000, the contract will provide for termination for cause and convenience by the Owner.

(C) **Equal Employment Opportunity**. The contract will include the equal opportunity clause provided under 41 CFR 60-1.4(b), in accordance with Executive Order 11246, "Equal Employment Opportunity" (30 FR 12319, 12935, 3 CFR Part, 1964-1965 Comp., p. 339), as amended by Ex. Order 11375, "Amending Ex. Order 11246 Relating to Equal Employment Opportunity," and implementing regulations at 41 CFR part 60, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor."

(D) **Davis-Bacon Act, as amended (40 U.S.C. 3141-3148)**. The contract will include a provision for compliance with the Davis-Bacon Act (40 U.S.C. 3141-3144, and 3146-3148) as supplemented by Department of Labor regulations (29 CFR Part 5, "Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction"). In accordance with the statute, contractors will be required to pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in a wage determination made by the Secretary of Labor. In addition, contractors will be required to pay wages not less than once a week. The current prevailing wage determination issued by the Department of Labor is set forth https://sam.gov/wage-determination/VA20210178/5. The decision to award a contract or subcontract must be conditioned upon the acceptance of the wage determination. The Owner will be required to report all suspected or reported violations to the Federal awarding agency.

(E) **Copeland Anti-Kickback Provisions**. The contract will include a provision for compliance with the Copeland "Anti-Kickback" Act (40 U.S.C. 3145), as supplemented by Department of Labor regulations (29 CFR Part 3, "Contractors

and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States"). The Act provides that each contractor or subrecipient must be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he or she is otherwise entitled. The Owner will be required to report all suspected or reported violations to the Federal awarding agency.

(F) **Contract Work Hours and Safety Standards Act** (40 U.S.C. 3701-3708). The contract will include a provision for compliance with 40 U.S.C. 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR Part 5). Under 40 U.S.C. 3702 of the Act, each contractor will be required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic must be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous.

(G) **Clean Air Act (42 U.S.C. 7401-7671q.) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387), as amended**. Contracts of amounts in excess of $150,000 will contain a provision that requires the parties to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251-1387). Violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).

(H) **Debarment and Suspension (Ex. Orders 12549 and 12689)**. The contract resulting from this IFB will not be awarded to parties listed on the government wide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 CFR 180 that implement Ex. Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989 Comp., p. 235), "Debarment and Suspension." SAM Exclusions contains the names of parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Ex. Order 12549.

(I) **Byrd Anti-Lobbying Amendment (31 U.S.C. 1352)**. Bidders who submit bids in amounts exceeding $100,000 must file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or

employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the non-Federal award.

(J) **Procurement of Recovered Materials**. The contract will require the parties to comply with section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act. The requirements of Section 6002 include procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds $10,000 or the value of the quantity acquired during the preceding fiscal year exceeded $10,000; procuring solid waste management services in a manner that maximizes energy and resource recovery; and establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.

The undersigned acknowledges and agrees that the foregoing provisions will be included in any contract awarded pursuant to this IFB.

Printed Name of Representative: _____

Signature/Date: _____/_____

Company Name: _____

Address: _____

City/State/Zip: _____

SSN or TIN No: _____

BYRD ANTI-LOBBYING CERTIFICATION

31 U.S.C. 1352 et seq.

(To be submitted with each bid or offer exceeding $100,000)

The undersigned certifies, to the best of his or her knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal Loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of and Federal contract, grant, loan, or cooperative agreement.

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for making lobbying contacts to an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form—LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions [as amended by "Government wide Guidance for New Restrictions on Lobbying," 61 Fed. Reg. 1413 (1/19/96). Note: Language in paragraph (2) herein has been modified in accordance with Section 10 of the Lobbying Disclosure Act of 1995 (P.L. 104-65, to be codified at 2 U.S.C. 1601, *et.seq.*)

3. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction by 31 U.S.C. § 1352 (as amended by the Lobbying Disclosure Act of 1995). Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

[Note: Pursuant to 31 U.S.C. § 1352(c)(1)-(2)(A), any person who makes a prohibited expenditure or fails to file or amend a required certification or disclosure form shall be

subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such expenditure or failure.]

The undersigned Bidder certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Bidder understands and agrees that the provisions of 31 U.S.C. § 3801, *et seq.*, apply to this certification and disclosure, if any.

Printed Name of Representative: _____

Signature/Date: _____

Company Name: _____

Address: _____

City/State/Zip: _____

TIN No: _____

(BIDS $100,000 OR HIGHER)

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, _____ of _____ (hereinafter called the "Principal"), and _____, a corporation organized and existing under the laws of the State of _____, with its principal office in _____, and authorized to do business in the Commonwealth of Virginia as a surety (hereinafter called the "Surety"), are held and firmly bound unto FAIRFAX COUNTY SCHOOL BOARD (hereinafter called the "Obligee") in the full and just sum which is equal to 5% of the total amount of the Principal's Bid (as that term is defined below), as submitted to the Obligee (such total amount referred to herein as the "Total Bid"), in good and lawful money of the United States of America, to be paid upon demand of the Obligee, for the payment of such sum well and truly to be made, the Principal and the Surety bind themselves, their respective successors, and permitted assigns, jointly and severally and firmly by these presents. The Total Bid is the aggregate amount (including amounts set forth with respect to any and all Alternates) set forth on the Principal's Bid Form for performance of the work described below, as submitted to and maintained by the Obligee (such Bid Form referred to herein as the "Bid"). The Surety hereby acknowledges and agrees that the Bid shall be deemed to be incorporated by reference in this Bid Bond to the same extent as if set forth fully herein.

WHEREAS, the Principal intends to submit, or has submitted to the Obligee, a Bid for the Principal to perform work for the Obligee, designated as:

_____

_____

(hereinafter called the "Project") and,

WHEREAS, the Principal desires to provide this Bid Bond in lieu of a certified check or cash escrow otherwise required to accompany the Principal's Bid.

NOW THEREFORE, THE CONDITIONS OF THIS OBLIGATION ARE SUCH THAT, if the Bid be accepted by the Obligee, and if the Principal shall, within ten days after the date of receipt of a written Notice of Award from the Obligee or any agency or department thereof, (i) execute a Contract in accordance with the Bid and upon the terms, conditions and price set forth therein, in the form and manner required by the Obligee, (ii) execute a sufficient and satisfactory Performance Bond in the amount of 100% of the total Contract Sum and a sufficient and satisfactory Payment Bond in the amount of 100% of the total Contract Sum, each payable to the Obligee, on a form prescribed by Obligee and with a surety satisfactory to Obligee, and (iii) provide the Obligee with copies of all required insurance policies, then this obligation is to be void; otherwise this obligation shall be and remain in full force and in the event of the failure

of any or all of the foregoing requirements to be satisfied within the time period specified above, the Principal and the Surety immediately shall pay to the Obligee, upon demand, the lesser of: (a) the amount hereof and (b) the difference between the Bid and the next low bid for the Project, in each case in good and lawful money of the United States of America, not as a penalty, but as liquidated damages.

Based upon the Surety's present knowledge and information, the Surety knows of no reason why it would not issue payment and performance bonds on behalf of the Principal for the above-referenced Project. The foregoing statement shall not be construed as a commitment on the part of the Surety to issue either or both of such bonds on behalf of the Principal.

The obligations evidenced hereby shall constitute the joint and several obligations of the Principal, the Surety, and their respective successors and permitted assigns.

Unless the context requires otherwise, capitalized terms not otherwise defined in this Bond shall have the meanings assigned to them in the Contract Documents.

IN WITNESS WHEREOF, we have hereunto set our signatures and seals this __ day of _____, 20___, all pursuant to due authorization.

_____
Principal

(SEAL)

By: _____
Name: _____
Title: _____

Address: _____
_____
_____

_____
Surety

(SEAL)

By: _____
Attorney-in-Fact (Attach Copy of Power of Attorney)

Name: _____
Title: _____

Address: _____
_____
_____

Countersigned for the
Commonwealth of Virginia:

By: _____
Resident Agent

Address: _____
_____
_____

END OF SECTION

(BIDS $100,000 OR HIGHER)

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS, that we, _____ of (hereinafter called the "Principal"), and _____, a corporation organized and existing under the laws of the State of _____, with its principal office in the City of _____ and authorized to transact business in the Commonwealth of Virginia as a surety (hereinafter called the "Surety"), are held and firmly bound unto the FAIRFAX COUNTY SCHOOL BOARD (hereinafter called the "Obligee") in the sum of _____ Dollars ($_____) lawful money of the United States of America for the payment of which well and truly to be made, the Principal and the Surety bind themselves, their heirs, executors, administrators, successors, and assigns, jointly and severally and firmly by these presents, to perform all Work in accordance with the requirements of the Contract Documents for the Project.

WHEREAS, the Principal has entered into a certain written agreement with the Obligee, dated as of the ____ day of _____, 20___, (hereinafter called the "Contract"), for _____, which Contract is by reference made a part hereof;

WHEREAS, the Principal is obligated to furnish security with respect to its obligation to perform the work to be performed under the Contract; and

WHEREAS, the Principal desires to furnish this Performance Bond in lieu of a certified check or cash escrow otherwise required to be provided to the Obligee.

NOW THEREFORE, THE CONDITIONS OF THE ABOVE OBLIGATIONS ARE SUCH THAT, if the Principal and its successors or assigns, or any of them shall:

> Well and truly and in good, sufficient, and workmanlike manner perform or cause to be performed the Contract, and each and every of the covenants, promises, agreements, warranties, and provisions to be performed by the Principal set forth therein, in strict conformity with the plans and specifications, and complete the same within the time period specified therein, all as may be amended from time to time by the parties thereto, and fully indemnify and save harmless the Obligee from all costs and damages which it may suffer by reason of the Principal's failure to do so and fully reimburse and repay the Obligee all costs and expenses which it may incur in making good any such default, then these obligations shall be null and void, otherwise they shall remain in full force and effect.

PROVIDED, HOWEVER, that this bond is subject to the following conditions and limitations:

(a) In no event shall the Surety, or its successors or assigns be liable hereunder for a greater sum than the amount of this bond.

(b) No action on this bond shall be brought unless within one year after: (i) completion of the Contract, including the expiration of all warranties and guarantees; or (ii) discovery of the defect or breach of warranty, if the action be for such, in all other cases.

The Surety, for value received, on behalf of itself and its successors and assigns, hereby stipulates and agrees that the obligations of the Surety and of its successors and assigns under this bond shall not in any manner be impaired or affected by: (a) any extension of time, modification, omission, addition or amendment of or to the Contract or the work to be performed thereunder; (b) any payment thereunder before the time required therein; (c) any waiver of any provision thereof; or (d) any assignment, subletting or other transfer of all or of any part thereof or of any work to be performed or of any moneys due or to become due thereunder; and the Surety, for itself and its successors and assigns, does hereby waive any right to receive notice of any and all of such extensions, modifications, omissions, additions, amendments, payments, waivers, assignments, subcontracts and transfers.

The Surety hereby stipulates and agrees that, in the event that the Obligee declares the Principal to be in default, the Surety will promptly, at the Obligee's election: (a) perform and complete the work to be performed under the Contract in accordance with the terms, conditions and covenants set forth therein with a duly licensed and qualified contractor designated by Obligee; (b) obtain bids from qualified contractors for completing the work to be performed under the Contract in accordance with the terms, conditions and covenants set forth therein and, upon determination by the Obligee and the Surety of the lowest responsible and responsible bidder, (i) arrange for a contract between such bidder and the Obligee and (ii) make funds available directly to the Obligee, or to such contractor(s) as the Obligee shall designate, to pay the costs of completion less the balance of the contract price as such may have been adjusted by change order (such amount, including other costs and damages for which the Surety may be liable hereunder, not to exceed the penal sum set forth in the first paragraph hereof); or (c) remedy the default. The Surety further stipulates and agrees that, within 45 days after its receipt of written notice from the Obligee specifying the Obligee's election of (a), (b) or (c) above, the Surety shall have resumed performance of the work or shall have caused the performance of the work to have been resumed, in accordance with the Obligee's election. In the event the Surety fails to resume the Work within such 45 day period, the Obligee may elect to perform or arrange for the performance of the Work at the sole cost and expense of the Surety in addition to any other rights and remedies available to Obligee. As employed herein, the phrases (i) "balance of the contract price" shall mean

the total amount payable by the Obligee to the Principal under the Contract after all proper adjustments have been made, less the aggregate of all amounts paid by the Obligee to the Principal thereunder and (ii) "resume the Work" shall mean the commencement and diligent performance of actual work activities at the site, as demonstrated by discernable daily progress at the rate contemplated by the Contract. All payments to be made by the Surety hereunder shall be paid within thirty (30) days after the Surety's receipt of a request or demand therefor.

The Obligee's omission to call upon the Surety in any instance shall in no event release the Surety from any obligation hereunder.

All notices, requests, demands and other communications which are provided hereunder, shall be in writing and shall be deemed to have been duly given upon the hand delivery thereof during business hours, or upon the earlier of receipt or three (3) days after posting by registered mail or certified mail, return receipt requested, or on the next business day following delivery to a reliable overnight delivery service, if to the Principal or the Obligee, to the addresses set forth in the Contract, and if to the Surety, to the address set forth beneath its signature.

The obligations evidenced hereby shall constitute the joint and several obligations of the Contractor, the Surety, and their respective heirs, executors, administrators, successors and assigns.

Unless the context requires otherwise, capitalized terms not otherwise defined in this Bond shall have the meanings assigned to them in the Contract Documents.

[SIGNATURES ON FOLLOWING PAGE]

IN WITNESS WHEREOF, the Principal and Surety have caused this Performance Bond to be signed and sealed by their duly authorized representatives as of the ____ day of _____, 20___.

_____
Principal

(SEAL)

By: _____
Name: _____
Title: _____

Address: _____
_____
_____

_____
Surety

(SEAL)

By: _____
Attorney-in-Fact (Attach Copy of Power of Attorney)

Name: _____
Title: _____

Address: _____
_____
_____

Countersigned for the
Commonwealth of Virginia:

By: _____
Resident Agent

Address: _____
_____
_____

END OF SECTION

(BIDS $100,000 OR HIGHER)

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS, that we, _____ of (hereinafter called the "Principal"), and _____, a corporation created and existing under the laws of the State of _____, and having its principal office in the City of _____ and authorized to transact business in the Commonwealth of Virginia as Surety (hereinafter called the "Surety)" are held and firmly bound unto FAIRFAX COUNTY SCHOOL BOARD (hereinafter called the "Obligee" in the sum of Dollars ($_____) lawful money of the United States of America, for the payment of which well and truly to be made, the said Principal binds itself and its successors and assigns, and the said Surety binds itself and its successors and assigns, all jointly and severally, firmly by these presents to pay for all labor performed and material furnished in accordance with the Contract Documents for the Project.

WHEREAS, the Principal has entered into a certain written agreement with the Obligee, dated as of the ____ day of _____, 20___ (hereinafter called the "Contract)", for _____, which Contract is by reference made a part hereof.

WHEREAS, the Principal is obligated to furnish security with respect to its obligation to pay for all labor performed and material furnished pursuant to the Contract; and

WHEREAS, the Principal desires to furnish this Payment Bond in lieu of a certified check or cash escrow otherwise required to be provided to the Obligee.

NOW, THEREFORE, THE CONDITIONS OF THE ABOVE OBLIGATIONS ARE SUCH THAT, if the Principal and its successors or assigns, or any or either of them shall:

Pay or cause to be paid the wages and compensation for labor performed and services rendered of all persons engaged in the prosecution of the work provided for therein, whether such persons be agents, servants or employees of the Principal, and of its successors or assigns, or of any subcontractor or any assignee thereof, including all persons so engaged who perform the work of laborers or of mechanics regardless of any contractual relationship between the Principal, or its assigns, or any subcontractor or any assignee thereof, and such laborers or mechanics, but not including office employees not regularly stationed at the site of the work, and further, shall pay or cause to be paid all lawful claims of subcontractors and of materialmen and other third persons arising out of or in connection with the Contract and the work, labor, services, supplies and materials furnished in and about the performance and completion thereof, then these obligations shall be null and void, otherwise they shall remain in full force and effect.

PROVIDED, however, that this bond is subject to the following conditions and limitations:

a. All persons who have performed or rendered services, as aforesaid, all subcontractors, and all persons, firms, corporations, including materialmen and third persons, as aforesaid, furnishing work, labor, services, supplies and material under or in connection with the Contract or in or about the performance and completion thereof, shall have a direct right of action (subject to the prior right of the Obligee under any claim which it may assert against the Principal and its successors, and assigns and/or the Surety and its successors and assigns) against the Principal and its successors, and assigns and/or the Surety and its successors and assigns on this bond, which right of action shall be asserted in proceedings instituted in the State in which such work, labor, services, supplies or material was performed, rendered or furnished, or where work, labor, services, supplies or material has been performed, rendered or furnished, as aforesaid, in more than one State, then in any such State. Insofar as permitted by the laws of such State, such right of action shall be asserted in a proceeding instituted in the name of the Obligee to the use and benefit of the person, firm or corporation instituting such action and of all other persons, firms and corporations having claims hereunder, and any other person, firm or corporation having a claim hereunder shall have the right to be made a party to such proceedings (but not later than one year after the performance of the Contract including the expiration of any warranty or guarantee) and to have such claim adjudicated in such action and judgment tendered thereof. Prior to the institution of such a proceeding by a person, firm or corporation in the name of the Obligee, as aforesaid, such person, firm or corporation shall furnish the Obligee with a bond of indemnity for costs, which bond shall be in a form and in an amount satisfactory to the Obligee.

b. Neither the Surety nor its successors or assigns shall be liable hereunder for any damages or compensation recoverable under any worker's compensation or employer's liability statute.

c. In no event shall the Surety, or its successors or assigns be liable hereunder for a greater sum than the amount of this bond, or subject to any suit, action or proceeding thereon that is instituted by any person, firm or corporation under the provisions of the above section(s), later than one year after such person last performed labor or last furnished or supplied materials.

And the Surety, for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligations of the Surety and of its successors and assigns, and this bond shall in no way be impaired or affected by any extension of time, modification, omission, addition or change in or to the Contract or the work to be

performed thereunder, or by any payment thereunder before the time required therein, or by a waiver of any provision thereof, or by an assignment, subletting or other transfer thereof, or of any part thereof, or of any work to be performed or of any moneys due or to become due thereunder; and the Surety, for itself and its successors and assigns, does hereby waive notice of any and all of such extensions, modifications, omissions, additions, changes, payments, waivers, assignments, subcontracts and transfers, and hereby stipulates and agrees that any and all things done and omitted to be done by and in relation to executors, administrators, successors, assignees, subcontractors, and other transferees, shall have the same effect as to the Surety and its successors and assigns, as though done or omitted to be done by and in relation to the Principal.

The Principal, for itself and its successors and assigns, and the Surety, for itself and its successors and assigns, do hereby expressly waive any objection that might be interposed as to the right of the Obligee to require a bond containing the foregoing provisions, and they do hereby further expressly waive any defense which they or either of them might interpose to an action brought hereon by any person, firm, or corporation, including subcontractors, materialmen and third persons, for work, labor services, supplies or material, performed, rendered or furnished as aforesaid, upon the ground that there is no law authorizing the Obligee to require the foregoing provisions to be placed in this bond.

Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Principal shall promptly furnish a copy of this Bond or shall permit a copy to be made on behalf of such potential beneficiary.

The obligations evidenced hereby shall constitute the joint and several obligations of the Contractor, the Surety, and their respective heirs, executors, administrators, successors and assigns.

Unless the context requires otherwise, capitalized terms not otherwise defined in this Bond shall have the meanings assigned to them in the Contract Documents.

IN WITNESS WHEREOF, we have hereunto set our signatures and seals this __ day of _____, 20___, all pursuant to due authorization.

_____
Principal

(SEAL)

By: _____
Name: _____
Title: _____

Address: _____
_____
_____

_____
Surety

(SEAL)

By: _____
Attorney-in-Fact (Attach Copy of Power of Attorney)

Name: _____
Title: _____

Address: _____
_____
_____

Countersigned for the
Commonwealth of Virginia:

By: _____
Resident Agent

Address: _____
_____
_____

END OF SECTION

GENERAL CONDITIONS

1. DEFINITIONS:

A. Architect. The duly licensed individual or entity who has been engaged by the Owner to observe performance of the Work and to consult with and advise the Owner during the construction process. As employed herein, the term "Architect" may refer to an individual, an organization or to the Architect's authorized representative.

B. Change Order. A written order to the Contractor signed by the Owner, the Architect, and the Contractor, which authorizes a change in the Work, an adjustment to the Contract Sum, and/or an adjustment to the Contract Period. The latest edition of AIA Standard Form G701 shall be utilized.

C. Construction Schedule. The schedule for completion of the Work. The Construction Schedule shall be developed utilizing a Critical Path method of scheduling, indicating time periods allotted for the performance of all constituent parts of the Work within the Contract Period.

D. Contract or Contract Documents. The terms "Contract" and "Contract Documents" shall be used interchangeably herein and shall consist of the following:

1. The signed Agreement

2. The General Conditions of the Contract, which appear herein;

3. The Drawings and Specifications;

4. The Supplementary Conditions;

5. Any Addenda issued prior to execution of the Agreement;

6. The Notice of Award issued by the Owner to the Contractor;

7. The Notice to Proceed issued by the Owner to the Contractor;

8. Any modifications which are issued subsequent to the execution of the Agreement and which may take the form of a Work Order, a Change Order, or written interpretations issued by the Architect;

9. The Contractor's Payment and Performance Bonds;

10. The Bidding Documents, which shall include the Contractor's completed Bid Proposal Form and the Instructions to Bidders; and

11. All provisions required by Law or Regulation to be incorporated herein, regardless of whether any such provision is referred to or set forth expressly in these Contract Documents.

E. Contract Period. The period of time allotted in the Contract Documents for completion of the Work, as such period may be adjusted from time to time in the manner prescribed herein.

F. Contract Sum. The total amount payable to the Contractor for performance of the Work. The Contract Sum is stated in the Contract Documents and shall be subject to adjustments in the manner specified herein.

G. Contractor. The corporation, limited liability company, partnership or other person or entity that contracts with the Owner to perform the Work. As employed herein, the term "Contractor" may refer to an individual, an organization, or to the Contractor's authorized representative.

H. Critical Path. The logical and necessary sequence through which all Work items must be completed within their respective timeframes or the completion date for the Project will change. A delay in the completion of any Work item that is on the Critical Path necessarily causes a corresponding delay to the Date of Substantial Completion.

I. Date of Final Completion. The date certified by the Owner/Architect as the date upon which the Work is completely finished, which event shall be achieved by the Contractor within the time period specified in Schedule of Completion. Work consisting of the completion of punch-list items, submission of O&M Manuals, any and all other Contract requirements being completed by the Contractor.

J. Date of Substantial Completion. The date certified by the Owner/Architect as the date upon which the Work has been sufficiently completed to allow the Work to be utilized by the Owner for the purpose for which it was intended. Such event shall be achieved by the Contractor within the time period specified in Schedule of Completion.

K. Day. The term "day" shall mean "calendar day."

L. Defective. An item described herein as “defective” shall be deemed to be unsatisfactory, faulty, or deficient in that it does not conform to the requirements of the Contract Documents, or does not meet the

requirements of any inspection, reference standard, test, or approval referred to in the Contract Documents, or has been damaged prior to the Date of Final Completion of the Work (unless responsibility for the protection thereof has been assumed by the Owner as of an earlier date).

M. Director, Office of Facilities Management. The official in charge of day to day construction matters for the Owner. The Director may designate a representative to act on his or her behalf.

N. Float. The period of time between the early start date and the late start date, or the early finish date and the late finish date of any of the activities set forth on the Construction Schedule. The Owner shall have and retain exclusive ownership of the Float.

O. Laws and/or Regulations. Any and all federal, state, and local laws, rules, regulations, ordinances, codes, and/or orders of any and all governmental bodies, agencies, authorities, and/or courts, which are applicable to the Work (or any aspect thereof) and are in effect at any time or from time to time during the Contract Period, including but not limited to Laws and/or Regulations applicable to projects funded by ESSER II funds.

P. Notice. Notice shall mean written notice. Written notice shall be deemed to have been duly served on the Contractor if delivered by U.S. Mail, hand delivery, or facsimile transmission to the Contractor's office at the Project or to the business address or fax number of the Contractor as stated in its Bid Form Proposal; or if delivered in person to the Contractor, to the Contractor's foreman or superintendent for the Project, or any officer or director of the Contractor. Unless otherwise specified herein, Notice shall be deemed to have been duly served on the Owner if delivered by U.S. Mail, hand delivery, or facsimile transmission (with a duplicate copy transmitted by another means of delivery authorized hereunder) to the Office of Facilities Management, Fairfax County Public Schools, 5025 Sideburn Road, Fairfax, Virginia 22030, fax number (703) 239-0462.

Q. Notice to Proceed. A written notice from the Owner to the Contractor, which gives consent for commencement of the Work. Unless otherwise provided, Work shall commence on the date specified in the Notice to Proceed.

R. Overhead. All costs of administration, field office and home office costs (including extended costs), general superintendence, office engineering and estimating costs, other required insurance, materials used in temporary structures (not including form work), additional premiums on the Performance and Payment Bonds of the Contractor, the use of small tools,

scheduling costs, cumulative impact costs and all other costs incidental to the performance of a change in the Work or to the cost of doing business. Small tools are defined as any tool with a replacement value less than $1,000.

S. Owner. The School Board of Fairfax County, Virginia, its authorized representatives and employees.

T. Project. The entire improvement of which this Contract and the Work contemplated hereby forms a part. The Project may include construction and/or other activities that are to be performed by the Owner or by one or more Separate Contractors.

U. Separate Contractor. Any corporation, limited liability company, partnership or other person or entity that contracts with the Owner to perform one or more portions of the Project, other than the Work.

V. Shop Drawings. All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for the Contractor and are submitted by the Contractor to illustrate a portion of the Work. Shop Drawings are not Contract Documents.

W. Site. The area upon or in which the Contractor's operations are performed and such other areas adjacent thereto as may be designated as such by the Architect. The Site may be shared by the Contractor with the Owner and with Separate Contractors and their subcontractors.

X. Subcontractor. Any corporation, limited liability company, partnership or other person or entity, other than an employee of the Contractor, who contracts with the Contractor to furnish or who actually furnishes labor, materials, services or equipment, or any combination thereof to the Contractor in connection with the Work.

Y. Submittal Schedule. A schedule for submission to the Architect of all required shop drawings, equipment data, and the like, which reflects lead times of critical submittals and is coordinated with the Construction Schedule for timely progress.

Z. Sub-Subcontractor. Any corporation, limited liability company, partnership or other person or entity, other than an employee of a Subcontractor, who contracts with a Subcontractor to furnish, or who actually furnishes labor, materials, service or equipment, or any combination thereof to a Subcontractor in connection with the Work.

AA. Surety. Any entity that has executed as Surety the Contractor's performance and/or payment bonds securing performance of the Work contemplated by this Contract and/or providing for protection of claimants who have and fulfill contracts to supply labor or materials to the Contractor in connection with the Work.

BB. Work. Everything explicitly or implicitly required to be furnished or performed under the Contract Documents. The Work may represent the whole, or a necessary and interdependent part of, the Project.

Number and Gender of Words. Whenever the Contract so admits or requires, all references to one number shall be deemed to extend to and include the other number, whether singular of plural, and the use of any gender shall be applicable to all genders.

2. INDEMNIFICATION:

The Contractor hereby assumes all liability for and agrees to indemnify and hold harmless the Owner and its Members, officers, authorized representatives and employees (each of whom shall be referred to herein as an "Indemnified Party") from and against any and all claims, losses, costs, damages, penalties, liabilities and fees (including reasonable attorneys' fees) and expenses resulting from: (i) any material breach of the representations, warranties, covenants and agreements of the Contractor contained in the Contract Documents; (ii) any injuries to persons or property caused by the negligence or other wrongful conduct of the Contractor, any Subcontractor, or any of its or their respective employees or authorized representatives; (iii) any claims filed by the Contractor (or by a Subcontractor, if permitted by law) that are adjudicated in favor of the Owner; or (iv) any other claim arising in any other manner out of or in connection with the performance of this Contract by or on behalf of the Contractor.

Notwithstanding the foregoing, the Contractor will in no event be obligated hereunder to indemnify or hold harmless any Indemnified Party against liability for damage arising out of bodily injury to persons or damage to property suffered in the course of the Work, caused by or resulting solely from the negligence of such Indemnified Party.

3. CONFLICT OF INTEREST:

The provisions of the State and Local Government Conflict of Interests Act (Va. Code § 2.2-3100, *et seq.*) and Article IV of the Virginia Public Procurement Act entitle "Ethics in Public Contracting" (Va. Code § 2.2-4367 *et seq.*) are incorporated herein by reference. The Contractor shall incorporate the above conflict-of-interest clause in each subcontract entered into hereunder.

4. EXAMINATION OF SITE:

Bidders are required to visit the site, compare the Drawings and Specifications with any work in place, and inform themselves of all conditions, including other work, if any, being performed. Failure to visit the site in no way relieves the successful bidder from the necessity of furnishing any materials or performing any work that may be required to complete work in accordance with Drawings and Specifications without additional cost to the Owner.

5. INSURANCE:

A. Contractor's Statutory and Legal Liability Insurance

During the Contract Period, the Contractor shall, at its own expense, purchase and maintain insurance to provide coverage for claims resulting from the Contractor's performance of the work. Such coverage shall extend to work performance by Subcontractors, persons or organizations directly or indirectly hired by the Contractor or any subcontractor in connection with the work, or any other person or organization who may cause liability to be incurred by the Contractor or any Subcontractor. Such coverage shall include, but not be limited to, the following:

1. Claims arising under workers' compensation, disability, or other related benefits programs.

2. Claims resulting from bodily injury, occupational illness or death of any employees performing the work.

3. Claims resulting from bodily injury, illness disease or death of any persons in contact with the work, but who are not engaged as employees.

4. Claims arising under personal injury liability coverage for injury to any employees, which are directly or indirectly attributable to his employment for performance of the work.

5. Claims arising under personal injury liability coverage for injury to any person not an employee which are attributable to performance of the work.

6. Claims arising for damage or destruction of tangible property, including loss of use of the affected property as a result.

7. Claims arising from pollution, including Loading and Unloading Cargo, Cargo In-transit, Site Pollution Clean-up Operations, and On-Going Contamination.

B. During the term of the Contract, the Contractor must maintain the following insurance with companies authorized to do business in Virginia. The Owner shall be designated on each policy as "The Fairfax County School Board" as an additional insured except for workers' compensation.

1. Workers Compensation including Occupational Disease and Employer's Liability Insurance: Statutory coverage as required by the District of Columbia, Maryland, and Virginia Workers Compensation Law, including provision for voluntary D.C. benefits as required in labor union agreements.

2. Employer's Liability:

   Bodily Injury by Accident -- $100,000 Each Accident
   Bodily Injury by Disease -- $500,000 Policy Limit
   Bodily Injury by Disease -- $100,000 Each Employee

3. Commercial General Liability Insurance written on ISO occurrence form CG 00 01 10 01 (or a substitute form providing equivalent coverage) with limits of $1 million per occurrence and $2 million aggregate per project to include the following:

   Contractual liability as required by the indemnification provision of Paragraph 1.

   Personal injury liability, including offenses related to employment.

   Coverage of explosion, collapse, or underground hazards.

   Broad form property damage liability, including completed operations coverage.

4. Business Auto Liability Insurance: including owned, non-owned and hired vehicles with policy limits of $1,000,000 combined single limit per accident.

5. Pollution Liability Insurance covering the Contractor's completed operations. This insurance must include sudden and gradual coverage for third-party liability including defense costs and completed operations. The coverage must be maintained during the term of the contract and at least three years following ins completion/termination.

6. Umbrella/Excess Liability Insurance with coverage limits of $5,000,000.

C. Additional Requirements:

1. The limits of liability of the insurance described may be superseded if the limits prescribed by law are greater.

2. If any insurance has been issued on a "claims made" basis, then Contractor must comply with either of the following conditions.

   a. Provide insurance for all required coverage for a period of two (2) years after final completion. Such coverage shall be subject to a retroactive date that is not later than the commencement of performance under the Contract, or

   b. Procure insurance for the extended reporting period endorsement for the policy or policies in force during the term of the Contract.

3. Notice of Insurance: Proof of insurance for each type of coverage listed herein shall be provided within ten (10) days after the Contractor's receipt of the Award Letter, and no work shall proceed unless all such insurance is in effect. The Contractor shall not allow any Subcontractor to commence work on its subcontract until all such insurance of the Subcontractor has been obtained and approved by the Contractor and found to be in accordance with the Contract. The Contractor certifies by commencement of the Work that its insurance and that of its Subcontractors is in effect and meets the requirements set forth herein.

4. Notice of Cancellation: The Contractor will give thirty (30) days prior written notice to the Owner if the policies are to be terminated or if any changes are made during the life of the Contract which will affect in any way the insurance requirements in the contract.

5. Copies of Insurance Policies: Upon demand, the Contractor shall provide the Owner with a copy of each policy, which the Contractor and each of its Subcontractors carry to meet the insurance requirements of the Contract, together with receipted bills evidencing proof of premium payment.

6. Owner's Liability Insurance: The Owner may, at its own expense, purchase and maintain its own liability insurance to protect against claims which may arise in connection with the work, or the Owner may self-insure such risks.

7. No Waiver: Nothing contained herein shall have the effect of waiving or shall be deemed to affect a waiver of the Owner's sovereign immunity under law.

6. COMPLIANCE WITH LAWS; PERMITS, FEES, AND NOTICES:

The successful bidder shall be required to comply with all local, state and federal laws, rules, regulations and ordinances applicable to the Contract and to the services contemplated thereby. The successful bidder shall be required to obtain, at its expense, all permits, licenses and other authorizations necessary for the performance of the services, except that the Owner shall obtain, at its expense, all Building Permits that are required for completion of the Project. The successful bidder shall be responsible for giving all required notices and certifications, and for complying with all laws, ordinances, rules, regulations and directives of any public authority bearing on the performance of the work, regardless of whether those notices, certifications, laws, ordinances, rules, regulations and directives are expressly referenced in the Contract.

7. OCCUPIED AREA:

A. The Contractor hereby certifies that: (i) neither the Contractor nor any employee of the Contractor who will have direct contact with students has been convicted of a felony or any offense involving the sexual molestation or physical or sexual abuse or rape of a child; and (ii) absent prior Notice to the Owner, neither the Contractor nor any employee of the Contractor who will have direct contact with students has been convicted of a crime of moral turpitude. The foregoing certification shall be binding upon the Contractor throughout the Contract Period and the Contractor hereby covenants and agrees to provide the Owner with immediate Notice of any event or circumstance that renders such certification untrue. The Contractor hereby covenants and agrees that it will require this certification to be included in every subcontract of every tier in order that the provisions contained herein will be binding upon each Subcontractor and Sub-subcontractor. The Contractor will ensure that no worker shall perform Work in occupied areas during school hours unless prior written approval has been granted by the Owner and proper safety precautions have been exercised to isolate the area of the Work.

B. Alcoholic beverages, illegal drugs, and weapons are prohibited on the Site and shall constitute grounds for immediate removal from the Site of the Project. The Contractor shall ensure that neither its employees nor those of any Subcontractor shall fraternize in any manner with any student of Fairfax County Public Schools at the Site of the Work. The Owner shall have the right to remove from the job Site any person whose presence the

Owner deems detrimental to the best interests of the Fairfax County Public Schools. Any individual who is removed from the Site pursuant to this paragraph may not return to such Site or to that of any other project of Owner without the prior written permission of the Owner.

C. Drug-Free Workplace. During the performance of the Contract, the Contractor agrees to (i) provide a drug-free workplace for the contractor's employees; (ii) post in conspicuous places, available to employees and applicants for employment, a statement notifying employees that the unlawful manufacture, sale, distribution, dispensation, possession, or use of a controlled substance or marijuana is prohibited in the contractor's workplace and specifying the actions that will be taken against employees for violations of such prohibition; (iii) state in all solicitations or advertisements for employees placed by or on behalf of the contractor that the contractor maintains a drug-free workplace; and (iv) include the provisions of the foregoing clauses in every subcontract or purchase order of over $10,000, so that the provisions will be binding upon each subcontractor or vendor. As employed herein, the term "drug-free workplace" shall mean each site for the performance of work hereunder.

8. CLEANING:

The Contractor shall be totally responsible for periodic cleaning up of the building and premises daily. In addition to general broom cleaning, the Contractor shall remove all refuse, waste materials and debris of any kind regardless as to who may have left same. All such refuse shall be removed from the property of the Owner and disposed of in a legal manner to the end that at all times the building and premises shall present a neat, orderly and workmanlike appearance. The definition of "periodic" shall mean - "as necessary and/or at the direction of the Owner or his representative."

9. SUBCONTRACTORS:

Unless otherwise specified in the Contract Documents, within ten (10) days after the award of the Contract, the Contractor must submit a written statement to the Owner setting forth the name and address, and telephone number of each proposed Subcontractor and Sub-subcontractor and the portion of the Work and materials for which each such Subcontractor or Sub-subcontractor is responsible.

10. ASSIGNMENT AND LEGAL REPRESENTATIVES:

The Contract Documents shall not be assigned, sublet or transferred, in whole or in part, by operation of law or otherwise, by either of the parties hereto except with the prior written consent of the other. Unless specifically stated to the contrary in any written consent to an assignment, no assignment shall operate to

release or discharge the assignor from any duty or responsibility under this Agreement.

11. TIME OF START:

The Contractor shall commence work within ten (10) calendar days after the date stated as the date to proceed in the Notice to Proceed. All work shall be performed during regular school business hours (7am – 5pm) only. Work performed outside of regular school business hours must be approved by the FCPS project manager or an FCPS representative prior to the work being performed.

12. EXTENSION OF TIME - NO WAIVER:

The Contractor shall be entitled to an extension of time for delay in completion of the Work only if obstructed or delayed in the commencement, prosecution or completion of any part of the work by any act or delay of the Owner, or by riot, insurrection, war, pestilence, acts of public authorities, fire, earthquakes, or by strikes, or other causes, which causes of delay mentioned in this Paragraph, in the opinion of the Owner, are entirely beyond the expectation and control of the Contractor. In such event, the period specified in any Notice to Proceed or Purchase Order for the completion of the work shall be extended by such time as shall be determined by the Owner. The parties agree that no extension beyond the date of completion fixed by the terms of the Contract shall be effective unless granted in writing and signed by the Owner.

13. LIQUIDATED DAMAGES:

The Owner and the Contractor hereby acknowledge and agree that time is of the essence with respect to this Contract and in the event the Contractor fails to complete any work within the established timeframe, the Owner will incur actual monetary damage. The amount of **$500.00** per day is set forth as the liquidated damages for each day that the time consumed in completing the work exceeds the time allowed. This amount shall in no event be considered as a penalty or otherwise than as the liquidated and adjusted damages to the Owner because of the delay.

14. UNTIMELY PERFORMANCE BY CONTRACTOR:

The Owner and the Contractor hereby acknowledge and agree that time is of the essence with respect to the performance of the Work. In the event the Contractor fails to complete the Work within the established timeframe, the Owner as well as Community Users will incur actual and direct harm. This includes, but is not limited to, the disruption or loss of scheduled classes, disruption or loss of school activities, loss of revenue from these cancelled

activities, disruption or loss of intermural academic and athletic tournaments, loss of revenue from these cancelled events, disruption or loss of scheduled community use of the schools and facilities.

In addition to the Owner's assessment of liquidated damages, unapproved project delays also can result in the Contractor's loss of eligibility for award of future FCPS Office of Facilities Management projects for a period of three years or more as determined by FCPS Office of Facilities Management.

15. PROGRESS SCHEDULE:

Prior to the first request for payment, submit Progress Schedule in such form as to readily indicate status of work as planned, scheduled, and so arranged so that at weekly intervals it may be clearly determined whether actual state of work is in accord with schedule to Owner as indicate actual progress thereon weekly. Contractor shall update schedule to show substantial completion of project and final completion as necessary when delays or change orders are agreed upon and issued.

16. SCHEDULE OF COMPLETION:

A. All work shall be substantially completed and certified according to the following schedule:

1. Onsite work shall begin on June 13, 2022.

2. Substantial Completion on or before August 5, 2022. *(See Definition)*

3. Final Completion on or before August 12, 2022. *(See Definition)*

B. Phasing of the project within the completion date will be jointly prepared by the Contractor, Office of Facilities Management, and school personnel to afford the least amount of disruption to school operations.

C. Construction and alteration will be performed while the building is in use and therefore, the Contractor shall give full cooperation to the school authorities in scheduling and performing the work. Contractor shall give forty-eight hours advance written notice to school authorities when work is to be performed.

17. CONSTRUCTION SCHEDULES:

A. The Contractor, promptly after receipt of the Award Letter, shall prepare and submit to the Owner, for approval, a construction schedule for the Work. The Construction Schedule, as approved, shall not exceed the time

limits provided in the Contract Documents, shall be revised at appropriate intervals as required by conditions of the Work and the Project, shall be related to the entire Project to the extent required by the Contract Documents and shall provide for the expeditious execution of the Work within the Contract Period.

B. The Contractor shall prepare and keep current, for the Owner's review and approval, a schedule of submittals which is coordinated with the Construction Schedule and is maintained both on the job site and available for the Owners review.

18. SHOP DRAWINGS:

A. The Contractor shall submit Shop Drawings and similar submittals required by the Contract Documents with reasonable promptness and in accordance with the Submittal Schedule as to cause no delay in the Work or in the activities of the Owner or of separate contractors.

B. The Contractor shall perform no portion of the Work requiring submittal and review of Shop Drawings or similar submittals until the Owner has approved the respective submittal. Such Work shall be performed in accordance with the approved submittals.

C. Delays in submission of shop drawings do not qualify for extension(s) in completion of the contract.

D. Contractor is responsible for reviewing shop drawings from subcontractors and suppliers to verify that they meet the project requirements prior to submitting them to the Owner. The Contractor shall mark on the shop drawings the name of the reviewer and the date reviewed

E. Shop drawings must have an approval block, the FCPS project number, and the specification section reference or plan sheet number.

19. CHANGE ORDERS:

19.1 PRELIMINARY PROCEDURES:

A. Owner may initiate changes by submitting Proposed Modification to Contractor. Request will include:

1. Detailed description of the Change, Products, and location of the change in the Project.

2. Supplementary or revised Drawings and Specifications.

3. A specific period of time during which the requested price will be considered valid, which shall be 90 calendar days, unless otherwise stated.

4. The specific action to be initiated by the Contractor.

5. The amounts of the unit prices to be:

   a. Those stated in the Agreement and the Bid Form.

   b. Those mutually agreed upon between Owner and Contractor.

B. Contractor may initiate changes by submitting a written notice to Owner containing:

1. Description of the proposed changes.

2. Statement of the reason for making the changes.

3. Statement of the effect on the Contract Sum and the Contract Time.

4. Statement of the effect on the work.

5. Documentation supporting any changes in Contract Sum or Contract Time, as appropriate.

C. All claims by the Contractor arising out of or relating to the performance of the work or any termination hereunder shall be made in writing and shall be decided by the Director of the Office of Facilities Management or his designated representative. All claims must be filed with the Office of Facilities Management within five (5) calendar days after sustaining the injury underlying the claim. Failure to comply with this provision shall constitute an absolute waiver of such claim. The Director or the Office of Facilities Management or his designated representative shall issue his written decision within thirty (30) days of his receipt of the written claim which decision shall be final.

19.2 DOCUMENTATION OF BIDS AND CLAIMS:

A. Support each quotation for a lump-sum bid, and for each unit price, which has not previously been established, with sufficient substantiating data to allow Owner to evaluate the quotation.

1. Bid costs attributable to labor shall be based upon labor rates for each category of personnel. A list of labor rates shall be submitted to the Owner for review and concurrence within 30 calendar days of the Notice to Proceed. See paragraph B2 below for allowable inclusions for establishment of labor rates.

B. Provide data for lump sum bids in accordance with the following criteria:

1. The Contractor's bid shall be itemized and segregated by labor, equipment, and materials for the various components of the Change in the Work (no aggregate labor total will be acceptable) and shall be accompanied by signed bids of any Subcontractors who shall perform any portion of the Change in the Work and of any entities who shall furnish materials or equipment for incorporation therein.

2. The portion of the bid relating to labor, whether by the Contractor's forces or the forces of any of its Subcontractors, shall include anticipated gross wages of Job Site labor, including foremen, who shall be directly involved in the Change in the Work (for such time as they will be so involved), plus payroll costs (including premium costs of overtime labor, if overtime is authorized, Social Security, Federal or State unemployment insurance taxes and fringe benefits required by collective bargaining agreements entered into by the Contractor or any such Subcontractor in connection with such labor).

3. The portion of the bid relating to materials may include the reasonable anticipated direct costs to the Contractor or to any of its Subcontractors of materials shall be purchased for incorporation in the Change in the Work, plus transportation and applicable sales or use taxes.

4. The bid may further include the Contractor's and any of his Subcontractor's reasonable anticipated equipment rental costs, except small hand tools, in connection with the Change in the Work. For rented equipment an hourly rental rate shall be used which shall be determined by using the monthly rental rates taken from the current edition of the Rental Rate Blue Book for construction Equipment and dividing it by 176. An allowance shall be made for operating costs for each and every hour the equipment is actually operating in accordance with the rates listed in the aforesaid Rental Book. The Contractor shall be allowed no more than 65% of the rental rate on Contractor owned equipment.

5. Base Cost is defined as the total of labor, material, and equipment rentals as described in Subparagraphs 17.2.B3 and 17.2.B4. The actual net cost in money to the Owner for the Change in the Work shall be computed as follows:

   a. Contractor overhead and profit: If the Contractor performs the Change in the Work, his compensation shall be the Base Costs as described above, plus a mark-up of 20% on Base Costs less than or equal to $10,000. If the Base Costs exceed $10,000, his compensation shall be the Base Cost, plus a mark-up of 20% on Base Costs less than or equal to $10,000, and a mark-up of 15% on Base Costs above $10,000.

   b. Subcontractor overhead and profit: If the work is performed by a Subcontractor, his compensation shall be the Base Costs as described above plus a mark-up as described in Paragraph 5.a. above for overhead and profit. The Contractor's compensation shall be a mark-up of ten percent (10%) of the Subcontractors Base Costs.

   c. Sub-subcontractor overhead and profit: If the work is performed by a Sub-subcontractor, his compensation shall be the Base Costs as herein described plus a mark-up as described in paragraph 5.a. above for overhead and profit. The Subcontractors compensation shall be a mark-up of ten percent (10%) of the Sub-subcontractor's Base Costs for his overhead. The Contractor's compensation will be a mark-up of ten percent (10%) of the Sub-subcontractor Base Costs.

6. The mark-up on the cost of labor, materials, and equipment described in above Paragraphs 5.a., 5.b., and 5.c. above shall compensate the Contractor, Subcontractor or Sub-subcontractor for all indirect costs associated with or relating to the Change in the Work including, but not limited to, labor and/or equipment inefficiency, changes in sequence, delays, interference, impact on unchanged work, gross receipts tax, superintendent, small tools, reproduction, administration, insurance, unrelated safety requirements, temporary structures and offices, all other general and administrative, home office, and field office expenses.

   a. The mark-up on the cost of labor, materials, and equipment described in above Paragraphs 5.b. and 5.c. above shall compensate the contractor or Subcontractor for all indirect

costs associated with or relating to the change in the Work including but not limited to, gross receipt tax, superintendent, reproduction, administration, and insurance.

C. Support each claim for additional costs, and for work done on a time-and-material basis, with documentation as required for a lump-sum bid, plus additional information:

1. Name of the Owner's authorized agent who ordered the work, and date of the order. Include copies of written authorization when applicable.

2. Dates and times that work was performed, and by whom, verified and signed by Owner's Authorized Representative.

3. Time record, summary of hours worked, and hourly rates paid.

4. Receipts and invoices for:

a. Equipment used, listing dates and times of use.

b. Products used, including listing of quantities.

c. Subcontracts.

C. Document requests for substitutions of Products as specified in Instructions to Bidders Section 16.

19.3 PREPARATION OF CHANGE ORDERS:

A. Owner will prepare each Change Order. Two copies shall be prepared, each with original signature.

B. Form: Change Order - AIA Document G701.

C. Change Order will describe changes in the work, both additions, deletions and any voided proposed modifications.

D. Change Order will provide an accounting of the adjustment in the Contract Sum and in the Contract Time.

E. Upon completion of work under a Change Order, enters the pertinent changes in Record Documents.

19.4 CHANGE ORDER CONTENTS:

A. Contents of Change Orders will be based on, either:

1. Owner's proposed Modification and Contractor's responsive Bid as mutually agreed between Owner and Contractor.

2. Contractor's Bid for a change as mutually agreed between Owner and Contractor.

B. Owner will sign and date the Change Order as authorization for the Contractor to proceed with the changes.

C. Contractor will sign and date the Change Order to indicate agreement with the terms therein.

20. CHANGES IN WORK:

20.1 MINOR CHANGES:

A. Owner's Right to Make Changes. The Owner reserves the right to make such additions, deletions, or changes to the Work as may be necessary in its sole and absolute discretion to complete the Work; provided, however, that no such additions, deletions or changes shall materially affect the substance hereof or materially change the Contract Sum. This Contract shall in no way be invalidated by any such additions, deletions or changes. No claim shall be made by the Contractor for loss of anticipated profits resulting from any such addition, deletion, or change to the Work.

B. Construction Conditions. Construction conditions may require minor changes in the location and installation of the Work and equipment to be furnished and other Work to be performed hereunder. The Contractor, when ordered by the Architect, shall make such adjustments and changes in the locations and Work as may be necessary without additional cost to the Owner, provided such adjustments and changes do not materially alter the character and quantity of the Work as a whole, or the Contract Sum, and provided further that Drawings and Specifications showing such adjustments and changes are given to the Contractor by the Owner or Architect within a reasonable time before work involving such adjustment and changes is begun. The Owner and the Architect shall be the sole judges of what constitutes a minor change for which no additional compensation shall be allowed.

C. Time Extension for Minor Changes. The Contractor shall be entitled to an extension of time for such minor changes only for the number of days which the Architect may determine to be necessary to complete such changes and only to the extent that such changes actually delay the completion of the Project, and then only if the Contractor shall have strictly complied with all the requirements of the Contract Documents.

20.2 EXTRA WORK:

A. The Owner may, in its sole discretion, at any time by a Proposed Modification or Change Order and without notice to the Sureties require the performance of such Extra Work as it deems necessary or desirable.

B. A Work Order or a Change Order covering Extra Work shall be valid only if issued in writing and signed by the Owner and the Contractor, and the Extra Work so ordered must be performed by the Contractor and reflects the amount of compensation to be paid to the Contractor

C. The amount of compensation to be paid to the Contractor for any Extra Work so ordered shall be determined as follows:

1. By such applicable unit prices as set forth in the Contract; or

2. If no such unit prices are set forth, then by a lump sum or other prices mutually agreed upon by the Owner and the Contractor.

21. CORRECTION OF WORK:

A. The Contractor shall promptly correct any work, which fails to conform to the requirements of the Contract Documents (the "Rejected Work"), whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. The Contractor shall bear all costs associated with the correction of any Rejected Work.

B. The Contractor's obligation to correct defective or non-complying work shall continue for a period of two (2) years after the date of Substantial Completion. The time period of this obligation may be extended by terms of warranties or other circumstances where required by law.

22. RIGHT TO SUPPLEMENT CONTRACTOR'S WORK FORCE:

In the event that the Contractor fails (in the opinion of the Owner) within 3 days following Notice from the Owner: (a) to correct defective Work; or (b) to supply labor, materials, or equipment that is necessary to complete the Work in strict accordance with the requirements of the Contract Documents, then the Owner shall have the right to (i) order the Contractor to stop the Work or a designated portion thereof; and/or (ii) supplement the Contractor's forces, in each case to the extent deemed necessary and advisable by the Owner and until such time as, in the opinion of the Owner, the cause of the order or action shall have been corrected. The Owner shall have the right to: (a) correct the deficiencies set forth in the Notice, either with its own forces or with a separate contractor engaged by the Owner to perform such corrections; (b) deduct the cost of correcting such deficiencies (including costs for additional services in connection therewith) from amounts then or thereafter due the Contractor under the Contract Documents; and (c) order the Contractor to re-start at a designated time all or any portion of the Work stopped by the Owner. If the amounts then or thereafter due the Contractor are insufficient to cover the cost of correcting the deficiencies, then the difference shall be payable by the Contractor to the Owner upon written demand. The Architect's determination of cost hereunder shall be final and binding upon the parties. The Owner's exercise of the right to correct deficiencies shall be in addition to, and shall in no way prejudice or limit, any other remedies available to the Owner. In the event that it is determined for any reason that grounds for stopping all or any portion of the Work did not exist, then, at the election of the Owner, the rights and obligations of the parties hereunder shall be the same as if the Notice directing the Contractor to stop the Work had been delivered under the provisions of Paragraph 23 hereof; provided, however, that the Contractor in such event shall be deemed to have received seven days prior written Notice of termination. Any compensation determined to be due the Contractor pursuant to Paragraph 23 shall be offset by the cost of correcting the Work. The Contractor shall in no event be entitled to receive anticipated profits or consequential damages of any kind in connection with any termination or action hereunder.

23. DISPUTED WORK:

If the Contractor is of the opinion that any work required by the Owner violates the terms and provisions of this Contract, then it shall, within four (4) days of commencing such work or action, notify the Owner of the asserted violation in writing. The Owner's Division Superintendent or Designee will make a determination within ten (10) days of the written request. Failure of the Contractor to so notify the Owner shall constitute a waiver and release of the Contractor's right to claim compensation for any work or damages resulting from such compliance.

24. CONTRACTOR CLAIMS:

A. The Contractor must, within five (5) days after the occurrence of the event giving rise to a claim, deliver to the Owner's Division Superintendent or Designee a written statement specifying that the Contractor has sustained such damage, and detailing the basis of the claim against the Owner with a breakdown of the nature and amounts of such damages, duly verified by the Contractor and notarized. This itemized breakdown shall be made to the fullest extent possible, otherwise the claim shall be deemed to be waived.

B. The Owner's Division Superintendent or Designee shall make a determination within twenty-five (25) days after receipt of the itemized breakdown, which decision shall be the final determination of the Owner.

C. No claim by the Contractor shall be made for loss of anticipated profits due to delay or extension of contract completion time. The Contractor shall be entitled to an extension of time for such minor changes only for the number of days which the Owner determines to be necessary to complete such changes and only to the extent the changes actually delay the completion of the project, and then only if the Contractor shall have strictly complied with all the requirements of the Contract Documents.

25. OWNER'S RIGHT TO TERMINATE FOR CONVENIENCE

The Owner shall have the right to terminate this Contract at its own convenience for any reason by giving seven (7) days prior written notice of termination to the Contractor. The Contractor shall be paid an amount equal to the lesser of: (1) the actual cost of any work, labor or materials actually performed or in place and the actual cost of any labor, equipment or materials ordered in good faith which could not be canceled, less the salvage value thereof, plus ten percent (10%) or (2) the pro rata percentage of completion based upon the Bid Breakdown plus the actual cost of any labor, equipment or materials ordered in good faith which could not be canceled, less the salvage value thereof.

26. CONTRACTOR'S DEFAULT AND TERMINATION:

A. The parties agree that:

1. if the Contractor is not prosecuting the Work with reasonable speed and diligence or is delaying the progress of the Work unreasonably or unnecessarily; or

2. If the Contractor fails to begin the Work when required to do so; or

3. if the force of workers or the quality or quantity of material furnished is not sufficient to insure completion of the Work within the specified time in the Contract Documents; or

4. if the Contractor fails in any manner of substance to observe the provisions of this Contract; or

5. if any of the Work, machinery, or equipment is defective and is not replaced; or

6. if the Contractor fails to make prompt payments to suppliers or to Subcontractors for Work performed in connection with the Contract; or

7. if the Contractor fails to cooperate in good faith with the Owner;

than the Owner, without prejudice to any other rights or remedies it may have hereunder, shall have the right to declare the Contractor in default, in whole or in part.

B. In the event the Owner elects to declare the Contractor in default, the Owner shall notify the Contractor and his Sureties by written notice describing the nature of the default and providing the Contractor a right to cure such default within three (3) calendar days after the date of the notice, or within such longer period as the Owner, in its sole and absolute discretion, may prescribe. In the event the default is not cured within the time period specified by the Owner, the Owner shall have the right to take any actions necessary to contract or complete the Work.

C. Any costs incurred in connection with completing or correcting the Work shall be deducted from the amounts then or thereafter due the Contractor. In the event such amounts are not sufficient to cover the costs incurred in connection with completing or correcting the Work, the Contractor and his Surety shall pay to the Owner the amount of any deficiency.

D. If, after issuance of a Notice of termination of the Contract under the provisions of this Paragraph, it is determined for any reason that the Contractor was not in default under the provisions of Paragraph 24(A)(1) through 24(A)(7), or that cause for such termination otherwise did not exist under the provisions of Paragraph 24(A)(1) through 24(A)(7), then the rights and obligations of the parties shall be the same as if the Notice of termination had been delivered under the provisions of Paragraph 23 hereof; provided, however, that the Contractor in such event shall be deemed to have received seven (7) days prior written Notice of termination. Any compensation thereupon owing to the Contractor under

Paragraph 23 shall be offset by the cost of remedying any defective Work performed by or on behalf the Contractor. In no event shall the Contractor be entitled to recover anticipated profits or consequential damages of any kind in connection with any termination of these Contract Documents.

27. SUBSTANTIAL COMPLETION:

A. When the Contractor considers that the Work is substantially complete, the Contractor shall provide the Owner written notification of such fact. The Owner shall prepare a comprehensive punch list of items to be completed and/or corrected. The Contractor shall proceed promptly to complete and correct the items on the punch list. Failure to include an item on the punch list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

B. It is the Contractor's responsibility to examine the work of all trades, to correct any deficiencies found, and to verify that all equipment is operating prior to notifying the Owner of Substantial Completion.

C. "Substantially complete" means that all work described in the specifications or shown on the drawings is done, with only minor items needed to fully complete the work. Typical work that should be done in order to be considered substantially complete include: all equipment installed, piped, electrically connected, and tested with any problems corrected; control systems completed, calibrated and functioning as intended, insulation installed. Equipment should be fully functional and ready for use.

28. FINAL INSPECTION:

Upon written notification by the Contractor that the Work is finally complete, and upon the Contractor's submission of a final application for payment, the Owner will conduct a final inspection of the Work. When the Owner determines that the Work has been satisfactorily completed and the Contract Documents fully performed, including the submission of Operation and Maintenance Data as required in Section 34, he shall promptly prepare and issue a Final Certificate for Payment.

29. PAYMENTS AND COMPLETION:

For the Contractor's complete performance of the Work, the Owner agrees to pay, and the Contractor agrees to accept, subject to the terms and conditions hereof, the Contract Sum, taking into consideration any deductions based on award of a combination of alternates, if applicable, plus the amount required to be paid for Extra Work less credit for any Work omitted.

30. SCHEDULE OF VALUES:

A. At the start of the Contract the Contractor shall provide a schedule of values for the work for the Owner's approval. The form shall be completed in detail including quantities and unit costs.

B. Submit three (3) copies to the project engineer for approval within 5 days of receipt of the Notice to Proceed.

C. The schedule of values shall be completed in detail including quantities and unit costs. Identify Schedule with:

1. Complete title of Project and Location
2. Contract number
3. Name and address of Contractor
4. Date of Submission
5. Labor per item to install (lump sum labor will not be acceptable)
6. Total Contract Sum

D. Organize the Content of Schedule into columns with headings as follows:

1. Item Number (Column No. 1)
2. Description of Item (Column No. 2)
3. Quantity (Column No. 3)
4. Unit of Measure (Column No. 4)
5. Cost per unit (Column No. 5)
6. Total cost of Item (Column No. 6)

E. Each item shall include a directly proportional amount of the Contractors overhead and profit.

31. REQUESTS FOR PAYMENTS AND PARTIAL PAYMENTS:

A. On or about the first of each month, the Contractor shall make and certify an estimate of the amount and fair value of the Work performed based on the schedule of values and may apply for partial payment. Invoice must have the FCPS contract number clearly indicated on it. The Contractor shall submit the request for payment on AIA Document G702 or equal detailing the schedule of values, work completed, retainage, etc.

B. The Owner will retain five percent (5%) of the amount of each estimate until final completion and acceptance of all work covered by this Contract, and (10%) of all equipment delivered and properly stored on the site.

C. Send all invoices to:

Fairfax County Public Schools
Department of Facilities and Transportation Services
Office of Facilities Management
Sideburn Support Center
5025 Sideburn Road
Fairfax, VA 22032-2637
Attention: Project Manager

32. CONTRACTUAL DISPUTES:

A. Any dispute arising hereunder or in connection herewith which is not otherwise resolved by the parties shall be decided by the Owner's Division Superintendent or Designee who shall reduce his decision to writing and mail or otherwise forward a copy thereof to the Contractor within thirty (30) days. The decision of the Owner's Division Superintendent or Designee shall be final and conclusive unless the Contractor appeals within six (6) months of the date of the final written decision by instituting legal action as provided in the Code of Virginia. A Contractor may not institute legal action, prior to receipt of the public body's decision on the claim, unless the public body fails to render such decision within the time specified.

B. Contractual claims, whether for money or other relief, shall be submitted in writing no later than sixty (60) days after final payment; however, written notice of the Contractor's intention to file such claim shall have been given at the time of the occurrence or beginning of the work upon which the claim is based. Nothing herein shall preclude a contract from requiring submission of an invoice for final payment within a certain time after completion and acceptance of the work or acceptance of the goods. Pendency of claims shall not delay payment of amounts agreed due in the final payment.

33. LEGAL ACTION:

No bidder, offeror, potential bidder or offeror, or Contractor shall institute any legal action until all statutory requirements have been met.

34. OPERATION AND MAINTENANCE DATA:

The Contractor shall compile data and related information appropriate for the Owner's record, maintenance and operation of products, equipment, materials and systems furnished under the Contract. This shall include as-built drawings.

A. Provide two (2) complete copies of the Record and Information Booklet and one (1) copy of Record and Information in a CD format and delivered to the Owner. Booklet shall be a commercial quality three-ring binder with durable and cleanable plastic cover.

B. The Contractor must include the Final Approved Equipment Submittal in the Booklet. The Contractor must provide a Warranty Letter indicating the warranty expiration date and a balancing report (if project is Mechanical/HVAC related) must be included in the Booklet.

C. Neatly typewritten table of contents for each volume, arranged in a systematic order by specification divisions. Indicate contractor, name of project, contract number and address of project on the face of the binder. On the end of the binder the school name shall be printed with a permanent readable label.

D. As-built drawings shall be red lined to show location and routing of any items not installed as shown on the original drawings.

35. BUILDING PERMITS:

Necessary building permits will be obtained by the Owner. Trade permits shall be obtained by the Contractor for all work prior to start of the project.

36. RIGHT OF AUDIT:

The Owner and its authorized representatives shall, until the expiration of three years from the date of final payment under these Contract Documents, have the right to examine and copy those books, records, accounts, documents, papers and other supporting data which involve transactions related to this Contract or which otherwise permit adequate evaluation of the cost or pricing data submitted, along with the computations and projections used therein (the "Records"), and the Contractor hereby covenants to maintain the Records in good order for such time and to deliver promptly the Records to the Owner within 5 days after its written request. In the event that the Contractor fails to comply with this Paragraph, then the Owner, in addition to any other available remedies, shall have the right to withhold payment of amounts otherwise due the Contractor until such time as the Contractor shall have complied fully with the obligations set forth herein.

37. NOTICES:

All notices required or permitted hereunder shall be in writing and delivered in the manner prescribed herein. Written notice shall be deemed to have been duly served on the Contractor if delivered by U.S. Mail, hand delivery, or facsimile transmission to the Contractor's office at any Project or to the business address or fax number of the Contractor as stated in its Bid Form; or if delivered in person to the Contractor, to the Contractor's foreman or superintendent for the Project, or any officer or director of the Contractor. Unless otherwise specified herein, Notice shall be deemed to have been duly served on the Owner if delivered by U.S. Mail, hand delivery, or facsimile transmission (with a duplicate copy transmitted by another means of delivery authorized hereunder) to the Office of Facilities Management, Fairfax County Public Schools, 5025 Sideburn Road, Fairfax, Virginia 22032, fax number (703) 239-0462.

38. ORDER OF PRECEDENCE:

The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work, including without limitation, all labor, materials, equipment and furnishings required in connection therewith. The Contract Documents are complimentary, and what is required by one shall be as binding as if required by all. In the event or any conflict, error or ambiguity in or among the various Contract Documents, such documents shall be accorded the following order of precedence:

A. Change Orders;

B. Notice to Proceed;

C. Notice of Award;

D. Supplementary Terms and Conditions;

E. General Conditions;

F. Agreement;

G. Addenda;

H. Drawings and Specifications;

I. Payment and Performance Bonds; and

J. The Bidding Documents, which shall include the Contractor's completed Bid Form and the Instructions to Bidders.

END OF SECTION

SUPPLEMENTAL TERMS AND CONDITIONS FOR PROJECT FUNDED WITH FEDERAL GRANT

1. Uniform Administrative Requirements

The Contractor agrees to comply with all applicable provisions of Title 2, Subtitle A, Chapter II, PART 200—UNIFORM ADMINISTRATIVE REQUIREMENTS, COST PRINCIPLES, AND AUDIT REQUIREMENTS FOR FEDERAL AWARDS contained in Title 2 C.F.R. § 200 *et seq*.

2. Domestic Preferences for Procurements-- 2 CFR § 200.322

The Owner and the Contractor agree that, pursuant to Section 2CFR § 200.322, the following regulation applies:

(a) As appropriate and to the extent consistent with law, the Owner should, to the greatest extent practicable in the award and performance of this Contract, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this section must be included in all subawards including all contracts and purchase orders for work or products under this award.

(b) For purposes of this section: (1) "Produced in the United States" means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States. (2) "Manufactured products" means items and construction materials composed in whole or in part of nonferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber.

3. Civil Rights Requirements – 29 U.S.C. § 62, 42 U.S.C. § 2000, 42 U.S.C. § 602, 42 U.S.C. § 12112, 42 U.S.C. § 12132, 49 U.S.C. § 5332

a. **Nondiscrimination** – In accordance with Title VI of the Civil Rights Act, as amended, 42 U.S.C. § 2000d, section 303 of the Age Discrimination Act of 1975, as amended, 42 U.S.C. § 6102, section 202 of the Americans with Disabilities Act of 1990, 42 U.S.C. § 12132, and all other provisions of Federal law, the CONTRACTOR agrees that it will not discriminate against any employee or applicant for employment because of race, color, creed, national origin, sex, age, or disability. In addition, the CONTRACTOR agrees to comply with applicable Federal implementing regulations.

b. **Equal Employment Opportunity** – The following equal employment opportunity requirements apply:

1. **Race, Color, Creed, National Origin, Sex** – In accordance with Title VII of the Civil Rights Act, as amended, 42 U.S.C. § 2000e, the CONTRACTOR agrees to comply with all applicable equal employment opportunity requirements of U.S. Department of Labor (U.S. DOL) regulations, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor," 41 CFR Parts 60 et seq., (which implement Executive Order No. 11246, "Equal Employment Opportunity," as amended by Executive Order No. 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," 42 U.S.C. § 2000e note), and with any applicable Federal Statutes, executive orders, regulations, and Federal policies that may in the future affect activities undertaken in the course of this Project. The CONTRACTOR agrees to take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, creed, national origin, sex, or age. Such action 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. In addition, the CONTRACTOR agrees to comply with any implementing requirements the funding federal agency may issue.

2. **Age** – In accordance with section 4 of the Age Discrimination in Employment Act of 1967, as amended, 29 U.S.C. § § 623 and other applicable law, the CONTRACTOR agrees to refrain from discrimination against present and prospective employees for reason of age. In addition, the CONTRACTOR agrees to comply with any implementing requirements the funding federal agency may issue.

3. **Disabilities** – In accordance with section 102 of the Americans with Disabilities Act, as amended, 42 U.S.C. § 12112, the CONTRACTOR agrees that it will comply with the requirements of U.S. Equal Employment Opportunity Commission, "Regulations to Implement the Equal Employment Provisions of the Americans with Disabilities Act," 29 CFR Part 1630, pertaining to employment of persons with disabilities. In addition, the CONTRACTOR agrees to comply with any implementing requirements the funding federal agency may issue.

c. The CONTRACTOR also agrees to include these requirements in each subcontract financed in whole or in part with Federal Assistance, modified only if necessary, to identify the affected parties.

4. Energy Conservation - 42 U.S.C. 6321 *et seq.*

The CONTRACTOR agrees to comply with mandatory standards and policies relating to energy efficiency which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act.

5. Davis-Bacon Act

a. **Minimum wages**.

i. All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is available here and incorporated by reference herein: https://sam.gov/wage-determination/VA20210178/5. The referenced wage determination is made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR § 5.5(a)(iv). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer's payroll records accurately set forth the time

spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

ii. The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the Contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

a. The work to be performed by the classification requested is not performed by a classification in the wage determination; and
b. The classification is utilized in the area by the construction industry; and
c. The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

iii. If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

iv. In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30- day period that additional time is necessary.

v. The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a) (1) (ii) (B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

a. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

b. If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

b. **Withholding**. The Owner shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the Contractor under this Contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, the Owner may, after written notice to the Contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

c. **Payrolls and basic records**.

i. Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the Work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of

the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(l](iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

ii. The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the (write in name of appropriate federal agency) if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to the (write in name of agency). The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/esa/whd/forms/wh347instr.htm or its successor site. The Contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the (write in name of appropriate federal agency) if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit them to the applicant, sponsor, or owner, as the case may be, for transmission to the (write in name of

agency), the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the applicant, sponsor, or owner).

Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

a. That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;
b. That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;
c. That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (c)(ii)(b) of this section.

The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

iii. The Contractor or subcontractor shall make the records required under paragraph (c)(i) of this section available for inspection, copying, or transcription by authorized representatives of the (write the name of the agency) or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them

available, the Federal agency may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR § 5.12.

d. **Apprentices and trainees—**

i. **Apprentices.** Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event

the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

ii. **Trainees.** Except as provided in 29 CFR § 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

iii. **Equal employment opportunity.** The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

e. **Compliance with Copeland Act requirements.** The Contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this Contract.

f. **Subcontracts.** The Contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5 (a) (1) through (10) and such other clauses as the (write in the name of the Federal agency) may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The Contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

g. **Contract Termination: debarment.** A breach of the contract clauses in 29 CFR § 5.5 may be grounds for termination of the Contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

h. **Compliance with Davis-Bacon and Related Act requirements.** All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this Contract.

i. **Disputes concerning labor standards.** Disputes arising out of the labor standards provisions of this Contract shall not be subject to the general disputes clause of this Contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

j. **Certification of eligibility.**

i. By entering into this Contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

ii. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

iii. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

6. **Contract Work Hours and Safety Standards Act.** The Agency Head shall cause or require the contracting officer to insert the following clauses set forth in paragraphs (6)(i), (ii), (iii), and (iv) of this section in full in any contract in an

amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by § 5.5(a) or 4.6 of part 4 of this title. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

i. **Overtime requirements.** No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

ii. **Violation; liability for unpaid wages; liquidated damages.** In the event of any violation of the clause set forth in paragraph (i) of this section, the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (i) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (i) of this section.

iii. **Withholding for unpaid wages and liquidated damages.** The Owner shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (ii) of this section.

iv. **Subcontracts.** The Contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (i) through (iv) of this section and also a clause requiring the subcontractors to include these

clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (i) through (iv) of this section.

In addition to the clauses contained in section (6)(i) through (iv), in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in § 5.1, the Agency Head shall cause or require the contracting officer to insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Agency Head shall cause or require the contracting officer to insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the Contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of Labor, and the Contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

7. **Recycled Products** – 42 U.S.C. 6962

The Recycled Products requirements apply to all contracts for items designated by the EPA, when the Owner or the Contractor procures $10,000 or more of one of these items during the fiscal year, or has procured $10,000 or more of such items in the previous fiscal year, using federal funds.

The Contractor agrees to comply with all requirements of Section 6002 of the Resource Conservation and Recovery Act (RCRA), as amended (42 U.S.C. 6962), including but not limited to regulatory provisions of 40 CFR Part 247, and Executive Order 12873, as they apply to the procurement of the items designated in Subpart B of 40 CFR Part 247.

8. **Clean Water Requirements** – 33 U.S.C. 1251 *et seq.*

i. The Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Federal Water Pollution Control Act, as amended. The Contractor agrees to report each violation to the Owner and understands and agrees that the Owner will, in turn, report each

violation as required to assure notification to appropriate federal agencies including the appropriate EPA Regional Office.

ii. The Contractor also agrees to include these requirements in each subcontract exceeding $100,000 financed in whole or in part with Federal assistance.

9. **Clean Air Act Requirements** – 42 U.S.C. 7401 *et seq.*

a. The Contractor agrees to comply with all applicable standards, orders, or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. §§ 7401 *et seq*. The Contractor agrees to report each violation to the Owner and understands and agrees that the Owner will, in turn, report each violation as required to assure notification to the funding federal agency, if any, and the appropriate EPA regional office.

b. The Contractor also agrees to include these requirements in each subcontract exceeding $100,000 financed in whole or in part with Federal assistance.

10. **Program Fraud and False or Fraudulent Statements and Related Acts** – 31 U.S.C. 3801 et seq.

a. The Contractor acknowledges that the provisions of the Program Fraud Civil Remedies Act of 1986, as amended, 31 U.S.C. § 3801 et. seq. and all appropriate federal agency regulations apply to its actions pertaining to this Project. The Contractor certifies or affirms the truthfulness and accuracy of any statement it has made, it makes, it may make, or causes to be made, pertaining to the underlying contract of the Federally assisted project for which this contract work is being performed. In addition to other penalties that may be applicable, the Contractor further acknowledges that if it makes, or caused to be made, a false, fictitious, or fraudulent claim, statement, submission, or certification, the Federal Government reserves the right to impose the penalties of the Program Fraud Civil Remedies Act of 1986 on the Contractor or to the extent the Federal Government deems appropriate.

b. The Contractor also acknowledges that if it makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submission, or certification to the Federal Government under a contract connected with a project that is financed in whole or in part with Federal assistance, the Federal Government reserves the right to impose the penalties of 18 U.S.C. § 1001 and 49 U.S.C. § 5307(n)(1) on the Contractor, to the extent the Federal Government deems appropriate.

c. The Contractor agrees to include the above two clauses in each subcontract financed in whole or in part with Federal assistance. It is further agreed that the clause shall not be modified, except to identify the subcontractor who will be subject to the provisions.

13. Interest of Members of Congress

No member of or delegates to the Congress of the United States shall be admitted to a share or part of this Contract or to any benefit arising there from.

14. Byrd Anti-Lobbying Amendment (31 U.S.C. 1352)

Contractors that apply or bid for an award exceeding $100,000 must file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the non-Federal award.

The Contractor certifies that it is in compliance with all applicable provisions of the Byrd Anti-Lobbying Amendment (31 U.S.C. 1352) and further certifies as follows:

1. No Federal appropriated funds have been paid or will be paid for on behalf of the Contractor, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of congress, or an employee of a Member of Congress in connection with the awarding of a Federal contract, the making of a Federal grant, the making of a Federal loan, the entering into a cooperative agreement, and the extension, continuation, renewal, amendment, or modification of a Federal contract, grant, loan, or cooperative agreement.

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of congress, or an employee of a Member of Congress in connection with this Contract or cooperative agreement, the Contractor shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying", in accordance with its instructions.

3. The Contractor shall require that the language of this certification be included in the documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

15. Compliance with Federal Law, Regulations, and Executive Orders

The parties acknowledge that that ESSER II funds will be used to fund this Contract, and not for any other purpose. The parties will comply with all Laws and Regulations applicable to this Contract and the performance of the Work hereunder, including but not limited to all laws, regulations, orders and directives relating to use of ESSER II funds.

16. No Obligation by Federal Government

The parties acknowledge that the United States federal government is not a party to this Contract and is not subject to any obligations or liabilities to the Owner, Contractor, or any other party pertaining to any matter resulting from the Contract.

17. ASHRAE Specifications

The Work must comply with the following standards of the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE):

(1) ASHRAE-90 A-1980 (Sections 1-9).

(2) ASHRAE-90 B-1975 (Sections 10-11).

(3) ASHRAE-90 C-1977 (Section 12).

GENERAL REQUIREMENTS
(For Project Funded by Federal Grant)

1. CONFLICT OF PROVISIONS:

Any provision of the Conditions of the Contract or of any other document incorporated herein by reference, which is in conflict or inconsistent with "Instructions to Bidders," except such provisions as are required by applicable codes, laws or regulations, shall be void to the extent of such conflict or inconsistency.

2. SITE CONDITIONS:

The Contractor is expected to have become familiar with, and taken into consideration, site conditions which may affect the work and to have checked all dimensions at the site.

A. No plea of ignorance of conditions that exist or may hereafter exist on the work site, or difficulties that may be encountered in execution of the work as a result of failure to make necessary investigations and examinations, will be accepted as an excuse for any failure or omission on the part of the Contractor to fulfill in every detail all the requirements of the Contract documents and to complete the work for the consideration set forth therein, or as a basis for any claim whatsoever.

3. GENERAL:

Minor details not usually shown or specified but necessary for the proper installation and operation shall be included in the work and in the Contractor's bid, the same as if herein specified or shown.

A. With submission of bid, the Contractor shall give written notice to the Owner of any materials or apparatus believed inadequate or unsuitable, in violation of Federal, State and Local Laws, Codes, Ordinances, and any necessary items of the work omitted. In the absence of such written notice, it is mutually agreed the Contractor has included the cost of all required items in his bid and that he will be responsible for the approved satisfactory functioning of the entire system without extra compensation.

B. All Contractors and subcontractors shall have current Virginia and Fairfax County licenses to do this kind of work.

C. A copy of these plans and specifications shall be kept at the job site for the duration of the project. If the Contractor requires additional copies of the plans and specifications it will be the Contractors responsibility to

request up to two (2) additional copies from the Owner at no cost to the Contractor. If additional copies are requested these will be supplied to the Contractor at a cost of $50 per set by the Owner. Owner will NOT perform any inspections, punch lists, or progress payments unless a copy of plans and specifications are on the job site.

D. Successful bidder shall meet the Owner's Representative at the site or at the Owner's Representative's Office for a pre-construction meeting. After receipt of the Notice to Proceed the Contractor will contact the Owner's Representative to arrange the date, time and location of the meeting.

E. It is the intention of the specifications and drawings to call for finished work, tested and ready for operation. Whenever the word "provide" is used, it shall mean "provide and install complete and ready for use."

F. Any apparatus, appliance, material or work not indicated in the drawings but mentioned in the specifications, or vice versa or any incidental accessories necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be furnished, delivered and installed by the Contractor without additional expense to the Owner.

G. Contractor shall install all equipment, materials in accordance with the Manufacturer's instructions, the drawings and these specifications.

H. Contractor shall include in the work, without additional cost to the Owner, any labor, materials, services, apparatus, drawings (in addition to the Contract Documents), required to comply with all applicable laws, ordinances, rules and regulations, whether or not shown or specified.

I. For security purposes, all personnel working at this building shall check in and check out at the building's office each day and wear any identification badges required by the building. **Contractor employees/representatives are required to have photo identification and be able to present upon request.** Contractor shall further supply all personnel with a form of identification as to company, name of employee and photographic likeness.

J. All work shall comply with current County, City, State and/or Federal codes and standards, whichever may apply.

K. The Contractor shall obtain Owner's approval for any revisions items specified prior to incorporation into the work.

L. Contractor shall inform all employees that Fairfax County has a NO SMOKING policy on school grounds. Therefore workers shall comply with this policy when students/school personnel are present.

4. SCAFFOLDING, RIGGING AND HOISTING:

A. Contractor shall furnish all scaffolding, rigging, hoisting, shoring and services necessary for erection and delivery into the premises, for equipment and apparatus furnished and removal of same from premises when no longer required.

B. No crane work will be done during regular school hours. The work area around cranes shall be protected with barricades, warning signs, and the Contractor shall provide personnel as necessary to prevent access to the work area by children or adults.

C. At no time the units shall be placed on the roof and rolled across the roof. Units shall be lifted directly onto the existing structural support on the roof.

5. ASBESTOS INSULATION:

A. The Owner will provide upon request copies of asbestos inspections/reports if necessary in the performance of this Contract.

B. If the Contractor encounters any suspected asbestos he shall immediately stop work and inform the Owner of the conditions.

C. The Owner will be responsible for testing and if necessary removal of any asbestos containing material encountered in the performance of this Contract.

D. No materials or equipment containing asbestos shall be utilized in the construction of the project.

6. SITE PROTECTION:

A. While work is in progress, new materials and work area appurtenances shall be covered or protected from dust, debris or damage.

B. The Contractor shall maintain the job site in a clean, safe, orderly working condition and shall leave the premises completely clean each day.

C. The Contractor shall be responsible for the repair or replacement of any roof, grass, asphalt pavement, building, or building contents damaged during the course of this Contract. In addition, any fencing removed by

the Contractor shall be re-installed without any damage and to the satisfaction of the Owner.

D. The Contractor shall provide all necessary manpower, barricades, safety signs and protection needed to safely perform the required work during the Contract.

E. All openings in building components required for installation of piping or wiring shall be cut, patched and repaired.

F. All items (lights, pipes, fencing, etc.) that have to be removed during the course of this work shall be reinstalled or relocated as necessary to complete the project.

G. Contractor shall protect all contents and infrastructure located within the work space and adjacent to the work areas. These shall include but not limited to bleachers, floor plates, lighting, sports padding, walls and ceiling. Gymnasium shall be left clean and free of all dust and debris.

H. Smoke dust and any construction odors shall not be allowed to enter the occupied building. Contractor shall provide exhaust fans, ducts, seal openings into the school, and if necessary, schedule work during off-hours to prevent problems during the times that students and teachers are in the building.

7. WARRANTY:

Contractor shall warrant the workmanship and materials against defects for a period of two (2) years from the date of final acceptance after all tests and inspections are complete. Manufacturer's warranty individual equipment shall be for two (2) years.

A. Any portion of the work supplied or performed by the Contractor, which fails within the warranty period shall be repaired or replaced by the Contractor without additional cost to the Owner. Repairs will be initiated within 24 hours of receiving a call from the Owner during the warranty period.

B. One (1) month prior to the expiration of the warranty, Contractor shall revisit the project with the Owner's representative to determine if any items require correction or if any items previously reported have not been corrected. If necessary, Contractor shall correct noted items even if correction work extends beyond the warranty expiration date.

8. INSTRUCTION OF OWNER'S REPRESENTATIVE:

A. The Contractor shall furnish, without additional expense to the Owner, full instruction in the care, adjustment, and operation of all parts and controls to the Owner's employees.

B. The instruction shall be given at a mutually agreed upon time with the Owner during the regular workweek after the equipment has been accepted and turned over to the Owner for regular operation. Where significant changes or modifications in equipment are made under the terms of guarantee, additional information shall be provided as may be necessary to acquaint the operating personnel with the changes or modifications.

9. OWNER'S REPRESENTATIVE:

The Director of the Office of Facilities Management, 5025 Sideburn Road, Fairfax, Virginia 22032, has designated **Lucy Dong** as the point of contact (703) 764-4387. The Director, Office of Facilities Management, may designate such other individual(s) as he deems necessary to assist in the administration of this Contract. These individuals shall have the authority to inspect the Contractor's performance.

10. RELEASE OF BONDS:

The Surety Corporation providing the bonds for this project shall obtain a written release from the Owner prior to the expiration date of the bonds.

11. LOCKOUT AND TAGOUT:

The Contractor shall have an established lockout/tagout procedure, which meets the requirements of VOSH Standard 29 CFR Part 1910, Subpart J, Subsection 147, entitled Control of Hazardous Energy Sources. The Contractor shall coordinate with the Owner's Representative to conform to the Owner's lockout/tagout program requirements.

12. BARRICADES, WARNING SIGNS AND LIGHTS:

Comply with recognized standards and code requirements for the erection of substantial, structurally adequate barricades where needed to prevent accidents and losses. Paint with appropriate colors, graphics and warning signs to inform personnel at the site and the public of the hazard being protected against. Provide lighting where appropriate and needed, including flashing yellow lights where appropriate.

13. CONFINED SPACES:

The Contractor shall have an established confined space procedure that meets the requirements of VOSH Standard 29 CFR 1910, Subpart J, §146, titled "Permit-Required Confined Spaces." The Contractor is responsible to provide confined space air monitoring and rescue equipment, as well as any other required devices or equipment on site to all employees. The Contractor must be able to provide safety training records of its employees performing work in a confined space to the Owner upon request. The Contractor shall coordinate with the Owner's representative to ensure the Contractor conforms to all confined space program requirement.

END OF SECTION

TECHNICAL SPECIFICATIONS
(For Project Funded by Federal Grant)

SECTION 01660

TESTING, ADJUSTING, BALANCING (TAB) AND COMMISSIONING OF SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General Conditions and Specification Sections, apply to the Work of this Section.

1.02 RELATED WORK

A. Division 15 Specifications: Section 15010, General Provisions.

1.03 WORK DESCRIPTION

A. The contractor shall be responsible for coordination with the Testing, Adjusting and Balancing (TAB) Contractor and Commissioning Authority (CA) to perform the work in Division 15000.

B. Testing, Adjusting and Balancing

1. Fairfax County Public Schools shall contract for the services of an independent balancing agency to perform the operations required for testing, adjusting, and balancing of HVAC systems and related work to prove the performance of the systems as shown on the Contract Documents. The Contractor and all associated sub-contractors shall coordinate their work with the balancing agency procedure and protocols. The Contractor and all associated sub-contractors shall provide a minimum of five working days notice in both writing and electronic format to the Fairfax County Public Schools Project Manager and the Fairfax County On-Site Field Representative that the system(s) installations are complete and accessible for testing, adjusting, and balancing.

   Projects which incorporate phased construction shall have each HVAC system, in the respective phase, air balanced prior to occupancy with all deficiencies corrected. Water balance for each respective phase shall be considered preliminary with the final water balance to be completed after the last phase of construction has been completed.

2. The balancing agency shall submit for review to the Fairfax County Public Schools Project Manager an acceptable procedure for performing the testing, adjusting, and balancing work within thirty (30) days after the agreement between the Fairfax County Public Schools and the Contractor has been signed. This procedure shall be forwarded to the Contractor for coordination of his installations within sixty (60) days after the agreement between the Fairfax County Public Schools and Contractor has been signed. A pre-conference testing, adjusting, and balancing meeting including, but not limited to representatives of the Fairfax County Public

Schools Project Manager, the Fairfax County On-Site Field Representative, the Contractor, the Sub-Contractors and the Architect/Engineer shall be conducted to review the procedure plan and schedule within ninety (90) days after the agreement between the Fairfax County Public Schools and Contractor has been signed.

3. The contractor shall make all the correction to the HVAC system to satisfy the deficiencies noted in the TAB report.

C. Commissioning

1. The Fairfax County Public Schools Office of Facilities Management shall perform the building commissioning and shall act as the CA. The contractor and all associated sub-contractors shall be responsible for participation and coordination within the Commissioning process including but not limited to;

a. Division 15000 (General)

1) In each purchase order or subcontract written, include requirements for submittal data, commissioning documentation, O&M data and training.

2) Attend commissioning scoping meeting and other meetings necessary to facilitate the commissioning process.

3) Provide the CA with normal cut sheets and shop drawing submittals of commissioned equipment.

4) Provide additional requested documentation, prior to normal O&M manual submittals, to the CA for development of start-up and functional testing procedures.

a) This is to include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any owner-contracted tests, fan and pump curves, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation, start-up and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the CA.

b) This contractor shall submit to the CA any additional requested documentation deemed necessary by the CA.

5) Provide a copy of the O&M manuals and submittals of commissioned equipment, through normal channels, to the CA for review and approval.

6) Assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.

7) Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the prefunctional checklists from the CA for all commissioned equipment. Submit to CA for review and approval prior to start-up.

8) During startup and initial checkout process, execute the mechanical-related portions of the prefunctional checklists for all commissioned equipment.

9) Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CA.

10) Address current A/E punchlist items before functional testing. Air and water TAB shall be completed with discrepancies and concerns remedied before functional testing of the respective air to water related items.

11) Provide skilled technicians to perform functional performance testing under the direction of the CA. Assist the CA in interpreting the monitoring data, as necessary.

12) Correct deficiencies (differences between specified and observed performance) as interpreted by the CA, CM and A/E and retest the equipment.

PART 2 - PRODUCTS

2.01 NOT APPLICABLE

PART 3 - EXECUTION

3.01 NOT APPLICABLE

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General Conditions and other Specification Sections, apply to the Work of this Section, with special attention to the following:

1. Intent on Cover Page - Summary of Work.

2. Section 01720 - Project Record Information

3. General Conditions – Paragraph 34 - Operating and Maintenance Data

1.02 CLOSEOUT PROCEDURES

A. Comply with procedures stated in General Conditions of the Contract for issuance of Certificate of Substantial Completion.

B. Owner will occupy designated portion of Project for the purpose of installation of equipment, conduct of business, under provision stated in Certificate of Substantial Completion.

C. When Contractor considers Work has reached final completion, submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect's inspection.

D. In addition to submittals required by conditions of Contract, provide submittals required by governing authorities, and submit final statement of accounting giving total adjusted Contract Sum, previous payments, and sum remaining due.

E. Owner's Representative will issue final change order reflecting approved adjustments to Contract Sum not previously made by Change Order.

F. Ceiling Concealment Inspection.

1. General: Prior to installation of ceiling panels, an inspection shall be conducted to ascertain the quality and degree of completion of all work above the finished ceiling and to record any discrepancies in the Contract Documents. The inspection shall be conducted by the Owner's Representative and the Contractor and recorded on forms provided by the Owner's Representative.

2. Ceiling Suspension System: Grilles, registers, diffusers, light fixtures, and cut panels around fixtures may be installed prior to the inspection, however, ceiling panels shall not be laid in place until after the inspection and all discrepancies have been corrected.

G. Wall Close-in Inspection: Prior to wall close-in, an inspection shall be conducted to ascertain the quality and degree of completion of all work concealed within walls and record any discrepancies in the Contract Documents. The inspection shall be conducted by the Owner's Representative, Architect, and the Contractor and recorded by the Contractor on forms provided by the Owner's Representative.

H. Copies of the Inspection Reports: Reports shall be prepared by the Contractor with copies to the Owner's Representative, Architect, and the Consulting Engineers. The inspection report shall be annotated as each discrepancy is corrected and any discrepancy remaining at the time of the Final Inspection shall be included on the punch list.

I. Substantial Completion: General Conditions, paragraph 16.

J. Final Inspection: General Conditions, paragraph 28.

1.03 SYSTEMS DEMONSTRATION

A. Prior to final inspection, demonstrate operation of each system to Owner's Representative.

B. Instruct Owner's designated operating and maintenance personnel in operation, adjustment, and maintenance of materials, products, equipment and systems, using the operation and maintenance data as the basis of instruction.

END OF SECTION

SECTION 01720

PROJECT RECORD INFORMATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General Conditions and other Specification Sections, apply to the Work of this Section, with special attention to the following:

1. General Conditions Paragraph 34, Operating and Maintenance Data.

1.02 DESCRIPTION OF WORK

A. During the course of construction, and as various portions of the work are performed, the Contractor shall record and maintain an accurate accounting of changes or deviations from the Contract Documents, and any other information which elaborates upon, or supplements, the description of work contained in the Contract Documents.

1.03 SUBMITTALS

A. Upon completion of work, Contractor shall forward one (1) complete set of all project record information (as built drawings) including the civil, architectural, structural, mechanical, plumbing and electrical portions of the work, as applicable, to the Architect. Based upon this data, the Architect shall prepare reproducible Project Record Documents.

1.04 QUALITY ASSURANCE

A. Accuracy of Record

1. Make legible entries on each pertinent sheet of drawings, specifications, or other documents as necessary, in order to properly document the entry.

B. Accuracy shall be such that the Architect may reasonably rely upon the information for preparation of Record Documents, and that the information may be reasonably relied upon for future reference and research by the Owner.

C. Entries shall be recorded in a timely fashion upon performance or notification of a change or deviation.

1.05 HANDLING OF RECORD INFORMATION

A. Maintain record information in a secure manner, protected from deterioration, loss or damage until work is completed and the data is ready to be forwarded to the Architect.

PART 2 - PRODUCTS

2.01 PROJECT RECORDS

A. The Contractor shall designate one (1) set of Contract Documents for compiling and maintaining project record data. Each individual part of the Contract Documents shall be designated and clearly labeled as "PROJECT RECORD INFORMATION - JOB SET".

PART 3 - EXECUTION

3.01 MAINTENANCE OF JOB SET

A. Make entries using colored pencil. Add description notes to clarify entry, such as item description, location and reason for the change. "Cloud" or otherwise highlight entries. Use different colors where different entries overlap.

B. All entries shall be dated.

C. Provide record data for in-place arrangements of circuitry, conduit, piping, ductwork, and other systems that are indicated by schematic layouts or diagrams in the Contract Documents. The Owner or Architect may, at his discretion, allow the Contractor to omit record data for items where the elaboration of the layout or diagrams conveys no additional useful information.

3.02 SUBMITTAL TO THE ARCHITECT

A. Upon completion of the work, forward the Project Record Information set to the Architect. The Architect may require the Contractor to perform corrections, provide additional information, or make other revisions necessary for completeness of data. Make all required corrections or revisions and promptly return the set to the Architect.

END OF SECTION

SECTION 03600

NONSHRINK GROUT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General Conditions and other Specification Sections, apply to the Work of this Section.

1.02 DESCRIPTION

A. This specification describes non-shrink cement-based grout to be used wherever shown or implied on the drawings or called for in the specifications.

PART 2 - PRODUCTS

2.01 GENERAL

A. Non-shrink grout shall consist of premeasured, prepackaged materials supplied by the manufacturer requiring only the addition of water. The manufacturer's instructions must be printed on the outside of each bag.

2.02 NONSHRINK CEMENT-BASED GROUT

The contractor shall submit information verifying that the grout exhibits the following:

A. Nonshrink: No shrinkage (0.0%) and a maximum 4.0% expansion when tested in accordance with ASTM C-827. No shrinkage (0.0%), and a maximum of 0.2% expansion in the hardened state when tested in accordance with CRD-C-621.

B. Compressive Strength: A minimum 28-day compressive strength of 5,000 psi when tested in accordance with ASTM C-109.

C. Setting Time: A minimum set time of 60 minutes when tested in accordance with ASTM C-191.

D. Technical Service: The manufacturer shall provide technical service upon request.

E. Composition: For column base plates, grout containing metallic particles such as aluminum powders or iron fillings may be used. For any other applications, the grout shall not contain metallic particles or expansive cement.

2.03 WATER

A. Drinkable water shall be used in mixing grout. Use the minimum water necessary for proper installation in accordance with flowability requirements and manufacturers recommendations for specific applications.

PART 3 - EXECUTION

3.01 GENERAL

A. Placing: The Contractor shall perform all mixing, grouting, and curing in accordance with the manufacturer's recommendations.

B. Temperature: The temperature of the grouting surfaces and the grout shall be maintained between 50 degrees F and 90 degrees F during grouting and for a minimum of 24 hours thereafter.

C. Elimination of Voids: Grout placement shall proceed in a manner that will assure the filling of all spaces and intimate contact of the grout with contact surfaces. Grout holes shall be used; location to be approved by Architect/Engineer if not otherwise detailed.

3.02 SURFACE PREPARATION

A. Concrete Surfaces:

1. The concrete on which the grout will bear shall have attained its design strength before grouting.
2. Concrete shall be sound and all surfaces to be in contact with the grout shall be entirely free of oil, grease, laitance, curing compounds, and other deleterious substances.
3. Surfaces shall be roughened by chipping, sandblasting or other mechanical means to assure bond of the grout to the existing concrete.
4. Concrete surfaces shall be washed clean, then saturated with water for 24 hours prior to placement of cement-based grout. Excess water must be removed prior to grouting.

B. Metal Surfaces: All metal surfaces, which are to be in direct contact with the grout, shall be thoroughly cleaned to bare metal immediately before grouting.

3.03 GROUT REMOVAL

A. Treat adjacent surfaces and formwork with a bond breaking material to prevent bonding of excess grout.

END OF SECTION

SECTION 04100

MORTAR

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General Conditions and other Specification Sections, apply to the Work of this Section.

1.02 REFERENCE STANDARDS

A. ASTM C150 – Portland Cement.

B. ASTM C91 - Masonry Cement.

C. ASTM C5 - Quicklime for Structural Purposes.

D. ASTM C207 - Hydrated Lime for Masonry Purposes.

E. ASTM C144 - Aggregate for Masonry Mortar.

F. ASTM C387 - Packaged, Dry, Combined Materials for Mortar and Concrete.

G. ASTM C270 – Standard Specification for Mortar for Unit Masonry.

H. ASTM C780 - Standard Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.

1.03 SUBMITTALS

A. Provide product data and certifications for all mortar materials including mortar design mix, to indicate compliance to referenced standards.

PART 2 - PRODUCTS

2.01 MORTAR MATERIALS

A. Portland Cement: ASTM C150, Type 1.

B. Masonry Cement: ASTM C91.

C. Aggregates: Standard masonry type, ASTM C144, clean, dry and protected against dampness, freezing and foreign matter.

D. Hydrated Lime: Conforming to requirements of ASTM C207, Type S.

E. Quicklime: Non-hydraulic type, ASTM C5.

F. Premix Mortar: Commercially prepared type, ASTM C387:

1. Below grade: Type M.
2. Above grade: Type S.

G. Water: Clean and free from injurious amounts of oil, alkali, organic matter or other deleterious material.

2.02 MORTAR MIX

A. Provide minimum 1800 psi mortar.

2.03 MORTAR ADMIXTURES

A. Accelerators: ASTM C494, Type C; AASHTO M194, Type C. shall not contain calcium chloride; W. R. Meadows "Hydraset-Free" accelerator or comparable.

PART 3 - EXECUTION

3.01 MIXING MORTAR

A. Thoroughly mix mortar ingredients, in quantities needed for immediate use.

B. Do not use anti-freeze compounds to lower the freezing point of mortar.

C. Mortar shall be used within two and one half hours of the initial mix-up at temperatures between 40 degrees F (10 degrees C) and 80 degrees F (26 degrees C) and within two hours of mixing at temperatures over 80 degrees F (26 degrees C). It shall not be used after it has begun to set.

D. If necessary, retemper mortar within two hours of mixing to replace water lost by evaporation. Do not retemper mortar after two hours of mixing.

END OF SECTION

SECTION 04200

UNIT MASONRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General Conditions and other Specification Sections, apply to the Work of this Section.

1.02 REFERENCES

A. ASTM A82 - Cold-Drawn Steel Wire for Concrete Reinforcement.

B. ASTM A615M - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

C. ASTM C55 - Concrete Building Brick.

D. ASTM C216 - Facing Brick.

E. ASTM C90 - Hollow and Solid Load-Bearing Concrete Masonry Units.

F. ASTM C129 - Non-Load-Bearing Concrete Masonry, Normal Weight Units.

G. ASTM C426 - Shrinkage Testing of Concrete Masonry Units.

H. ASTM C476 - Grout for Reinforced and Non-Reinforced Masonry.

I. FF QQ-W-416 - Wire, Steel, Carbon, (Round, Bare and Coated).

J. ASTM C140 - Sampling and Testing Concrete Masonry Units.

K. ACI-530/ACI 530.1 - Building Code Requirements for Masonry Structures and Specifications for Masonry Structures.

L. ASTM C331 – Standard Specification for Lightweight Aggregate for Concrete Masonry Units.

M. ASTM A951 – Standard Specification for Masonry Joint Reinforcement.

N. ACI 216.1-97/TMS 0216.1-97 – Standard Method for Determining Fire Resistance of Concrete and Masonry Construction Assemblies.

1.03 REQUIREMENTS OF REGULATORY AGENCIES

A. Fire-resistance rated masonry: Comply with requirements for materials and installation established by governing authorities for the construction and fire-resistance rating indicated.

1.04 SUBMITTALS

A. Product Data for each type of masonry unit, accessories and other manufactured products specified in this Section.

B. Grout mix design for grout used in reinforced and non-reinforced masonry.

C. Material certificates signed by the manufacturers, attesting to compliance with referenced standards and requirements of this Section.

1. Cement products required for masonry grout.
2. Each type and size of joint reinforcement.
3. Each type and size of anchors, ties, and other metal accessories.
4. UL listings (or equivalencies) for masonry utilized in fire resistive assemblies, indicating hourly rating.

1.05 QUALITY ASSURANCE:

A. Test Reports: As a condition of approval, the masonry units listed here shall require the submittal of the following certified test reports:

1. Hollow load-bearing units:

a. ASTM C90-93, for Type 1, moisture-controlled units using 8" samples.
b. ASTM C-426-83 for average shrinkage not to exceed .030 using a minimum of three (3) 8" samples. The test report shall indicate shrinkage measurements for each duration period of drying. Testing shall be performed for a minimum total time of 19 days, or until equilibrium is obtained, whichever is greater.
c. ASTM C140-75 indicating absorption characteristics.

2. Hollow non-load bearing units:

a. ASTM C129-85 for Type 1, moisture-controlled units using 6" samples.
b. ASTM C426-83 for average shrinkage not to exceed .030 using a minimum of three (3) 6" samples. The test report shall indicate shrinkage measurements for each duration period of drying. Testing shall be performed for a minimum total time of 19 days, or until equilibrium is obtained whichever is greater.
c. ASTM C140-75 indicating absorption characteristics.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Units shipped from the manufacturer shall comply with the parameters of Type 1 for moisture content. Units shall be delivered covered and protected from the weather in such a manner as to eliminate contact with excessive moisture.

B. Store units above ground.

C. Store on level platform, which permits air circulation under stack.

D. Cover and protect units from weather, moisture and neglect.

E. Protect anchors, ties, and reinforcement from weather exposure and construction activity.

1.07 COLD WEATHER PROTECTION

A. Conform to BIA Technical Notes 1, and 1A.

B. Conform to applicable requirements of ACI 530.1.

1.08 HOT WEATHER PROTECTION

A. Protect masonry construction from direct exposure to wind and sun when erected in an ambient air temperature of 99 degrees F in shade, with RH less than 50 percent.

B. Conform to applicable requirements of ACI 530.1.

PART 2 - PRODUCTS

2.01 FACE BRICK

A. Face brick shall comply with ASTM C216, Type FBS, Grade SW. (Face brick shall match existing for addition and alteration projects.)

2.02 CONCRETE MASONRY UNITS

A. Single source responsibility: All masonry units shall be of one manufacturer.

B. Hollow load-bearing units: ASTM C90-93, Grade N, Type 1 nominal face dimension of 8 x 16 inches.

C. Building Brick: ASTM C55-85, Grade N, Type 1.

D. Hollow non-load bearing units: ASTM C129-85, Type 1 and nominal face dimension of 8 x 16 inches.

E. Solid load bearing units: ASTM C90-93.

F. Approved Manufacturers:

1. An approved manufacturer is one who has given evidence that the masonry units to be supplied have been tested in accordance with the ASTM specifications listed in this specification (see Quality Assurance). The manufacturer shall have on file with the Owner current certified test reports. Current test reports are defined as those reports performed and dated within twelve (12) months of the bid due date for this project.
2. The manufacturer shall certify, as a condition of approval, that the masonry units supplied for the project shall be a minimum of 30 days old at time of shipment from manufacturer and shall comply with 1.05 (A) above.

G. Provide UL listed units as required for fire resistant ratings indicated or provide units for masonry assemblies complying with ACI 216.1-97/TMS 0216.1-97 for the fire-resistant rating required.

H. Provide Bullnose units as indicated and at all external corners.

2.03 ANCHORS, TIES AND JOINT REINFORCEMENT

A. Acceptable Manufacturers:

1. Hohmann and Barnard, Hauppage, NY, 1-631-234-0600 (www.h-b.com) (Basis of Specification except as noted).
2. AA Wire Products, LLC, Chicago, IL, 1-312-586-6700.
3. Wirebond, Charlotte, NC, 1-800-849-6722 (www.wirebond.com).

B. Horizontal Joint Reinforcement:

1. General: Factory welded, truss type wire units, pre-fabricated into straight, corner and tee units.
2. Multi-wythe (cavity) wall: Truss type joint reinforcement with factory welded projecting eyes to accommodate thickness of cavity insulation and to accept adjustable masonry veneer ties. Hohmann and Barnard "Lox All" adjustable eye-wire, truss type #170.
3. Composite Wall (no cavity): 3-wire truss type joint reinforcement; Hohmann and Barnard "Lox All" #130 "Truss-Tri Mesh".
4. Single-wythe wall: 2-wire truss type joint reinforcement; Hohmann and Barnard "Lox All" #120 "Truss-Mesh".
5. Longitudinal wire:

a. Style: Single one sided.
b. Treatment: Deformed.
c. Wire: ASTM A-82.
d. Size: 9 gauge.

6. Transverse wires:

   a. Wire: ASTM A-82.
   b. Size: 9 gauge.

7. Finish: Hot-dip galvanized, ASTM A153, class B-2 for both exterior and interior masonry walls.

C. Restoration Anchors (for securing existing face brick to existing CMU backup): Hohmann and Barnard Torq-Lox 500, sized to fit masonry joint (facade hole diameter).

D. Masonry Ties and Anchors:

1. Masonry-to-column ties: 3/16" diameter wire, hot dipped galvanized, triangular type; Hohmann and Barnard #VBT "Vee" wall tie (for use with weld-on column ties).
2. Rigid partition anchors (load bearing walls): 3/16" x 1 1/4" bent bars, hot dipped galvanized, 2" bends; Hohmann and Barnard #344.

2.04 MASONRY REINFORCING STEEL

A. Steel reinforcing bars: Billet steel complying with ASTM A615, Grade 60, deformed.

B. Steel reinforcing wire: Complying with ASTM A496, deformed, with ASTM A153, Class B-2 zinc coating.

2.05 FLASHING

A. Through-wall Flashing Membrane (Self-Adhering):

1. SBS modified bitumen, self-adhering sheet membrane complete with a cross-laminated polyethylene film, having the following physical properties:

   a. Thickness: 40 mils (1.0 mm).
   b. Tear Resistance: 45 lbs. MD to ASTM D1004.
   c. Tensile Strength (film): 5000 psi ASTM D882.
   d. Puncture Resistance: 134 lbf to ASTM E154.
   e. Low temperature flexibility: -22˚F to CGSB 37-GP-56M.
   f. Aluminum termination bar, wire-bond model #4200 required for vertical membrane flashing with a vertical rise greater than 12" or higher, seal top with Henry 925 Sealant.

2. Basis of Design Product: Blueskin TWF, Henry Company, Huntington Park, CA.

3. Coordinate with and confirm compatibility with air barrier system specified in section 07265.

2.06 WEEP HOLES

A. Full course and joint polypropylene plastic weep vent in a range of colors for Architect's selection and coordination with the range of brick types in the project. Weep vent installed in accordance with 3.13 of this Section. Basis of design "Cell Vent" or approved equal.

2.07 CLEANING AGENTS

A. As recommended by brick manufacturer. Protect adjacent surfaces, such as window frames, door frames and wall cladding from exposure to cleaning agents.

PART 3 - EXECUTION

3.01 QUALITY CONTROL

A. Should concrete masonry units be encountered on the job that do not comply with the criteria described in 1.06 and 2.02, then this condition shall be grounds for rejection of the company producing the units as an approved manufacturer.

3.02 INSPECTION

A. Carefully examine Drawings. Check arrangement of courses and jointing with size of masonry openings and work built-in in connection with masonry. If discrepancies occur, notify Architect immediately.

3.03 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces of columns, walls and arises do not exceed 1/4 inch in 10 feet, 3/8 inch in a story height not to exceed 20 feet, nor 1/2 inch in 40 feet or more. For external corners, expansion joints, control joints and other conspicuous lines, do not exceed 1/4 inch in any story or 20 feet maximum, nor 1/2 inch in 40 feet or more.

B. Variation from Level: For lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in any bay or 20 feet maximum, or 3/4 inch in 40 feet or more.

C. Variation of Linear Building Line: Position indicated in plan and related portion of columns, walls, and partitions, do not exceed 1/2 inch in any bay or 20 feet maximum, nor 3/4 inch in 40 feet or more.

D. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, for dimensions indicated, do not exceed minus 1/4 inch nor plus 1/2 inch.

3.04 INSTALLATION

A. Do not lay masonry when temperature is below 40 degrees F unless suitable means as approved by Architect and Owner's Representative are provided to heat materials. Protect work from cold and frost and ensure that mortar will harden without freezing.

B. Cut masonry units with motor-driven saws designed to cut masonry with clean, sharp, unchipped edges. Cut units as required to provide pattern shown and to fit adjoining work neatly. Use full units without cutting wherever possible.

C. Set units plumb, true to line with level courses accurately spaced within tolerance specified.

D. Lay units in running bond.

E. CMU shall be dry when laid.

F. Adjust unit to final position while mortar is soft and plastic.

G. Cut and fit masonry units, including that required to accommodate work of other sections, by masonry mechanics with masonry saws.

H. Remove units disturbed after mortar has stiffened, clean joints and relay unit with fresh mortar.

I. Grout masonry cells with reinforcing bars solid. Grout lift height and grout pour height shall not exceed 5 feet. Acceptable range for grout slump shall be between 8" and 11". Do not consolidate grout by rodding. Utilize cleanouts at base of masonry walls if necessary, to verify that cells have been completely filled.

3.05 JOINING OF WORK

A. Where fresh masonry joins partially or totally set masonry, clean exposed surface of set masonry and remove loose mortar and foreign material prior to laying fresh masonry.

B. If necessary, to stop off a horizontal run of masonry, rack back one-half block length in each course. Toothing shall not be permitted.

C. Fill collar joints full.

3.06 PROTECTION OF WORK

A. Provide temporary shoring and bracing for all exterior and interior bearing and exterior bearing walls subsequent to erection and prior to permanent connection to floor or roof systems or abutting cross walls. Temporarily shore and brace any other walls exposed to lateral forces or other conditions, which would compromise stability prior to completion of building envelope.

B. Protect face materials against staining.

C. Remove misplaced grout or mortar immediately. As walls are constructed, use methods to avoid mortar droppings in cavities.

D. Protect adjacent areas and surfaces from mortar drippings or other damage during construction.

3.07 HORIZONTAL AND VERTICAL FACE JOINTS

A. Uniform 3/8-inch-thick unless otherwise required to obtain coursing indicated.

B. Shove vertical joints tight.

C. Tool joints in all exposed masonry surfaces, when thumbprint hard, with round jointer.

D. Cut mortar joints in surfaces covered with finish material flush.

E. Remove mortar protrusions extending into cells or cavities to be reinforced and filled.

F. Fill horizontal joints between top of masonry partitions and underside of concrete slabs or metal deck with compressed mineral wool firesafing insulation (unfaced).

3.08 HOLLOW UNIT MORTAR BEDDING

A. Lay with full mortar coverage on horizontal and vertical face shells.

B. Bed webs in courses of piers, columns, and pilasters; in starting course; and where adjacent to cells or cavities to be reinforced or filled with grout.

3.09 SOLID UNIT MORTAR BEDDING

A. Lay with full horizontal and vertical joints.

3.10 BONDING WITH PREFABRICATED JOINT REINFORCEMENT

A. Bond facing and backing of adjacent wythes of masonry walls with prefabricated joint reinforcement.

B. Provide one cross wire serving as tie for not more than each two square feet of wall face area.

C. Vertical spacing of reinforcement shall not exceed 16 inches.

D. Embed longitudinal wires in mortar. Lap reinforcement a minimum of 6" at ends. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" Sections.

3.11 WEEP HOLES

A. Provide polypropylene plastic weep vent at 24 inches maximum on center horizontally in mortar joints of exterior wythe of walls along bottom of the foundations, through-wall flashings, and other water stops in wall. Place weep vent to span full height of head joint.

B. Keep weep holes free of mortar and other obstructions.

3.12 FLASHING OF MASONRY WORK

A. Provide concealed flashings in masonry work at, or above, all shelf angles, lintels, ledges, and other obstructions at the downward flow of water in the wall to divert water to the exterior. Prepare masonry surfaces smooth and free of projections that could puncture flashing. Place through-wall flashing on bed of mortar and cover with mortar. Seal penetrations in flashing with sealant before covering with mortar.

B. Extend flashings the full length of lintels and shelf angles and minimum of 4 inches into masonry each end. Turn up flashing a minimum of 2 inches each end. Extend flashing from a line 1/4 inch in from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 4 inches. Terminations which are 12" or higher shall be secured with a termination bar and sealant.

1. Install in accordance with manufacturer's instructions.
2. Align and position the leading edge of through-wall flashing membrane with the fully adhere membrane over surface.
3. Roll firmly into place. Ensure minimum 2-inch overlap at all end and side laps.
4. Promptly roll all laps and membrane to affect the seal.
5. Ensure all air barrier work is complete prior to applying through-wall flashing.
6. Ensure through-wall flashing membrane extends fully to the exterior face of the exterior masonry veneer. Trim off excess as directed by the Architect.

C. Provide weep holes in the head joints of the same course of masonry bedded in the flashing mortar.

3.13 POINTING AND CLEANING

A. Cut out defective joints and holes in exposed masonry and repoint with mortar.

B. Dry brush masonry surface after mortar has set at end of each day's work and after final pointing.

C. Clean exposed masonry with stiff brush and clear water.

D. Leave work area and surrounding surfaces clean and free of mortar spots, droppings, and broken masonry.

3.14 CLEAN UP

A. Remove all excess materials from the work area and dispose of legally.

END OF SECTION

SECTION 05120

STRUCTURAL STEEL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General Conditions and other Specifications Sections, apply to the Work of this Section.

1.02 RELATED WORK

A. Section 03600: Non-Shrink Grout.

B. Section 04200: Unit Masonry.

1.03 REFERENCE STANDARDS

A. 2015 Virginia Uniform Statewide Building Code (2015 VUSBC, Chapters 16 and 17).

B. Fairfax County Special Inspections Program (SIP) publication: Current Edition.

C. American Institute of Steel Construction (AISC): Manual of Steel Construction.

D. American Institute of Steel Construction (AISC): Code of Standard Practice.

E. Welding: American Welding Society (AWS) "Structural Welding Code."

1.04 QUALITY ASSURANCE

A. Examine Drawings and Specifications prior to bidding or executing work. Notify the Architect immediately should omissions or errors be discovered.

B. Furnish templates as required for proper installation of anchor bolts. Furnish instructions for setting anchor bolts and ascertain that they are properly set during the progress of the work.

C. All welders, both shop and field, shall be certified qualified operators, in accordance with the requirements of the American Welding Society.

D. The Specifications as written do not separate the responsibilities of the fabricator and erector. In the event that the Contractor elects to subdivide responsibilities of this section to two or more sub-contractors, the Contractor shall coordinate the work.

E. Testing: The Owner shall retain the services of a testing and inspection agency. The testing and inspection agency shall perform the following:

1. Inspect high-strength bolted connections, visually inspect welded connections, perform required tests and inspections, and prepare test reports.
2. Submit three copies of test reports to the Architect.
3. Review mill test reports, and certify compliance with Specification requirements to the Architect.
4. If steel is not accompanied by test reports, or if test reports fail to verify compliance, perform additional tests in compliance with procedures specified in the appropriate ASTM specifications and prepare test reports.
5. Conduct and interpret the tests and state in each report whether the test specimens comply with the requirements.
6. Verify dry mil thickness of shop prime coat.
7. Perform additional tests, at Contractor's expense, as may be necessary to reconfirm any noncompliance of the original work, and as may be necessary to show compliance of corrected work.
8. Shop Welding: Inspect and test during fabrication of structural steel assemblies, as follows:

    a. Certify welders and conduct inspections and tests as required. Record types and locations of all defects found in the work. Record work required and performed to correct deficiencies.
    b. Perform visual inspection of all welds.
    c. Non-destructive testing of welds.
    d. Verify fabricator participates in the AISC Quality Certification program and is designated as an AISC certified plan category std.

F. If the fabricator does not participate in the AISC Quality Certification Program and is not designated as an AISC certified plan, Category STD, Special Inspections will be required and performed.

1. Payment for special inspections that are required will be the responsibility of the contractor.

G. Coordination: Close coordination, exchange of shop drawings, and cooperation is required of the fabricators and erectors of structural steel, steel joists, metal deck, studs, precast work and masonry.

1.05 SUBMITTALS

A. Special Inspections: This project is subject to the requirements of The Fairfax County Special Inspections Program. All shop drawings showing details and layouts of structural steel components and connections shall be reviewed and approved by both the Structural Engineer of Record and The Fairfax County Critical Structures Section.

B. Shop Drawings: Provide fabrication and erection documents for structural steel members and connections.

1. Include all information necessary for the fabrication of component parts of the structural steel system. Indicate size and weight of members.
2. Welded Connections: Submit written welding procedures and provide complete details of welded conditions using standard AWS welding symbols and recommended standard details shown in the AISC and AWS manuals. The size, length, type and location of all welds shall be indicated. Show field welds on the erection plans.
3. Bolted Connections: Provide information on location, type and size of all bolts.
4. Include setting drawings and templates for anchorages which shall be installed as work of other Sections.

C. Product Data: Submit producers' or manufacturers' data for the following, including data to show compliance with specified requirements:

1. Structural steel primer.
2. Adhesive anchors.
3. Headed studs.

D. Mill test reports for each type of structural steel.

E. Mill test reports for high strength bolts, nuts and washers, including chemical analysis, tensile strength tests, and hardness tests.

F. Welder Qualifications: Submit evidence that welders employed in the work of this Section are currently certified under AWS qualification procedures.

G. Certified mill test reports made by testing laboratory in accordance with ASTM A-6 shall be submitted prior to fabrication. The fabricator shall submit an affidavit that structural steel conforms to the requirements of the grades specified when requested.

1.06 QUALITY STANDARDS

A. All workmanship shall be in accordance with the Standard Specifications for Structural Steel for Building, and the Code of Standard Practice, as adopted by the American Institute of Steel Construction, except as otherwise specified. Exercise special care to ensure that structural steel work engaging architectural work will be straight, plumb and true, and that it will not interfere with the installation of such work.

B. Any material or operation specified by reference to the published specifications of a manufacturer, The American Society for Testing and Materials (ASTM), The American Institute of Steel Construction (AISC), the American Welding Society (AWS), or other published standard, shall comply with the requirements of the

standard listed. In case of a conflict between the referenced specification and the project specifications, the project specifications shall govern.

1.07 EXPERIENCE AND QUALIFICATIONS

A. The fabricator/erector shall have not less than five years' experience in structural steel work.

B. The fabricator/erector shall submit a written description of fabrication and erection ability including equipment facilities, personnel, and a list of similar completed projects.

C. Certified Welders shall be certified by a competent, experienced welding inspector or a recognized testing facility in the field of welding. The welder shall be certified to make certain welds under qualified procedures. The welder shall be qualified for each position, type weld, electrode, and thickness of base metal that he intends to weld in the shop or field. The welder shall re-qualify for a weld when he has not performed that weld within a six-month period of time. Each welder shall mark his identification symbol on his work in the shop or field.

1.08 DELIVERY STORAGE AND HANDLING

A. Deliver steel properly marked for correct field assembly and erection.

B. Deliver anchor bolts, washers and other anchorage devices to be built into other work in a timely manner to allow proper installation into other work.

C. Protect steel and other accessories provided under this Section from damage, corrosion, distortion of members, and injury to shop paint. Store steel members off the ground, using platforms or pallets, in a location easily accessible for inspection.

PART 2 - PRODUCTS

2.01 STRUCTURAL STEEL

A. Structural Steel Wide Flange Shapes: ASTM A 992 (Grade 50).

B. Steel shapes angles, channels, bars and plates: ASTM A36 (See structural plans for specific yields).

C. Structural steel tubing: ASTM A500, (Grade B), with a minimum of 46 KSI.

D. Structural steel pipe: ASTM A53 (grade B), Type E or S.

E. Standard unfinished threaded fasteners:

1. Bolts and nuts - ASTM A307.

2. Washers - ANSI B27.2.

F. Anchor bolts: F1554 (Grade 36).

G. High strength threaded fasteners:

1. ASTM A325.
2. ASTM A490.

H. Filler metals for welding:

1. Shielded Metal-Arc Welding - AWS A5.1 or 5.5 and AWS Code.
2. Submerged ARC Welding - AWS A5.17 and AWS Code.
3. Flux-cored Arc Welding - AWS A5.20 and AWS Code.
4. Gas-Shielded Welding - AWS A5.20 and AWS Code.

I. Electrodes:

1. Use AWS Matching Base Metals- see AWS Code 4.1.1 Table.
2. Use type to produce weld metal with characteristics of steel being welded.

J. Standard Primer Paint: High solids, low VOC, rust inhibitive, all-purpose primer, free of lead, chromates, and other heavy metals. Primer paint is not required for non-exposed steel where encased in masonry.

K. Provide zinc coating for galvanizing exposed hung plates of structural steel beams or lintels encased in exterior masonry, for other structural members or assemblies not encased in masonry and exposed to the weather, shall be galvanized.

1. ASTM A123 for rolled, pressed, and forged steel shapes, plates, bars, and strips.
2. ASTM A386 for assembled steel fabrications.
3. ASTM A153 for steel hardware.

L. Bedding mortar to be non-shrink factory-packaged grout conforming to CRD-C621; Embecco, Vibra-Foil or equal.

M. Masonry Anchors: See Section 04200, Unit Masonry.

N. Teflon expansion pads: see Section 05820, Slide Bearings (where applicable).

PART 3 - EXECUTION

3.01 FABRICATION STANDARDS

A. Fabricate structural steel members in accordance with AISC Specifications and as indicated on the approved shop drawings.

B. Shop Fabrication and Assembly; Fabricate and assemble structural steel members in the shop to the greatest extend possible. Assemble and weld built-up sections using methods to produce true alignment of axes without warp.

C. Fabricate architecturally exposed structural steel in accordance with the applicable standards of the AISC. Members shall be sharp, true, and free from burrs and other irregularities. Welds shall be smooth, continuous and watertight.

D. Except as otherwise detailed or noted on the Drawings, all connections shall be equivalent in detail to AISC standards.

E. Welding: Where structural joints and connections are made by welding, the details of all conditions, the welding techniques, the appearance and quality of welds, and the methods used in correcting defective work shall conform to the requirements of the AISC "Specifications for the Design, Fabrication and Erection of Structural Steel Buildings," and the AWS "Structural Welding Code."

F. High Strength Steel Bolts: Where structural joints and connections are made using high strength bolts, hardened washers and nuts tightened to a high tension, the materials, methods of installation and tension control, type of wrenches and inspection methods shall conform to "Specifications for Structural Joints Using ASTM A325 and A490 Bolts," as approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.

G. Cut, drill or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning.

H. Holes for Other Work: Provide holes required for securing other work to structural steel members and for the passage of other work through steel members, as shown on approved, final shop drawings. Provide threaded nuts welded to framing members and other specialty items as indicated.

I. Accessories: Provide anchorage for masonry to steel members as indicated on the Drawings.

J. Lintels and shelf angles:

1. Structural steel shapes or plates of sizes noted on the Drawings:

    a. Built-up sections where indicated with or without separators as required.
    b. Bolted or welded as noted or as approved.
    c. Attached to concrete or steel structural members as noted or detailed.

2. Lintel Bearings at each end shall be 6" minimum on masonry, unless otherwise noted.
3. Shelf angles:

a. Miter joints at corners.
b. Allow for expansion near corners and 40 ft. o. c. maximum.

K. Column Bases: Press straightened for plates up to 4" thickness; milled for thicknesses over 4".

L. Shop Painting:

1. After inspection and before galvanizing or shipping, clean all steel surfaces to be painted. Remove loose rust, mill scale and spatter, slag or flux deposits. Clean surfaces in accordance with SSPC-SP-3 "Power Tool Clean" for concealed steel and SSPC-SP-6 "Commercial Blast Cleaning" for architecturally exposed structural steel.
2. After surface preparation, apply primer paint in accordance with manufacturer's instructions and at a rate to provide a dry film thickness of not less that 1.5 mils. Paint application method shall result in full coverage of joints, corners, edges and all exposed surfaces.

3.02 EXAMINATION OF PROJECT CONDITIONS

A. Contractor shall examine the areas and conditions under which the work of this Section is to be installed. Notify the Architect and Owner's Representative in writing of conditions detrimental to the proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

1. Survey as-built anchor bolt, bearing plate, and embedded plate layouts prior to setting structural steel.
2. Notify Architect and Owner's Representative if the erection of steel will deviate from the approved, final shop drawings as the result of fabrication errors, misalignment of embedded items, or other deviations.

3.03 ERECTION

A. General: Set structural frames true and plumb and set accurately to the lines and elevations indicated. Align and adjust the various members forming a part of a complete frame or structure before permanently fastening. Clean surfaces that will be in permanent contact once assembly is completed. Make approved adjustments to compensate for discrepancies in elevation and alignment.

B. Temporary bracing shall be introduced wherever necessary to take care of all loads to which the structure may be subjected including natural forces, erection and operation of equipment. Temporary bracing shall be removed by the Contractor when no longer required.

C. Establish required leveling and plumbing measurements based on the mean operating temperature of the structure. Make allowances for the difference between temperature at time of erection and mean temperature for structure on a building is in service.

D. Whenever stocks of material, erection equipment, or other loads are temporarily supported by the steel work during erection, proper provision shall be made to take care of stresses resulting from temporary loading.

E. All final connections shall be welded or bolted as indicated on the Drawings. All bolts for bolted final connections shall be ASTM A-325 and shall be tightened to a "snug - tight" condition. All bolted connections shall have minimum capacities as shown in Tables I and II of the AISC Manual.

F. Braces and guys: Coordinate the location of all braces and guys with the work of other trades. All removal of temporary braces, guys and struts shall be part of the work of this Section and shall be coordinated with the work sequence as walls, floors and roof systems are constructed. All cable guys shall be double clamped and kept under tension.

G. Welding rod ovens are required. Welding will not be permitted unless all ovens are in working order and used in accordance with the AWS Code.

H. Column base plates and bearing plates shall be set level to correct elevations and shall be temporarily supported on steel wedges or shims until the supported members have been plumbed and grouted. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges and shims. Cut any protruding part of wedges and shims flush with edge of plate prior to grouting. The entire bearing area under plates shall be grouted solid with non-shrink grout.

I. Pack bedding mortar solid between surfaces and bases or plates to assure that absolutely no voids remain. Finish exposed surfaces and allow ample time to cure according to manufacturer's recommendations.

J. Splice members only where indicated on approved, final shop drawings.

K. Gas Cutting: Field correcting of fabrication by gas cutting shall not be permitted on any major member in the structural framing without prior written approval of the Architect and Owner's Representative.

L. Fastening of splices of compression members shall be done after the abutting surfaces have been brought completely into contact.

M. Do not enlarge unfair holes in members by burning or by the use of drift pins. Ream holes that must be enlarged to receive bolts.

N. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth.

O. Field Welds: Comply with AISC specifications for removal of shop paint on surfaces adjacent to field welds.

P. Masonry Expansion Bolts: Anchor only to solidly grouted masonry which has cured for a minimum of three days. Install expansion bolts in accordance with manufacturer's written instruction, using only masonry carbide bits for drilling. Provide a minimum embedment of bolt into masonry of 5" unless noted otherwise on Drawings.

Q. Touch-Up Painting: After erection and final adjustments, wire brush clean and paint scarred surfaces, field welds, and rust spots using the same type of paint as that applied in the shop.

3.04 TOLERANCES

A. Individual pieces shall be erected so that the deviation from plumb, level and alignment shall not exceed 1 to 500.

3.05 FIELD QUALITY CONTROL

A. Owner will employ an independent testing and inspection agency to inspect high strength bolted connections and welded connections and to perform tests and prepare test reports for all field inspections.

B. When required by VUSBC-1704, Special Inspections, the testing and inspection agency shall visit and inspect the fabricator's plant. The agency shall verify fabricator's compliance with the AISC Quality Certification Program for the appropriate category and with other current edition SIP and VUSBC Chapter 17 requirements.

C. The testing and inspection agency shall conduct tests in accordance with current edition SIP and VUSBC-1704 requirements, shall interpret the tests and shall state in reports whether the test specimens comply with or deviate from test requirements.

D. Correct deficiencies in structural steel work that has been determined not to be in compliance. Additional tests, performed by contractor, which reconfirm non-compliance of original work or which are necessary to confirm compliance of corrected work, shall be at contractor's expense.

END OF SECTION

SECTION 05500

METAL FABRICATIONS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:

1. Steel framing and supports for mechanical and electrical equipment.

B. Products furnished, but not installed, under this Section include the following:

1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

C. Related Requirements:

1. Section 042000 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.

1.03 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.04 ACTION SUBMITTALS

A. Product Data: For the following:

1. Fasteners.
2. Shop primers.
3. Shrinkage-resisting grout.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:

1. Steel framing and supports for mechanical and electrical equipment.

1.05 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer's experience with providing delegated-design engineering services of the kind indicated, including documentation that engineer is licensed in the jurisdiction in which Project is located.

B. Mill Certificates: Signed by stainless steel manufacturers, certifying that products furnished comply with requirements.

C. Welding certificates.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

E. Research Reports: For post-installed anchors.

1.06 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.07 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.02 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.

2.03 FASTENERS

A. General: Unless otherwise indicated, provide zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A (ASTM F568M, Property Class 4.6); with hex nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.

C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325 (Grade A325M), Type 3, heavy-hex steel structural bolts; ASTM A563, Grade DH3, (ASTM A563M, Class 10S3) heavy-hex carbon-steel nuts; and where indicated, flat washers.

D. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

E. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329/F2329M.

2.04 MISCELLANEOUS MATERIALS

A. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

B. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Non-Shrink Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.05 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. 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.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.06 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

C. Fabricate steel pipe columns from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.

D. Galvanize miscellaneous framing and supports where indicated.

2.07 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize miscellaneous steel trim.

D. Prime miscellaneous steel trim with zinc-rich primer.

2.08 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.09 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Cast Aluminum: Heavy coat of bituminous paint.
2. Extruded Aluminum: Two coats of clear lacquer.

3.02 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

3.03 INSTALLATION OF BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with shrinkage-resistant grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.04 REPAIRS

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

a. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099123 "Interior Painting."

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION

SECTION 07210

BUILDING INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General Conditions and other Specification Sections, apply to the Work of this Section.

1.02 REFERENCE STANDARDS

A. ASTM E84 - Test for Surface Burning Characteristics of Building Materials.

B. ASTM C-665 - Insulation Blankets, Thermal (Mineral Fiber, for Ambient Temperatures).

C. ASTM C-578 - Rigid Polystyrene Insulation.

D. ASTM E96/E96M-[05]: Test Method for Water Vapor Transmission of Materials.

E. ASTM E331-[00]: Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.

F. NFPA 285 [2006]: Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components Using the Intermediate-Scale, MultistoryTest Apparatus

1.03 SUBMITTALS

A. Manufacturer's Literature: Descriptive data and installation instructions.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in manufacturer's original unopened packaging.

B. Identify contents, manufacturer, brand name, thermal values and applicable standards.

C. Store materials in area protected from weather and moisture. Materials exposed to inclement weather will be rejected.

D. Remove damaged material from site and replace same at no additional cost to the Owner.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Do not install insulation when temperature is 40°F or below, during rain or wet weather or when surfaces are wet.

1.06 WARRANTY

A. Provide written warranty that the actual thermal resistance of the extruded polystyrene foam insulation will not vary by more than 10% from its published thermal resistance.

PART 2 - PRODUCTS

2.01 FIRESAFING INSULATION

A. Mineral Wool Batt: ASTM C-665, Type 1, unfaced; USG "Thermafiber" SAFB or comparable (www.usg.com).

B. Foam Seal: Silicone - Dow Corning 3-6548.

2.02 EXPANDING FOAM INSULATION

A. Expanding polyurethane base foam prepackaged in metal aerosol containers.

2.03 MECHANICAL FASTNERS

A. Acceptable Products for Steel Stud Wall Insulation:

1. Rodenhouse Inc "Thermal-Grip Insulation Fasteners" with 2 inch diameter solid faced high-grade plastic washers
2. Wind-lock Corporation "ci-Lock Steel Series Selection" with 1-3/4 inch diameter high-grade plastic washers

B. As recommended by insulation manufacturer.

C. Minimum length 1/2 inch longer than insulation thickness.

2.04 ADHESIVES

A. As recommended by insulation manufacturer.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine areas to receive rigid building insulation to ensure that preceding work is completed, and that such work will not adversely affect the installation. Notify the Architect and Owner's Representative of any adverse conditions that have been observed.

B. Check surfaces to receive rigid building insulation to ensure uniform plane; and those surfaces are free of mortar chips, debris, grease, oil or other items detrimental to installation.

C. Proceed with application of insulation only when adverse conditions have been corrected to the satisfaction of the Architect and Owner's field representative.

3.02 INSTALLATION

A. Follow Manufacturer's written recommendations for installation of foundation perimeter and cavity wall insulation. Install insulation with close, tight joints, with the vapor barrier to the warm side, to form a complete and unbroken seal over the entire area to be insulated. Provide clips, wire pins, brackets, adhesive mastics, tape and other mechanical devices recommended by the manufacturer of the insulation to ensure a permanent and secure installation.

B. Extend insulation full thickness over entire surface to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation and mastic.

C. Exercise care to prevent damage and soiling of faces on insulation units exposed to view. Align joints accurately, with adjoining surfaces set flush.

D. Tape joints and ruptures in vapor barriers, using adhesive tape of type recommended by insulation manufacturers. Seal each continuous area of insulation to surrounding construction to ensure vapor-tight installation of the units.

E. Completely pack voids between top of walls and flutes of roof decking with firesafing insulation.

F. After installation, in-place insulation shall be inspected by the Architect and Owner's Representative, before installation of subsequent work which will conceal the insulation from view.

3.03 CLEAN-UP

A. Remove insulation adhesive splatters and smears from exposed surfaces.

B. Remove debris related to work of this Section from project site and dispose of legally.

C. Leave work areas in clean condition.

END OF SECTION

SECTION 07510

4-PLY BUILT-UP ROOFING WITH GRAVEL BALLAST AND INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of contract, including General Conditions and other Specification Sections, apply to the Work of this Section.

1.02 RELATED WORK

A. See Roof Plans and Details.

B. Section 07600-Flashing and Sheet Metal.

1.03 DESCRIPTION OF WORK

A. Extent of built-up roofing system work is indicated on drawings and by provisions of this section and is defined to include roofing membrane, insulation flashing and stripping and roofing accessories integrally related to roof installation.

B. The work consists of patching and tieing into new (installed between 2013 and 2015) built-up roofing over existing decks where tear-off of all or partial existing layers of membrane, insulation and flashings shall be performed. The existing roof plan with existing roofing and warranty expiration dates are provided at the end of this section for contractors reference. These should be used to supplement information on the contract drawings. Refer to drawings for scope of work and field verify all existing conditions. Any repairs or replacement to existing decking, wood blocking or other parts of the building structure will be done as directed by a Fairfax County Public Schools (FCPS) inspector on a time and material basis.

1.04 QUALITY ASSURANCE

A. Single Source Manufacturer: Provide primary products, including each type of roofing sheet (felt), bitumen, insulations, composition flashings, produced by a single manufacturer. Provide secondary products only as recommended by manufacturer of primary products for use with roofing system specified.

B. Installer Qualifications: A single Installer ("Roofer") shall perform the work of this section; and shall be a firm with not less than ten (10) years of successful experience in installation of built-up roofing systems similar to those required for this project. The roofer shall be a certified installer for the approved roofing system. The Roofer must have an office, warehouse with supplies, and permanent roofing crews within a 50-mile radius of the City of Fairfax, Virginia. Roofer shall have had Soprema, Firestone "Red Shield", GAF Master Select or Johns Manville approval in this area for at least eight (8) years from manufacturer, and shall perform a

minimum of twenty (20) of these built-up roofing manufacturer guarantees per year.

C. Pre-Roofing Conference: As soon as possible after award of built-up roofing work, contractor shall schedule and attend a meeting with Roofer, Manufacturer's Representative, installers of substrate construction (decks) and other work adjoining roof system, including penetrating work and roof-top units; Architect, Owner, and representatives of other entities directly concerned with performance of roofing system. Review requirements of Contract Documents, submittals, status of coordinating work, availability of materials and installation facilities and proposed installation schedule, requirements for inspections, testing, certifications, forecasted weather conditions, governing regulations, insurance requirements, and proposed installation procedures.

D. Insurance Certification: Assist Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance on roofing and associated work.

E. UL Listing:

1. Provide built-up roofing system and component materials which have been tested for application and slopes indicated on Drawings and are listed by Underwriters Laboratories, Inc. (UL) for Class A external fire exposure.
2. Provide roof covering materials bearing Classification Marking (UL) on bundle, package or container indicating that materials have been produced under UL's Classification and Follow-up Service.

F. Product and Application Guides: Soprema or Firestone manufacturer's "Roofing Manual for Commercial/Industrial Roofing Solutions."

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data, installation instructions and recommendations for each type of roofing product required. Include data substantiating that materials comply with requirements.

1. For asphalt bitumen: provide label on each container or certification with each load of bulk bitumen, indicating flash point (FP), finished blowing temperature (FBT), softening point (SP) and equiviscous temperature (EVT).
2. Expansion Joints: Follow FCPS specified details.

B. Shop Drawings: Submit shop drawings showing plan layouts of all roofing assembly types, materials, roof top equipment, tapered insulation, crickets and drains. For additional information and requirements see section 01340.

1.06 JOB CONDITIONS

A. Weather Condition Limitations: Proceed with roofing work only when existing and forecasted weather conditions will permit work to be performed in accordance with manufacturers' recommendations and warranty requirements.

1.07 DELIVERY, STORAGE AND PRODUCT HANDLING

A. Deliver specified materials and accessories in unopened rolls, containers and packaging with manufacturer's original labels intact bearing name, source of product and delivery, storage date of manufacture. Cover all materials with waterproof tarps or two layers of plastc. Original material covering is not accepted as a single covering.

B. Store and handle roofing felts in a manner that will ensure that there is no possibility of significant moisture pick-up.

C. Store in a dry, well ventilated, weather-tight place. Unless protected from weather or other moisture sources, do not leave unused felts on the roof overnight or when roofing work is not in progress. Store rolls of felt and other sheet materials on end, on pallets or other raised surface. Handle and store materials or equipment in a manner to avoid significant or permanent deflection of deck. Materials that are found to have been exposed to moisture-related weather will be marked or designated as deficient and must be removed and not used on any FCPS project.

D. Stockpiles of aggregate on roof surface shall only be set on areas which have been coated with asphalt, in order to protect the underlying membrane.

E. Roof Loading: Do not store materials on roof decks or position installation equipment on roof decks in concentrations or locations exceeding design live loading for structural roof system.

F. All roofing materials shall be covered with weatherproof tarps or two layers of plastic.

1.08 WARRANTIES

A. Manufacturer's Guarantee (Project): Submit three (3) executed copies of full 20 year "NDL" (no dollar limit) "Manufacturer's Roofing Guarantee" on form approved by Owner, covering work of this section to include roofing membrane, composition flashing, roof insulation, and roofing accessories. Contractor is to maintain original roofing warranties and provide certification that new work is in accordance with original warranty.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. Insurance and Code Requirements: Provide materials complying with governing regulations and which can be installed to comply with the following:

1. Underwriters Laboratories "Fire Classified" and "Class 90" wind uplift resistance.

2.02 ROOF INSULATION

A. Patching Existing Roofing:

1. Polyisocyanurate Insulation (Bottom Layer): 2 layers of 2.5" both layers staggered in all directions," Rigid, closed cell polyisocyanurate foam, faced with a fiberglass, reinforced mat. Meets requirements of ASTM C1289-02, Type II, Class 1, Grade 2. R value: 6.0/inch over the expected life of the insulation. Thickness: Total thickness: 5" R-value of 28.8 (LTTR).
2. ½ "Perlite (Top Layer), with R-value of 1.32, and shall comply with ASTM C728.

B. Tapered polyisocyanurate or tapered perlite panels roof insulation for slopes, tapered edge strips, and crickets.

2.03 BUILT-UP ROOF MEMBRANE SYSTEM

A. Insulated-Deck Asphalt/Glass-Fiber/Aggregate Roofing: Provide built-up aggregate-surfaced roof system with asphalt bitumen and 4 plies of glass fiber felts for lay-up as indicated.

1. Primer: Asphalt cutback primer complying with ASTM D41.
2. Ply Felts: 4 plies of asphalt-impregnated glass-fiber felts, Type 4 of Firestone, Soprema, GAF or Johns Manville ASTM D2178.
3. Bitumen: Roofing asphalt, complying with ASTM D312, Type III."Low Odor"/"Low Fume Only".
4. Paint all base flashing seams: Firestone – 1 coat base and 1 coat top:

a. Firestone – 1 coat base and 1 coat top.
b. Soprema – Alsan Finish.
c. GAF-1 coat Unibase Primer and 1 coat Roof Mate top coat.
d. JohnsManville – 1 coast base and 1 coat top.

5. Broom all felts

B. Comply with NRCA Roofing and Waterproofing Manual, 5th edition, Specification Plate #BU-4-I-A-A or latest edition, Diagram B; except 4 plies.

C. Products: Subject to compliance with requirements, provide the following BUR System: NO SUBSTITUTIONS ALLOWED!

1. Soprema.

2. Firestone.
3. GAF.
4. Johns Manville.

D. Base Flashings:

1. Firestone- 1 ply SBS Premium base mopped only and 1 ply Ultra White Granual SBS FR torched or mopped.
2. Soprema- 1 ply Sopralene Sandes PS mopped only and 1 ply Sopra Star Flame torched or mopped.
3. GAF- 1 ply rubberoid mop smooth 1.5 and 1 ply Siplast Pavator 30 BW.
4. Johns Manville- 1 ply Dyna Base PR and 1 ply Dyna Glas FR CR G.

E. Strippling Piles: For gravel stops, vent pipe flashings, pitch pockets, and "B" vent type flashing install 2 plies type 4 felt set in hot asphalt. At gravel stop/drip edge flashing install 1 ply SBS Ultra White gravels. For Firestone, 1 ply Sopra Star white for Soprema and Johns Manville Dyna Glas FR CR G.

2.04 BUR EDGE/PENETRATION MATERIALS (As recommended by manufacturer)

A. Roofing Cement: Asphaltic cement; comply with ASTM D4586, (non-asbestos containing).

B. Glass Fiber Fabric: 1.5-pound minimum sheet of woven glass fiber, impregnated with asphalt (ASTM D 1668).

C. Lead Flashing: 4-pound sheet of common desilverized pig lead. All sides primed that come in contact with built-up roofing.

D. Preformed Edge Strips: Rigid insulation units matching roof insulation, or asphalt-impregnated organic fiber insulation units, molded to form 3-1/2" x 3-1/2" x 45 deg cant strips and 1-5/8" x 18" tapered edge strips, as shown to receive roofing ply-sheet courses and lift edges above main roofing surfaces. (Set in asphalt).

E. Cant strips: Fiber or perilite (Set in aslphalt).

2.05 SHEET METAL ACCESSORY MATERIALS

A. Stainless Steel: ASTM A 167, AISI 302/304, No. 2D finish, temper as required for forming and performance; 0.015" thick (28 gage), except as otherwise indicated.

B. Copper: ASTM B 370, cold-rolled unless soft temper required for forming and performance; 16-ounce (0.0216" thick), except as otherwise indicated.

C. Aluminum: ASTM B 209, alloy 3003, temper H 14 unless harder temper required for forming and performance, AS-C22A41 clear anodized finish; 0.032" thick (20 gauge), except as otherwise indicated.

D. Solder for Sheet Metal: Except as otherwise indicated or recommended by metal manufacturer, provide 50/50 tin/lead type (ASTM B32) for tinning and soldering joints; use rosin flux. All joints shall be soldered.

1. Solder stainless steel joints with 60/40 tin/lead type solder; use acid-chloride flux, except use rosin flux on tinned surfaces.

2.06 MISCELLANEOUS MATERIALS

A. Surfacing Aggregate: Crushed stone, free of sharp edges and complying with ASTM D 1863. Color: White. Texas #7- NO SUBSTITUTIONS

B. Wood Members: Provide wood pressure treated with water-borne preservatives for above-ground use, complying with AWPB LP-2 as indicated on drawings.

C. Provide High Temperature "Ice and Water Guard" at all metal roof and wall panel areas includinig covering all fascia and perimeter edge wood. Provide one of the following: Carlisle "WIP 300" or Soprema "Lasto Bond Shield HT".

D. Mastic Sealant: Polysiobutylene (plain or bituminous modified), non-hardening, nonmigrating, nonskinning and nondrying.

E. Asphaltic Primer: Comply with ASTM D 41.

F. Mechanical Fasteners: To comply with FM approval Guide 1-28 for I-90 classification; provide industry-standard types of mechanical fasteners for BUR system work, tested by manufacturer for required pull-out strength where applicable and compatible with deck type and roofing products used. Provide either 1" diameter nail heads or 1-3/8" diameter x 30-gage sheet metal caps for nails used to secure felts or insulation boards of roofing system.

1. Metal Decks: Soprema Fastening System, Firestone, or GAF approved equal. Note: Where acoustical deck is used, fasteners shall not protrude below the bottom of the rib profile. Should this occur, the protruding portion of the fastener shall be cut.
2. Gypsum Concrete Decks: Soprema, Firestone, GAF, or Johns Manville Specialty Systems.

G. Vapor Retarders: (Acoustical Deck): Provide self adhering "Blueskin PE 200 HT" vapor retarding, high temperature roof underlayment by Henry Company, 800-486-1278. Vapor retarding underlayment shall be 40 mils thick, SBS rubberized asphalt compound laminated to a non-slip coated, polyethylene film top layer and a silconizes kraft paper bottom layer.

H. Expansion Joints: Install new expansion joints and replace existing expansion joints at locations shown on the drawings in details as indicated.

2.07 FABRICATION OF SHEET METAL ACCESSORIES

A. SMACNA and NRCA Details: Work shall conform with details shown, and with applicable fabrication requirements of "Architectural Sheet Metal Manual" by SMACNA. Comply with installation details of "Roofing and Waterproofing Manual" by NRCA.

B. Provide 4" wide flanges for all accessories for setting on BUR membrane with concealment by composition stripping.

C. Fabricate work with flat-lock soldered joints and seams; except where joint movement is necessary provide 1" deep interlocking hooked flanges, filled with mastic sealant.

D. Fabricate penetration sleeves with minimum 8" high stack of diameter 1" larger than penetrating element. Counter flashing is specified as work of Section 07600, Flashing and Sheet Metal.

E. All metal copings shall have standing seam joints (per manufacturer's recommendation).

F. All masonry associated counterflashing will use existing through wall assembly or provide new through wall assembly per the plans and specifications.

PART 3 - EXECUTION

3.01 INSPECTION OF SUBSTRATE

A. Examine substrate surfaces to receive roofing system and associated work and conditions under which roofing will be installed. For re-roofing projects, examine existing conditions (such as deck substrate, edge construction, curb openings and other roof penetrations) and verify that such conditions will allow proper installation of the roof membrane assembly. Do not proceed with roofing until unsatisfactory conditions have been corrected in a manner acceptable to Installer and complying with manufacturer's standards. Existing decking will be cleaned completely of all debris including deck flutes.

B. Final determination of existing conditions will be that of FCPS Design and Construction. Any repair or replacement of existing structure will be directed by FCPS inspector on a time and material basis.

1. Verify that flatness and fastening of metal roof decks comply with the following:

a. Top Flanges: No concavity or convexity in excess of 1/16" across any 3 adjacent flanges.
b. Side Laps: Minimum 2" laps located over and fastened to supports.

c. Deck secured to each supporting member in every other rib (maximum spacing of 12" o. c.) with puddle welds or approved mechanical fasteners.

2. Deck infiller replacement shall follow FCPS specification details.

3.02 GENERAL INSTALLATION REQUIREMENTS

A. Comply with manufacturer's published specifications for ply lapping, asphalt application, fastener recommendations, roof edge details and base flashing details. NOTE: FCPS specifications may supersede the minimum manufacturer requirement.

B. Cooperate with inspection and test agencies engaged or required to perform services in connection with BUR system installation.

C. Protect other work from spillage of BUR materials and prevent liquid materials from entering or clogging drains and conductors. Replace and restore other work damaged by installation of BUR system work.

D. Insurance/Code Compliance: Install BUR system for (and test where required to show) compliance with governing regulations and with the insurance requirements of this Section.

E. Coordinate the installation of insulation, roofing felts flashings, stripping, coatings and surfacings, so that insulation and felts are not exposed to precipitation nor exposed overnight. Provide cut-offs at end of each day's work, to cover exposed felts and insulation with a course of coated felt with joints and edges sealed with roofing cement. Remove cut-offs immediately before resuming work. No phasing of roofing will be accepted unless approved by FCPS.

F. Asphalt Bitumen Heating: Heat and apply bitumen in accordance with Equiviscous Temperature Method ("EVT Method") as recommended by NRCA. Do not raise temperature above minimum normal fluid-holding temperature necessary to attain EVT ("25 degrees F or 14 degrees C, at point of application) more than one hour prior to time of application. Discard bitumen that has been held at temperature exceeding Finished Blowing Temperature (FBT) for a period exceeding 3 hours. Determine flash point, FBT and EVT of bitumen, either by information from bitumen producer or by suitable tests, and determine maximum fire-safe handling temperature and do not exceed temperature in heating bitumen. In no case shall bitumen be heated to a temperature higher than 25 degrees F (14 degrees C) below flash point. For aggregate-surfaced pour coats of bitumen, limit application temperature to minimum required for proper embedment of aggregate, and maximum which will permit retention of a coating of weight required, depending upon slope of surface. Tankers only will be used on all FCPS roof projects.

G. Bitumen Mopping Weights: For interply mopping and for other moppings except as otherwise indicated, apply bitumen at the following rate:

Asphalt: 25-lbs. of asphalt (25% on a total-job average basis) per roof square (100 square feet) between plies, but not less than 23 pounds per square per ply, applied within the EVT range.

H. Substrate Joint Penetrations: Do not allow bitumen to penetrate substrate joints and enter building or damage insulation, vapor barrier (retarders) or other construction. Where steep asphalt is applied directly to a substrate, hold mopping back 2" from both sides of each joint.

I. Cut-Offs: At end of each day's roofing installation, protect exposed edge of incomplete work, including ply sheets and insulation. Provide temporary covering of 2 plies of No. 15 roofing felt set in full moppings of hot bitumen; remove at beginning of next day's work. Do not glaze coat ply sheets in the interim before surfacing.

J. Cold Weather Application: Fully comply with manufacturer's written guidelines for cold weather roof installation when work shall be performed in temperatures below 45°F.

K. Newly installed roofing that is left unsurfaced for a period of time that will exceed that of what is recommended by the manufacturer will be coated with asphalt at a rate that is recommended by that manufacturer.

L. At all times provide an odor eliminator additive – use "desent" by Arrmaz Custom Chemicals or approved equal.

M. For roof replacement remove loose gravel by power vacuuming only.

3.03 INSTALLATION OF INSULATION

A. General: Comply with insulation manufacturer's instructions and recommendations for the handling, installation and bonding or anchorage of insulation to substrate.

B. Secure insulation: to deck using mechanical fasteners specifically designed and sized for attachment of specified board type insulation to deck type shown. Fasten all layers of insulation over entire area of roofing at spacing as required by manufacturer.

C. Three-Layer Installation: Install required thickness in three layers with joints of second layer staggered from joints of first layer a minimum of 12" each direction.

D. Mecanically attach the first two layers together. Install third layer staggered from the second layer in full mopping of hot Type III asphalt, applied within temperature range of EVT " 25°F (14°C) and at average rate of 25 pounds. ("25% on total-job basis) per 100 square foot.

E. Tapered insulation will be installed at all roof drains, crickets, tapered areas and on the high sides of all units as per the drawings and specifications.

F. Tapered Insulation: Installation shall be as recommended by manufacturer.

G. Install one-ply of #15 lb. felt laid in dry at all walls, roof edges and penetrations prior to installing roofing plies. #15 felt should be set under 1st layer of new insulation.

3.04 ROOF MEMBRANE INSTALLATION

A. Shingling of Plies: Except as otherwise indicated, install membrane with ply sheets shingled uniformly to achieve required number of thickness of membranes throughout. Shingle in proper direction to shed water on each large area of roofing. Drainage flow shall be over or parallel to, but not against the lap. Lightly broom felts as directed on all roofing plies. **GLAZE COAT PLIES IF SURFACE IS NOT INSTALLED WITHIN 60 DAYS.**

B. Cant Strips/Tapered Edge Strips: Except as otherwise shown, install preformed 45° insulation cant strips at junctures of BUR membrane with vertical surface. Provide preformed tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces. Set all edge strips and cant strips in hot asphalt.

C. Inter-Ply Felts: Provide the number and type(s) of felts indicated, lapped (shingled) as required to form a continuous, uniform membrane with bitumen moppings between sheets so that ply sheet does not touch ply sheet. Except as otherwise indicated, glaze-coat top of ply-sheet membrane with 10-pound mopping of same bitumen, integrally with operation of laying up membrane.

1. Mop base directly to substrate.
2. Extend BUR membrane to 2" (nominal) above top edge of cant strip, solidly adhered, without bridging or buckling.
3. Provide a folded-back envelope at edges and penetrations of BUR membrane where it is not turned up on a tapered strip, so as to provide positive protection against flow of bitumen into building or off the edge. Extend base sheet to form envelope or, where no base sheet is provided, install one ply or coated felt set in steep asphalt with joints sealed. Seal corners and other interruptions of envelope with large beads of roofing cement to provide positive protection against flow of bitumen.
4. Nail edges of roofing membrane to wood blocking at perimeter edges of roof prior to installing metal gravel stops/fascias. Space recommended fasteners at minimum 6" o. c. with staggered rows through one-inch (1") diameter metal discs, unless otherwise noted.

D. Set-on Accessories: Where small roof accessories are set on BUR membrane, set metal flanges in a bed of roofing cement, and seal penetration of membrane with bead of roofing cement to prevent flow of bitumen from membrane.

E. Roof Drains: All roof drains shall have a tapered insulation sump area consisting of a minimum 12' x 12' total area. The sump shall be a minimum of 6' in each direction from the center of the roof drain. Sump area may need to be larger depending on the thickness of new insulation. Insulation should have a gradual slope to drain not to exceed ¾" per foot or approved by FCPS. Fill clamping ring

base with a heavy coat of roofing cement. Set lead flashing sheet in a bed of roofing cement over completed ply sheet course. Lead sheet shall be primed with asphalt primer, clamped in roof drain ring, and extended a minimum of 24" onto the roof. Cover lead sheet with two plies of Type 4 felt. Finish by covering the entire sump area with SBS White Modified Bitumen sheet specified under the base flashing section,extending a minimum of 6" out onto the roofing field.

1. Lead flashing sheet: Minimum 30" x 30" in size.

F. Allow for Expansion: of running metal flashing and edge trim that adjoins roofing. Do not seal or bond BUR membrane or composition flashing and stripping to metal flanges over 3'-0" in length.

G. Flashings: Two-ply flashings shall not be applied until the roof membrane (excluding surfacing) has been installed. Provide a temporary seal at ply terminations until flashing can be installed.

1. Prime masonry surfaces and wood cant and expansion joint with recommended asphalt primer at the rate of one (1) gallon per 100 square feet.
2. Apply asphaltic primer to all sheet metal that shall come into contact with bituminous materials (top and bottom).
3. Embed flashings into a solid mopping of steep asphalt extending at least eight inches (8") up the curb or wall, and extending at least four inches (4") beyond the cant strip onto the roof.
4. Seal all nail heads, inside and outside corners with roof cement. Provide a three- (3) course seal using glass fabric embedded into and covered with roofing cement under all surface-mounted counter flashing.
5. Cover all wood blocking/plywood not covered by the B/U/R with ice/wwater shield.

H. Counter Flashings: Counter flashings, cap flashings, expansion joints,through wall receiver metal are "all" stainless steel and "all" similar metal work to be coordinated and will become part of the BUR work.

I. Roof Accessories: Miscellaneous sheet metal accessory items, including, and major items of accessories to be coordinated with BUR work, are specified in other sections of these specifications.

1. Sheet metal flashing flanges and through wall shall have all seams (base and up seams) soldered. Prime coat all parts that come into contact with roofing membrane. Set in bed of roofing cement prior to concealment by composition stripping.

J. Aggregate Surfacing: Promptly after completion of BUR membrane, edge treatment and set-on accessories in each substantial area of roofing, flood-coat surface as indicated and while each small area is hot and fluid, cast the following approximate weight of aggregate in a uniform course. NOTE: ALL AREAS THAT SHALL RECEIVE AGGREGATE SHALL BE INSPECTED BY OWNER'S

REPRESENTATIVE AND ROOFING MANUFACTURER'S REPRESENTATIVE PRIOR TO INSTALLING AGGREGATE.

1. Flood Coat: 60 pounds per square into hot steep asphalt.
2. Aggregate: Texas #7 White Stone ONLY! No Sustitutions

Roof surface shall be clean, free of dirt, dust, and moisture prior to applying aggregate. Install aggregate so that at least 50% of the aggregate is solidly adhered in the asphalt.

K. Do not install flood coating of bitumen and aggregate surface source at edges of roofing until composition flashing and stripping work has been completed. Glaze-coat ply sheet courses where surfacing cannot be installed on the same day. Delay aggregate surfacing only as long as necessary to substantially complete edge work and tests where required.

L. Allow 5% of extra asphalt and stone for ponded water areas.

3.05 CORRECTION OF DEFECTIVE OR DAMAGED WORK

A. Owner reserves the right to direct that roof cuts (samples) be taken in any area of the work whenever defective work is suspected. Owner's Representative will notify Contractor and Roofing Manufacturer's Representative, when such action is deemed necessary in the opinion of the Owner.

B. "Fishmouths" (non-adhered arched ply edges). Cut out plies which are not properly embedded in bitumen; replace the cut area with the minimum number of plies specified for the roofing system, plus one (1) additional ply using the "feather out" method recommended by the Manufacturer for cut-out repair. Embed each ply in a solid, uniform 23 to 35 pounds per square mopping of hot bitumen. No dry laps shall be permitted. Feather felts 2" over preceding layers.

C. Physical damage resulting from construction activity: Cut out damaged plies and insulation. Install new insulation and repair the cutout in accordance with the procedures outlined in paragraph A above.

D. Non-adhered laps: Secure laps by embedding each ply in a solid, uniform 23 to 35 pounds per square mopping of hot bitumen.

E. Other defective or non complying work discovered as a result of Manufacturer's audit for guaranty requirements shall be corrected in accordance with manufacturer's recommended procedures for each type of defect encountered.

3.06 CLEANING

A. Remove excess materials, equipment, trash and debris associated with the roofing activities from the project area and dispose of legally.

B. Repair damage to adjacent work of other trades which has resulted from roofing activities; remove stains and drippage resulting from bitumen application.

3.07 PROTECTION OF ROOFING

A. Upon completion of roofing work, including associated work, Roofer shall advise Contractor of recommended procedures for surveillance and protection of roofing during remainder of construction period. At end of Construction period, or at Contractor's option, at a time when remaining construction work will in no way affect or endanger roofing, Roofer shall make a final inspection of roofing and prepare a written report, directed to Contractor with copy to Owner describing nature and extent of deterioration of damage found in the work.

B. Roofer shall repair or replace deteriorated or defective work found at time of final inspection. Roofer shall be engaged by Contractor to repair damages to roofing that occurred subsequent to roofing installation and prior to final inspection. Repair or replace the roofing and associated work to a condition free of damage and deterioration at time of substantial completion.

C. Repair all damaged side walks, grounds and all other damaged surfaces to match existing.

END OF SECTION

SECTION 07600

FLASHING AND SHEET METAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General Conditions and other Specification sections, apply to work of this section.

1.02 RELATED WORK

A. Section 07510 – 4-ply Built-up Roofing with Gravel Ballast and Insulation.

1.03 DESCRIPTION OF WORK

A. Extent of each type of flashing and sheet metal work is indicated on the drawings and by provisions of this section.

B. Type of work specified in this section includes, but is not limited to, the following:

1. Metal counter flashing; and base flashing.
2. Miscellaneous sheet metal accessories.

C. Roofing accessories, which are installed integral with roofing membrane, and provided by the roofing manufacturer, are specified in Section 07510 as part of roofing work.

E. Set-on type, pre-manufactured unit roof accessories are specified in Section 07510 as part of roofing work.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's product data, installation instructions and general recommendations for each specified sheet material and fabricated product.

1.05 JOB CONDITIONS

A. Coordinate work of this Section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

1.06 WARRANTIES

A. Provide a five (5) year written guarantee on labor and a ten (10) year written guarantee on materials for all flashing and sheet metal work.

PART 2 - PRODUCTS

2.01 FLASHING AND SHEET METAL MATERIAL

A. Sheet Metal Flashings and Trim:

1. Counter Flashings, Scuppers, Built-in Receivers, Expansion Joint flashings and umbrella cones for roof mounted pipe supports:

a. Stainless Steel: ASTM A167 AISI 302/304, No 2D finish, temper as required for forming and performance; 0.018" thick (28 gage) except as otherwise indicated.
b. Sheet Aluminum: ASTM B 209, aluminum alloy, embossed with "Kynar" fluorocarbon enamel finish; 0.032" thick except as otherwise indicated. Color as selected by Architect.

B. Miscellaneous Materials and Accessories:

1. Fasteners: Same metal as flashing and sheet metal or other non-corrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.
2. Bituminous Coating: FS TT-C-494 or SSPC - Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.
3. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.
4. Epoxy Seam Sealer: 2-part noncorrosive metal seam cementing compound, recommended by metal manufacturer for exterior/interior nonmoving joints including riveted joints.
5. Adhesives: Type recommended by flashing sheet manufacturer for waterproof/weather-resistant seaming and adhesive application of flashing sheet.
6. Solder for Sheet Metal: Except as otherwise indicated or recommended by metal manufacturer, provide 50/50 tin/lead type complying with ASTM B32; use rosin flux.
7. Metal Accessories: Provide sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material being installed, non-corrosive, size and gage required for performance.
9. Roofing Cement: ASTM D 4586, asphaltic and non-asbestos containing.

2.02 FABRICATED UNITS

A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown, and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels indicated with exposed edges folded back to form hems.

B. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Horizontal seams, such as copings, shall be standing seams. Gutters-seams, apply waterblock or butyl caulk before joining pieces together. Seal joined seams with EPDM flashing membrane.

C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used, or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1" deep, filled with mastic sealant (concealed within joints).

D. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.

E. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.

PART 3 - EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations, and with SMACNA "Architectural Sheet Metal Manual." Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible and set units true to line and level as indicated. Install work with laps, joints and seams which will be permanently watertight and weatherproof.

B. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.

C. All stainless steel or copper metal through wall flashing, gravel stops, pitch pockets, rain collars and expansion joints with lapped joints shall be soldered watertight.

3.02 WEATHER-RESISTANT BARRIER

A. Install the membrane directly on a clean, dry, continuous structural plywood sheathing, blocking, and other locations as indicated. Remove dust, dirt, loose nails, and old roofing materials. Protrusions from the substrate area must be removed. Decks shall have no voids, damaged, or unsupported areas. Repair areas before installing the membrane. Install membrane in accordance with manufacturer's printed directions.

3.03 CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

B. Protection: Installer shall advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction. Ensure that work shall be without damage or deterioration, due to factors other than natural weathering, at time of acceptance by Owner.

END OF SECTION

SECTION 07900

SEALANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General Conditions and other Specification Sections, apply to the Work of this Section.

1.02 REFERENCE STANDARDS

A. FS TT-S-230C - Sealing Compounds, Synthetic-Rubber, Single Component, Chemically Curing.

B. FS TT-S-00227E – Sealing Compound, Elastomeric Type, Multi-Component.

C. ASTM C834 – Latex Sealing Compounds.

D. ASTM C920 – Elastomeric Joint Sealant Compounds.

E. ASTM E90 – Airborne Sound Transmission Loss.

1.03 SUBMITTALS

A. Comply with applicable provisions of General Condition Section 18, Shop Drawings, Product Data and Samples.

B. Submit sealant manufacturer's catalog and technical data, including surface preparation and installation instructions. Include data for compressions seals, backer rods, bond breakers, and other accessories for joint conditions as detailed or required by Drawings, and per manufacturer's recommendations.

C. Submit samples of sealant colors.

1.04 WARRANTY

A. Provide a two (2) year written warranty covering materials and installation.

PART 2 - PRODUCTS

2.01 SEALANT MANUFACTURERS

A. The materials specified in 2.02 are products manufactured by Pecora Corporation (www.pecora.com); (Basis of Specification).

B. Other manufacturers, pre-bid approved in accordance with Section 01630, and complying with the requirements and the intent of this Section shall be acceptable.

2.02 SEALANT MATERIALS

A. Type 1: "AC-20+Silicone"; one-part, non-sag, acrylic latex caulk, complying with ASTM C834.

B. Type 2: "890NST"; single-component, Non-sag, Nonstaining, Ultra-Low Modulus, Neutral Moisture-curing, Silicone Sealant, 100% extension/50% compression; complying with TT-S-001543, TT-C-00230C, CDPH-CA01350 and ASTM C920, Type S, Grade NS Class 100/50, Use NT, M, G, A, O.

C. Type 3: "Urexpan NR-201"; one-part urethane, self-leveling (Type I), 25% maximum movement capability for extension/compression; complying with FS TT-S-230C, ASTM C920.

D. Type 4: "AC-20FTR"; one-part, modified acrylic latex acoustical sealant, complying with ASTM E90-16 and ASTM C834.

E. Type 5: "BC-158" Butyl Sealant, Federal Specification FS TT-S-001657 (Type I), Shore A hardness of 25 or greater.

2.03 PRECOMPRESSED SEALANT TAPE

A. "Will-Seal" as manufactured by Illburck, U.S.A.

1. Tape Type 150; tape number W-820.

B. Install in compliance with manufacturer's recommendations.

1. Verify conditions of installation (and actual field dimensions) with manufacturer's supplier as for correctness of installation.

C. See Drawings for locations and details.

2.04 NEOPRENE COMPRESSION SEAL

A. Preformed vulcanized elastomeric compound as manufactured by Watson Bowman Acme Corp.

1. Heavy Duty Seal, WA Series, Number WA 162.
2. Install utilizing manufacturer's recommended lubricant type adhesive.

B. Prepare and shape material adjoining seal in compliance with manufacturer's recommendations.

C. Install in compliance with manufacturer's recommendations.

2.05 ACCESSORIES

A. Primer: Non-staining type, as recommended by sealant manufacturer for type of sealant, joint substrate, and size of joint.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Backer Rod: Round, closed cell polyethylene or "Denver Foam" polyurethane foam rod as required by manufacturer for type of sealant; oversize 30 to 50 percent.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

E. Masking Tape: To prevent application of sealant on surfaces not scheduled to receive it. Tape shall be removable without damage to substrate.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that joint dimensions, physical and environmental conditions are acceptable to receive work of this Section.

B. Beginning of installation shall indicate acceptance of condition of substrates and of adjacent installed work.

3.02 PREPARATION

A. Clean, prepare, and size joints in accordance with manufacturer's written instructions. Remove any dirt, grease, loose materials and other foreign matter that might impair adhesion and proper performance of sealant.

B. Verify that joint shaping materials and release tapes are compatible with sealant.

C. Examine joint dimensions and size materials to achieve width/depth ratios as required by manufacturer.

D. Use backer rod to achieve required joint depths, and to allow sealants to perform in accordance with manufacturers technical specifications.

E. Use bond breaker tape where recommended by the sealant manufacturer and where indicated on the Drawings.

3.03 INSTALLATION

A. Seal exterior joints subject to moisture penetration and interior joints exposed to view with sealant specified in schedule below.

B. Perform work in accordance with latest ASTM requirements for type of sealant and type of application.

C. Install sealant in accordance with manufacturer's written instructions.

D. Apply sealant within manufacturer's recommended temperature ranges. Consult manufacturer prior to installation when sealant cannot be applied within recommended temperature ranges.

E. Tool joints to a concave profile.

F. Joints shall be free of air pockets, foreign embedded matter or other foreign substances. Joints shall be uniform, free of ridges, and sags.

3.04 SCHEDULE

A. Type 1: Interior non-moving joint applications.

B. Type 2: Exterior vertical surface applications, and interior moving joint applications.

C. Type 3: Exterior horizontal surface applications.

D. Type 4: Interior acoustical applications.

E. Type 5: Radon mitigation joints where slabs abut foundation walls.

3.05 CLEAN-UP

A. Clean adjacent surfaces of excess sealant and sealant droppings as the work progresses, using solvents or cleaning agents recommended by manufacturer for surfaces to be cleaned.

B. Upon completion of sealant installation, remove all associated debris, empty containers, and surplus sealant from the job site. Do not leave excess sealants and accessories on the premises as "attic stock".

END OF SECTION

SECTION 07910

THROUGH PENETRATION PROTECTION SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General Conditions and other Specification Sections, apply to the Work of this Section.

1.02 REFERENCE STANDARDS

A. ASTM International E 814, "Standard Test Method for Fire Tests of Through-Penetration Fire Stops".

B. UL 1479, "Standard for Fire Tests of Through-Penetration Firestops"

1.03 SYSTEM PERFORMANCE REQUIREMENTS

A. F-Rated (flame penetration to the unexposed side of the construction assembly) Through-Penetration Firestop systems: Provide through-penetration firestop systems with F ratings indicated, as determined per ASTM E 814, but not less than the fire-resistance rating of the construction assemblies penetrated.

B. T-Rated (temperature rise on the non-fire side of the construction assembly) Through-Penetration Firestop Systems: Provide through-penetration firestop systems with T ratings, as determined per ASTM E 814, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupiable floor areas. T-rated assemblies are required where firestop systems protect penetrating items larger than a 4-inch-diameter nominal pipe or 16 square inches in overall cross-sectional area.

C. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E 119, but not less than the fire-resistance rating of the construction in which the joint occurs.

D. For firestopping exposed to moisture, and potential physical damage, only provide products that do not deteriorate when exposed to these conditions.

E. For piping penetrations for plumbing and wet-pipe sprinkler systems, only provide moisture-resistant through-penetration firestop systems.

F. For penetrations involving insulated piping, only provide through-penetration firestop systems not requiring removal of insulation.

1.04 SUBMITTALS

A. Provide manufacturer's literature illustrating details, materials, surface preparation, installation methods, and relationships to adjoining construction for each through-penetration firestop system, each kind of construction condition penetrated and each kind of penetrating item. Include firestop design designation from qualified testing and inspecting agency demonstrating compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from U.L. or other qualified testing and inspecting agency, applicable to each through-penetration firestop configuration required, for each construction type and all items penetrating such construction.

B. Submit certification from firestopping manufacturer indicating that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs), and that those products are nontoxic to building occupants.

C. Submit product certificates, signed by manufacturers of firestopping products, certifying that their products comply with specified requirements.

D. It shall be the Contractor's sole responsibility to submit and obtain approval from Fairfax County DPWES for through-penetration firestop system materials and systems approved by U.L. or other qualified testing and inspection agency, for the required through-penetration configurations.

1.05 WARRANTY

A. Submit copies of written warranty agreeing to repair or replace joint sealers which fail in joint adhesion, extrusion resistance, migration resistance, or general durability or appear to deteriorate in any other manner not clearly specified by submitted manufacturer's data. The warranty period shall be one year. See Section 01740 for effective date of warranty commencement.

1.06 QUALITY ASSURANCE

A. Installer's qualifications: A specialty firestop contractor experienced in installation or application of systems similar to those required for this project, plus the following:

1. Acceptable to or licensed by manufacturer, State, or local authority where applicable.
2. At least 2 years' experience with required systems.
3. Member in good standing of Firestop Contractors International Association (FCIA).

B. Local and State regulatory requirements: Submit forms of acceptance for proposed assemblies, if not conforming to specific UL Firestop System numbers, or UL classified devices.

C. Materials shall have been tested to provide fire rating at least equal to that of the type of construction being penetrated.

PART 2 - PRODUCTS

2.01 FIRESTOPPING, GENERAL

A. Through-Penetration Firestopping of Fire-Rated Construction:

1. Systems or devices listed in the U.L. Fire Resistance Directory under categories XHCR and XHEZ shall be used, and they shall conform to the construction type, penetrant type, annular space requirements and fire rating required for each condition. Systems shall be symmetrical for wall applications. Systems or devices shall be asbestos-free. Mortar systems shall be approved by Warnock Hersey International.
2. Additional requirements: Systems shall withstand the passage of cold smoke either as an inherent property of the system, or by the use of a separate product included as a part of the U.L. system or device and designed to perform this function.
3. Acceptable manufacturers and products.

    a. Those listed in the U.L. Fire Resistance Directory for the U.L. System involved. Mortar systems: approved by Warnock Hersey International.

4. All firestopping products shall be supplied by a single manufacturer.

B. Compatibility: Provide firestopping systems using components that are compatible with each other, the substrates forming the openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer, and based on testing and field experience.

C. Accessories: Provide components for each firestopping system that are needed to install fill materials. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:

1. Permanent forming, damming, and backing materials including the following:

    a. Semi-refractory fiber (mineral wool) insulation.
    b. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
    c. Fire-rated form board.
    d. Joint fillers for joint sealants.

2. Temporary forming material.

a. Substrate primer.
b. Collars
c. Steel sleeves.

D. Application: Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.

2.02 FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS (AS REQUIRED BY SYSTEM)

A. Intumescent, Latex Sealant: Single-component, intumescent, latex formulation.

B. Intumescent Putty: Non-hardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.

C. Intumescent Wrap Strips: Single-component, elastomeric sheet with aluminum foil on one side.

D. Silicone Foam: Two-component, silicone-based liquid elastomer that, when mixed, expands and cures in place to produce a flexible, non-shrinking foam.

E. Silicone Sealant: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealant of grade indicated below:

1. Grade: Non-sag formulation for openings in vertical and other surfaces requiring a non-slumping, gunnable sealant.

F. Products for Through Penetration Firestop Systems: Design standards and U.L. design assemblies listed on the Drawings are based on 3M Fire Protection products. These and other products listed below shall be acceptable, subject to compliance with the requirements of this Section and the Drawings:

1. Intumescent Latex Sealant:

a. Metacaulk 950, The RectorSeal Corporation.
b. Fire Barrier CP 25WB Caulk, 3M Fire Protection Products.

2. Intumescent Putty:

a. Pensil 500 Intumescent Putty, General Electrical Co.
b. Flame-Safe FSP1000 Putty, International Protective Coating Corp.
c. Fire Barrier Moldable Putty, 3M fire Protection Products.

3. Intumescent Wrap Strips:

a. Dow Corning Fire Stop Intumescent Wrap Strip 2002, Dow Corning Corp.
b. CS2420 Intumescent Wrap, Hilti Construction chemicals, Inc.

c. Fire Barrier Moldable Putty, 3M Fire Protection Products.

4. Silicone Sealants:

a. Dow Corning Firestop Sealant 2000, Dow Corning Corp.
b. Down Corning Firestop Sealant SL 2003, Dow corning Corp.
c. Pensil 100 Firestop Sealant, General Electric Co.
d. CS240 Firestop Sealant, Hilti Construction Chemicals, Inc.
e. Metacaulk 835, The RectorSeal Corporation.
f. Metacaulk 880, the RectorSeal Corporation.
g. Fyre-Sil, Tremco Inc.
h. Fyre-Sil S/L, Tremco Inc.

5. Cable Management through-Penetration Systems:

a. "Flame Stopper" Thru-Wall Fitting, The Wiremold Company, or comparable. System shall be compatible with cable trays.

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to beginning work, Contractor shall verify that joint dimensions, physical and environmental conditions are acceptable to receive work of this Section. Contact Architect or Owner's Representative immediately if conditions are not acceptable. Do not begin work until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping, in accordance with written recommendations of firestopping manufacturer and the following requirements:

1. Remove all foreign materials from surfaces of openings and joint substrates, and from penetrating items that could interfere with adhesion of firestopping.
2. Clean openings, joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form release agents from concrete.
4. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to area of bond; do not allow spillage and migration onto exposed surfaces.
5. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work, or would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears form firestopping materials. Remove tape in accordance with manufacturer's instructions in order to avoid disturbing firestopping seal and adhesion to substrates.

3.03 INSTALLING THROUGH-PENETRATION FIRESTOPS

A. General: Comply with the "System Performance Requirements" article in PART 1, the through-penetration firestop manufacturer's installation instructions and Drawing requirements.

B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for Through Penetration firestop systems in accordance with manufacturer's written instructions.

D. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.

E. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

F. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.04 INSTALLING FIRE-RESISTIVE JOINT SEALANTS

A. General: Comply with the "System Performance Requirements" article in PART 1, with ASTM C 1193, with the sealant manufacturer's installation instructions and Drawing requirements.

B. Install joint fillers to provide support of sealants during application and at position required to provide the cross-sectional shapes and depths of installed sealants relative to joint widths. Install fillers to allow optimum sealant movement capability and development of fire-resistance rating required.

C. Install sealants in accordance with manufacturer's written instructions to result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and to provide uniform, cross-sectional shapes and depths relative to joint width that allow optimum sealant movement capability. Install sealants at the same time joint fillers are installed.

D. Tool non-sag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads in configuration indicated or required to produce fire-resistance rating, as well as to eliminate air pockets. Ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces. Use only tooling agents approved by sealant manufacturer.

3.05 QUALITY CONTROL

A. Do not enclose firestopping with other construction until reports of examinations are issued.

B. Where deficiencies are found, repair or replace firestopping.

3.06 CLEANING

A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses, using methods and cleaning materials approved by manufacturers of firestopping products and which are suitable for substrates in which openings and joints occur.

B. Protect firestopping during and after curing period from contact with contaminating substances, and from damage resulting from construction operations or other causes until time of Substantial Completion and Owner acceptance.

1. If damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to produce firestopping complying with specified requirements.

C. Remove all excess materials, packaging, tools, and other items associated with the work of this Section and dispose of legally offsite.

END OF SECTION

SECTION 09110

NON-LOAD BEARING WALL FRAMING SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General Conditions and other Specification Sections, shall apply to this Section.

1.02 REFERENCE STANDARDS

A. ASTM A653 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.

B. ASTM A1003 - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.

C. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.

D. "Gypsum Construction Handbook" as published by United States Gypsum Company or "SFIA's Technical Guide for Cold-Formed Steel Framing Products" or a comparable manual as published by other acceptable manufacturer.

1.03 SUBMITTALS

A. Materials Lists: Complete list of materials proposed to be furnished and installed, stating manufacturer's name and catalog number for each item.

B. Manufacturer's Recommendations: Current recommended method of installation for each item. Recommendations shall be the basis for acceptance or rejection of actual installation methods used.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Protection: Use means necessary to protect metal products from rusting and damage before, during and after installation and to protect the installed work and materials of other sections.

B. Replacement: In event of damage, immediately make repairs and replacements necessary.

C. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI's "Code of Standard Practice".

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. ClarkDietrich Building Systems (basis of specification), West Chester, OH (www.clarkdietrich.com).

B. Directly comparable products of the following manufacturers:

1. MBA Building Supplies, Inc. Frackville, PA 17931 (www.mbastuds.com).
2. Southeastern Stud & Components, Inc., Montgomery, AL (www.sestud.com).

C. Other manufacturers, pre-bid approved in accordance with Section 01630, shall be acceptable.

2.02 MATERIALS

A. General: Items specified are products of ClarkDietrich Building Systems. All studs shall be fabricated from steel having 33KSI minimum yield strength or better.

B. Protective Coating: Comply with ASTM C 645; roll-formed from hot-dipped galvanized steel; complying with ASTM A 1003/A 1003M and ASTM A 653/A 653M G40 (Z120) or having a coating that provides equivalent corrosion resistance. A40 galvannealed products are not acceptable.

C. Metal Studs: ClarkDietrich ProSTUD 20 (20 gauge) with 1-1/4" flange; thickness as indicated on Drawings; 16" o. c. unless denoted otherwise on Drawings.

D. Ceiling and Floor Runner: ClarkDietrich ProTRAK to match studs with 1-1/4" flange.

E. Furring Channels: ClarkDietrich metal furring channel, 25 gauge; 7/8" x 2-23/32".

F. Metal Angle Runners: 24 gauge.

G. Cold Rolled Channels: ClarkDietrich cold rolled channels, 16 gauge; 3/4" and/or 1-1/2" as required.

H. All studs and accessories to be galvanized.

I. Backing Plate: Proprietary fire-resistance-treated blocking and bracing in width indicated.

1. Product: Subject to compliance with requirements, provide ClarkDietrich Building Systems; Danback Fire-Treated Wood Backing Plate D16F or D24F, or a comparable product.

J. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

1. Product: Subject to compliance with design requirements provide ClarkDietrich Building Systems; MaxTrak Slotted Deflection Track, or a comparable product.

2.03 FASTENERS

A. Runner fasteners, power-driven type, to withstand 193 pounds single shear and 200 pounds bearing force when driven through structural head or base and without exceeding allowable design stress in runner, fastener or structural support.

B. Screws: Pan self-drilling, self-tapping of size recommended by manufacturer for type of construction involved. See "Selector Guide for USG Screws" as printed in USG "Gypsum Construction Handbook."

2.04 AUXILARY MATERIALS

A. Isolation Strips at exterior walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt; ASTM D 226, Type I (No. 15 asphalt felt) nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8" (3.2 mm) thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to work, carefully inspect installed work and verify work is complete to point where installation may commence.

B. Verify that metal studs may be installed in accordance with original design and manufacturer's recommendations.

C. In event of discrepancies, immediately notify Owner's Representative and Architect. Do not proceed with installation until discrepancies have been fully resolved.

3.02 PREPARATION

A. Accurately lay out partitions and wall lines from dimensions given.

3.03 INSTALLATION

A. Install metal studs and accessory items in accordance with manufacturer's instructions, anchoring members securely in position.

B. Align partitions and wall assemblies to a tolerance of 1/8 inch in 8 feet, maximum variation from plumb or level in exposed line or surface.

C. Securely fasten floor and ceiling runners 24 inches o. c. with suitable fasteners or to suspended ceiling at 16 inches o. c.

D. Installation, Standard Metal Studs: ASTM C 754.

1. Position vertically in the runners, spaced 16 inches o. c.
2. Anchor studs located adjacent to door frames, partition intersections and corners to runner flanges by positive screw engagement with panhead screws through each stud flange and runner flange.
3. Splice, when necessary, by nesting two studs with a minimum lap of 8 inches and attaching flanges together with two screws in each flange.
4. When partitions abut an exterior wall, place an additional stud no greater than 6 in. from abutment.
5. Extend and brace partitions to structure above ceiling as required and indicated on drawings.
6. Install continuous isolation strips at all exterior wall and metal framing junctures to fully isolate metal from contact with exterior wall construction.

E. Isolation of Partitions from Structure: Where partitions abut ceiling or deck construction or vertical structural elements, provide slip or cushion-type joint between partition and structure as recommended by stud manufacturer to prevent the transfer of structural loads or movements to partitions.

F. Extend partition framing full height to structural supports or framing above suspended ceilings unless partitions are indicated to terminate at suspended ceilings.

END OF SECTION

SECTION 09250

GYPSUM WALLBOARD

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General Conditions and other Specification Sections, apply to the Work of this Section.

1.02 REFERENCE STANDARDS

A. ASTM C475 - Joint Treatment Materials for Gypsum Wallboard Construction.

B. ASTM C 1396 - Standard Specification for Gypsum Board.

C. ASTM E84 - Surface Burning Characteristics of Building Materials.

D. ASTM E90 - Laboratory Measurement of Airborne-Sound Transmission Loss of Building Partitions.

E. ASTM E119 - Fire Test of Building Construction and Materials.

F. FS HH-1-521 - Insulation Blankets, Thermal (Mineral Fiber, for Ambient Temperatures).

1.03 CONSTRUCTION STANDARDS

A. "Gypsum Construction Handbook" as published by United States Gypsum Co. or handbook of other approved manufacturer's; maintain one copy on job site.

B. ASTM C840 - Application and Finishing of Gypsum Wallboard.

1.04 SUBMITTALS

A. Submit the following:

1. Certified test reports of other acceptable testing agencies that perform testing in accordance with ASTM E119, E84, and E90 are acceptable.
2. Provide GREENGUARD Certification as a low emitting material that meets CHPS requirements.
3. Provide Data for the weighted average recycled-content valve both in postconsumer and secondary.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Coordinate delivery with installation to minimum storage periods at project site. Deliver in manufacturer's unopened bundles or packages, fully identified with manufacturer's name, brand, type and grade.

B. Protect from weather, soiling and damage, using handling equipment and storage techniques recommended by the manufacturer.

C. Store wallboard, trim and other accessories in a dry location, protected from weather and physical damage.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. U.S. Gypsum Co. (Basis of Specification), Chicago, IL (www.usg.com).

B. Products of the following manufacturers that meet or exceed the Specifications shall be acceptable:

1. Temple-Inland Forest Products Corporation, Diboll, TX (www.templeinland.com).
2. Gold Bond Building Products, National Gypsum Company, Charlotte, NC (www.nationalgypsum.com).
3. Georgia Pacific, Corp., Atlanta, GA (www.gp.com).
4. Lafarge North America, Inc., Herndon, VA (www.lafargenorthamerica.com).
5. CertainTeed, Valley Forge, PA (www.certainteed.com).
6. ClarkDietrich Building Systems, West Chester, OH (www.clarkdietrich.com).

2.02 MATERIAL (Products of U. S. Gypsum Co. are specified below, except as noted)

A. Gypsum Board:

1. Regular Board: USG "Sheetrock" - 5/8" unless otherwise denoted on Drawings: Complies with ASTM C1396 and Fed. Spec. SS-L-30D, Type III, Grade "R", Class 1.

B. Fasteners:

1. Screws: Self-drilling, self-tapping, bugle head, for use with power driver; minimum of Type S, 1 inch for single layer applications; 1-5/8 inch for two layer applications, in compliance with the recommendations of USG "Gypsum Construction Handbook."

C. Joint Treatment Materials:

1. Joint Tape: "Perf-A-Tape" perforated reinforcing tape.
2. Joint Compound: USG; ASTM C475, Ready-Mixed All-Purpose Joint Compound.

D. Metal trim: (products of ClarkDietrich Building Systems)

1. ClarkDietrich 103 Deluxe Corner Bead.
2. ClarkDietrich 093 Zinc Control Joint.
3. ClarkDietrich U-Trim M20A.

E. Gasket:

1. Sponge neoprene strips as recommended by wallboard manufacturer, 75 maximum flame spread, ASTM E84.

PART 3 - EXECUTION

3.01 INSPECTION

A. Check framing for accurate spacing and alignment to product surfaces within specified tolerances.

B. Verify that spacing of installed framing does not exceed maximum allowable for thickness of drywall to be used.

C. Do not proceed with installation of drywall until deficiencies are corrected and surfaces to receive drywall are acceptable.

1. Repair protrusions of framing, twisted framing members, or unaligned members before installation of drywall is started.

3.02 INSTALLATION

A. Install panels to a tolerance of 1/8 inch in 8 feet, maximum variation from plumb, or level in exposed line or surface, and with vertical joints on bearing.

B. Use panels of maximum size practical lengths to minimize end butt joints. Where unavoidable, locate end butt joints as far from center of walls or ceilings as possible and stagger in alternate courses.

C. Install gypsum drywall panel with face side out. Do not install imperfect, damaged, damp or wet panels. Butt panels together for a light contact at edges or ends with not more than 1/16 in. open space between panels. Do not force into place.

D. Locate edges or end joints over supports except in horizontal applications or where intermediate supports or gypsum board backblocking is provided behind end joints. Position panels so that tapered edge joints abut and mill-cut or field-cut end joints

abut. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partition/walls.

E. Provide additional framing and blocking as required to support gypsum drywall at openings and cutoffs.

F. Accurately measure and precut gypsum drywall units prior to installation. Make cuts from face side by scoring and snapping away from face side or by sawing. Completely cut paper on back face; do not break paper by tearing. Maintain close tolerances for accurate fit at joints between sheets and at framed openings and to allow for covering of edges of cutouts with plates and escutcheons. Cut edges smooth as required for neat and accurate fit.

G. Power-drive screws with electric screwdriver. Set screw so that head provides a slight depression below surface of drywall without tearing face of paper.

3.03 METAL TRIM AND CORNER BEADS

A. Carefully inspect Drawings and verify location of metal trim required.

B. Install trim in accordance with the manufacturer's recommendations.

3.04 TAPING AND FINISHING

A. Environmental conditions:

1. Control heating and ventilating during finishing operations to ensure the maintenance of 55 degrees F. minimum temperature.

B. First coat:

1. Spread compound evenly over joints, using suitable tools designed for the purpose.
2. Fill joint recesses and metal trim.
3. Center the reinforcing tape on joint and press into fresh compound, wiping down with sufficient pressure to remove excess compound but leaving sufficient compound under the tape for proper bond.
4. Feather edges and leave surface free from blisters and tape wrinkles.
5. Apply compound to fastener recesses, leaving flush with adjacent surfaces.
6. Fold reinforcing tape along centerline and apply to interior angles, following the same procedure as for joints.

C. Second coat:

1. Lightly sand dry compound with fine sandpaper to remove irregularities.
2. Apply a second coat of compound to joints, feathering approximately three inches beyond edges of tape.
3. Apply second coat to fastener recesses; allow to dry.

D. Third coat:

1. Lightly sand dry compound with fine sandpaper to remove all irregularities.
2. Apply final skim coat, feathering out approximately two inches beyond second coat.
3. Third coat fastener recesses and metal trim and interior angles; allow to dry.

E. "Smooth" finish:

1. Carefully sand coat to uniformly smooth surface free from irregularities visible to unaided eye at distance of five feet.

3.05 CLEAN UP

A. Do not allow accumulation of scraps and debris arising from work of this Section. Maintain the premises in a neat and orderly condition. In the event of spilling or splashing compound onto other surfaces, immediately remove spilled or splashed material and traces or residue.

B. Remove all excess materials from the project area after completion of all work and dispose of all materials legally. Do not leave any materials on the premises as "attic stock."

END OF SECTION

SECTION 09252

HIGH IMPACT GYPSUM WALLBOARD

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General Conditions and other Specification Sections, apply to the Work of this Section.

1.02 SCOPE (Install High Impact and Abuse Resistant Gypsum Wallboard at the following locations or as shown on the drawings).

A. Wall surfaces.

1.03 REFERENCE STANDARDS

A. U.S. Gypsum Company Guide SA929, "Abuse Resistant Systems."

B. National Gypsum "Gypsum Wallboard Systems" Guide.

C. ASTM C36 - Gypsum Wallboard.

D. ASTM C475 - Joint Treatment Materials for Gypsum Wallboard Construction.

E. ASTM E119 - Fire Test of Building Construction Materials.

F. ASTM C473 - Humidified Deflection.

G. ASTM D1037 - Linear Variation.

H. ASTM E72 - Racking Resistance.

I. Gypsum Association Manual GA-214, "Recommended Specifications For Levels of Gypsum Board Finish".

J. Gypsum Association Fire Resistance Design Manual, GA-600.

K. ICC ES Legacy Report, NER-684.

1.04 CONSTRUCTION STANDARDS

A. ASTM C840 – Standard Specification for Application and Finishing of Gypsum Wallboard.

B. Construction manual of approved gypsum manufacturer.

1.05 SUBMITTALS

A. Submit the following:

1. Certified Test Reports for testing performed in accordance with Reference Standards.
2. Provide GREENGUARD Certification as a low emitting material that meets CHPS requirements.
3. Provide Data for the weighted average recycled-content valve both in the postconsumer and secondary.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver wallboard, trim, and accessories in Manufacturer's unopened bundles or packaging, clearly identified by Manufacturer's name, brand, type, and grade.

B. Protect materials from weather, soiling, and damage in accordance with manufacturer's recommendations.

C. Store materials in a dry, secure location protected from physical damage. Store all panels flat (not vertically).

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Georgia-Pacific Gypsum Atlanta, GA 303031-800-225-6119 www.gpgypsum.com.

B. Other Manufacturers pre-bid approved in accordance with Section 01630, and complying with the requirements of this Section, shall be acceptable.

2.02 WALLBOARD

A. "DensArmor Plus High performance Interior Panel":

B. Impact-Resistant Gypsum Board:

1. ASTM E-136 (non-combustibility).
2. ASTM E-84: Flame Spread 5, Smoke Developed 0 (both faces of panels).
3. ASTM C-1278.
4. ASTM D-3273) Mold Resistance.
5. Description: Type X: ASTM 1396/C 1396M DensArmor Plus Fireguard resistance type gypsum-based panels.

a. Exposed face: High Strength Gypsum and cellulose fibers.
b. Core: Perlite.
c. Unexposed face: Glass fiber-mesh scrim embedded in high strength gypsum &cellulose fibers.
d. Long Edges: Tapered.
e. Thickness: 5/8 inch.

f. 95% recycled content material. Green Cross Certified by Scientific Certification Services (SCS).

C. Performance properties:

1. Surface Abrasion: Level 3 Tested in accordance with ASTM C1629.
2. Surface Indentation: Level 1 Tested in accordance with ASTM C1629.
3. Soft-body Impact: Level 3 Tested in accordance with ASTM C1629.
4. Hard-body Impact: Level 2 Tested in accordance with ASTM C1629.

D. Primer Finish – 40% weight solids content.

1. S-W HIGH BUILD Interior Latex Primer B28W08601 by Sherwin Williams (Basis of Design).

a. Comply with manufacturers recommendations on surface preparation and application.

2. Pre-bid approved manufacturer in accordance to this section and Section 01630.

2.03 ACCESSORIES

A. Accessories listed in paragraphs B through E are products of U.S. Gypsum Co. Comparable products by Georgia-Pacific Gypsum and National Gypsum and compatible with the "Hi-Impact" Fireshield panel shall be acceptable.

B. Fasteners: Corrosion-resistant, ASTM C-840. Self-drilling, self-tapping, bugle head screws for use with power driver. Use type S, 1" long for single layer applications; 1-5/8" for two-layer applications.

C. Joint Tape: "Sheetrock Joint Tape", U. S. Gypsum Co., ASTM C475. Use of fiberglass tape is not acceptable.

D. Joint Compound: "Sheetrock" Setting-Type ("Durabond") Joint Compound.

E. Beadex Metal Trim (U. S. Gypsum Co.).

2.04 Corner Bead and Trim:

A. Sheetrock Brand Paper Faced Metal Drywall Bead and Trim Paper-Faced Metal Trim for Gypsum Board:

1. Conform to profile and dimensions indicated.
2. Material for interior work: Comply with ASTM C1047.
3. Outside corners: Paper Faced Metal Bead and Trim B1W series by USG.
4. Inside corners: Flex Tape by USG.
5. Trims: L shape – B4 SERIES by USG; J shape: B9 SERIES by USG.

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to installing wallboard panels, carefully inspect metal framing for accurate spacing and alignment.

B. Verify that spacing of metal framing does not exceed that shown on Drawings and recommended for the thickness of wallboard to be installed.

C. Verify that depth of doorframes is compatible with the finished thickness of wall.

D. Do not proceed with wallboard installation until deficiencies are corrected and framing surfaces are acceptable for installation as recommended by Manufacturer.

3.02 INSTALLATION

A. Comply with ASTM C840 and Manufacturer's wallboard installation instructions.

3.03 METAL TRIM AND CORNER BEADS

A. Carefully inspect Drawings and verify location of metal trim required.

B. Install trim in accordance with Manufacturer's recommendations.

3.04 TAPING AND FINISHING

A. Environmental conditions:

1. Control heating and ventilating during finishing operations to ensure the maintenance of 55 degrees F. minimum temperature, with a maximum range of 55 to 70 degrees F.
2. Fill joint recesses and metal trim.
3. Center the reinforcing tape on joint and press into fresh compound, wiping down with sufficient pressure to remove excess compound, but leaving sufficient compound under the tape for proper bond.
4. Feather edges and leave surface free from blisters and type wrinkles.
5. Apply compound to fastener recesses, leaving it flush with adjacent surfaces.
6. Fold reinforcing tape along centerline and apply to interior angles, following the same procedure as for joints.

B. Second Coat:

1. Light sand dry compound with fine sandpaper to remove irregularities.
2. Apply a second coat of compound to joints, feathering approximately three inches beyond edges of tape.
3. Apply second coat to fastener recesses; allow to dry.

C. Third coat:

1. Lightly sand dry compound with fine sandpaper to remove all irregularities.
2. Apply final skim coat, feathering out approximately two inches beyond second coat.
3. Third coat fastener recesses and metal trim and interior angles; allow to dry.

D. "Smooth" finish:

1. Carefully sand coat to uniformly smooth surface free from irregularities visible to unaided eye at distance of five feet.

3.05 CLEAN UP

A. Do not allow accumulation of scraps and debris. Maintain the premises in a neat and orderly condition. In the event of spilling or splashing compound onto other surfaces, immediately remove spilled or splashed material and traces of residue.

B. Remove all excess materials from project area after completion and dispose of legally.

END OF SECTION

SECTION 09510

ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General Conditions and other Specification Sections, apply to the Work of this Section.

1.02 REFERENCE STANDARDS

A. ASTM A366 - Standard Specification for Steel, Carbon Cold-Rolled Sheet, Commercial Quality.

B. ASTM A641 - Standard Specification for Zinc-Coated (galvanized) Carbon Steel Wire.

C. ASTM C635 - Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.

D. ASTM C636 - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

F. ASTM E1264 - Classification for Acoustical Ceiling Products.

G. Provide data that the products meet or exceed the VOC content requirements of CHPS and GreenGuard certification.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's technical literature and installation instructions for each type of panel and grid suspension system specified in this section.

B. Certifications:

1. Provide manufacturer's certifications indicating compliance with specified requirements, including laboratory test reports conducted in accordance with specified tests and standards.
2. Provide VOC Emission Test Certificate in compliance with California Department of Public Health (CDPH).
3. Provide data information of the Recycled Content.

1.04 WARRANTIES

A. Provide manufacturer's 10-year limited warranty against visible sag of panels when subjected to environmental conditions of 104°F and 90% relative humidity.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original unopened packaging with all identification labels intact. Store in a dry; secure area, protected from exposure to moisture, sunlight, surface contamination, construction damage and other harmful conditions.

B. Handle components to prevent damage to panel edges, grid components and panel and grid finishes.

1.06 REPLACEMENT OF EXISTING ACOUSTICAL TILE CEILING *(RENOVATIONS)*

A. Work shall include removal and replacement of existing acoustical tile ceilings (panels and grid) where called for on the drawings.

B. Remove and replace acoustical tile ceilings (panels only) where called for on the drawings.

1.07 REMOVAL, STORAGE, AND REPOSITIONING OF EXISTING TILE CEILING (RENOVATIONS AND ALTERATIONS)

A. Where panels and/or grid members must be removed to accommodate work in existing ceiling space, carefully remove, store, and protect such items from construction damage. Prior to removing, tag any panels or grid that are damaged, and notify Architect and Owner's Representative. Carefully reposition panels and grid once overhead work in ceiling is completed.

PART 2 - PRODUCTS

2.01 SUSPENSION SYSTEM

A. Acceptable System: ASTM C-635 heavy duty system, double web exposed main runners and cross tees. Intermediate duty shall not be acceptable. Approved manufacturers shall be as follows:

1. Standard of Quality: Chicago Metallic Series 200 main runners and Series 229 cross tees, at 24" and 209 at 48".
2. Armstrong "Prelude XL": Series 7301 for main runners and Series 7328 for 24" cross tees (Series XL 7348 for 48" cross tees).
3. Pre-bid approved manufacturer in accordance with Section 01630.

B. Standard Grid: Non-fire rated, 15/16" exposed face, with components die cut and interlocking. Where indicated on Drawings, provide fire rated grid in compliance with UL Design Assembly.

C. Accessories: Splices, and edge moldings as required to complete, and compliment suspended ceiling grid system.

D. Materials/Finish: Commercial quality rolled steel with galvanized coating; white baked enamel finish on exposed surfaces.

E. Hangers: Minimum 12 gauge (0.106") galvanized carbon steel wire per ASTM A641 (Class 1); soft temper, pre-stretched with a yield stress load of at least 3 times design load; size and type to suit application and to rigidly secure complete acoustic unit ceiling system, with maximum deflection of 1/360.

F. Retention clips: for fire resistive ceiling/floor and ceiling/roof assemblies, and for ceiling areas adjacent to exterior doors in corridors; provide spring steel clips as required by rated assemblies, and as recommended by manufacturer for impact resistance.

G. Fascia Mouldings: For changes in ceiling elevations that are 8" or less:

1. Material/Finish: Commercial quality rolled steel with galvanized coating; white baked enamel finish (to match grid components) on exposed surfaces.
2. Approved Manufacturers:

a. Armstrong #7814 (4" height), #7816 (6" height) or #7818 (8" height) depending on change in elevation. Flange width: 1".
b. Comparable products of other ceiling system manufacturers approved under 2.01A of this Section shall be acceptable.

H. Soffit drywall Framing: Pre-Engineered drywall framing system for angles shown on documents. Provide brace as recommended by manufacturer.

1. Approved Manufacturers:

a. Armstrong Series HD8906 for drywall main beam runner, XL8945 Drywall Cross tee.
b. United States Gypsum Company (USG) DGLWE 1-1/2" main tees, DGLW224E or DGLW424E for cross tees with DGTC-90 Transition clips and associated splice clips and plates.
c. Rockfon Series 640 drywall runners and associated accessories.

2.02 LAY-IN PANELS

A. Standard Acoustical Panels (Type 1 for classrooms):

1. General characteristics: Mineral fiber composition, wet formed, factory applied white finish, class A flame spread, Type III, Form 2 per ASTM E1264; square edge design. Surface pattern shall be available in Fire Rated panels where rated assemblies occur.

a. Pattern: Fissured, non-directional surface.
b. Light Reflectance: 0.70 - 0.81.
c. NRC: .70.
d. CAC: 40.
e. Size: 24" x 48" x 5/8" thick.

2. Approved Manufacturers:

a. Armstrong World Industries, Inc., "School Zone Fine Fissured"with "HumiGuard Plus" #1714.
b. United States Gypsum Company (USG) "Radar Clima Plus," #2444.
c. Certain Teed "Fine Fissured" (HHF-497 DP).
d. Pre-bid approved Manufacturer in accordance with Section 01630.

B. Impact Resistant Acoustical Panels (Type 2 for corridors):

1. General Characteristics: ASTM E1264, Type III, Form 2, Class A (25 or less). Impact resistant in accordance with Gardner Impact Test or other comparable test procedure. Square edge design. Surface pattern shall be available in Fire Rated Panels where rated assemblies occur.

a. Pattern: medium coarse, or lightly perforated/lightly textured, non-directional texture.
b. Light Reflectance: 0.75 to 0.85.
c. NRC: 0.50 or better.
d. CAC: 35 to 39.
e. Size: 24" x 48" x 5/8".

2. Approved Manufacturers:

a. Armstrong "School Zone Fine Fissured" with "HumiGuard Plus" #466.
b. USG "Rockface Clima Plus".
c. Certain Teed "School Board" (SB-197).
d. Pre-bid approved manufacturer in accordance with Section 01630.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas where Work of this Section shall be installed. Notify the Architect and Owner's Representative of any adverse conditions encountered that would interfere with the proper installation of acoustical ceiling systems. Do not proceed until such conditions have been corrected. Work shall not commence until the work of "wet" trades has been finished and is thoroughly dry, and all major above-ceiling work is complete.

3.02 INSTALLATION

A. Install acoustical ceiling systems in accordance with ASTM C-636 and manufacturer's written instructions to produce finished ceiling true to lines and levels, free from warped, soiled, or damaged grid or lay-in panels.

B. Install ceiling systems in a manner capable of supporting superimposed loads, including light fixtures, with maximum permissible deflection of 1/360 of span and maximum surface deviation of 1/8 inch in 20 feet.

C. Coordinate the location of hangers with other installed work. Ensure hangers are located to accommodate fittings and units of equipment placed after installation of ceiling grid systems.

D. Suspend main runners from overhead structure with hanger wires spaced 4'-0" on center along the length of the runner. Hanger wire shall be plumb and straight.

E. Where ducts or other equipment prevent regular spacing of hangers, provide additional hangers to adequately support ceiling.

F. Hang suspension system independently of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of the longitudinal axis or face plane of adjacent members.

G. Install edge moldings at intersection of ceiling and vertical surfaces, using maximum lengths, straight, true to line and level. Miter corners. Provide edge moldings at junctions with other ceiling finishes. Where bullnose concrete block corners occur, provide preformed closers to match edge molding.

H. Fit acoustic lay-in panels in place, free from edge damage or other defects detrimental to appearance and function. Fit border units neatly against abutting surfaces.

I. Install lay-in panels level, in uniform plane and free from twist, warp and dents.

3.03 ADJUSTMENTS

A. Adjust sags or twists which develop in the ceiling systems and replace parts that are damaged or faulty. Remove and replace damaged components that cannot be successfully adjusted or restored.

3.04 CLEANING

A. Clean acoustical ceilings, including trim, edge moldings and suspension members in accordance with manufacturer's written recommendations.

B. Remove all excess materials, packaging, installation debris, and other rubbish associated with the work of this Section from the work site and dispose of legally.

END OF SECTION

SECTION 09900

PAINTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General Conditions and other Specification Sections, apply to the Work of this Section.

1.02 PRODUCT HANDLING

A. Deliver materials to the site in original, new, and unopened packages and containers bearing manufacturer's name and label.

B. Provide paint manufacturer's printed label on each container with the following information:

1. Name or title of material.
2. Manufacturer's stock number.
3. Manufacturer's name.
4. Analysis of major pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name or number.
8. Manufacturer's recommended wet and dry film thickness in mils.

1.03 COLOR SELECTION

A. Match color(s) of existing adjacent surfaces.

B. Proprietary names of a specified manufacturer used to designate colors or materials are not intended to imply that products of the specified manufacturer are required to the exclusion of equivalent approved colors or materials of other manufacturers.

1.04 PAINT COORDINATION

A. Provide finish coats compatible with prime paints used. Review other sections of specifications in which prime coats are specified to ensure compatibility of the total coating system.

1.05 DESCRIPTION OF WORK (EXISTING CONSTRUCTION ONLY)

A. Alterations in Existing Building: All painting and staining required for all new work and existing surfaces affected by such work shall be as specified in the following painting schedule.

B. Mechanical Equipment: Paint all exposed and concealed piping, valves, and pumps as scheduled in this Section for mechanical color coding.

1.06 WARRANTY

A. General Requirements, Warranty paragraph 7.

1.07 SUBMITTALS

A. Provide data that the products shall meet or exceed the VOC content requirements of South Coast Air Quality Management District (SCAQMD) Rule 1113.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Provide materials that meet or exceed the VOC content requirements of South Coast Air Quality Management District (SCAQMD) Rule 1113.

B. Provide undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer and use only within recommended limits.

C. Painting materials scheduled are products of Akzo Nobel (Glidden Professional and Devoe Coatings) (www.gliddenprofessional.com), except as otherwise noted. Comparable products produced by the following manufacturers are acceptable alternates to those scheduled:

1. Sherwin-Williams Co., (www.sherwin-williams.com).
2. Benjamin Moore and Company (www.benjaminmoore.com).
3. PPG Paints-PPG Architectural Coatings (www.ppg.com).
4. Duron Paints and Wallcoverings (www.duron.com).
5. Comparable products of other manufacturers, pre-bid approved in accordance with Section 01630, shall be acceptable.

D. Paint materials specified in the Painting Schedules of Part 3 are compliant with the Ozone Transport Commission (OTC) Regulations, as required by the Federal Clean Air Act. Comparable materials by other approved manufacturers shall be compliant with these regulations.

E. Renovations and Alterations: Oil-based paints shall not be applied on interior building surfaces, or other areas when exposure of occupants to fumes is a possibility.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine areas and conditions under which painting work will be performed. Notify Architect, in writing, of conditions detrimental to proper execution of the work. Do not proceed with work until unsatisfactory conditions have been corrected.

B. Starting of painting work will be construed as acceptance of surfaces within particular area.

C. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

3.02 SURFACE PREPARATION

A. General:

1. Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions for each substrate condition.
2. Remove hardware, hardware accessories, machine surfaces, plates, lighting fixtures and similar items in place and not to be finish painted, or provide surface applied protection prior to surface preparation and painting operations. Following completion of painting of each space or area, reinstall removed items.
3. Clean surface to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program the cleaning and painting so that dust and other contaminants from the cleaning process will not settle on to wet, newly painted surfaces.
4. Dislodge dirt, mortar splatters, and other dry materials from surfaces by scraping and brushing. Remove loose material by brushing, sweeping and vacuuming.

B. Previously Painted Surfaces:

1. A representative from the approved paint manufacturer shall visit the site and, together with the Owner's Representative, Architect and Contractor, shall inspect existing painted surfaces prior to preparation and repainting.
2. Thoroughly clean all surfaces in accordance with this Section, and the recommendations of the Paint Manufacturer's Representative.
3. Remove all loose or peeling paint by scraping or by means of low or non-VOC containing stripping system approved by the Owner's Representative and Architect.
4. Prepare existing epoxy surfaces by scuff sanding. Remove all loose particles.
5. Where new coatings are to be applied over existing oil-based paint, the surface shall be scrubbed clean and dried. The gloss shall be dulled

using sandpaper or wire brushing. Remove all dust or other loose particles.

6. All previously painted surfaces shall be completely re-primed, using a primer recommended by Paint Manufacturer for type of substrate and compatible with new topcoats.

   a. Prior to re-priming, perform a "patch test" covering approximately 2 to 3 square feet in area, by applying recommended primer and specified topcoats. Allow patch to dry thoroughly, and test for adhesion in the presence of Manufacturer's Representative, Owner's Representative, Architect and Contractor.

3.03 MATERIALS PREPARATION

A. Mix and prepare paint materials in accordance with manufacturer's directions.

B. Stir materials before application to produce a mixture of uniform density and stir as required during the application of the materials. Do not stir surface film into the material. Remove the film and if necessary, strain the material before using.

3.04 APPLICATION

A. General:

1. Apply paint by brush, roller, or spray in accordance with manufacturer's directions and paragraphs E and F. Use brushes best suited for type of material being applied. Use roller of carpet, velvet back or high pile sheep's wool as recommended by paint manufacturer for material and texture required. Spray paint uniformly with suitable equipment.

   a. Spray applications shall not be allowed when adjacent areas are occupied.

2. Number of coats and paint film thickness required is same regardless of application method.
3. Apply additional coats when undercoats, stains, or other conditions show through the final coat of paint, until paint film is of uniform finish, color, and appearance.
4. "Exposed surfaces" shall mean areas visible when permanent or built-in fixtures, convector covers, grilles, etc., are in place in areas scheduled to be painted.
5. Paint interior surfaces of ducts, where visible through registers, grilles, decorative ceiling, with flat, non-specular black paint.

B. Minimum Coating Thickness:

1. Apply each material at not less than manufacturer's recommended spreading rate, to provide a total wet and dry film thickness of not less than that indicated on manufacturer's printed label.

C. Pigmented (Opaque) Finishes:

1. Cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage.

D. Brush Application:

1. Brush-out and work brush coats onto surface in an even film. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

E. Mechanical Applications:

1. Limit roller applications to interior wall and ceiling finish coats. Apply each roller coat to provide equivalent hiding as brush-applied coats.
2. Confine spray application to metal framework, siding, decking, wire mesh, and similar surfaces where hand brush work would be inferior.
3. Wherever spray application is used, apply each coat to provide the equivalent hiding of brush-applied coats. Do not double back with spray equipment for the purpose of building up film thickness of two coats in one pass.

a. Do not use spray applications at acoustical concrete block units.

F. Complete Work:

1. Match samples for color, texture, and coverage. Remove finish or repaint work not in compliance with specified requirements.

3.05 PAINTING SCHEDULE, EXTERIOR (Existing and New)

A. Metal:

1 coat: PPG Paints: 90-912 Pitt Tech Plus WB DTM Metal Primer.
2 coats: PPG Paints; 90-1210 Series Pitt Tech Plus WB DTM S/G Enamel.
1 coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series.
2 coats: S-W Pro Industrial DTM Acrylic Semi-Gloss Coating, B66 -1150 Series.

3.06 PAINTING SCHEDULE, INTERIOR (See paragraph 3.02 for Surface preparation of existing surfaces; all existing surfaces shall be re-primed)

A. Metal:

1 coat: PPG Paints; 90-912 Pitt Tech Plus WB DTM Metal Primer (eliminate on shop primed items).
2 coats: PPG Paints; 90-1210 Series Pitt Tech Plus WB DTM S/G Enamel.
1 coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series.
2 coats: S-W Pro Industrial DTM Acrylic Semi-Gloss Coating, B66 -1150 Series.

B. CMU:

1 coat: PPG Paints; Professional: Block Filler Interior/Exterior Primer 3010-1200.
2 coats: PPG Paints; 6-4510X series SPEEDHIDE zero Interior Zero-VOC Latex Semi-Gloss.
1 coat: S-W PreRite Latex Block Filler B25W00025 (new block).
2 coats: S-W Pro Mar 200 Zero VOC Int. Latex Semi-Gloss B31-2600 Series.

C. Gypsum Wallboard:

1 coat: PPG Paints; 6-4900XI SPEEDHIDE zero Interior Zero-VOC Latex Sealer.
2 coats: PPG Paints; 6-4310XI Series SPEEDHIDE zero Interior Zero VOC Latex Eggshell.
1 coat: S-W Multi-Purpose Primer (repaint) or, Pro Mar Zero VOC Primer (new).
2 coats: S-W Pro Mar 200 Zero VOC Int. Latex Eg-Shel B20-2600 Series.

3.07 PAINTING SCHEDULE - MECHANICAL

A. Mechanical Equipment: (eliminate on pre-finished items):

1 coat: PPG Paints; 90-912 Pitt Tech Plus WB DTM Metal Primer (eliminate on shop primed items).
2 coats: PPG Paints; 90-1210 Series Pitt Tech Plus WB DTM S/G Enamel.
1 coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series.
2 coats: S-W Pro Industrial DTM Acrylic Semi-Gloss Coating, B66 -1150 Series.

B. Mechanical Color Coding:

1. Overflow and blowoff pipes to be painted LIGHT GREEN except as noted for boiler blowdown pipes. DO NOT PAINT motors, gauges, nameplates, A.S.M.E. labels, water gauge, and main operating control mechanism. Paint all valves with a color to match the pipe to which it is attached.
2. All exposed Fire Protection piping to be painted RED.
3. All exposed Gas piping (indoor and outdoor) to be painted YELLOW.
4. Direction arrows and letters, size proportioned to pipe size, shall be painted on all water, steam (if any), condensate (if any oil and gas piping, whether covered or uncovered, to indicate the direction of flow and pipe

type. Direction arrows over painted pipe shall be black or white and located where it can be easily read from the floor and spaced at each change of direction and not more than 20 feet apart on any one pipe. Direction arrows and letters on piping concealed within the ceiling or crawl space (if any) shall be in the same color as the color code and not more than 20 feet apart on any one pipe.

5. Size of arrow and letters proportioned according to size of pipe or covering as follows:

Diameter of Pipe or Covering	Size of Letter and Length of Arrow
Less than 1-1/4"	1/2" - 6"
1-1/2 to 2"	3/4" - 6"
2-1/2 to 3"	7/8" - 8"
3-1/2 to 4"	1-1/4" - 12"
4-1/2 to 5"	1-1/2" - 12"
6"	1-3/4" - 12"
7"	2" - 12"
8 to 9"	2-1/2" - 12"
10 to 1	3" - 12"
12" and over	3-1/2" - 12"

6. Colors: Safety Colors Conforming to OSHA and ANSI Standards:

Cold Water (Domestic)	Dark Blue
Hot Water 140^0 (Domestic)	Orange
Hot Water Recirc.140^0 (Domestic)	Orange with Black Banding
Tempered Water (Domestic)	Beige
Tempered Water Recirc. (Domestic)	Beige with Black Banding
Gas	Yellow
Steam	Red
Condensate	Black with Red Banding
Condensate Pump and Receiver	Black with Blue Banding
Receiver (Vac) Condensate	Black
Vacuum Pump and Air Separator (but not motor)	Green
Boiler Feed Pump and Piping (but not motor)	Light Blue
Chilled Water Supply	White
Hot Water Supply	Red with White Banding
Chilled Water Return	White with Black Banding
Hot Water Return	Black with Red Banding
Unloading Pump Overflow Pipe	Light Green
Burner Plate	Black
Boiler Blowdown, Pipes and Valves	Orange
Oil Lines	Brown
Oil Heater and Piping	Brown
Hot Water Heater Storage Tank	Light Gray
Boiler	Medium Gray - Lt.

Lines to Cooling Tower	Aluminum

7. Letters shall be provided for piping as shown in symbols list on drawings.

C. All equipment shall be labeled with a minimum of 4" high letters.

3.09 CLEANING

A. Touch-up and restore where finish is damaged.

B. Remove spilled, splashed, or splattered paint from all surfaces.

C. Remove all debris, painting accessories, paint cans, and other associated equipment from the premises and legally disposes of off-site. Do not leave surplus painting materials on the premises as "attic stock."

END OF SECTION

SECTION 15010

GENERAL PROVISIONS

PART I - GENERAL

1.01 GENERAL

A. The Bidding and Contract Requirements and General Requirements for the Construction of this project shall apply to this division and all sections herein.

B. Where items under the Bidding and Contract Requirements, and General Requirements are repeated in this section, it is intended to call particular attention to or qualify the items. It is not intended that any other parts under the Bidding and Contract Requirements of General Requirements shall be assumed to be omitted if not repeated herein.

1.02 SCOPE

A. The work included under this Division shall include a complete mechanical system as shown on the drawings and as specified herein. Any apparatus, appliance, material or work not shown on the drawings but mentioned in the specifications, or vice versa, or any incidental accessories necessary to make the work complete in all respects and ready for operation, even if not particularly specified, shall be furnished, delivered and installed by the contractor without additional expense to the Owner.

B. The contractor shall note that all items of equipment are specified in the singular; however, the contractor shall provide and install the number of items of equipment as indicated on the drawings and as required for a complete system.

C. It is the intention of the specifications and drawings to call for finished work, tested, and ready for operation. Wherever the word "provide" is used, it shall mean, "provide and install complete and ready for use."

D. Minor details not usually shown or specified but necessary for proper installation and operations shall be included in the contractor's estimate, the same as if herein specified or shown.

~~E. This contractor shall be responsible for participation and coordination with the Commissioning process as specified in section 01660.~~

1.03 APPLICABLE SPECIFICATIONS, CODES, STANDARDS AND PERMITS

A. All equipment, materials and installation shall conform to the requirements of national, state and local codes, laws, ordinances, rules and regulations. All utility connections shall conform to the requirements of the local utilities.

B. Unless otherwise specified herein or shown on the contract drawings, the work and materials shall conform to the applicable requirements of the following codes, standards and regulations:

1. VUSBC	Virginia Uniform Statewide Building Code
2. BOCA	Building Officials & Code Administrators International, Inc.
3. ICC	International Code Council
4. AMCA	Air Movement and Control Association International, Inc
5. ARI	Air Conditioning & Refrigeration Institute
6. ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
7. ASME	American Society of Mechanical Engineers
8. ASTM	American Society of Testing Materials
9. NEC	National Electrical Code
10. NFPA	National Fire Protection Association
11. OSHA	Occupational Safety and Health Association
12. SMACNA	Sheet Metal and Air Conditioning Contractors National Association
13. UL	Underwriters Laboratories, Inc.
14. ANSI	American National Standards Institute
15. AWS	American Welding Society
16. NEMA	National Electrical Manufacturer's Association
17. CISPI	Cast Iron Soil Pipe Institute
18. IRI	Industrial Risk Insurers
19. CAA	Clean Air Act Amendment of 1990 (Title VI, Section 608)
20. CTI	Cooling Tower Institute

C. Contractor shall give all necessary notices, obtain all permits and pay all Government taxes, fees and other costs, including costs for water, sewer, and gas connections or extensions including meters, in connection with his work, file all necessary plans, prepare all documents and obtain required certificates of inspection for work and deliver same to Owner before request for acceptance and final payment for work.

D. The contractor shall be responsible for purchasing equipment and appliances that bear the label of an agency, as approved by the Department of Public Works and Environmental Services (DPWES), Fairfax County. It shall be the responsibility of the contractor to pay for any label testing of equipment or appliances that are installed without the label of a DPWES approved agency.

1.04 SHOP DRAWINGS

A. The contractor shall submit shop drawings to the Architect for review with ample time for checking prior to delivery of any of this equipment or material to the job site. The project's and the contractor's names shall be on each submittal.

B. Shop drawings shall be submitted on all major pieces of equipment and material. Each item of equipment proposed shall be a standard catalog product of an established manufacturer. The shop drawing shall give complete information on

the proposed equipment such as: capacity, size, construction, material, dimensions, arrangement, operating clearances, performance characteristics, weight and rating authority. Each item of the shop drawing shall be properly labeled, indicating the intended service of the material.

C. The contractor shall, before submitting the shop drawings of the equipment to the Architect, check each item of the shop drawings to verify the proper equipment. Items to check shall include but not be limited to:

1) Will equipment physically fit into space.
2) Proper equipment for the job; electrical characteristics.
3) Voltage matches that of electric service; proper arrangements for connections.
4) Meets code requirements.

D. The shop drawings shall be neatly bound and submitted to the Architect with a letter of transmittal, which shall list each item, submitted with the manufacturer's name.

E. Review of the shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings have been reviewed, said review does not mean that drawings have been checked in detail; said review does not in any way relieve the contractor from his responsibility or the necessity of furnishing material or performing work as required by the contract drawings.

1.05 EQUIPMENT DEVIATIONS

A. Where the contractor proposes to use an item of equipment other than the prototype equipment (a specified manufacturer's equipment used as the basis of design) or that detailed on the drawings which requires any redesign of the structure, partitions, foundations, piping, wiring or any other part of the mechanical, electrical or architectural layout, all such redesign and all new drawings and detailing required therefore shall be prepared by the contractor at his own expense and be approved by the Owner and Engineer.

B. Where such deviation from the prototype equipment requires a different quantity and arrangement of materials and equipment, the contractor shall furnish and install any such ductwork, piping, structural supports, insulation, controllers, motors, starters, electrical wiring and conduit and any other additional equipment required by the system at no additional cost to the Owner.

1.06 QUALIFICATIONS FOR BIDDERS

A. The contractor shall examine drawings and specifications relating to work of all trades and become fully informed as to the extent and character of work required and its relation to all other work in the project prior to submission of bid or prior to start of any construction covered by these specifications and drawings.

B. Before submitting bid the contractor shall visit the site and examine all adjoining

existing building, equipment and space conditions on which his work is in any way dependent, for the best workmanship and operation according to the intent of the specifications and drawings. Contractor shall verify dimensions and fully inform himself as to the nature and scope of the proposed work and also the conditions under which it is to be conducted. He shall report to the Owner any conditions that in his estimation might preclude him from installing his equipment and work in the manner intended and noted on the drawings and in this specification. Failure to take the above precaution will in no way relieve the contractor from his obligations to provide the material and work as indicated and as specified without additional cost to the Owner or extension of completion time.

1.07 TEMPORARY FACILITIES

A. Are specified under Temporary Facilities, the General Conditions, Supplementary General Conditions, and Division I. General requirements are hereby made a part of this section as fully as if repeated herein.

1.08 DRAWINGS

A. The drawings are diagrammatic, indicating general arrangement of work, and should not be scaled to establish location of work. The drawings show the size of piping and ductwork branches, risers and equipment, and must be followed. Where a change of location or method of running becomes necessary due to obstructions or other construction difficulties, such changes shall be made after securing approval of the Owner in writing and at no increase in amount of contract.

B. Decisions regarding any and all substitutions and options permitted by the specifications shall be submitted for approval to the Owner. Approval will only be recognized when in writing.

C. In finished spaces all piping and ductwork shall be concealed or run behind furring unless shown otherwise. Where concealing is not possible piping and ductwork may be exposed after obtaining the Owner's approval.

D. All horizontal piping and ductwork not run below slab on grade shall be run as close as possible to underside of floor and parallel to building lines. Maintain maximum headroom in all areas.

E. All vertical piping and ductwork shall be run as close to walls and partitions as practicable.

F. Coordination of all other trades prior to erecting any piping or ductwork is required to avoid conflict between various components of the building.

1.09 COOPERATION WITH OTHER TRADES

A. The contractor shall give full cooperation to other trades and shall furnish in writing, with copies to the Owner, any information necessary to permit the work of all trades to be installed satisfactorily with the least possible interference or delay.

B. Where the work of the contractor will be installed in close proximity to work of other trades, or where there is evidence that work will interfere with work of other trades, he shall assist in working out space conditions to make a satisfactory adjustment. This contractor shall prepare composite working drawings at a scale not less than 1/4" = 1'-0" clearly showing how his work is to be installed in relation to the work of the other trades. If the contractor installs his work before coordinating with other trades or as to cause any interference with work of other trades he shall make necessary changes to his work to correct the condition without additional cost to the Owner.

C. The contractor shall furnish to other trades as required all necessary templates, patterns, setting plans and shop details for the proper installation of the work and for the purpose of coordinating adjacent work.

D. Structural support elements as shown on the drawings must be in place prior to the installation of piping or the setting of rooftop equipment. The contractor shall not install any piping or rooftop equipment until such elements are in place.

1.10 ELECTRICAL WIRING

A. The contractor shall, regardless of voltage, furnish and install all temperature control wiring, all interlock wiring, and equipment control wiring for the equipment that the contractor furnishes unless otherwise noted. Division 16 will furnish and install power wiring to the mechanical equipment and make electrical connections unless otherwise noted on the drawings.

B. All electrical wiring furnished under the mechanical contract shall conform with Division 16.

1.11 FOUNDATIONS AND SUPPORTS

A. Contractor shall provide all necessary foundations, supports, pads and bases required for mechanical equipment and any other equipment furnished under this contract, unless covered under the architectural or structural work.

B. For pumps, compressors and other rotating machinery and all equipment where foundations are indicated, furnish and install concrete pads 4" in height (unless otherwise noted) extending not less than 4" beyond equipment base in all directions. Equipment installed in areas other than slab on grade shall be installed with the appropriate vibration assembly.

C. Construction of foundations, supports, pads, bases and piers where mounted on the floor, shall be of the same materials and same quality of finish as the adjacent

and surrounding flooring material.

1.12 SCAFFOLDING, RIGGING AND HOISTING

A. Unless otherwise specified, contractor shall furnish all scaffolding, rigging, hoisting, shoring and services necessary for erection and delivery into the premises for any equipment and apparatus furnished and shall remove same from premises when no longer required.

1.13 CUTTING AND PATCHING

A. On new work the contractor shall furnish sketches showing the locations and sizes of all openings and chases and furnish and locate all sleeves and inserts required for the installation of the mechanical work before the walls, floors and roof are built. The contractor shall be responsible for the cost of cutting and patching where any mechanical items were not installed or where incorrectly sized or located. The contractor shall do all drilling required for the installation of his hangers.

B. On alterations and additions to existing projects, the contractor shall be responsible for the cost of all cutting and patching unless otherwise noted.

C. No structural members shall be cut without the approval of the Owner, and all such cutting shall be done in a manner directed by him. All patching shall be performed to match the existing surface in shape, texture and color.

1.14 ACCESSIBILITY

A. The contractor shall locate equipment, which must be serviced, operated or maintained in fully accessible position. Equipment shall include but not be limited to: valves, traps, or low limit devices, damper operators, motors, controllers, drain points, fusible links of fire dampers, fire dampers, filters, etc. If required for better accessibility, furnish access doors for this purpose. Minor deviations from drawings may be made to allow for better accessibility, and any change shall be approved. Motor starters shall be installed not more than 6'-0" above finished floor unless otherwise approved by the Owner.

B. All filters furnished with air handling equipment shall be readily removable from sides or bottom of cabinet as required by equipment location. Contractor shall verify location of all equipment and proper location of access to filters for removal before submitting shop drawings, placing order for equipment and setting and connecting of equipment. Any filters deemed by the owner to be inaccessible after installation will be made accessible by the contractor at no additional cost to the owner.

1.15 RECORD DRAWINGS

A. The contractor shall keep daily updated accurate records of all deviations in work as actually installed from work indicated on the contract drawings. The record drawings shall be kept at the job site, available to the Owner at all times and

labeled as "Project Record Information - Job Set". When work is completed one complete set of marked-up prints shall be delivered to the Owner.

1.16 PERSONNEL INSTRUCTION AND OPERATING INSTRUCTIONS

A. The contractor shall submit for approval three (3) copies of all of the manufacturer's installation, operating and maintenance manuals for all new mechanical equipment listed in the equipment schedule, all necessary components of mechanical equipment, testing and balancing reports, equipment start-up records, equipment capacity (input and output) and a list of filter sizes and belt sizes for all mechanical equipment that requires filters and belts (this includes, but is not limited to, fan coils, unit ventilators, rooftop units, cabinet heaters, exhaust fans and air handlers). Submit four (4) copies of the operating and maintenance manuals for the automatic temperature control system components and diagrams for approval. A complete written narrative of how each system is intended to operate shall be included. Manuals shall be assembled in black vinyl hardback loose-leaf binders, labeled with job name, address and date. Information on each piece of equipment of system shall be in a separate tab labeled section. Provide a complete index of the contents. After approval by the Engineer the binders shall be forwarded to the Owner.

B. After all tests are conducted and approved as specified below, furnish a competent operating engineer for a period of two days to instruct and demonstrate to the Owner or his authorized representative the operation of the system. The mechanical systems demonstration shall not coincide with the electrical demonstration. Notify the owner in writing of the person to whom this instruction was given and the date it was given.

C. On phased construction projects the aforementioned equipment start-up records shall be completed and made available to the owner for review prior to the occupancy of the completed phase.

1.17 TESTS

A. The contractor shall, at his expense, conduct capacity and general operating tests on each system. The test shall demonstrate the specified capacities of the various pieces of equipment and shall be conducted in the presence of the Owner or his authorized representative. The general operating tests shall demonstrate that the entire equipment is functioning in accordance with the contract documents. Furnish all instructions and test equipment.

B. After all systems are completely tested, submit three copies of the test results to the Owner for approval before final acceptance of project.

1.18 EQUIPMENT AND SYSTEMS CHECKOUT AND START-UP

A. This contractor is responsible for the checkout and start-up of all equipment and systems. Equipment start-up shall be in accordance with the manufactures requirements and recommendations and shall be performed by personnel who are

knowledgeable with the equipment and its requirements. When required by the equipment manufacturer or as noted in the specifications, equipment checkout and start-up shall be performed by personnel certified by the manufacturer. Evidence of proper certification of startup personnel shall be provided to the owner.

B. All checkout and start-up activities are the responsibility of this contractor.

C. This contractor shall notify FCPS two weeks prior to equipment checkout and start-up.

D. Systems and equipment shall be operated at both full and part load conditions to ensure specified requirements can be achieved.

E. The equipment manufacturer's checkout and start-up logs shall be completed in their entirety; should a reference be non-applicable it shall be marked as such. Copies of completed logs shall be submitted to FCPS personnel the day of checkout and start-up activities, as well as included in the Operation and Maintenance manual.

1.19 WARRANTY

A. The contractor shall deliver the work described herein in a first-class operating condition in every respect. The contractor shall also warrant that the material, equipment and workmanship furnished shall be entirely free from defects for a period of one year. All apparatus will develop capacities and characteristics specified, and that if during the period of one year - from date of substantial completion (See Warranty Section, General Requirements, paragraph 7) any such defects in workmanship, materials or performance appear, he will, without cost to the Owner, remedy such defects within a reasonable time. In default thereof, Owner may have such work done and charge the cost to the contractor. In cases where equipment warranties through the manufacturer exceed the periods listed in these specifications, the manufacturer's warranty shall take precedence. The contractor is responsible for all periodic service and maintenance required to maintain such warranties on completed work for the duration of the project (See Warranty Section, General Requirements, paragraph 7. Once the entire project is substantially complete, periodic maintenance shall be the responsibility of the owner.

1.20 CONNECTING INTO EXISTING UTILITIES

A. Procedures: The procedures used for the accomplishment of connecting into existing work shall provide for safe conduct of the work, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services.

B. Scheduling of Work: Work shall be performed in the sequence, locations and time periods agreed to by the Owner prior to commencement of work.

C. Dust Control: The amount of dust resulting from connecting existing utilities shall be controlled to avoid creation of a nuisance in the surrounding area. Masks shall be worn for protection against dust inhalation by all persons in the vicinity of work involving removal of masonry.

D. Protection of Existing Work:

1. Existing work and furnishings to remain shall be protected from damage. Work damaged by the Contractor shall be repaired to match existing work without any additional cost to the Owner.
2. Cover equipment as necessary, to protect it from dust.
3. Floors shall be protected from damage.
4. At the end of each workday and during inclement weather, close exterior openings with weatherproof cover.
5. Provide temporary filter media on any portions of existing ductwork which communicate with corridors and construction areas. This media shall be checked frequently and changed as necessary.

E. Environmental Protection: Contractor shall comply with all Federal and local regulations pertaining to Environmental Protection.

F. Removal of Existing Equipment and Materials: Existing equipment and materials shall be dismantled and/or cut-up so as to be removable through existing building's access passages. No alterations to the building shall be made for the purpose of removing existing equipment and material.

G. Clean-up:

1. Debris and Rubbish: Remove debris and rubbish from the site daily. Do not allow to accumulate in building or on site.
2. Debris Control: Remove and transport debris in a manner so as to prevent spillage on site or adjacent areas.
3. Regulations: Local regulations regarding hauling and disposal shall apply.

1.21 DOWNTIME

A. The contractor shall so arrange his work that domestic water, gas, storm sewer, sanitary sewer, air conditioning, and heating systems shall be maintained at all times while the school classes are in session.

B. The contractor shall submit written requests to disconnect any existing utility services and to obtain equipment downtime. Only after receiving Owner approval of these requests shall work be allowed to proceed. This contractor shall be responsible for restoring the existing utilities.

C. If contractor fails to provide domestic hot/cold water, gas, sewers, air conditioning and/or heating systems as specified herein it is understood and agreed that there will be liquidated damages deducted in the amount as stated in Division 01010, per school per consecutive calendar day.

1.22 CONSTRUCTION LIMITATIONS

A. In renewal projects which require work to be continually done, above the corridor ceilings, while school is in progress. The following requirements shall be met:

1. No construction material may be stored in a corridor at any time.
2. Any work done in the corridors after school hours must allow a minimum corridor of 72" to remain for safe egress. No work such as welding, soldering, etc., which is considered hazardous to the occupants of the building, may take place during school hours.
3. The contractor shall immediately clean any area of debris, if work is done in any occupied space.
4. No gas-powered construction equipment will be allowed in the building during school hours.

END OF SECTION

SECTION 15050

BASIC MATERIALS AND METHODS

PART I - GENERAL

1.01 GENERAL

A. The Bidding and Contract Requirements, General requirements and section 15010 - General Provisions, shall apply to this section.

1.02 SCOPE

A. The work covered under this section covers the basic materials and methods for a complete mechanical system.

PART 2 - PRODUCTS

2.01 PIPE AND PIPE FITTINGS

A. All materials shall be of an approved type and shall be designed for the pressures and temperatures at which they are to be operated, for the materials they are to handle and for their intended use.

B. Materials shall conform to the standard reference numbers listed below. See individual sections of the specifications for use.

1. Ductile Iron Water Pipe - (Water Service) - AWWA C151.
2. Copper Tubing (Water Distribution - Type L or K) - ASTM B75, B88, B251.
3. Cast Iron Fittings – ASME B16.4, B16.12; ASTM A74, A888; CISPI 301.
4. Copper Fittings - ASME B16.15, B16.18, B16.22, B16.23, B16.26, B16.29, B16.32
5. Cast Iron Soil Pipe - ASTM A74, A888; CISPI 301.
6. Copper Pipe (Waste, Vent, & Hydronic) - ASTM B42, B302.
7. Galvanized Steel Pipe (Waste & Vent) - ASTM A53.
8. Polyvinyl Chloride (PVC) Plastic Pipe - ASTM D2665, D2949.
9. Plastic Fittings - ASTM D2466, D2467, D2468, D3311, F409, F438, F439.
10. Concrete Pipe - ASTM C14, C76.
11. Steel Pipe - ASTM A53, A106.
12. Malleable Iron Fittings - ASME B16.3.
13. Steel Butt Welding Fittings - ASME B16.9.
14. Steel Fittings - ASTM A420.
15. Gray Cast Iron Fittings - ASTM A126.
16. Steel Pipe Flanges - ASME B16.5.

2.02 PIPING SPECIALTIES

A. Piping Specialties shall be designed and installed to meet the intended use including pressures and temperature.

1. Gaskets - Shall be full face with a working pressure of 300 lbs. and temperature up to 212 * F. Gaskets shall be manufactured by JM CLIPPER, US PIPE, FNW, or AMERICAN.
2. Strainers - HONEYWELL-BRAUKMAN, ARMSTRONG or SARCO.
3. Unions:

a. Unions shall be of an approved type, shall meet the requirements for the pressure and temperature at which they are to operate and shall be compatible with the pipe materials.
b. Brass Couplings - Shall be used for connecting steel pipe to copper tubing.
c. Die-electric unions or waterways shall not be permitted.

4. Escutcheons - Escutcheon plates shall be stamped brass chromium plated, shall be of sufficient size to cover sleeved openings for the pipes, shall be of sufficient depth to cover sleeves projecting above floors, and shall be manufactured by BLATON AND CALDWELL, DEARBORN BRASS, MASON or GRINNELL.
5. Gauges and Thermometers - Shall be as listed below unless otherwise specified under other sections of the specifications.

a. Temperature Gauges or Thermometers - Shall be the separable socket, adjustable angle type, not less than 9" scale V-shaped, organic filled, blue reading column. Range shall be applicable for the service. Thermometers shall be adjustable type to permit easy reading from floor and outside of insulation, as manufactured by ASHCROFT, WEKSLER, TAYLOR or TRERICE.
b. Pressure Gauges - Shall be of the liquid filled, bourdon-tube type with dial diameter not less than 4" and operating range 0 - 160 psig. Install a shut-off cock in line to each gauge. Gauges as manufactured by ASHCROFT, WEKSLER, TAYLOR or TRERICE.
c. Compound Gauges - Shall be of the liquid filled, bourdon-tube type with dial diameter not less than 4" and operating range 30" - 0 - 30 psig. Install a shut-off cock in line to each gauge. Gauges as manufactured by ASHCROFT, WEKSLER, TAYLOR or TRERICE.

2.03 PIPE HANGERS AND SUPPORTS

A. Pipe Hangers and Supports Material - Provide a combination of pipe hangers and supports such as steel and copper clad clevis hangers, round steel rods, concrete inserts, clamps, brackets and other items as applicable. Hangers and supports shall meet the recommendations of the manufacturer. Parallel runs of horizontal piping shall be grouped together on adjustable trapeze hangers. All hangers in contact with copper pipe shall be copper-plated. Pipe hangers and support shall

be of the size to accommodate the pipe and insulation where applicable. Pipe hangers and supports manufacturer: MASON, GRINNELL, CARPENTER AND PATERSON, ANVIL or NIBCO.

B. Hanger Spacing for Horizontal Pipe shall not exceed:

1.	Cast Iron Soil Pipe (all diameters)	5'-0"
2.	Plastic Pipe (all diameters)	4'-0"
3.	Schedule 40 Steel Pipe	
	½" to 1" Pipe	6'-0"
	1-1/4"to 2" Pipe	8'-0"
	2-1/2" to 4" Pipe	10'-0"
	5" and Larger Pipe	12'-0"
	½" to ¾" Pipe	5'-0"
	1" Pipe	6'-0"
	1-1/4"Pipe	7'-0"
	1-1/2"to 2"Pipe	8'-0"
	2-1/2" Pipe	9'-0"
	3" Pipe	10'-0"
	3-1/2" Pipe	11'-0"
	4" Pipe	12'-0"
	5" Pipe	13'-0"
	6" Pipe	14'-0"

C. Hanger Spacing for Vertical Pipe shall not exceed:

Cast Iron Soil Pipe	At the base and at each story
Threaded Pipe	At each story
Plastic Pipe	At each story and at the midpoint between floors
Copper Tube	At each story

D. Hanger Rods shall be at least:

Pipe to 2"	3/8" diameter
2 1/2" to 3"	1/2" diameter
4" to 5"	5/8" diameter
6" to 8"	3/4" diameter
10" to 12"	7/8" diameter

E. Sheet Metal Saddles - Supports for insulated pipes shall not contact the pipe but shall surround the unbroken covering. Provide galvanized steel sheet metal saddles properly formed to the jacket between hanger and the lower 1/3 of the circumference. The size of the saddles shall be as follows:

Pipe to 3"	24 gauge x12" long
4" to 6"	18 gauge x 12" long
8" and larger	16 gauge x 12" long

2.04 VALVES

A. Valves shall be of an approved type and shall meet the requirements for the pressure and temperature at which they are to be operated, for the material they are to handle and for their intended use. Valve manufacturers are listed in the individual sections of the specifications.

B. Valve and Tag Chart - Furnish and install on each valve a brass tag with a number and the abbreviation PLMB (for plumbing) HVAC (for mechanical systems) embossed in the brass tag for each valve and securely fastened to each valve wheel with beaded chain or brass wire. Provide a laminated chart in the water heater room, showing the locations and use of each valve. Laminating film shall be at least 10mil thick. Two charts shall be provided - one for the plumbing valves and one for the heating and cooling valves. The plumbing valves shall start with number 1 and continue consecutively until all plumbing valves are numbered. The heating and cooling valves shall start with number 1 and continue consecutively until all heating and cooling valves are numbered. A copy of the valve tag charts shall also be contained in the operation and maintenance manual.

2.05 ACCESS DOORS

A. The contractor shall furnish access panels not smaller than 16 X 16" for access to concealed valves, traps, dampers, etc. where no other means of access is provided. Access panels shall be all steel construction with nom. 16-gauge wall or ceiling and nom. 14 gauge panel door with not less than 1/8" insulation secured to inside of the door. Doors shall be supported with concealed hinges and secured with suitable clips and countersunk flush screws. Outside of access panels shall be flush with finished wall or ceilings, except that where panels are located in acoustic tile or paneling, the door shall be recessed to receive adjacent finish material. The contractor shall determine the final position of each access door and the size to be used. Access panels shall be as manufactured by MILCOR. Fire ratings of access door shall not be less than the surface on which the door is installed. Where required by specifications locking access doors shall be fitted with a HL302 lock cylinder and key.

2.06 ELECTRIC MOTORS

A. The contractor shall provide and install all electric motors for equipment furnished under Division 15. All motors shall be NEMA standard design for quiet operation. The motors shall be of ample size to operate at their proper load and full speed continuously without causing noise, vibration or temperature rise in excess of the rating. Provide high efficiency motors when called for on the drawings or hereinafter specified.

B. Motors with belted drives shall be mounted in a manner to allow for belt adjustment. All belts shall be adjusted before turning project over to owner. All motors with belt drives shall have belt guards.

2.07 ELECTRIC MOTOR STARTERS

A. The contractor shall furnish all motor starters complete with lugs sized to receive conductors specified and with accessories as required such as stop-start push button switches, hand-off-auto selector switches, pilot lights, remote switches, auxiliary contacts, transformers, relays, fuses and overload thermal units or heaters. Contractor coil voltage shall be 24 volts. All components are to be housed within enclosure.

1. The motor starters shall be the type to meet the requirements of the motor and shall be in accordance with NEMA Standards, sizes and horsepower ratings. The starters shall be manufactured by SQUARE 'D', GENERAL ELECTRIC, CUTLER-HAMMER or SIEMENS.
2. Three phase motors shall have across-the-line magnetic starter and single-phase motors shall have manual starters. The starters shall have NEMA 1 enclosures unless otherwise noted or required. Outdoor starters shall have weatherproof enclosures.
3. The starter shall have an overload thermal unit in each phase conductor. The thermal units shall be sized as recommended by the manufacturer for full protection of the motor.
4. All three phase motors and equipment with compressors shall be provided with three phase motor protectors as manufactured by DIVERSIFED, SLM-ASE series (match voltage to corresponding model number). Unit shall include range plug, output fuse, output switch, line adjustment, status/trouble lights and adjustable/selectable operation with built-in time delays. Unit shall be U/L labeled. Protectors as manufactured by TIMEMARK #265 or MOTECTOR Power Guardian PLUS shall also be acceptable.

2.08 EQUIPMENT

A. Equipment shall be furnished and installed as listed in the specifications or as required for a complete project.

B. All equipment shall be new and shall bear the manufacturer's name and trade name. The equipment furnished under each section of the specifications shall be essentially the standard product of a manufacturer regularly engaged in the production of the required type of equipment.

C. All three-phase equipment and equipment with compressors shall be provided with three phase motor protectors as manufactured by DIVERSIFIED, SLM-ASE series (match voltage to corresponding model number). Unit shall include range plug, output switch, line adjustment, status/trouble lights and adjustable/selectable operation with built-in time delays. Unit shall be U/L labeled. Protectors as manufactured by TIMEMARK #265 or MOTECTOR Power Guardian PLUS shall also be acceptable.

D. Nameplates/Labels – Provide engraved pin-attached laminated plastic nameplates for all pumps, air handling units, exhaust fans, boilers, chillers, fan powered

heaters unit ventilators, fan coil units, blower coil units, terminal devices, VAV boxes, VRF units, fire dampers, smoke detectors and roof mounted equipment. Where equipment is located above the ceiling, nameplates shall be mounted on the ceiling below the device. Exhaust fans located on the roof will require two separate nameplates; one is to be attached to the fan, the other on the ceiling grid directly below the fan. Each nameplate shall identify the item served, such as "PRV-2."or "SMOKE DETECTOR AHU-1" Laminated plastic shall be one eight (1/8) thick, black with white center core, exception: fire damper nameplates shall be red with white center core. Nameplates shall be a minimum of one inch by three inches, with minimum one-quarter inch high block lettering. Adhesive backed, embossed lettering tape is not acceptable. Exhaust grilles or registers in each space shall be labeled. Each label shall identify the exhaust fan serving this grille or register, such as "PRV-2". Identification labels shall be BROTHER type "P-TOUCH", clear tape with upper case letters, minimum ¼ inch high block lettering, and black printing and shall be located on the ceiling grid next to the grille or register.

PART 3 - EXECUTION

3.01 PIPE, FITTINGS AND JOINTS

A. Pipe and Fittings

1. Pipe, fittings and specialties stored at the job shall be stored in such a manner as to prevent dirt and moisture from collecting in the material. Openings in the piping system during construction shall be protected at all times from foreign matter entering the piping system. PVC piping shall not be stored in direct sunlight.
2. Installation - The piping shall be installed complete and shall be of the size required by code. When a size is not indicated or is in conflict with other drawings, the contractor shall request the pipe size from the engineer. All piping shall be cut accurately from dimensions established at the project site and allowances shall be made for the clearance of windows, doors and other openings. No part of the building structure may be cut to allow for the installation of piping unless specifically approved in writing.
3. All piping shall be installed parallel or perpendicular to the building construction and shall be installed so as to allow for expansion and drainage. Due to the small scale of the drawings, it is not possible to show all elbows and swing joints required to allow for expansion; however, the contractor shall install three elbow swing joints at all runouts and other connection to mains.
4. Install continuous galvanized sheet metal drip pan under all water piping passing through all rooms with electrical equipment such as electrical, elevator equipment and transformer rooms and all other spaces provided primarily for the installation of electrical equipment. Drip pan shall be channeled out of the space and be extended to the closest drain.
5. Eccentric reducing fittings or eccentric reducing couplings shall be installed to bring top of mains in line and prevent pockets. Eccentric fittings will not be required on water mains. Ends of pipes shall be reamed out before

being installed.

6. Pipe Sleeves:

   a. Pipe sleeves shall be installed on all pipes passing through walls, ceilings and floors except floor slabs on grade. On insulated pipes the sleeves shall be large enough to pass the insulation without damaging the vapor barrier. The ends of the sleeves shall extend 1/2" above the finished floor and made watertight around sleeve. Where pipes pass through fire rated floors and wall the space between the pipe and the sleeve shall be fire stopped and smoke stopped with the appropriate U.L. rated assembly. Sleeves not in contact with the earth shall be schedule 40 black steel pipes, except sleeves in poured concrete slabs above grade may be a manufactured pipe sleeve. PVC sleeves shall not be used in plenum spaces.

   b. Pipe Sleeves in contact with the earth shall be cast iron. The space between the pipe and the cast iron pipe sleeve shall be packed with oakum with a lead joint and made watertight. The pipe passing through and under footings and wall below grade shall have cast iron sleeves. The sleeves not entering the building need not be watertight.

B. Piping Joints

1. Screwed Joints - Screwed joints shall be made with full cut American Standard Pipe Thread. All pipes shall be reamed to full diameter of the pipe. Pipe thread compound shall be applied to the male thread only.
2. Welded Joints:

   a. Welded joints for steel pipe 2 1/2" and larger shall be made in accordance with the procedure standard in the American Standards Association piping code, and before assigning any welder to work covered, the contractor shall provide for the approval of the name(s) of pipe welders to be employed in the work, together with certification that each of these welders has passed qualification tests as prescribed by the National Certified Pipe Welding Bureau or by other reputable testing laboratory or agency using procedures approved by the ASME or American Welding Society. The contractor shall use only approved factory manufactured welding type fitting for the intersection welding or branching to mains. Valves and specialties shall have screwed or flanged joints.

   b. Welding tees, ells, reducers and caps shall be of wrought or forged construction similar to those manufactured by TUBE TURNS, INC. In lieu of wrought or forged welding tees for branch outlets, weldolets or welding nipples may be used; provided, first that the nipples are accurately coped in the shop to fit the pipes and leveled for field welding; and provided, second that openings in the walls of pipes are cut to full inside diameter of the nipples; and third, that the outlet diameter shall be less than 3/4 the diameter of the main.

c. For connections on welded piping to valves 2 1/2" and over and that of other accessories required to be flanged, weld neck or slip-on companion flanges shall be used. The flange face shall be in every case perpendicular to the axis of the pipe valve.

3. Solder Joints - the solder joint above grade shall be made, unless otherwise noted, with 95/5, lead free solder using approved flux. All underground joints and refrigeration joints shall be made with an approved silver bearing solder. Cut pipe shall be reamed to full diameter. Copper to steel pipe shall be made with proper fittings.
4. Cast Iron Pipe Joints - for bell-and-spigot soil pipe the joint shall be firmly packed with oakum and filled with molten lead not less than 1" deep and not to extend more than one-eighth inch below the rim. The use of a neoprene gasket when installed in accordance with the manufacturer's recommendations is also acceptable.
5. Concrete Pipe Joint - Shall be bituminous joint compound or a cement plaster installed in accordance with the manufacturer's recommendations. Joints firmly packed with oakum and filled with a concrete mortar, which shall extend mortar to 3" beyond the hub, shall also be acceptable. All joints shall be made with precast concrete fittings.
6. Flanged joint - The flanged joint shall be made with the proper number and size of bolts and with the proper gasket between the flanges.
7. Plastic Pipe Joints - Shall be made with solvent as recommended by the pipe manufacturer.

3.02 PIPE SPECIALTIES

A. Pipe specialties shall be installed as indicated in the specifications and as required to make a complete system.

B. Escutcheon Plates shall be mounted on all exposed pipes extending through wall, floor, ceiling or cabinet bases. On insulated pipes the escutcheon shall be on the outside of the insulation.

C. Pressure and Compound Gauges shall be installed with shut-off cock in the line to each gauge.

3.03 PIPE HANGERS AND SUPPORTS

A. All pipes shall be supported from the building structure, and wherever possible, parallel runs of horizontal piping shall be grouped together on adjustable trapeze hangers. Single runs of horizontal piping shall be supported with clevis type hangers. The hangers shall be on the outside of the insulation. Vertical risers shall be supported at each floor line with steel pipe clamps. All hangers in contact with copper pipe shall be copper plated. The use of wire or perforated metal to support pipe will not be permitted. In no case shall copper pipe be in contact with a ferrous metal.

B. The pipe hanger spacing and support shall be as listed under 2.03 in this section.

C. Where piping is supported from the steel, the support shall be attached at the top of the steel. Attachments shall be made either by welding or using top beam clamps.

D. Any supplemental steel required between building structural members shall be provided by this contractor.

3.04 VALVES

A. The contractor shall install valves where indicated on the drawings and where required for adequate control of the system. Provide shut-off valves at the base of the risers and main branches at points of take-offs from the supply or return mains. Branches shall be considered main branches when they serve three or more units or fixtures. Provide valves necessary to isolate each piece of equipment separately from the remainder of the system. Valves shall be installed in accessible locations. Allow isolation for inspection, maintenance and repair of each piece of equipment and each service loop. Provide valves to allow for the phasing of work where required. Valve size shall be the same as the pipe size except for control valves.

B. Valves shall be installed with their stems in an upright or horizontal position. Stems shall not be inverted.

C. After approval of a particular valve, this type valve shall be used throughout the project. Do not mix styles or manufacturers.

D. Ball valves shall be provided with a 2" extended handle of a non-thermal conductive material and shall include a protective sleeve that allows operation of the valve without breaking the vapor seal or disturbing the insulation. Extended handle shall be internally insulated.

3.05 ACCESS DOORS

A. Install hinged and lock type access doors as required for operation and maintenance of equipment. The access doors shall be installed so that they maintain the rating integrity of the material in which they are mounted. Those with an exposed surface in a finished area shall be flush with the finished material with a recessed space for installation of flush matching materials when in panel or acoustical tile.

3.06 ELECTRIC MOTORS

A. Electric motors shall be supplied with equipment furnished under Division 15. All moving parts shall be protected as required by OSHA.

3.07 ELECTRIC MOTOR STARTERS

A. Electric motor starters and accessories shall be installed under Division 16.

B. Three phase motor protectors shall be installed in accordance with manufacturers' recommendations and installation instructions. Unit shall be selected for voltage specified.

3.08 EQUIPMENT

A. The contractor shall receive and properly store the equipment pertaining to the mechanical work. The equipment shall be tightly covered and protected against dirt, water, chemical or mechanical injury and theft. The manufacturer's directions shall be followed completely in the delivery, storage, protection and installation of all equipment and materials.

B. The contractor shall provide and install all items necessary for the complete installation of the equipment as required by code without additional cost to the owner, regardless of whether the items are covered in the specifications. Such items could be - but are not limited to: concrete pad, supports, vibration eliminators, additional piping and valves, motor controllers, relief valves and piping, insulation, electrical wiring, lubrication, refrigerants and start-up and service.

C. It shall be the responsibility of the contractor to clean the equipment, make necessary adjustments and place the equipment into operation before turning equipment over to the Owner. Any paint that was scratched during construction shall be touched-up with factory color paint. Any items that were damaged during construction shall be replaced.

D. Where equipment is supported from the steel, the support shall be attached at the top of the steel. Attachments shall be made either by welding or using top beam clamps.

E. Three phase motor protectors shall be installed in accordance with manufacturer's recommendations and installation instructions. Unit shall be selected for voltage specified. Motor protectors shall be installed prior to start-up.

F. Permission for the use of new HVAC equipment to be used as a method for providing temporary heating or cooling shall be at the discretion of the owner. The use of new HVAC equipment for temporary heating or cooling shall not modify the terms of the warranty nor shall it constitute substantial completion or beneficial use. The mechanical contractor is responsible for providing a dust free HVAC system and shall correct all equipment or system damage caused by construction operations. New HVAC equipment used for temporary heating or cooling shall have the filters changed on a regular basis or as directed by the owner and prior to turning over equipment for permanent operation. The spare filters provided by the specifications shall not be used for this purpose. The equipment fan belts shall be inspected for excessive wear and replaced as directed by the owner. The equipment cooling coils, condensing coils, heat exchangers, energy recovery devices and associated ductwork shall be inspected for cleanliness and cleaned as directed by the owner, to a level satisfactory to the owner which may include this work to be done by an independent third party contractor at this contractors expense.

G. The mechanical contractor shall set all outside air dampers to the approximate minimum position during equipment installation and prior to the start- up of equipment.

H. The installer shall be responsible for providing and installing new fan or motor sheaves and belts when required to obtain the designed airflow.

END OF SECTION

SECTION 15250

INSULATION

PART I - GENERAL

1.01 GENERAL

A. The Bidding and Contract Requirements, General Requirements, Section 15010 - General Provisions and Section 15050 - Basic Materials and Methods, shall apply to this section.

1.02 SCOPE

A. The work covered under this section shall include providing and installing the insulation on the items listed in this section or as shown on the drawings.

1.03 QUALITY ASSURANCE

A. All insulation shall have a composite fire hazard rating as tested by ASTM E-84, NFPA 25 or UL 723 not to exceed 25 flame spread, 50 smoke developed, and 50 fuel contributed.

1.04 SUBMITTALS

A. Provide shop drawings on proposed insulation as described in section 15010 - 1.04. Shop drawings shall include proposed uses of all insulation components.

PART 2 - PRODUCTS

2.01 GENERAL

A. The manufacturer of the products specified in this section shall be OWENS-CORNING, CERTAIN-TEED, JOHNS-MANVILLE, ARMSTRONG, MANSON or KNAUF.

2.02 PIPING INSULATION

A. The piping shall be insulated with heavy density rigid molded fiberglass pipe insulation with factory applied all service jacket (ASJ) with a 'K' factor not to exceed .25 @ 75°F mean temperature. The minimum insulation thickness for the various items shall be as follows:

1. Domestic Cold Water Piping and Cold Water Makeup Piping - 1/2". Exceptions: Exterior walls and plumbing chases shall be 1".
2. Domestic Hot Water, Tempered Water and Hot Water Recirculating Piping -1". Piping greater than 1-1/2" shall have 1-1/2" thick insulation.

Exceptions: Fixture runouts in interior plumbing chases and walls may be 1/2".

3. Condensate Piping - 1".
4. Refrigerant Piping - 1" closed cell, semi-slit pipe insulation with a composite fire hazard rating as tested by ASTM E-84 not to exceed 25 flame spread and 50 smoke developed. Prototype: ARMSTRONG Armaflex AP.

B. Sheet Metal Saddles - See section 15050 - 2.03.

C. Finish - Exposed Piping - Cover with 8 oz. canvas jacket.

1. Exposed piping in the kitchen shall be insulated per the specification and covered with a PVC jacket 20 mil thick, white in color, washable and approved by the USDA and the FDA.

2.03 PIPING, FITTINGS, VALVES AND SPECIALTIES INSULATION

A. Fittings, valves and specialties for the piping systems shall be insulated by two-piece molded fiberglass fittings with an insulating value equivalent to the pipe insulation. Acceptable alternative insulation methods shall be as described in paragraph 3.02 D.

B. The following piping, fittings, valves, and specialties shall be insulated.

1. Domestic cold-water piping.
2. Domestic hot water, tempered water and hot water recirculating piping.
3. Condensate piping.
4. Refrigerant Piping.

C. Finish - Insulation on exposed piping fittings, valves and specialties shall be covered with an 8-oz. canvas jacket.

2.04 DUCTWORK INSULATION

A. Concealed Supply/Return, including flexible connections (horizontal FCU's) And Outside Air Ductwork - Unless noted otherwise on the drawings shall be insulated with fiberglass duct wrap insulation at 1 pound per cubic foot density, having a facing of laminated composite aluminum foil and kraft paper reinforced with a glass reinforcing, with a perm rating not exceeding .05. The 'K' value shall not exceed .29 @ 75 degrees F mean temperature. The duct wrap insulation shall have a minimum thickness of 2 inches. Insulate flexible connections on horizontal fan coil units.

B. Exposed Supply/Return and Outside Air Ductwork - Unless noted otherwise on the drawings shall be insulated with 6 pounds per cubic foot density fiberglass insulating board having a facing of laminated composite aluminum foil and kraft paper reinforced with a glass reinforcing with a perm rating not exceeding .05. The 'K' value shall not exceed .23 @ 75°F mean temperature. The duct board shall

have a minimum thickness of 1-1/2 inches. Exposed ductwork shall include but is not limited to, ductwork in accessible attics, equipment mezzanines, boiler rooms and equipment rooms. The exposed supply/return and outside air ductwork shall also be covered with an 8-ounce canvas jacket and be prepared for painting.

C. Insulation on Supply/Return Air Ductwork Mounted Outdoors shall be as specified in section 15840.

PART 3 - EXECUTION

3.01 GENERAL

A. All insulating material shall be installed in accordance with the manufacturer's recommendations by personnel regularly employed in the pipe, duct and equipment insulating trade.

B. The insulation shall not be applied until all surfaces are clean and dry and until inspected and released for insulation application.

C. A complete moisture and vapor seal shall be provided on cold surfaces where vapor barrier jackets or coatings are required. Anchors, hangers, and other projections shall be insulated and vapor sealed to prevent condensation.

D. Pipe or duct insulation shall be continuous through walls and floor openings except where walls or floors are required to be fire stopped or required to have a fire resistance rating.

3.02 PIPE INSULATION APPLICATION

A. Pipe insulation shall be installed in accordance with the manufacturer's instructions.

B. Piping (except refrigeration piping) - Butt all joints firmly together. Ends of pipe insulation shall be sealed off with a vapor barrier coating at all fittings and valves. The insulation laps and butt strips shall be sealed by one of the following methods:

1. Insulation without self-seal laps shall have lap adhesive manually applied to all laps and butt strips. Stapling is not acceptable.
2. Insulation with self-seal laps shall have lap adhesive manually applied to the outside of all laps and butt strips after installation. Stapling is not acceptable.

C. Refrigeration Piping and domestic water piping using closed cell insulation – Butt joints and seams shall be joined together with contact adhesive Prototype-Armstrong 520 or manufacturer's recommended adhesive. Both surfaces to be joined shall be coated with the adhesive.

D. Fittings and Valves - Shall be insulated with molded fiberglass fittings, segments of pipe covering, or with firmly compressed foil faced fiberglass blanket. Mitered joints are not acceptable. Secure in place with 20-gauge corrosion resistant wire and apply a smoothing coat of insulating cement. Vapor seal by applying a layer of open weave glass cloth fabric embedded between flood coats of vapor barrier mastic. Lap glass fabric 2 inches onto adjacent pipe. PVC covers are acceptable only if the item covered is fully insulated first. Insulation shall be installed so the cover cannot be deformed. Contractor shall request an inspection by the Owner of the insulated items prior to cover installation.

E. Finish - All exposed piping, and piping fittings, valves and specialties insulation shall receive an 8 oz. canvas jacket smoothly pasted in place with lagging adhesive and sized with one brush coat of lagging adhesive. The finished surface shall be suitable for painting. Exposed piping includes piping in accessible attics, equipment mezzanines, boiler rooms and equipment rooms.

F. Outdoor Piping - Weatherproofing Finishes for All Outdoor Insulation.

1. Piping - Apply aluminum metal jacket 0.016" with moisture barrier around pipe and slip edge into preformed Z lock positioned to shed water. Butt next jacket section leaving approximately 3/8" gap. Place preformed 2" butt aluminum band and wing seal.
2. Fittings - Apply prefabricated metal fittings in composition to pipe jacketing.

G. Sheet Metal Saddles shall be provided and installed on all pipe hangers as stated under section 15050, 2.03. .

H. Pipe Insulation Support - All insulated piping shall be supported at hanger and sleeve locations by either using a high-density pipe insulation or wooden blocking, installed inside the vapor barrier for all pipe sizes one inch and larger. High-density pipe insulation shall be of the type as recommended by the manufacturer and shall be substituted for no less than the bottom half section of the fiberglass pipe insulation. The lengths of the high-density insulation shall be at least two inches longer (each end) than the length of the saddle. The lengths of wooden blocking shall be eight inches. Wooden blocking shall be the same thickness as the pipe insulation, the same width as the pipe, shall be tapered within the insulation and shall be centered at the hanger. Remove portions of the fiberglass pipe insulation by peeling back the factory applied all service jackets from the insulation and cut out and replace the required sections for either method of insulation support. Re-wrap the vapor barrier to completely enclose the installation. Manually apply lap adhesive to the outside lap and apply butt strips. The installations shall also meet any additional requirements recommended by the insulation manufacturer.

3.03 DUCTWORK INSULATION APPLICATION

A. Fiberglass Duct Wrap Insulation - The duct wrap insulation shall be secured to the ductwork with fire retardant adhesive in sufficient quantities to prevent sagging. Ducts with a width of over 30" shall be further secured on the underside with

mechanical fasteners on 18" maximum centers. Insulation shall be butted with facing overlapping all joints at least 2" and sealed with fire retardant vapor barrier adhesive. Seal all breaks and punctures with vapor barrier tape and same type of fire-retardant adhesive. Stapling is not acceptable.

B. Fiberglass Insulating Board Application

1. The insulating board shall be secured to the ductwork with mechanical fasteners. The fasteners shall be spaced 12" to 18" on center with a minimum of two rows per side of duct. Secure insulation in place with washers firmly embedded in insulation. Seal all joints, breaks and punctures with fire retardant vapor adhesive reinforced with a 3" wide strip similar to that of facing.
2. Finish - A glass cloth shall be applied over the facing into a wet coat of fire-retardant adhesive, overlapping seams at least 2". Apply finish coat of same fire-retardant adhesive.

END OF SECTION

SECTION 15350

NATURAL GAS PIPING

PART 1 - GENERAL

1.01 GENERAL

A. The Bidding and Contract requirements, General Requirements, Section 15010 - General Provisions, and Section 15050 - Basic Materials and Methods, shall apply to this section.

1.02 SCOPE

A. The work under this section shall include a complete natural gas piping system.

1.03 QUALITY ASSURANCE

A. All work shall conform with the International Fuel Gas Code, NFPA 54 - National Fuel Gas Code, local gas code, and local gas supplier's requirements.

B. The entire piping system shall be tested and approved before being placed in operation.

1.04 SUBMITTALS

A. Provide shop drawings on all piping and valves as described in Section 15010 – 1.4. Shop drawings shall include proposed uses of all items.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS

A. Gas Piping Above Ground - Shall be schedule 40 black steel pipe with malleable screwed 125 psi fittings or schedule 40 black steel pipe with 150 psi weld fittings.

B. Gas Piping Underground - Shall be plastic pipe and compatible fittings conforming with ASTM D2513, and shall be installed as recommended by the pipe manufacturer and local requirements.

C. Gas Piping Below Floor Slab on Grade - Shall be schedule 40 black steel pipe with malleable screwed 125 psi fittings run inside a pipe sleeve that is vented to the outside atmosphere. Pipe sleeves that are located below floor slabs, in walls or non-plenum spaces shall be schedule 40 PVC pipe and fittings. Pipe sleeves located in plenum spaces shall be welded schedule 40 black steel pipe with 150 psi welded fittings. Pipe sleeves shall terminate to the outside atmosphere through the roof or exterior wall, shall be turned down to prevent water from entering system and shall have a bug screen over the end of pipe.

2.02 VALVES

A. Gas valves shall be of the approved type with an AGA/UL label and shall be installed as required. Gas valves shall not be located in plenum spaces. Provide operating nut in lieu of lever handle for all valves located outside of the building. Pressure regulating valves shall be as manufactured by SENSUS or MAXITROL.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The Contractor shall coordinate the service with the local gas supplier.

B. The Contractor shall make the gas connection to all gas equipment.

C. The Contractor shall coordinate the gas pressures required with the local gas supplier. Gas piping shall be supplied at 2 psi from the meter and throttled down to a minimum of 11" W.C. at the units.

D. Unions shall not be located in plenum spaces.

E. Paint all gas piping with yellow exterior semi-gloss paint

END OF SECTION

SECTION 15401

DOMESTIC WATER PIPING SYSTEM

PART I - GENERAL

1.01 GENERAL

The Bidding and Contract Requirements, General Requirements, Section 15010 - General Provisions, and Section 15050 - Basic Materials and Methods shall apply to this section.

1.02 SCOPE

The work covered under this section shall include a complete domestic water piping system.

1.03 QUALITY ASSURANCE

All water piping shall be tested for leaks before the insulation is applied and before the piping is covered up. The test shall be at least 100 psi of water pressure for duration of 12 hours.

All grooved couplings, and fittings, valves and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.

All casting used for coupling housings, fittings, valve bodies, etc., shall be date stamped for quality assurance and traceablility.

1.04 SUBMITTALS

Provide shop drawings on all piping and valves as described in Section 15010 - 1.04.

PART 2 – PRODUCTS

2.01 PIPE AND FITTINGS

A. Water piping above grade. Shall be one of the following:

1. Type 'L' hard drawn copper tubing with 125 psi wrought copper sweat fittings and all joints soldered with 95/5 or silver solder.
2. The use of mechanically formed tee connections is acceptable. Branches shall be formed up to the run tube size as shown in ASTM 2014. Forming procedures shall be in accordance with tool manufacturer's recommendations.
3. Grooved mechanical pipe couplings, fittings, valves and other grooved components may be used as an option to brazing, soldering or flanged

methods. All grooved components shall be of one manufacturer and conform to local code approval. Grooved end product manufacturer to be ISO-9001 certified. Grooved couplings shall meet the requirements of ASTM F-1476. Grooved components shall be manufactured by VICTALUIC. Grooved components manufactured by GRINNELL or ANVIL INT. are acceptable providing all aspects of the specification are met. No substitutions.

a. All products shall be UL classified in accordance with ANSI /NSF-61 for potable water service and shall meet the low-lead requirements of NSF-372.
b. Copper pipe shall be roll grooved in accordance with manufacturer's current listed standards.
c. Mechanical couplings for joining copper pipe shall be cast of ductile iron conforming to ASTM A-395, grade 65-45-15 and ASTM A-536, grade 65-45-12. Housings shall be cast with an angle pattern bolt pad for direct connection of copper without flaring to IPS dimensions. Coupling bolts shall be zinc plated (ASTM B-633) heat treated carbon steel track head conforming to physical properties of ASTM A-449 and ASTM A-183. Couplings shall be coated with copper colored alkyd enamel paint. Zinc electroplated bolts and nuts conforming to ASTM B633 shall be provided for couplings.
d. Gaskets for grooved piping shall be molded of synthetic rubber in a configuration conforming to the copper tube size outside diameter and coupling housing. Gaskets shall be" E "EPDM compound designated for domestic water use and complying with ASTM, UL/ULC and ANSI/NSF standards.
e. Couplings shall be installation-ready, for direct slab installation without field assembly.
f. Fittings for grooved piping shall be full flow smooth turn copper fittings with copper tube size grooves designed to accept grooved end couplings. Fittings shall be wrought copper per ASTM B-75 alloy C12200 and ANSI B16-22; bronze sand castings per ASTM B-584 copper alloy CDA 836 (85-5-5-5) per ANSI B16.18. Victaulic copper connection.

2.02 VALVES

Valves shall be manufactured by VICTAULIC, STOCKHAM, JENKINS, HAMMOND, MILWAUKEE, CONBRACO INDUSTRIES, INC., APOLLO VALVES, FAIRBANKS, CRANE, WATTS, NIBCO or JOMAR. All valves shall be certified to be lead free in accordance with NSF/ANSI 61 section 8, which states that the wetted surfaces of all plumbing valves shall have a weighted-average lead content of no more than 0.25%.

A. Ball valves 2 1/2" and smaller- These valves shall be sweated bronze full port, with chrome plated ball, have extended insulated handles (such as NIBCO'S Nib-seal or Apollo Valves Therma-seal) and rated at not less than 200-pound wog.

B. Gate valves larger than 2 1/2" - Shall be flanged iron body OS & Y gate valve with

stainless steel or bronze trim, ductile iron wedge and a minimum rating of 125 psi and 200-pound wog.

C. Check valves 2 1/2" and smaller - Shall be sweated bronze, horizontal swing check valves with solid bronze discs and a minimum rating of 200-poundwog.

D. Check valves larger than 2 1/2" - Shall be flanged ductile iron, horizontal swing check valves with stainless steel or cast-iron disc and a minimum rating of 200-pound wog.

E. Balancing valves – Valves shall be manufactured by CIRCUITSOLVER with integrated union assembly model CSUA. Thermostatic balancing valve assembly shall include union body and ball valves. CIRCUITSOLVER vales size 1/2" to 1", based on pipe size, shall be rated for the return system temperature (110°F, 120° F, 140°F). Acceptable manufacturers shall include HAYS FLUID CONTROLS.

2.03 PRESSURE REDUCING VALVES

Pressure reducing valves shall be as shown on drawings and shall be manufactured by MUELLER, WATTS or A.W. CASH.

2.04 BUILDING TEMPERING VALVE

A. Building Tempering Valves – LEONARD VALVE Model XL-690 2PS-LF, ASSE 1070 approved with unions, ball valves, and thermometers.

PART 3 - EXECUTION

3.01 PIPING SUPPORTS

Piping supports in general shall be as called for in section 15050. Support of pipe, tubing and equipment shall be accomplished by means of engineered products, specific to each application. Makeshift, field devised methods shall not be allowed. The Supports shall be as manufactured by HOLDRITE, M-CO., ADJUSTO-SYSTEM, SUMMER SYSTEM, CARPENTER&PATTERSON, or BRACKET SYSTEM.

3.02 CLEANING/DISINFECTION OF PIPING SYSTEM

The entire piping system shall be flushed, disinfected and restored to operation in accordance with the provisions of the international plumbing code and the Health Department requirements. All new, repaired or extensions of existing piping systems shall be flushed and disinfected prior to utilization. Provide owner with a copy of the disinfection report. The report shall include as a minimum, chlorine solution concentration/duration method used, system pH level data including levels prior to commencement of work, levels during pre-flushing and levels during post flushing. System cleaning shall be witnessed by the owner.

3.03 VALVES

A. Gate Valves/Ball Valves - Shall be installed at the service entrances, at the base of all risers and in the distribution system to isolate a group of three or more fixtures as well as at each shock absorber location.

B. Stop Valves - Shall be installed at each fixture.

C. Pressure Reducing Valves - Shall be installed at the service entrance when the water pressure exceeds 60 psi. Renewal projects shall have existing pressure reducing valves replaced. All valves shall have pressure gauges.

3.04 PIPE INSULATION

Pipe insulation shall be as called for in section 15250.

3.05 MECHANICALLY FORMED OUTLETS

A. Mechanically formed outlets shall have a collar height not less than three times the thickness of the branch tube wall. The branch shall be notched to conform to the inner curve of the run and shall be dimpled or otherwise impeded from penetrating the run pipe/tube. The branch tube shall also be dimpled to indicate the location of the notches with respect to the run. Such marking shall be at a sufficient distance from the face of the joint to allow for a visual point of inspection after the joint is brazed. All joints constructed using this method shall be brazed. Note: soft soldered joints will not be permitted.

3.06 GROOVED PIPING

A. Pipe ends shall be clean and free from indentations, projections and roll marks in the area from pipe end to groove for the proper gasket sealing.

B. Gasket style and material shall be verified as suitable for the intended service.

C. Grooved end fittings, couplings, flange adapters, and valves shall be sized to copper tube dimensions. Flaring of pipe ends to IPS dimensions is not allowed.

D. All grooved components shall be of one manufacturer.

E. Grooved connections shall not be installed in inaccessible concealed locations.

F. Grooved joints shall be installed in accordance with the manufacturer's latest published installation instructions.

G. Gaskets shall be molded and produced by the coupling manufacturer and shall be verified as suitable for the intended service.

END OF SECTION

SECTION 15423

DOMESTIC RECIRCULATING PUMP

PART 1 - GENERAL

1.01 GENERAL

The Bidding and Contract Requirements, General Requirements, section 15010 - General Provisions, and section 15050 - Basic Materials and Methods shall apply to this section.

1.02 SCOPE

Provide and install the domestic recirculating pump as shown on the drawings and specified herein.

1.03 QUALITY ASSURANCE

A. Pump must be selected from published test curves showing actual brake horsepower. The selection point shall be confined to the left of center of the efficiency curve for the impeller being furnished.

B. All pump motors shall meet NEMA Standards and shall be U/L listed.

C. All pumps shall be factory tested prior to shipment to the job site.

1.04 SUBMITTALS

Provide shop drawings on this equipment as described in Section 15010 - 1.04.

PART 2 - PRODUCTS

2.01 DOMESTIC RECIRCULATING PUMP

The domestic recirculating pump shall be of the centrifugal inline mounted type and of the size, capacity and voltage shown on the drawings. The pump shall be manufactured by BELL & GOSSETT. Pumps fully equal to the specified pump and manufactured by ARMSTRONG, WEINMANN, or PATTERSON are acceptable.

A. Pump - Shall be quiet operating, horizontal, oil lubricated, inline, single stage, vertical split case design, and shall be all-bronze construction for domestic water applications. The pump internals shall be capable of being serviced without disturbing piping connections. The pump shall have a dynamically balanced impeller keyed and locknutted to a ground and polished steel shaft with hardened integral thrust collar. Shaft shall be supported by oil lubricated bronze sleeve bearings. Watertight mechanical seal faces shall be carbon on cast iron or ceramic.

B. Coupling - Shall be self-aligning, flexible type connecting the pump and motor.

C. Motor - Shall be open drip proof, journal bearing, resilient mounted, 1750 rpm, and shall be especially selected for quiet operation. The electrical characteristics of the motor shall be as shown on the drawings. The horsepower of the motor shall be of such a size as to insure non-overloading of the motor throughout the capacity range of the pump. The motor shall have sealed bearings.

D. Testing - The pump shall be factory tested, thoroughly cleaned, and painted with one (1) coat of machinery enamel prior to shipment. A set of installation instructions shall be included with the pump at the time of shipment.

E. Starter - Provide a manual starter for single phase units and magnetic across-the-line starter for three phase units. The starter shall have HAND-OFF-AUTOMATIC switch and red running light. See Section 15050 paragraph 2.07.

2.02 SPECIALTIES

Specialties shall be provided for all pumps, which shall include, but not be limited to, isolation valves, unions, thermometers, and check valves.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The pump shall be installed and serviced in accordance with the manufacturer's recommendations and as shown on the drawings.

B. Coupling guards shall be installed per ANSI and OSHA standards.

END OF SECTION

SECTION 15426

CONDENSING DOMESTIC GAS WATER HEATER

PART 1 - GENERAL

1.01 GENERAL

The Bidding and Contract Requirements, General Requirements, Section 15010 - General Provisions, and Section 15050 - Basic Materials and Methods shall apply to this section.

1.02 SCOPE

The work covered under this section shall include providing and installing complete the forced draft gas water heater as shown on the drawings.

1.03 QUALITY ASSURANCE

A. The gas water heater shall conform with NFPA 54 - Natural Fuel Gas Code Requirements.

B. The gas water heater shall conform with the current International Fuel Gas Code.

C. The water heater shall meet the requirements of the current ASHRAE Standard 90.1, for energy conservation.

D. The gas water heater shall bear the AGA or CSA label.

E. The water heater shall be tested at a pressure of 225 psi and shall have a water working pressure of 150 psi.

F. Water heaters shall be ASME constructed and bear the UL label. ASME fabrication documents shall accompany the submittal data.

G. Water heaters with an AGA rating of 300,000 BTU/HR input or greater shall have the manufacturer's GE-GAP (IRI) /CSD-1 rated gas train assembly installed.

H. The water heater shall be installed as recommended by the manufacturer and local codes.

I. The water heater installation shall include factory start-up. Start up on the unit shall be performed by factory trained and authorized personnel. Provide the Owner with a copy of the start-up record.

J. First year service policy, including parts and labor, shall be provided at no additional cost to the owner.

1.04 SUBMITTALS

Provide shop drawings on this equipment, including an installation diagram, as described in Section 15010, 1.04.

PART 2 - PRODUCTS

2.01 GAS WATER HEATER

A. The rating, type and capacity of the water heater are shown on the drawings along with the specified manufacturer.

B. Tank - The steel tank shall be glass lined or an unlined pressure vessel constructed from phase-balanced austenitic and ferritic duplex stainless steel. The tank shall be insulated to meet the current ASHRAE Standard 90.1 requirements.

C. Water heaters with full rated input below 600,000 BTU will operate at a minimum 96% thermal efficiency at full firing rate when tested to the ANSI Z21.10.3 thermal efficiency test protocol (DOE 10 CFR 431). Water heaters with full rated input above 600,000 BTU will operate at a minimum 94% thermal efficiency at full firing rate when tested to the ANSI Z21.10.3 thermal efficiency test protocol (DOE 10 CFR 431). The water heater shall be ETL listed as a complete unit. The heater shall satisfy current Federal Energy Policy Act standards for both thermal efficiency and stand-by heat losses as established for gas fired water heaters.

D. Combustion will be provided by a premix, fan-assisted surface burner with a gas train meeting UL, ANSI and FM standards for the input specified. Burner will be stainless steel.

E. Water heater will be a category IV, condensing appliance and vent through PVC or CPVC. Water heater will satisfy requirements for sealed combustion. Vents for inlet and exhaust can terminate in different pressure zones.

F. The Contractor shall totally regulate the gas supply to main and pilot burners. The heater shall also be equipped with an automatic gas shut off device to shut off the entire gas supply in the event of excessive temperature in tank and pilot safety shut off. The gas controls shall have an adjustable temperature setting to deliver hot water at the temperature called for on the drawings.

G. The water heater shall be a vertical fire tube, design that is constructed and stamped in accordance with Section IV, Part HLW of the ASME code. Water heater will be National Board Registered for a working pressure of 150 psi and will be pressure tested at 1-1/2 times working pressure. Materials shall meet ASME Section II material requirements and be accepted by NSF 61 for municipal potable water systems. All tank connections/fittings shall be nonferrous or stainless steel. The water heater shall employ an electronic operating control with digital temperature readout. Operator shall be capable of connecting to a building automation system through serial connection using Modbus RTU protocol. At a minimum, the water heater shall be equipped with the following:

1. Electronic flame monitoring.
2. Electronic low water cutoff.
3. An immersion operating control.
4. An immersion UL listed temperature limiting device.
5. Condensate neutralization system (Part#121778).
6. Concentric Vent Kit (Part#12574).

2.02 PRESSURE AND TEMPERATURE RELIEF VALVE

The combination pressure and temperature relief valve for the water heater(s) shall be rated equal to or greater than the maximum hourly heat input rate of the water heater. Each relief valve shall be ASME listed, rated and stamped. Pressure relief setting shall be 150 psi or less and temperature relief of 210 degrees F, all bronze body with stainless steel spring, test level and mounted to monitor the temperature within 6" of the tank. A thermometer shall be installed in the hot water pipe above the top of the tank.

2.03 EXPANSION TANK

Shall be ASME labeled and the size listed on the drawings. Provide the tank with the required tappings and a prime coat of paint. The expansion tank shall be BELL & GOSSETT.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Gas Water Heater - The water heater shall be installed as shown on the drawings in an accessible location. Gate valves shall be installed on both the cold-water supply pipe and the hot water pipe. A vacuum relief shall be installed on the cold-water pipe between the gate valve and tank and shall be located above the top of the tank. A thermometer shall be installed in the hot water pipe above the top of the tank. All valves shall be mounted so as to be accessible while standing on the floor. Start up on the water heater shall be performed by factory trained and authorized personnel. A copy of the start up report shall be provided to the contractor and Owner.

B. Piping - The relief valve shall be piped full size to a receptor or to the floor.

C. Thermostats - The thermostats in the water heater shall be adjusted to produce the water temperature called for on the drawings.

D. Instructions - The water heater instruction booklet shall be secured to the water heater.

E. Start up on the unit will be performed by factory trained and authorized personnel. A copy of the startup report will be provided to the contractor and Owner.

F. Provide a spare fuse for the water heater.

G. Provide an ASME rated expansion tank. Install as recommended by manufacturer.

END OF SECTION

SECTION 15616

WATER HEATER VENT

PART 1 - GENERAL

1.01 GENERAL

The Bidding and Contract Requirements, General Requirements, Section 15010 - General Provisions, and Section 15050 - Basic Materials and Methods shall apply to this Section.

1.02 SCOPE

Provide and install a complete factory-built vent system as called for on the drawings.

1.03 QUALITY ASSURANCE

The vents shall meet the requirements of NFPA standards and The International Fuel Gas Code, be UL listed, and satisfy all state and local codes.

1.04 SUBMITTALS

Provide shop drawings on this equipment as described in section 15010 - 1.04.

PART 2 - PRODUCTS

2.01 GAS FIRED WATER HEATER VENT

Provide and install the water heater vents and combustion air inlet pipe complete as shown on the drawings and specified herein. The vents shall be UL listed for this application.

PART 3 - EXECUTION

3.01 WATER HEATER VENT

The water heater vent shall be installed in accordance with the manufacturer's recommendations and to meet the requirements of NFPA No. 54 and/or No. 211, state and local codes. manufacturer.

3.02 CONNECTIONS TO CHIMNEYS

Vent connections to chimneys shall be made with thimbles. The thimble shall be permanently cemented in place, utilizing heat-resistant cement. The metal vent shall be flush with the inside wall of the chimney.

END OF SECTION

SECTION 15616

WATER HEATER VENT

PART 1 - GENERAL

1.01 GENERAL

The Bidding and Contract Requirements, General Requirements, Section 15010 - General Provisions, and Section 15050 - Basic Materials and Methods shall apply to this Section.

1.02 SCOPE

Provide and install a complete factory-built vent system as called for on the drawings.

1.03 QUALITY ASSURANCE

The vents shall meet the requirements of NFPA standards and The International Fuel Gas Code, be UL listed, and satisfy all state and local codes.

1.04 SUBMITTALS

Provide shop drawings on this equipment as described in section 15010 - 1.04.

PART 2 - PRODUCTS

2.01 GAS FIRED WATER HEATER VENT

Provide and install the water heater vents and combustion air inlet pipe complete as shown on the drawings and specified herein. The vents shall be UL listed for this application.

PART 3 - EXECUTION

3.01 WATER HEATER VENT

The water heater vent shall be installed in accordance with the manufacturer's recommendations and to meet the requirements of NFPA No. 54 and/or No. 211, state and local codes. manufacturer.

3.02 CONNECTIONS TO CHIMNEYS

Vent connections to chimneys shall be made with thimbles. The thimble shall be permanently cemented in place, utilizing heat-resistant cement. The metal vent shall be flush with the inside wall of the chimney.

END OF SECTION

SECTION 15651

REFRIGERATION PIPING SYSTEMS

PART 1 - GENERAL

1.01 GENERAL

A. The Bidding and Contract Requirements, General Requirements, section 15010 - General Provisions, and Section 15050 - Basic Materials and Methods shall apply to this section.

1.02 SCOPE

A. The refrigeration piping system shall be provided, installed, tested, evacuated and charged.

1.03 QUALITY CONTROL

A. The refrigeration piping system shall be provided, installed, tested, evacuated and charged in accordance with the manufacturer's recommendations, ANSI, ASHRAE, and ARI's Safety Code for Mechanical Refrigeration, state and local codes.

1.04 SUBMITTALS

A. Provide shop drawings on the proposed system as described in Section 15010 - 1.4.

PART 2 - PRODUCTS

2.01 GENERAL

A. The refrigerant piping system shall be provided complete and installed in accordance with the manufacturer's recommendations and as specified herein. The size of the refrigerant pipes shall be obtained from the equipment manufacturer unless otherwise shown on the drawings.

1. Pipe, Fittings and Accessories - The pipe shall be type ACR 'L' copper refrigerant tubing with hard wrought copper fittings. Pipe sized ½ inch and larger shall be hard drawn. Pipe size 3/8 inch and smaller can either be hard or soft drawn. All of the joints shall be brazed with a filler material that complies with AWS classification BCuP-5. A sight glass with moisture indicator shall be provided if not provided with equipment (not required on VRF systems). A removable type SPORLAN cartridge type drier-strainer shall be installed in the liquid line with a three-way valve by-pass if it is not provided on the equipment (not required on VRF systems). Use type 'L' copper tubing to pipe the relief valve discharge to the outside.
2. Condensate Drain Piping - Shall be type 'L' copper tubing.
3. Pipe Hangers and Supports - Shall be as required in section 15050.

4. The piping shall be insulated as shown in section 15250.

PART 3 - EXECUTION

3.01 GENERAL

A. The Refrigeration Piping System shall be installed in accordance with the manufacturer's recommendations as shown on the drawings and as specified herein.

1. Installation- During brazing an inert gas (such as nitrogen) shall be continuously passed through the system at a rate sufficient to maintain an oxygen free environment to prevent the formation of copper oxide scale. After piping has been completed, the refrigerant piping system shall be pressure tested at a pressure of 300 psi on the high side and 150 psi on the low side. The pressure shall be maintained on the system for a minimum of 12 hours. The system shall be evacuated when the surrounding ambient air is not less than 60°F. If the temperature is less, auxiliary heat must be provided to insure proper evacuating conditions. A minimum vacuum of 500 Microns of Hg. shall be pulled on the system and maintained for 12 hours. The vacuum pump displacement shall be not less than 2 cfm for up to 15 tons.
2. The system shall be charged as recommended by the equipment manufacturer.

END OF SECTION

SECTION 15700

VARIABLE REFRIGERANT FLOW SYSTEM

PART 1 - GENERAL

1.01 GENERAL

The Bidding and Contract Requirements, General Requirements, Section 15010 - General Provisions, and Section 15050 - Basic Materials and Methods shall apply to this section.

1.02 SCOPE

The work covered under this section shall include the following:

A. Complete variable refrigerant flow system including equipment, piping, and controls. System shall be a VRF (variable refrigerant flow) multi split air conditioning system. The system will utilize an air-cooled condensing unit supplying a maximum of forty indoor fan coil units with combinations of outdoor units 3 - 25-ton capacity with a maximum of 2 outdoor units connected at one time for 208-230V/ 3 Phase service.

B. The VRF (Variable Refrigerant Flow) system shall be a simultaneous cooling and heating heat pump system. The VRF system shall consist of an outdoor unit, high efficiency heat recovery units designed for minimum piping and maximum design flexibility, indoor units, and controls by the equipment manufacturer. Each indoor unit shall be independently capable of operating in either heating or cooling mode regardless of the mode of other indoor units.

C. The variable refrigerant flow system piping system shall be designed by a manufacturer's certified designer. If Basis-of-Design system is not used, contractor shall submit fully revised piping layout to engineer, complete with revised locations and quantities of heat recovery units. Revised piping layout shall be submitted with equipment submittal for review and approval by engineer. Revised piping layout shall not affect performance of indoor or outdoor units. The contractor is responsible for all costs associated with additional review required by engineer.

D. The variable refrigerant flow system piping system shall be installed by a manufacturer's certified contractor.

E. The installing contractor shall be trained and certified at the manufacturer's training facility prior to installation, start-up, and commissioning. Submit for review the installation contractor's certification from the manufacturer. This certification shall include the company certification as well as certifications for each individual which will be working on this project.

F. The refrigeration piping system shall be provided, installed, tested, evacuated, and charged.

G. The installing contractor shall have at least one-year experience installing variable refrigerant flow systems (VRF) similar in size to the individual mechanical systems on this project. Proof of experience and project work shall be provided with the submittals.

1.03 QUALITY ASSURANCE

A. Manufacturers Field Service - Engage a factory-authorized service representative to inspect field assembled components and equipment installation, including connections, and to assist in field testing.

B. The units shall be listed by Electrical Laboratories (ETL) and bear the ETL label. All wiring shall be in accordance with the National Electrical Code (NEC). The units shall be manufactured in a facility registered to ISO 9001 and ISO14001.

C. The refrigeration piping system shall be provided, installed, tested, evacuated and charged in accordance with the manufacturer's recommendations, ANSI, ASHRAE, and ARI's Safety Code for Mechanical Refrigeration, state and local codes.

D. Perform the following field tests and inspections and prepare test reports:

1. Leak Test - After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test - After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Remove and replace malfunctioning units and retest as specified above.

F. Equipment installer shall attend a controls coordination meeting with the Section 15900 contractor as described in 15900, 1.03.

1.04 SUBMITTALS

Provide shop drawings on this equipment as described in Section 15010, 1.04. The controls coordination meeting described in 15900 shall be held before the shop drawings are submitted.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers - Provide products by one of the following:

1. MITSUBISHI ELECTRIC/TRANE.
2. Daikin Industries.

B. Coordinate any changes from the basis of design with all associated trades. Any additional costs associated with the alternate equipment shall be covered by the equipment manufacturer. No additional costs shall be incurred by the Owner.

2.02 REFRIGERANT COMPONENTS

A. The equipment specified in this section shall operate with refrigerant R410A - no exceptions or substitutions.

B. The system shall utilize fully modulating electronic expansion valves.

C. Refrigerant Piping:

1. The refrigerant piping system shall be provided complete and installed in accordance with the manufacturer's recommendations and as specified herein and the requirement of 15651. The size of the refrigerant pipes shall be obtained from the equipment manufacturer unless otherwise shown on the drawings.
2. Pipe, Fittings, and Accessories - The pipe shall be type ACR 'L' copper refrigerant tubing with hard wrought copper fittings. Pipe sized ½ inch and larger shall be hard drawn. Pipe sized 3/8 inch and smaller can either be hard or soft drawn. All of the joints shall be brazed with a filler material that complies with AWS classification BCuP-5. Use type 'L' copper tubing to pipe the relief valve discharge to the outside.
3. Condensate Drain Piping - Shall be type 'L' copper tubing.
4. Pipe Hangers and Supports - Shall be as required in Section 15050.
5. All refrigerant lines shall be insulated from the outdoor unit to the indoor terminal units as shown in Section 15250.
6. The system shall be capable of operating with refrigerant piping up to 492 equivalent feet, a total combined length of 984 feet of piping between the condensing and fan coil units with 164 feet maximum vertical difference, without any oil traps or additional equipment. The vertical difference shall not exceed a maximum of 131 feet where the outdoor unit is located below the indoor unit.
7. The use of GelCopper pre-insulated copper tubing, or approved equal, is acceptable for use from the refrigerant mains, typically located in corridors, to the terminal devices in sizes listed for soft copper.

2.03 HEAT PUMP CONDENSING UNIT

A. The outdoor unit will have air cooled heat exchange coils constructed from copper tubing with aluminum fins. The coils will be set in a vertical formation with air being drawn in through three sides of the unit and discharged out of the top of the unit. The systems will have a single fan mounted on top of the coils.

B. The outdoor unit will have one inverter controlled hermetic compressor. Partial capacity cooling/heating capability must be available. The system shall use a control sequence to ensure that indoor loads are matched to compressor capacity control.

C. The refrigeration process of the outdoor unit will be maintained by pressure and temperature sensors controlling solenoid valves check valves and bypass valves. The heating or cooling mode of the outdoor unit will be controlled using a combination of two- and three-way valves which will reverse the cycle of the refrigerant to change the mode of the outdoor unit.

D. The variable capacity, heat pump air conditioning system shall be variable refrigerant flow split system. The system shall consist of multiple evaporators using PID control and inverter driven outdoor unit. The unit shall consist of direct expansion (DX), air-cooled heat pump air conditioning system, variable speed driven compressor multi zone split system. The outdoor unit may connect an indoor evaporator capacity of 50-130% to that of the outdoor condensing unit capacity. Each indoor unit shall be capable of operating separately with individual temperature control.

E. The outdoor unit shall be interconnected to indoor unit types specified in this section. The indoor units shall be connected to the outdoor units utilizing the specialized piping joints and headers provided by the equipment manufacturer.

F. General - The outdoor unit is designed specifically for use with manufacturers components:

1. Refrigerant: R410A.
2. The outdoor unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of a compressor, motors, fans, condenser coil, electronic expansion valve, solenoid valves, four-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports, liquid receivers and accumulators.
3. Both liquid and suction lines shall be individually insulated between the outdoor and indoor units.
4. The outdoor unit shall be wired and piped with outdoor unit access from left, right, rear, or bottom.
5. The connection ratio of indoor units to outdoor unit shall be 50% to 130%.
6. The outdoor unit shall have a sound rating no higher than 63 dB(A).
7. The system shall automatically restart operation after a power failure and shall not cause any settings to be lost, thus eliminating the need for re-programming.
8. The outdoor unit shall be modular in design and should allow for side-by-side installation with minimal spacing.
9. The following safety devices shall be included on the condensing unit: high pressure switch, crankcase heaters, high pressure switch, overload relay, inverter overload protector, thermal protectors for compressor and fan

motors, and over current protection for the inverter. To ensure the liquid refrigerant does not flash when supplying to the various fan coil units, the circuit shall be provided with a sub-cooling feature. Oil recovery cycle shall be automatic, occurring one hour after system start up, every six hours of system operation or as required to maintain oil levels at the system condensing unit.

10. The outdoor unit shall operate in heating mode to -4F dry bulb ambient temperature without additional ambient controls.

G. Unit Cabinet - The outdoor unit model shall be completely weatherproof and corrosion resistant. The outdoor unit will be constructed from steel plate and treated with acrylic paint, or galvanized steel, bonderized and finished with a powder coated baked enamel.

H. Fan:

1. The condensing unit shall consist of a propeller type, direct-drive fan motor that has multiple speed operation via a DC inverter.
2. The fan motors shall have inherent protection and permanently lubricated bearings and be mounted.
3. The fan motors shall be provided with a fan guard to prevent contact with moving parts.

I. Condenser Coil - The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond. Provide vandal/hail guards for condenser coils.

J. Compressor:

1. The compressor shall be variable speed control capable of changing the speed to follow the variations in total cooling load as determined by the suction gas pressure as measured in the condensing unit.
2. The inverter driven compressor in each condensing unit shall be a high efficiency DC, hermetically sealed compressor.
3. The capacity control range shall be a minimum of 20% to 100% of total capacity.
4. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.
5. Oil separators shall be standard with the equipment together with an oil balancing circuit.
6. The compressor shall be mounted to avoid the transmission of vibration.

K. Electrical:

1. The power supply to the outdoor unit shall be 208/230 volts, 3 phase, 60 hertz with a voltage range of 187 volts to 253 volts.

2. The control wiring shall be a two-wire multiplex transmission system, making it possible to connect multiple indoor units to one outdoor unit with one 2-cable shielded communications wire.

2.04 HEAT RECOVERY UNITS FOR SIMULTANEOUS HEATING AND COOLING SYSTEMS

A. General - The Heat Recovery Unit shall be designed for use with VRF equipment of the same manufacturer. These units shall be equipped with a circuit board that interfaces to the controls system and shall perform all functions necessary for operation. The unit shall have a galvanized steel finish. The heat recovery unit shall be completely factory assembled, piped, and wired. Each unit shall be run tested at the factory. This unit shall be mounted indoors. The sum of connected capacity of all indoor air handlers shall range from 50% to 150% of rated capacity.

B. Unit Cabinet:

1. The casing shall be fabricated of galvanized steel.
2. Each cabinet shall house a liquid-gas separator and multiple refrigeration control valves.
3. The unit shall house tube-in-tube heat exchangers.

C. Refrigerant - R410A refrigerant shall be required for Heat Recovery units in conjunction with outdoor unit systems.

D. Refrigerant Valves:

1. The unit shall be furnished with multiple branch circuits which can individually accommodate up to 54,000 BTUH and/or three indoor units. Branches may be twinned to allow more than 54,000 BTUH.
2. Each branch shall have multiple two-position valves to control refrigerant flow for optimum efficiency.
3. Service shut-off valves shall be installed for each branch to allow service to any indoor unit without field interruption to overall system operation. Shut-off valves shall be full-port ball valves, rated at 700 PSIG, with a Schrader port.
4. Linear electronic expansion valves shall be used to control the variable refrigerant flow.

E. Integral Drain Pan - A integral condensate pan and drain, if required, shall be provided.

F. Electrical:

1. The unit electrical power shall be 208/230 volts, 1 phase, 60 hertz.
2. The unit shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253V (230V/60Hz).
3. The Heat Recovery unit shall be controlled by integral microprocessors.

4. The control circuit between the indoor units and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

2.05 INDOOR AIR HANDLING UNITS

A. It shall be possible for the total connected capacity of the indoor units to be between 50 and 130% of the capacity of the outdoor unit.

B. Each indoor unit will have a heat exchanger which shall be constructed from copper tubing with aluminum fins. The flow of refrigerant through the heat exchanger will be controlled by an electronic proportional expansion valve. This valve will be controlled by two pipe thermistors, a return air and discharge air thermistor and shall be capable of controlling the variable capacity of the indoor unit between 25% and 100%.

C. Each indoor unit shall have an operating voltage of 208-230V/1 phase/60Hz. The indoor unit shall supply demand capacity information to the outdoor unit via its control algorithm.

D. Four (4) Way Ceiling Cassette Indoor Unit:

1. The indoor unit shall be a ceiling cassette fan coil unit for installation into the ceiling cavity equipped with an air panel grille to be connected to indoor unit as scheduled and specified in this section. The indoor unit shall have a four-way air distribution type, impact resistant and washable decoration panel. The supply air shall be distributed via motorized louvers which can be horizontally and vertically adjusted from 0 degree to 90-degree angle.
2. Construction:

a. The indoor unit shall be completely factory assembled and tested. The unit shall include factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, condensate drain pan, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
b. The 4-way supply airflow shall be field modifiable to 3-way and 2-way airflow to accommodate various installation configurations including corner installations.
c. Return air shall be through the concentric panel, which shall include a filter.
d. The indoor unit shall be equipped with a condensate pan.
e. The indoor unit shall be equipped with a return air thermistor.
f. The indoor unit shall be separately powered with 208-230V/1 phase/60Hz.
g. The voltage range shall be 253 volts maximum and 187 volts minimum.

h. The indoor unit shall be equipped with a condensate pump capable of providing at least 19" of lift.

3. Unit Cabinet:

a. The cabinet shall be space saving and shall be located into the ceiling.
b. The airflow of the unit shall have the ability to shut down one or two sides allowing for simpler corner installation.
c. Provide fresh air intake kit where used and indicated on the drawings. A branch duct knockout shall exist for branch ducting supply air.

4. Fan:

a. The fan shall be direct-drive turbo fan type with statically and dynamically balanced impeller with high and low fan speeds available.
b. The indoor unit shall operate with a power supply of 208/230 volts, 1 phase, 60 hertz. The allowable voltage range shall be 187 to 253 volts.
c. The airflow rate shall be adjustable and have high, medium and low fan settings.
d. The fan motor shall be thermally protected.

5. Filter - The return air shall be filtered by means of a long-life filter.
6. Coil:

a. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
b. A condensate pan shall be located under the coil. The condensate pan shall have a built in high level safety alarm to shut down the unit.
c. A thermistor shall be located on the liquid and gas line.

E. One (1) Way Ceiling Cassette Indoor Unit

1. The indoor unit shall be a ceiling cassette fan coil unit for installation into the ceiling cavity equipped with an air panel grille to be connected to indoor unit as scheduled and specified in this section. The indoor unit shall have a one-way air distribution type, impact resistant and washable decoration panel. The supply air shall be distributed via motorized louvers which can be horizontally and vertically adjusted from 0 degree to 90-degree angle.
2. Construction:

a. The indoor unit shall be completely factory assembled and tested. The unit shall include factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector,

condensate drain pan, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.

b. Return air shall be through the concentric panel, which shall include a filter.
c. The indoor units shall be equipped with a condensate pan.
d. The indoor units shall be equipped with a return air thermistor.
e. The indoor unit shall be separately powered with 208-230V/1 phase/60Hz.
f. The voltage range shall be 253 volts maximum and 187 volts minimum.
g. The indoor unit shall be equipped with a condensate pump capable of providing at least 23" of lift.

3. Unit Cabinet:

a. The cabinet shall be space saving and shall be located into the ceiling.
b. Provide fresh air intake kit where used and indicated on the drawings. A branch duct knockout shall exist for branch ducting supply air.

4. Fan:

a. The fan shall be direct-drive fan type with statically and dynamically balanced impeller with high and low fan speeds available.
b. The indoor unit shall operate with a power supply of 208/230 volts, 1 phase, 60 hertz. The allowable voltage range shall be 187 to 253 volts.
c. The airflow rate shall be adjustable and have high, medium and low fan settings.
d. The fan motor shall be thermally protected.

5. Filter - The return air shall be filtered by means of a long-life filter.
6. Coil:

a. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.

b. A condensate pan shall be located under the coil. The coil in the condensate pan shall have a built in high level safety alarm to shut down the unit.
c. A thermistor shall be located on the liquid and gas line.

2.06 CONTROLS

A. The units shall have controls provided with the unit by the manufacturer to perform input functions necessary to operate the system.

B. Computerized PID control shall be used to maintain room temperature within 1F of setpoint.

2.07 CONTROLLERS

A. Physical Characteristics - The control system shall be a neutral color plastic material with a Liquid Crystal Display (LCD).

B. Electrical Characteristics:

1. General - From each circuit board to the controls, the electrical voltage shall be 16 - 24 volts DC.
2. Wiring: Control wiring shall be installed in a daisy chain configuration from indoor unit to indoor unit then to the outdoor unit. Control wiring shall run from the indoor unit terminal block to the specific controller for that unit.
3. Wiring Size: The wire shall be a shielded, size AWG16-2 or AWG 18-2.

C. Individual Zone Controller:

1. The simplified wired remote controller shall be able to control 1 group (maximum of 16 fan coil units).
2. The simplified wired remote controller shall have the following features:

a. Operation - Start/Stop, Operation Mode, Temperature Setting, 60F - 90F Set Point Range, Fan Speed, Airflow Direction.
b. Monitoring - Status, malfunction flashing, malfunction content, filter sign, operation mode, temperature setting, permit/prohibit selection, fan speed, airflow direction.
c. Scheduling - ON/OFF Timer.
d. Control Management - Field Setting Mode, Group Setting, Auto Restart.

D. Centralized Controller:

1. The Centralized Controller shall be capable of controlling a maximum of 50 indoor units across multiple outdoor units. Centralized controller shall have a color LCD touch-screen. The Centralized Controller shall support system configuration, daily/weekly scheduling, monitoring of operation status, night setback settings, free contact interlock configuration and malfunction monitoring. The Centralized Controller shall have five basic operation controls which can be applied to an individual indoor unit, a group of indoor units (up to 50 indoor units), or all indoor units (collective batch operation). This basic set of operation controls for the Centralized controller shall include on/off, operation mode selection (cool, heat, auto, dry, and fan), temperature setting, fan speed setting, and airflow direction setting. The Centralized Controller shall allow the user to define both daily and weekly schedules with operations consisting of ON/OFF, mode selection, temperature setting, air flow (vane)

direction, fan speed, and permit/prohibit of remote controllers.

2. The functions of the Centralized Controller shall be accessible through the Web via a Web gateway in the Operator Interface Software as described in 15900 2.05 I2. Any required hardware or software for this access shall be provided by the VRF manufacturer. The Centralized Controller shall be connected to the buildings Local Area Network (LAN).

E. BACnet Interface to Building Automation System

1. The cooling and heating BACnet7 interface shall be compliant with BACnet7 Protocol (ANSI/ASHRAE 135-2004) and be Certified by the (BTL) BACnet7 Testing Laboratories. The BACnet7 interface shall support BACnet Broadcast Management (BBMD). The BACnet7 interface shall support a maximum of 50 indoor units. Operation and monitoring points include, but are not limited to, space temperature, space temperature setpoint, on/off, operation mode, fan speed, prohibit remote controller, filter sign reset, alarm state, error code and error address.

F. Control Panel

1. This contractor shall deliver the components of the centralized controllers and the BACnet interface devices to the Division 15900 contractor. It is the responsibility of the Division 15900 contractor to construct the control panel, housing these components in compliance with 15900 specification 2.02F.

G. Indoor Unit Sequence of Operations

1. On/Off Control - the indoor units shall be commanded ON/OFF by the BAS. If all indoor units are off, the outdoor unit shall turn off. With the Night Setback Function/Mode, the system shall cycle on during unoccupied periods as needed to maintain unoccupied temperature setpoint of 55°F (adjustable).
2. Space Temperature Control - the indoor unit shall modulate its internal linear expansion valve (LEV) to maintain the temperature setpoint via the indoor unit's internal controls.

    a. The setpoint is provided and adjustable through the BAS interface.

    b. The temperature setpoint provided through the BAS interface shall additionally be adjustable to a maximum of ±2°F from that setpoint using the room controller.

3. Mode Control:

    a. Auto Mode:

        1) The indoor unit shall determine whether it should be in auto-heat mode or auto-cool mode based on space temperature relative to temperature setpoint. If the indoor unit is in auto-heat mode, the indoor unit control board shall follow the heat mode sequence. If the indoor unit is in auto-cool mode, the indoor unit control board shall follow the cool mode sequence.

2) The indoor unit shall switch from auto-heat to auto-cool when the space temperature rises above and remains above the temperature setpoint plus the dead band for 3 minutes.
3) The indoor unit will switch from auto-cool to auto-heat when the space temperature drops below and remains below the temperature setpoint minus the dead band for 3 minutes.

b. Heating Mode - the indoor unit shall modulate its linear expansion valve (LEV) to maintain temperature setpoint of 71°F (adjustable).
c. Cooling Mode - the indoor unit shall modulate its linear expansion valve (LEV) to maintain temperature setpoint of 74°F (adjustable).

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install all piping, fittings, and insulation to meet manufacturers requirements. Install units level and plumb. Evaporator-fan components shall be installed using manufacturers standard mounting devices securely fastened to building structure. Install and connect refrigerant tubing and fittings.

B. Installer shall supply isolation ball valves for zoned refrigerant isolation. Installer shall supply Isolation ball valves with Schrader connection for isolating refrigerant charge and evacuation at each connected air handling unit and condensing unit. Isolation ball valves, with Schrader connection, are required for instances of air handling unit isolation for troubleshooting, repair, or replacement without affecting the remainder of the system. Isolation ball valves with Schrader connection are also required at condensing unit connection to isolate unit for troubleshooting, repair or replacement and as required to provide partial capacity Heating/Cooling in the instance of a failure of one of the multiple outdoor unit (condensing unit) compressors.

C. During brazing an inert gas (such as nitrogen) shall be continuously passed through the system at a rate sufficient to maintain an oxygen free environment to prevent the formation of copper oxide scale. After piping has been completed, the refrigerant piping system shall be pressure tested at a pressure of 300 psi on the high side and 150 psi on the low side. The pressure shall be maintained on the system for a minimum of 12 hours. The system shall be evacuated when the surrounding ambient air is not less than 60 F. If the temperature is less, auxiliary heat must be provided to insure proper evacuating conditions. A minimum vacuum of 500 Microns of Hg. shall be pulled on the system and maintained for 12 hours. The vacuum pump displacement shall be not less than 2 cfm for up to 15 tons. The system shall be charged as recommended by the equipment manufacturer. Owner/Engineer shall be notified to witness both the pressure and vacuum tests.

D. Electrical wiring required by this section, both high and low voltage, shall comply with the Division 16 requirements.

E. Start Up - Engage manufacturer or factory-authorized service representative to perform startup service. Manufacturer shall provide on-site startup and commissioning assistance through job completion. Complete installation and startup checks according to manufacturers written instructions. This shall include a factory startup for factory provided control devices as well as configuring control points for other DO devices. Service representative shall completely configure all control devices and establish remote internet connectivity with the owner's energy management department web server.

F. Demonstration - Engage manufacturer or factory-authorized service representative to demonstrate and instruct the owner's maintenance personnel of the operation and functionality of the system.

G. Training - Engage manufacturer or factory authorized service representative to train owner's maintenance personnel for a period of 2 days, to adjust, operate and maintain individual units and complete system. This shall also include training of the owner's energy management department representatives as to establish control system programming, scheduling routines, alarm reporting, system topography, communication protocols and password level assignments.

1. This training shall take place on-site and at the owner's maintenance facility at 5025 Sideburn Road, Fairfax VA 22032.

H. The indoor air handling and outside condensing units shall be installed in accordance with the manufacturer's recommendations and as shown on the drawings. The first unit installed will be considered the typical mockup and shall require notification, inspection and approval by the designated owner representative and/or architect and engineer before any additional installations will be allowed.

I. Provide laminated as built drawings and manufacturer's refrigeration piping layout showing typical layout of the system. This shall include the actual room numbers, not from construction documents, and addressing scheme. Laminate shall have minimum thickness of 10 mil. Drawing size shall be 11"x17". Provide multiple drawings should zones not fit into one page. These will be mounted in the water heater room unless otherwise shown.

J. Refrigerant distribution (BC) controllers shall include a label affixed to the controllers which identifies the room or rooms served such as "VRF-A1, A125" for each line set on the controller. Use the actual room numbers and not room numbers from construction documents. Identification labels shall be BROTHER type "P-TOUCH", white tape with upper case letters, minimum ½ high block lettering, and black printing and shall be located on the bottom of the branch controller next to each pipe run.

K. Provide a typed list of all the different units, their filter sizes, to be included in the O&M manuals. The list shall include the unit designation, filter size, and the

number of filters required for each unit. In addition to this, submit to the Owner two additional copies of the list, distributed to:

1. Project Manager, Office of Facilities Management, Sideburn Support Center, 5025 Sideburn Road, Fairfax, Virginia 22032.
2. Coordinator, Mechanical Maintenance Division, Maintenance Services, 5025 Sideburn Road, Fairfax, Virginia 22032.

L. Warranty Tag - The Contractor shall attach an engraved weatherproof Guarantee or Warranty tag to the exterior of each condensing unit. Tag is to be screwed or riveted to unit. Identification tag shall be black with engraved ½ " white letters which reads:

UNIT #_____

INSTALLED BY:_____

2-YEAR WARRANTY EXPIRES: (month/day/year)_____

SERVICE PROVIDER:(Service Providers Name)_____

PHONE: (Service Providers Phone Number)_____

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M. This contractor is responsible for the completion and approval of documents required by the manufacturer to initiate the warranty. In any instance where the manufacturer's warranty is pulled due to the incorrect installation or workmanship, the terms of this warranty become this contractor's responsibility.

N. Provide two (2) spare individual room controllers (wired remote) turn over to owner on project completion.

END OF SECTION

SECTION 15840

DUCTWORK AND DUCT ACCESSORIES

PART 1 - GENERAL

1.01 GENERAL

A. The Bidding and Contract Requirements, General Requirements, Section 15010 - General Provisions and Section 15050 - Basic Materials and Methods shall apply to this section.

1.02 SCOPE

A. The work covered under this section of the specifications shall include furnishing and installing the ductwork, accessories, associated items and all necessary connections to outlets, inlets and equipment required for a complete system as shown on the drawings and hereinafter specified.

1.03 QUALITY ASSURANCE

A. Galvanized sheet metal shall meet the requirements of ASTM A653 and A924 standards.

B. Ductwork and duct accessories shall meet the requirements and recommendations of SMACNA standards, SMACNA Duct Cleanliness for New Construction (Advanced Level), UL-181 standard and ASHRAE recommendations.

C. The installation of ductwork and duct accessories shall comply with NFPA standard 90A and state and local codes.

1.04 SUBMITTALS

Provide shop drawings on ductwork materials and accessories as described in Section 15010 - 1.04. Shop drawings are not required for duct layouts.

PART 2 - PRODUCTS

2.01 DUCTWORK SYSTEM CLASSIFICATION

A. For determination of ductwork construction criteria, all ductwork systems shall be classified as either low or medium pressure according to the following velocities or pressures. In all cases the higher of the two values shall be used to determine the system classification unless other overriding considerations are established on the drawings or in the specifications. A ductwork system is defined as, the complete run of a supply, return, exhaust, or intake air system, each classified individually.

B. Ductwork systems with any portion having an average cross-sectional velocity up to and including 2000 FPM and not exceeding 2" w.g. maximum static pressure at any point in the system shall be classified as low pressure.

C. Ductwork systems with any portion having an average cross-sectional velocity exceeding 2000 FPM or exceeding 2" w.g. maximum static pressure at any point in the system shall be classified as medium pressure.

D. All air duct systems outside exposed to weather regardless of velocity and pressure conditions are classified as medium pressure and shall be constructed in compliance with SMACNA's three (3) inch pressure classification, formerly 'High Pressure Duct Construction Standard.' Joints and seams shall be sealed as described in this specification.

2.02 DUCT MATERIALS

A. All ductwork, housings, dampers, access doors and all other duct related accessories shall be formed from galvanized steel sheets unless otherwise noted.

B. All angles used for reinforcement, support, hanging and other construction uses shall be galvanized steel and shall be equal to that used for ductwork. Galvanized angle iron shall be used where required by SMACNA standards.

2.03 DUCTWORK CONSTRUCTION

A. The low-pressure ductwork as defined in Article 2.01 shall be constructed in accordance with the one (1) inch pressure classification, as described in SMACNA's "HVAC Duct Construction Standards – Metal and Flexible".

B. Ductwork classified as other than low pressure shall be constructed in accordance with the three (3) inch pressure classification, as described in SMACNA's "HVAC Duct Construction Standards – Metal and Flexible".

C. Duct sizes are shown on the drawings in inches. The dimensions given establish the free or unobstructed area required on the inside of the duct. In case a duct size is not shown the dimensions shall be requested from the Architect.

D. The ductwork shall be fabricated from field measurements to avoid conflict with beams, columns, pipes and other obstructions. Where necessary to avoid obstructions, the ductwork shall be transformed, divided or moved to one side as long as the free area is not reduced and such changes meet the approval of the Architect.

E. The minimum thickness of the sheet metal shall be either as described in SMACNA's "HVAC Duct Construction Standards – Metal and Flexible" or as shown in the following table:

DUCT CONSTRUCTION MINIMUM SHEET METAL GAUGES

RECTANGULAR DUCTS

Maximum side (inches)	Steel (Minimum Galvanized Sheet Gauge)	Aluminum (Minimum B & S Gauge)
Thru 12"	26 (0.022 inches)	24 (0.020 inches)
13" - 30"	24 (0.028 inches)	22 (0.025 inches)
31" - 54"	22 (0.034 inches)	20 (0.032 inches)
55" - 84"	20 (0.040 inches)	18 (0.040 inches)
Over 84"	18 (0.052 inches)	16 (0.051 inches)

ROUND DUCTS

Diameter (inches)	SPIRAL SEAM DUCT Steel (Minimum Galvanized Sheet Gauge)	LONGITUDINAL SEAM DUCT Steel (Minimum Galvanized Sheet Gauge)	FITTINGS Steel (Minimum Galvanized Sheet Gauge)
Thru 12"	28 (0.019 in.)	26 (0.022 in.)	26 (0.022 in.)
13" - 18"	26 (0.022 in.)	24 (0.028 in.)	24 (0.028 in.)
19" - 28"	24 (0.028 in.)	22 (0.034 in.)	22 (0.034 in.)
29" - 36"	22 (0.034 in.)	20 (0.040 in.)	20 (0.040 in.)
37" - 52"	20 (0.040 in.)	18 (0.052 in.)	18 (0.052 in.)

F. When required, heavier ductwork shall be installed to meet the requirements of the UL Fire Resistance Index.

G. Where indicated on the drawings or where insufficient space is available for round ductwork, flat oval ductwork may be used. The conversion from round duct sizes to flat oval should be made on an equivalent pressure loss basis, not on an equal cross-sectional area. The flat oval ducts shall be constructed in accordance with current SMACNA standards.

H. Rectangular Duct Section Connections - Shall be as described in the SMACNA Standards. Contractor may use zero leakage four corner bolted companion angle transverse joint as manufactured by DUCTMATE INDUSTRIES, INC. or LOCKFORMER. Joint shall be constructed of galvanized steel with bolting corner pieces, roll formed double wall mating angles, gasketing, mastic sealer and snap-on flange cover cleats.

2.04 FLEXIBLE DUCTWORK

A. Where shown on the drawings provide flexible ductwork between branch ducts and terminals or air outlets. It shall be of a low or medium pressure to match duct system served.

B. Ductwork

1. Insulated flexible ductwork shall be factory pre-insulated duct composed of a corrosion-resistant reinforcing wire or band helix permanently bonded and enclosed in polyester film, covered with minimum R-6 density fiberglass insulation blanket sheathed in a vapor barrier of aluminum polyester film laminated to glass mesh, elastomer back coated. The flexible duct shall be rated for a minimum working velocity of 2000 fpm, shall be listed by Underwriters Laboratories under their UL-181 standards as a Class 1 air duct material and shall comply with NFPA standard No. 90A.
2. Taps for flexible ductwork shall be high efficiency gasketed air-tite type with manual damper

C. The maximum length of flexible duct connection shall be ten feet., or as otherwise shown.

D. Flexible ductwork shall not be used for return air or exhaust air ductwork.

2.05 DUCT ACCESS DOORS

A. Duct Access Doors shall be provided in both the low and medium pressure duct systems as shown on the contract drawings and as specified.

B. Access doors shall be constructed as shown in SMACNA standards for the appropriate pressure classification. Door shall be the same gauge and material as the duct. All access doors shall be hinged, except where a removable type is required.

C. The minimum size of all access doors shall be 20" x 14" except where the duct is less than 16", in which case one dimension shall be 20" and the other 2" less than the duct width.

D. Access doors shall be provided in the following locations: At the linkage side of automatic dampers; at the manual volume control dampers; at smoke detection heads; fire dampers; and any other service, balance or control device requiring periodic maintenance.

2.06 FLEXIBLE CONNECTIONS AT FAN

A. Flexible connections shall be provided at the inlet and outlet connection for each fan, between ductwork and inlet and outlet collars.

B. Each flexible connection shall be designed to allow one inch of free movement and shall be completely airtight and shall have sewed and cemented seams.

C. Flexible connections for low-pressure ductwork shall be in accordance with SMACNA standards. Material shall be neoprene coated glass fabric, 30 oz. per square yard.

D. Flexible connections for medium pressure ductwork shall be the same as for low pressure except additional reinforcing shall be provided as required by the operating pressure of the system.

E. Flexible connections to any roof mounted equipment shall not be exposed to the elements. Flexible connections shall be located inside the building just below the roofline. For side discharge units the flexible connection shall be located inside the building just inside the wall.

2.07 TURNING VANES

A. Any square elbow ductwork 18 inches or over in width shall require turning vanes of galvanized steel.

B. Vanes for Low and Medium Pressure Systems: Shall be as shown in SMACNA standards for appropriate pressure classification.

C. Vane lengths shall not exceed 36" for low-pressure systems or 48" for medium pressure systems. Where greater lengths are required, separate banked sections shall be provided.

2.08 FIRE DAMPERS

A. Fire dampers, also known as flame retarding or primary dampers, may be of the individual folded blade type, the continuous folded stainless steel one piece curtain type, the pivoted single blade type or the pivoted multi-blade type, providing they bear a UL label for the complete assembly. Dampers shall be sized so that folded or open blades do not restrict the duct free area given by the duct dimensions. Dampers shall have a positive lock in the closed position. Fusible links shall be UL listed and marked 160°F.

B. All dampers shall be installed in sleeves a minimum of two gauges heavier than the connecting ductwork unless noted otherwise. Sleeves shall be mounted within and secured to wall, floor, ceiling or other structural penetration. Dampers shall be positioned only as permitted in the UL listing.

C. Connecting ductwork shall be joined to the sleeve so that in the event of damage to the duct system it will break away leaving the fire damper and sleeve intact in the structural penetration. When necessary to avoid obstructions and after acceptance by the Architect, damper dimensions may be different from the connecting ductwork providing the required free area is maintained and 15° maximum transitions are used.

2.09 MANUAL VOLUME CONTROL DAMPERS

A. Manual Volume Control Dampers in ducts not exceeding 12" on the longest side shall be as shown in SMACNA Duct Standards. For ducts over 12", dampers of the opposed multi-blade type shall be used. Dampers shall be galvanized steel,

swivel end bearings at one end of the blade, and quadrant with level and lock-screw at the opposite end. Multi-blade dampers shall have steel washers at ends of damper rods with self-aligning blade interconnecting hardware.

2.10 COATED DUCT LINER

A. Duct Liner: Low-Pressure Ductwork

1. All plenums and transfer ducts shall receive duct liner. Supply air ductwork shall receive duct liner from the fan discharge to 20 feet downstream from the fan discharge or as otherwise shown. Return air duct work shall receive duct liner from the fan suction to 20 feet upstream from the fan suction or as otherwise shown.
2. Duct liner shall be designed for use as an acoustical and thermal insulation for sheet metal heating and cooling ducts and plenums. The duct liner shall have a density of 1.5 pounds per cubic foot a "K" factor not to exceed .24 @ 50°F mean temperature and a minimum NRC rating of .75. The minimum duct liner thickness shall be 1 inch.
3. Duct liner air stream surface shall be coated with an immobilized, EPA-registered antimicrobial agent so it will not support microbial growth. Duct liner shall be Johns Manville Linacoustic RC. Duct liners with similar characteristics will be considered as long as all aspects of the specifications are met.

PART 3 - EXECUTION

3.01 DUCT INSTALLATION

A. The ductwork, fittings, access doors, flexible connections, turning vanes, hangers and supports, fire dampers, volume dampers and other accessories shall be installed as recommended by SMACNA Duct Construction Standards. Ductwork shall not be supported from bottom chords of bar joists, bridging between bar joists or from metal decks. Ductwork shall be supported from the top chords of bar joists.

B. All necessary allowances and provisions shall be made by this contractor for beams, columns or other obstructions of the building or the work of other contractors, whether or not same is indicated. Where necessary to avoid obstructions, the ducts shall be transformed, divided or moved to one side with the required free area being maintained, all as approved or directed by the Architect.

C. Flexible ducts shall be secured to the metal ductwork, terminal units and supply diffusers by use of a 3/4" minimum width stainless steel drawband pulled tight with an adjusting worm drive type screw. Flexible duct insulation shall be properly sealed at connections to maintain vapor seal/barrier.

D. All duct dimensions shown on the drawings are inside clear dimensions. The duct sizes of ducts with duct liner shall be increased accordingly.

3.02 DUCT LINER

A. Duct Liner Application: Coated duct liner shall be cut to assure overlapped and compressed longitudinal corner joints. Apply liner with coated surface facing the air stream and adhere with 100% coverage of fire-retardant adhesive. Coat all exposed leading edges and all transverse joints with fire retardant adhesive. The liner shall be additionally secured with mechanical fasteners which shall compress the duct liner sufficiently to hold it firmly in place as follows:

B. Low Velocity to 2000 FPM: Fasteners shall start within 3" of the upstream transverse edge of liner and 3" from the longitudinal joints and shall be spaced at a maximum of 12" o.c. around the perimeter of the duct, except that they may be a maximum of 12" from a corner break. Elsewhere they shall be a maximum of 18" o.c. except that they shall not be more than 6" from a longitudinal joint of liner nor 12" from a corner break. Coat all exposed joints with a fire-retardant adhesive.

C. In addition to adhesive edge coating of transverse joints, any longitudinal joints shall be similarly coated with adhesive.

3.03 WATERPROOFING DUCTWORK ABOVE ROOF

A. Exposed ductwork shall be waterproofed with a prefabricated self-adhering, sheet-type waterproofing membrane as manufactured by Venture Tape and offered as VentureClad-1579CW series. Additional manufacturers will be considered providing all aspects of the specifications are met.

B. MATERIALS

1. Prefabricated, Self-Adhering, Sheet-Type Waterproofing Membrane.

a. Description:

1) Top Layer: Stucco-embossed, UV-resistant aluminum weathering surface.
2) Middle Layer: Double layer of high-density polyethylene reinforcement.
3) Bottom Layer: Uniform layer of rubberized asphalt adhesive, protected by disposable silicone release paper.
4) Heat Aging, ASTM D 794: No visible blistering or deterioration.
5) Tear Resistance, ASTM D 1424, Average: 660 grams.
6) Elongation, ASTM D 412, Minimum: 450 percent.
7) Low Temperature Flexibility, 1,000,000 Cycles at -10 Degrees F, 1,200 Cycles at 20 Degrees F: No cracking.
8) Water Vapor Transmission, ASTM E 96: 0.009 perms.
9) Flame Spread Index, ASTM E 84.0.
10) Smoke Density Index, ASTM E 84.5.
11) Wind-Driven Rain, SFBC TAS-110-95, 100 mph: No leakage or failure.

12) UV Stability: Excellent.

C. SURFACE PREPARATION AND APPLICATION

1. Prepare surfaces in accordance with manufacturer's instructions.
2. Ensure tops of ducts have sufficient slope to eliminate ponding water.
3. Remove dirt, dust, oil, grease, hand oils, processing lubricants, moisture, frost, and other contaminants that could adversely affect adhesion of waterproofing membrane.
4. Ensure surfaces are clean and dry.
5. Apply membrane to clean, dry, primed metal ductwork and foil-faced rigid insulation boards. Do not apply over wet or nonrigid insulation.
6. Apply membrane in accordance with manufacturer's air, material, and surface temperature requirements.
7. Apply firm, uniform pressure with hand roller to entire membrane to ensure proper adhesion. Concentrate pressure at seams and on underside of ductwork.
8. Apply membrane to ducts in accordance with manufacturer's instructions.
9. Apply membrane shingle fashion to shed water over, not against laps.
10. Do not terminate membrane on bottom of duct.
11. Apply minimum 3-inch side laps and minimum 6-inch end laps for ductwork applications.

3.04 LEAKAGE

A. All low-pressure supply, return and outside air ductwork shall be tested and made substantially airtight at static pressure indicated for the system before covering with insulation or concealing in masonry. Substantially airtight shall be construed to mean that no air leakage is noticeable through the senses of feeling or hearing at all duct joints. Supply, return and outside air transverse duct joints shall be sealed a water based brush on duct sealant such asFLEX-GRIP550 as manufactured by HARDCAST or UNI-FLEX as manufactured by McGill LLC.

B. The entire medium pressure ductwork system shall be pressure tested for leakage at three (3) inches ductwork static pressure. Perform leakage tests in accordance with the SMACNA HVAC Duct Leakage Test Manual, using test forms equivalent to those outlined in manual. Tests shall be observed by the Architect, Engineer and owner's representative. A test log shall be maintained by the contractor which will contain the results of systems tested and approval from test observer. Copies of the test log will be included in the operation and maintenance manuals.

3.05 CLEANING/STORAGE

A. Every effort should be made to ensure the components of the ductwork systems are kept clean and free of dust and debris. Stocked ductwork shall be stored in areas which are away from dust producing operations. Lined ductwork shall be stored in areas which are substantially weather-tight. Should any portion of lined ductwork become water saturated during storage or installation identified sections will be removed and replaced at no additional cost to the owner. As ductwork is

being installed any open ductwork shall be temporarily sealed to prevent the ductwork from being contaminated with construction debris or dust. Temporary filter media shall be installed on the return systems of any equipment which is required to be run as a temporary control during the construction period. Temporary filters shall be monitored and changed frequently to ensure the cleanliness of the ducted systems.

B. After completing installation of ductwork, entire system shall be cleaned of rubbish, plaster, dirt and any other debris. After installation of equipment and connections are made on fan, and before any grilles are installed, entire system shall be blown out with dampers and outlets wide open.

3.06 DUCT SMOKE DETECTORS

Duct smoke detectors shall be furnished under and interconnected between the auxiliary contacts and the fire alarm system by the Division 16 contractor and installed under this section. The duct smoke detectors shall be installed in accordance with the manufacturer's recommendations, NFPA requirements and local fire marshal requirements. Duct smoke detectors shall be mounted to allow full access for service.

3.07 FIRE DAMPERS

A. Provide fire dampers where ducts pass through fire-rated components and where required by the local authority. Install in accordance with local codes, NFPA, SMACNA-FSR and manufacturers requirements.

END OF SECTION

SECTION 15870

AIR DISTRIBUTION DEVICES

PART 1 - GENERAL

1.01 GENERAL

A. The Bidding and Contract Requirements, General Requirements, Section 15010 - General Provisions and Section 15050 - Basic Materials and Methods, shall apply to this section.

1.02 SCOPE

A. The work covered under this section shall include various types of air outlets and inlets to be furnished and installed complete.

1.03 QUALITY ASSURANCE

A. Air outlets and inlets shall be rated by a recognized testing agency such as the Air Diffusion Council, ASHRAE Standard 36-72, Air Movement and Control Association International, Inc., or an acceptable manufacturer's test laboratory.

1.04 SUBMITTALS

A. Provide shop drawings on this equipment as described in Section 15010 - 1.04. Shop drawings shall include proposed uses of all items.

PART 2 - PRODUCTS

2.01 GRILLES, REGISTERS AND CEILING DIFFUSERS

A. The grilles, registers and ceiling diffusers shall be provided as shown on the drawings along with accessories as required. The grilles, registers and ceiling diffusers shall be manufactured by CARNES, KRUEGER, TITUS, TUTTLE and BAILEY, NAILOR, PRICE or METALAIRE unless otherwise noted, provided the items are fully equal to the item specified below.

1. Supply Air Diffuser, Ceiling, Square: lay-in type, steel, stamped type, fixed pattern, square louvered face, opposed blade volume damper, equalizing grid, (combination damper/grid are not acceptable) white powder coat finish. Price model SCD.
2. Supply Air Louver, Exposed Duct Mounting, Drum Louver: Aluminum, adjustable pattern, aluminum finish with volume damper. Price model HCD1.
3. Supply Air Registers: Steel adjustable vanes, double deflection, vertical front vanes, opposed blade dampers, Aluminum finish. Price model 520D.

4. Air Extractor: Pivoted adjusting curved blades with adjusting strap. Price model AE1.
5. Return Air Grille, Ceiling: Steel individual fixed horizontal face bars, 0° deflection, white finish, size shall be minimum 12" x 24". Price model 510HZ.
6. Return Air Grille, Wall: Steel, individual fixed horizontal face bars, 40° deflection, heavy duty type, aluminum finish. Price model 91.
7. Return Air Register, Ceiling: Steel, individual fixed horizontal face bars, 0° deflection, volume damper, white enamel finish. Price model 510ZD. Exhaust air register shall be the same except aluminum, Price model 610ZD.

2.02 MOTORIZED DAMPERS

A. Motorized dampers shall be low leakage opposed blade galvanized steel type with 16-gauge frame and 16 gauge blades. Maximum blade width 8". Provide neoprene seals at all blade edge and side meeting surfaces so that air leakage shall be no more than 1% at 4" static pressure. Provide Teflon or oil impregnated bronze shaft bearings and standard finish. Prototype: ARROW model 395. Motorized dampers fully equal to damper specified and manufactured by RUSKIN, AIR BALANCE, PENN VENTILATOR, CESCO, DOWCO, GREENHECK or CARNES will be acceptable.

PART 3 - EXECUTION

3.01 GRILLES, REGISTERS, DIFFUSERS, AND LOUVERS - INSTALLATION

A. The grilles, registers and ceiling diffusers shall be installed in accordance with the manufacturer's recommendations. Dampers shall be installed where shown and where required to balance the air system.

B. Before locating grilles and ceiling diffusers, check the Architectural and Electrical drawings to make sure that there is no conflict with floor moldings, electrical outlets, lighting fixtures or any other obstruction. Low sidewall grilles and registers shall be mounted with the bottom edge eight inches above the floor with the vanes turned down. High sidewall grilles and registers shall be mounted six inches below the ceiling or as shown on architectural drawings.

C. Air extractors shall be provided and installed as shown on the drawings. Provisions shall be made to adjust air extractor from the exterior of the ductwork. When air extractor is installed, no damper for the register is required.

END OF SECTION

SECTION 15990

TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.01 GENERAL

The Bidding and Contract requirements, General Requirements, Section 15010 - General Provisions and Section 15050 - Basic Materials and Methods, shall apply to this section.

1.02 SCOPE

A. The testing, adjusting and balancing of the air distribution systems are specified under Section 01660.

B. The installers shall give notice when the systems are ready for testing, adjusting and balancing, and give assistance in adjusting and correcting deficiencies.

PART 2 - PRODUCTS

2.01 SHEAVES AND BELTS

A. The installer shall be responsible for providing and installing new fan or motor sheaves and belts when required to obtain the designed airflow.

2.02 AIR FILTERS

A. The installer shall be responsible for providing and installing new, clean, air filters. Filters shall be installed before final inspection and before giving notice for the testing, adjusting and balancing.

PART 3 - EXECUTION

3.01 GIVING NOTICE TO PROCEED

A. It shall be the responsibility of the installers to properly install, inspect and assure proper operation of each individual component of the system before giving notice to proceed with the testing, adjusting and balancing. The testing, adjusting and balancing shall not be performed until all mechanical equipment is properly installed and is 100 percent operational, all temperature controls are installed and calibrated and all systems are cleaned and clean filters installed.

B. The mechanical contractor shall set all outside air dampers to the approximate minimum position during equipment installation and prior to start-up of equipment.

C. The Balancing Contractor shall be responsible for properly plugging test holes which were made for testing purposes. Plugs shall be made of rubber and shall be

sized to fit testing holes.

D. The balancing contractor shall set relief vent counter balanced backdraft dampers per the manufactures installation instructions to maintain .05 " (positive) building static pressure.

3.02 CORRECTION OF DEFICIENCIES AND ASSISTANCE

The installers shall assist in the testing, adjusting and balancing the systems, shall adjust the system and make corrections of any deficiencies found such as: motor starters and horsepower; improper sheave and belt sizes; missing, improperly installed or malfunctioning volume control dampers, air extractors, air terminals, air monitors, variable or constant volume boxes, power wiring, controls and any other items that prevent the completion of the testing, adjusting and balancing of the systems.

3.03 ADDITIONAL MATERIAL

Any additional items or material required to be installed in the ductwork system to implement the testing, adjusting and balancing shall be furnished under Section 01660 along with the location. The installers shall install these items or materials.

3.04 COMMISSIONING RESPONSIBILITIES

This contractor shall be responsible for participation and coordination with the commissioning process as specified in section 01660.

END OF SECTION

SECTION 15748

ELECTRIC UNIT HEATERS

PART 1 - GENERAL

1.01 GENERAL

The Bidding and Contract Requirements, General Requirements, Section 15010 - General Provisions, and Section 15050 - Basic Materials and Methods shall apply to this section.

1.02 SCOPE

Provide and install complete with all accessories the electric unit heater as shown on the drawings and as specified herein.

1.03 QUALITY ASSURANCE

A. The electric unit heater shall have published ratings and be listed by Underwriters Laboratories.

B. Equipment installer shall attend a controls coordination meeting with the Section 15900 contractor as described in 15900, 1.03.

1.04 SUBMITTAL

Provide shop drawings on this equipment as described in Section 15010, 1.04. The controls coordination meeting described in 15900 shall be held before the shop drawings are submitted.

PART 2 - PRODUCTS

2.01 ELECTRIC UNIT HEATER

The electric unit heater shall be of the type and capacity shown on the drawings. The unit heater shall be manufactured by TRANE. Unit heaters fully equal to the specified manufacturer and manufactured by QMARK, SINGER, BERKO, ERINCRAFT, or MARKEL are acceptable.

A. Unit Casing – Casing shall be constructed of heavy gauge steel, zinc coated for rust resistance and finished with baked enamel. All hardware used in the casing shall be plated for rust resistance. Enclosures shall be equipped with elements, contactor and built-in controls.

B. Discharge – Shall be of the louver type. Discharge grille shall be adjustable to direct the air downward to floor.

C. Elements – Shall consist of helically coiled nickel chromium alloy resistance wire embedded and completely surrounded in magnesium oxide, enclosed and swagged into corrosion resistant sheaths to which are permanently attached corrosion resistant steel fins.

D. Motors – Shall be totally enclosed industrial rated, single phase, permanently lubricated and equipped with thermal overload protection with automatic reset. Units rated 20 KW and less shall have shaded pole motors. Those over 20 KW shall have permanent split capacitor motors.

E. Fan Blade – Shall be of the axial flow type designed for high efficiency and quiet operation. Fan speed shall not exceed 1750 rpm.

F. Thermal Overload Protection – All heaters shall be equipped with a manual reset thermal cutout which disconnects elements and motors in the event normal operating temperatures are exceeded.

G. Wiring – Heaters shall be designed for a single supply circuit, with elements, motor and control circuits sub-divided and fused to conform to the current National Electrical Code, Occupational Safety and Health Act (OSHA) and Underwriters Laboratories, Inc. Standard. All three phase heaters shall have balanced phases.

H. Controls – The unit heater shall be provided with low voltage (24v) controls by the manufacturer to interface with Division 15900 ATC system.

PART 3 - EXECUTION

3.01 INSTALLATION

The electric unit heater shall be installed complete with all accessories in accordance with the manufacturer's recommendations and as shown on the drawings.

END OF SECTION

SECTION 15749

ELECTRIC CABINET UNIT HEATERS

PART 1 - GENERAL

1.01 GENERAL

The Bidding and Contract Requirements, General Requirements, Section 15010 - General Provisions, and Section 15050 - Basic Materials and Methods shall apply to this section.

1.02 SCOPE

Provide and install cabinet unit heater as shown on the drawings and specified herein.

1.03 QUALITY ASSURANCE

A. The cabinet unit heater shall have published ratings and be UL listed and bear the UL label.

B. Equipment installer shall attend a controls coordination meeting with the Section 15900 contractor as described in 15900, 1.03.

1.04 SUBMITTALS

Provide shop drawings on this equipment as described in Section 15010, 1.04. The controls coordination meeting described in 15900 shall be held before the shop drawings are submitted.

PART 2 - PRODUCTS

2.01 CABINET UNIT HEATERS

The cabinet unit heater shall be completely factory assembled and of the type, capacity and voltage shown on the drawings. The cabinet unit heater shall be manufactured by QMARK. Units fully equal to the specified manufacturer and manufactured by TRANE, STERLING, RITTLING, BERKO or AIRTHERM are acceptable.

A. Cabinet: All cabinets shall be constructed of galvanized steel panels, acoustically and thermally insulated with glass fiber blanket material. The cabinet shall be constructed of a minimum of 16-gauge steel on top and sides with 18-gauge front panels. Front panels of horizontal cabinet unit heaters shall be provided with a restraining device or hinges which hold this front panel securely when servicing. Ceiling mounted units shall be recessed and provided with a ceiling mounting flange. The interior chassis shall be constructed of not less than 16-gauge galvanized steel and coated with rust inhibiting paint. Cabinet shall have baked enamel finish with color selected from manufacturer's selection chart by the Architect.

B. Filters: Shall be one (1) inch thick throwaway type.

C. Motor and Fan: Shall be direct driven, forward curved, centrifugal, double width type design for quiet operation. The motor shall be multi-speed, permanent split capacitor. Motor shall have built-in thermal overload protection. The electric input shall not exceed those listed on drawings.

D. Controls: Fan control shall be from multi-speed fan switch located in cabinet unless otherwise noted. The cabinet unit heater shall be provided with low voltage (24v) controls by the manufacturer to interface with Division 15900 ATC system.

E. Electric Heating Coil: The coil shall be finned tube metal sheeted type with extended fins for high heat transfer and reduced operating temperature. The elements shall be enclosed in a heavy gauge steel enclosure.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The cabinet unit heaters shall be installed as shown on the drawings and in accordance with the manufacturer's recommendations.

B. Two sets of spare filters shall be provided in addition to the set used during construction with each unit. The filters shall be changed after the construction dust has been eliminated and before final inspection. The other set of filters shall be stored in the respective mechanical rooms or spaces.

C. Provide a typed list of all the different units and their filter sizes to be included in the O & M manuals. In addition to this, submit to the Owner two additional copies of the list, distributed to:

1. Project Manager, Office of Facilities Management, 5025 Sideburn Road, Fairfax, VA 22032.

END OF SECTION

SECTION 15769

PACKAGE ROOFTOP MAKE-UP AIR UNITS (DOAS) WITH ENTHALPY WHEELS

PART 1 - GENERAL

1.01 GENERAL

A. The Bidding and Contract Requirements, General Requirements, Section 15010 - General Provisions, and Section 15050 - Basic Materials and Methods shall apply to this section.

1.02 QUALITY ASSURANCE

A. The system shall deliver the specified air volume at the static pressure scheduled.

B. The unit shall be constructed to provide smooth interior surfaces and to limit the casing leakage at less than 1% of the specified air volume at operating static.

C. Unit shall be constructed in accordance with CSA C22.2 and UL 1812 and shall carry the ETL label of approval.

D. Unit shall be constructed in accordance with industrial design practices.

E. Insulation shall comply with NFPA 90A requirements for flame spread and smoke generation.

F. Airflow data shall comply with AMCA 210 method of testing.

G. Cabinet and exterior components shall be tested and certified weatherproof.

H. All units shall be 100% factory tested.

I. All effectiveness data of heat and energy recovery components shall be certified by the ARI 1060 certification program directory.

J. Equipment installer shall attend a controls coordination meeting with the section 15900 contractor as described in 15900, 1.03.

1.03 SUBMITTALS

A. Provide shop drawings on this equipment as described in Section 15010, 1.04. The controls coordination meeting described in 15900, 1.03 shall be held before the shop drawings are submitted.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. The rooftop unit shall be manufactured by VALENT. Units fully equal to the specified manufacturer and manufactured by GREENHECK or AAON are acceptable.

2.02 EQUIPMENT

A. General - Factory assembled, consisting of fan and motor assemblies (supply and exhaust), compressor section, direct expansion cooling section, gas fired heating section, hot gas reheat coil section, heat wheel, all necessary dampers, hoods, plenums, filters, drain pans, wiring and controls. Unit shall be stand-alone controlled with all control devices provided by the unit manufacturer. Unit shall have single point power connection. Unit shall be designed for 100% outside air.

B. Unit Cabinet:

1. The rooftop unit is to be installed outdoors by the mechanical contractor. Indoor units weatherized for outdoor use are not acceptable.
2. All unit panels are fixed with zinc plated hexagonal head type screws complete with a washer and rubber gasket for a weatherproof assembly. Self-drilling, self-tapping screws are used and therefore no tools are required from the unit interior for panel removal. These panels allow for fast service to all major components.
3. All panel joints must be caulked with a weatherproof silicone. The silicone used must be clear to match any color surfaces. After application, the silicone must react with atmospheric moisture to produce a formed-in-place silicone rubber glazing and curtain wall seal.
4. The unit base frame shall be constructed from a bolted, structural formed G90 galvanized steel with internal structural cross members properly sized to allow rigging and handling of the unit. All major components shall be supported by the base without sagging or pulsating. Lifting lugs shall be provided and strategically located to allow equilibrium during lifting.
5. Unit construction consists of an insulated 14 gauge galvanized structural frame complete with die cast aluminum corners. The rigid frame provides stable construction allowing for panel removal without affecting the unit integrity. Panels shall be double wall construction using 2" thick mineral wool insulation 1.5 lbs/ft3 density, 18-gauge galvanized steel exterior panels (satin coat finish) and 26-gauge G90 galvanized steel inner liner. The unit shall be designed to resist any snow, ice and wind loads, as well as seismic loads in compliance with the National Building Code. Single wall construction with coated insulation will not be acceptable. Exposed insulation edges in the air stream will not be acceptable
6. Internal partition wall shall be insulated and constructed the same as the unit cabinet.
7. Full size access door(s) to allow for periodic maintenance and inspections must be provided for all serviceable components. Serviceable components include but are not limited to coils, heat exchanger, damper sections, motor sections, compressor sections, and piping enclosures. Doors shall be double wall construction made of 18-gauge galvanized steel on both outer and inner liner for maximum rigidity. Door

insulation is the same as the unit panels. Provide doors with heavy duty corrosion resistant aluminum hinges that allow the door to open at 180°. Compression type handles are operable from both sides of the unit access door(s) and neoprene resilient bubble gaskets for an enclosure that is sealed tight shall also be provided. Plastic latch hinges are not acceptable.

8. Outdoor constructed units shall have a pitched roof to dissipate water accumulation. Rain gutters must be provided above access doors. All roof joint seams are "T" shape construction, minimum height of 1.5", sealed and encapsulated by a metal strip.
9. All weather hoods for outdoor constructed units shall be provided with birdscreen and rain gutters. Hoods may ship loose for field assembly.
10. Recessed, double-sloped drain pans shall be made of formed sections of stainless steel. Drain pans are sloped with a threaded drainpipe connection of 1 1/2" in diameter ending outside through the structural base channel. All drain pan corners shall be welded.
11. Paint:

    a. Outdoor constructed units shall have one coat of primer and two coats of enamel paint.
    b. All galvanized steel surfaces that require paint shall be made of satin coat-finished galvanized steel of the specified gauge(s).
    c. All galvanized steel surfaces without any paint shall be made of G90 galvanized steel of the specified gauges.
    d. All unit surfaces that require paint must be cleaned and free from all oil, dirt, and other contaminants before painting.

C. Energy Recovery Heat Wheel

1. Heat Wheels shall comply with UL standards.
2. Heat Wheel - Provide aluminum or polymer transfer media, flame spread rating of not more than 25, and smoke developed rating of not more than 50, and shall be independently tested in accordance with ASTM standard E-84. Rotor media shall be independently tested in accordance with ASHRAE Standards. It shall allow laminar flow (but not radial) at usual velocities and prevent leakage, bypassing and cross contamination by cross flow within wheel. Size the transfer media to allow passage of 300-micron particles without fouling or clogging. Treat media with non-degrading desiccant that is bacteriostatic, non-corroding, and non-toxic. No asbestos material will be allowed. Wheel shall not condense water directly or require a condensate drain for summer or winter operation. Performance rating shall be in accordance with ARI Standard 1060.
3. Provide casing seals on periphery of rotor as well as on duct divider and purge section. Seals are to be adjustable, of extended life materials, and effective in limiting air leakage.
4. Wheel shall be supported by ball or roller bearings and belt driven by a fractional horsepower, totally enclosed, NEMA Standard motor through a close coupled positively lubricated speed reducer, or gear/chain speed reduction. Wheel motor shall be controlled by a manufacturer provided variable frequency drive.

5. Unit shall be constructed of heavy gage steel to insure rigidity and stability. Casing side panels shall be removable to insure easy access to internal parts. Provide integral flanges for flanged duct connection and provide lifting holes or lugs.
6. Provide rotation sensor to monitor energy recovery wheel rotation.

D. Fans:

1. Fan performance ratings for flow rate, pressure, power, air density, speed or rotation, and efficiency shall be factory tested and shall comply with the requirements of AMCA 210.
2. All fans shall be statically and dynamically balanced and designed for continuous operation at the maximum rated fan speed and motor horsepower in accordance with AMCA 300.
3. Fans shall be of centrifugal type, rigidly braced and reinforced to help prevent vibration or pulsation. Wheel diameters and outlet areas shall be in accordance with the standard sizes adopted by AMCA.
4. Fan and motors shall be mounted inside the unit casing with 1" (minimum 90% efficiency) deflection spring vibration isolators and supplied with neoprene flexible connections.
5. Fans shall be selected for a stable operation, at least 20% under the fan's first critical speed.
6. Units shall be equipped with non-overloading, airfoil, SWSI plenum fan, Arrangement 3 (AMCA labeled) supply and exhaust fans to provide scheduled airflows against static pressures indicated.
7. Fan shaft shall be solid steel, turned, ground, polished, and completed with a corrosion resistant coating. Fan wheels shall be keyed to the shaft.
8. Bearings shall be heavy duty, grease-lubricated, self-aligning ball or pillow block type. Bearing shall be selected for a basic rating fatigue life (L-50) in excess of 200,000 hours at maximum operating speed in accordance with AFBMA 9 regulations.
9. Fan drives shall be designed for a 1.4 service factor. Drives are factory mounted with final alignment and belt adjustment made before unit start-up.
10. Belt drives with motor pulley shall be adjustable pitch for use with motors up to and including 10 HP. Fan pulleys shall be fixed pitch.

E. Motors:

1. All motors are internal to the unit casing and are mounted on an adjustable base allowing for belt alignment and tensioning.
2. Fan motors shall be heavy duty, 1800 rpm, high efficiency (E-pact Series), open drip proof (ODP), NEMA Design B Class F insulation and 1.15 service factor. Motors shall be constant speed operable at field voltage: 460 volts, 60 Hz, 3 phase.
3. Torque characteristics shall be sufficient to accelerate the drive loads satisfactorily.
4. Motor sizes shall be minimum size indicated in the equipment schedule. If not indicated, large enough so that the drive load will not require the motor to operate in the service factor range.
5. Temperature rating shall be 122°F (50°C) maximum temperature rise at 104°F (40°C) ambient for continuous duty at full load (Class B Insulation).

6. Motor construction shall be NEMA Standard MG 1, general purpose, continuous duty, Design B.

   a. Bases shall be adjustable.
   b. Bearings shall be:

      1) Ball or roller bearing with inner and outer shaft seals.
      2) Grease lubricated.
      3) Designed to resist thrust loading where belt drives or other drives produce lateral or axial thrust in motors.

   c. Energy efficient motors shall have a minimum efficiency as scheduled in accordance with IEEE Standard 112-B. If efficiency is not specified, motors shall give a higher efficiency than "average standard industry motors" in accordance with IEEE Standard 112-B.

F. Filters:

1. Filters shall be UL 900 Class II.
2. Outside and return air inlet shall be equipped with galvanized steel racks that permit slide out removal of filters (side access) for units equal or smaller than 78", and universal holding frames with upstream access for units taller than 78".
3. Filter banks shall be arranged for flat orientation. The air velocity shall not exceed 500 fpm through each filter bank.
4. Unit shall include 2" disposable type MERV 13 air filters.

G. Dampers:

1. Air leakage through a 48" x 48" damper shall not exceed 10.3 cfm/sq.ft. against 4 in. wg. differential static pressure at standard air. Standard air leakage data to be certified under AMCA certified rating program.
2. Dampers are designed for operation in temperatures ranging between minus 40°F and 212°F.
3. Unit shall be equipped with all necessary dampers. Dampers for outside air intake, exhaust air and all other dampers required for the system including the dampers for defrost (if required).
4. Intake outside air dampers are opposed blade type and exhaust air dampers are parallel blade type. For other dampers, see manufacturer's recommendations.
5. Outside air dampers and bypass dampers shall be motorized. Provide damper actuators with 24 VAC drive voltage. 0-10 VDC modulation.
6. Exhaust air dampers shall be gravity backdraft type. Provide damper actuators with 24 VAC drive voltage. 0-10 VDC modulation.
7. Damper construction shall be as follows:

   a. Damper frame shall be extruded aluminum.
   b. Blades shall be extruded aluminum.
   c. Dampers shall be opposed blade type or parallel blades where indicated
   d. Damper blade ends shall be sealed with neoprene flexible edge seals complete with bottom and top blade wiper seals.

e. Frame and blades shall be non-insulated.

H. Direct Expansion Cooling Section

1. Compressors - Shall be quiet-running hermetic, scroll-type. They shall be mounted in an isolated compartment to be serviceable without affecting airflow and mounted on neoprene isolators to minimize vibration transmission and noise. Unit shall be capable of full modulation to maintain space temperature.
2. Condenser and Evaporator Coils - Shall have copper tubes with permanently expanded aluminum fins. Evaporator coils shall be mounted on a stainless-steel drain pan. Condenser coils shall be provided with hail/ vandal guards to protect the coils.
3. Provide factory mounted sensor between the evaporator coil and the hot gas reheat coil for connection to the ATC system.
4. Thermal Expansion Valves - Shall provide refrigerant control.
5. Standard features of the packaged direct expansion cooling include:

a. Liquid-Line Filter Drier.
b. High Pressure Manual Reset Cutout.
c. Low Pressure Auto-Reset Cutout.
d. Time Delay Relay for Compressor Protection.
e. Service/Charging Valves.
f. Moisture Indicating Sight Glass.

I. Indirect Gas Fired Heating Section - Shall be 80% efficient, ETL Listed for outdoor installation to ANSI Standard Z83.8 - 2002, CGA approved per 2.6 - 2002 and have a blow through fan design. Furnace shall operate with natural gas and have a power venting system. The burner and heat exchanger shall be constructed of aluminized steel. Standard furnace features shall include main gas pressure regulator, main gas valve, fully modulating electronic controls to maintain discharge temperature, direct spark ignition system, high limit, and a 24-volt control transformer.

J. Hot Gas Reheat for Dehumidification - Hot gas reheat coils, piping, and modulating controls shall be factory installed for humidity control.

K. Roof curb - Unit shall be mounted on steel dunnage.

L. Temperature Controls shall be provided by the unit manufacturer.

1. Shall be provided to accomplish control sequence as outlined in the automatic temperature control section of specifications. All temperature controls shall be factory installed, wired, and programmed by the manufacturer or see item 3 below.
2. Manufacturer shall provide an interface which will allow the Owner's energy management system to access the control points shown on the points list. This interface shall be in complete compliance with the current ANSI/ASHRAE Standard #135. Provide any coordination as required to facilitate this interface into the Owner's EMS. Provide all necessary protocol documentation and gateway hardware and software (if required) such that the section 15900 system suppliers may successfully create a communication interface between the control system

furnished in this section of the specification and the section 15900 control system. Provide an adequate level of technical support to guide the section 15900 personnel towards completion of subject communication interface. Protocol must support reading/writing status and analog and digital point information from this section of the specification. All documentation, gateway hardware and software, and required technical support are understood to be included in the bid.

3. Factory built-in controls shall be provided to interface with the ATC to accomplish control sequence as outlined in Automatic Temperature Control section of specifications.

M. A water level sensing device shall be factory provided in the unit condensate pan which shall shut down the unit in the event this device's level is exceeded. Device shall be located in a readily accessible location.

2.03 ELECTRICAL COMPONENTS

A. All electrical controls shall be ETL listed and the entire unit shall be factory wired in accordance with the National Electrical Code Standard.

B. The outdoor constructed units shall be supplied with a weatherproof non-fused main power disconnect switch. A single point power connection shall be provided for all units.

C. Unit shall be equipped with all necessary high voltage components as follows:

1. Motor starters on all high voltage motors for constant speed applications.
2. Thermal protection on all high voltage motors.
3. Fuses and fuse holders.
4. All necessary control transformers.

D. Unit shall be completed with all necessary relays, time delay, damper actuators with auxiliary switches (as required).

E. Terminal board shall be provided for low voltage control wiring. Low voltage is 24V.

F. Fan access doors are equipped with a momentary interrupt switch that shuts off the unit when a protected door is opened. These switches can be removed if belt guards are installed on the fan assembly.

G. An integral control panel shall be provided having a hinged access door and an approved locking device.

H. All control devices, except those not mounted directly to the unit, shall be factory mounted and wired. Control panel shall have a labeled strip to land all wires for field installed control components.

I. All components are fully wired and 100% tested prior to shipping.

PART 3 - EXECUTION

3.01 SEQUENCE OF OPERATION (DOAS UNITS)

A. Controller shall be provided with required sensors and programming for rooftop unit. Controller shall be factory programmed, mounted and tested. Controller shall have a LCD readout for changing set points and monitoring unit operation.

B. UNIT START COMMAND (Unit will be enabled to start once a jumper is placed between R to G):

1. Factory mounted and wired outdoor air are powered.
2. Supply fan starts after 10 seconds (adj.) delay.
3. Tempering options to function as described below.

C. UNIT STOP COMMAND (OR DE-ENERGIZED)

1. Supply fan, exhaust fan and tempering options de-energized.
2. Outdoor air damper actuator is spring return close.

D. OCCUPIED/UNOCCUPIED MODES

1. The VFD controls shall control the occupied/unoccupied mode and relay information to DOAS controller.

a. Occupied Mode:

1) Damper control per below.
2) Supply fan ON.
3) Heating per below.
4) Cooling per below.

b. Unoccupied Mode (Unit Off): Unit remains off when in unoccupied mode:

1) Supply fan OFF.
2) Tempering OFF.
3) Outdoor air damper closed.

E. SUPPLY BLOWER SEQUENCE: The supply blower shall be provided with a factory mounted variable frequency drive. The supply blower speed will be controlled with the following sequence:

1. Constant Volume (on/off): The supply blower will operate at a constant speed set point (adj.) during operation.

F. COOLING SEQUENCE: The cooling is controlled to maintain the supply temperature set point. The mechanical cooling will be locked out when the outside air is < 55°F - 2°F hysteresis, adj.

1. Packaged DX Cooling (Digital Scroll): The controller will provide a modulating signal for cooling. From 10-100%, the digital scroll will be controlled to maintain discharge temperature.
2. Modulating Hot Gas Reheat Sequence: During dehumidification the modulating HGRH is controlled to maintain the supply temperature set point.
3. Standard Head Pressure Control: The controller will provide a signal for 2 condensing fans to maintain ahead pressure set point.

G. DEHUMIDIFICATION SEQUENCE: The cooling is controlled to maintain the cooling-coil set point. The dehumidification sequence will be locked out when the OA is <10°F above the cold-coil set point.

1. Cold Coil Setpoint Reset Function: The controller will control the cooling to maintain an active set point. The active set point will set to local control (55° F, adj) from the factory and can be field adjusted to the following sequence.
2. Room Dew Point: The controller will adjust the cold coil leaving air temperature set point between the minimum (50°F, adj.) and the maximum (55°F, adj.) set points, to satisfy the desired room dew point setpoint.

H. REHEAT SEQUENCE: While the unit is in dehumidification mode, the outdoor air can be reheated via Primary Heating Source, On/Off Hot Gas Reheat or Modulating Hot Gas Reheat for Space Neutral Applications.

1. Modulating Hot Gas Reheat: The controller will modulate the hot gas reheat reheat valve with a 0-10 V signal to maintain the supply temperature set point (adj.).

I. HEATING SEQUENCE: The heating is controlled to maintain the supply temperature set point. The heating will be locked out when the outside air is > 70°F + 2°F hysteresis, (adj.).

1. Indirect Gas Furnace: The controller will Modulate the indirect gas furnace to maintain the supply temperature set point (adj.).

J. SUPPLY SET POINT RESET FUNCTION. The controller will modulate the heating and cooling to maintain an active set point. The active set point will be set to outdoor air reset from the factory and can be field adjusted to the following sequence.

1. OA Reset (Default): The controller will monitor the outdoor air temperature and adjusts the desired supply temperature set point accordingly. For example, when the outdoor air is below 55 °F, the controller will change the supply set point to 70 °F. If the outdoor air is above 65 °F, the controller will change the supply set point to 55°F. If the outdoor air temperature is between 55°F and 65°F, the supply set point changes according to the outdoor air reset function. A visual representation of this is shown below.
2. Room Reset: The controller will reset the supply air temperature set point to maintain the room temperature set point (adj.).
3. Local: The supply set point will be a constant temperature set from the controller (adj.).

4. BMS Control: The controller will adjust the desired supply temp set point to satisfy the desired BMS setpoint.

K. BUILDING FREEZE PROTECTION: If the supply air temperature drops below 35°F (adj.) for 300s (adj.), the controller will de-energize the unit and activate the alarm output after a preset time delay.

L. TEMPERATURE PROTECTION: The controller will enable the supply fan to modulate down to help the unit keep up with heating demand in the event of wheel failure or the unit operating outside design conditions. (This can be enabled under the manufacturer menu in the controller).

M. ALARMS INDICATION: The controller will display alarms and have one digital output for remote indication of an alarm condition. Possible alarms include:

1. Building Management System: The controller will send all alarms to the BMS.
2. Dirty Filter Alarm: A digital signal is sent to the controller indicating an increased pressure drop across the supply air filter (Must be adjusted in field during start up). The controller will then provide a dirty filter alarm.
3. Supply Air Alarm: The controller monitors the proving switch on supply blower and sends an alarm in the case of the blower proving switch not engaging for 30s (adj.).
4. DX Alarm: The controller monitors the refrigerant pressure. In the case of low refrigerant pressure the compressors will shut down until refrigerant pressure returns to normal values and the controller will send an alarm. In the case of high refrigerant pressure the compressors will shut down, requiring a manual reset and the controller will send an alarm.
5. Temperature Sensor Alarm: The controller sends an alarm in the case of a failed air temperature sensor.

N. VFD controller Interfacing: The DOAS unit controls shall be fully integrated with the VFD controller and allow the control and monitoring of all DOAS control points.

O. Phase and Brown Out Protection: Factory mounted and wired component which monitors the main power coming into the unit. If a phase drops out, or if the incoming voltage exceeds the acceptable range, the component will turn off the unit to help protect the electrical systems.

3.02 INSTALLATION

A. Factory Start-up – The manufacturer shall supply complete factory start-up by a factory approved start-up agent.

B. The packaged rooftop unit shall be installed complete with all accessories in accordance with the manufacturer's recommendations, as indicated in the specifications and as shown on the drawings.

C. Two sets of spare filters shall be provided in addition to the set used during construction with each unit. The filters shall be changed after the construction dust has been eliminated and before final inspection. The other set of filters shall be stored in the respective mechanical rooms or spaces.

D. Provide one spare fan belt for each air handling unit.

E. Provide a typed list of all the different units, their filter sizes, and belt sizes to be included in the O & M manuals. The list shall include the unit designation, filter size belt size and the number of filters and belts required for each unit. In addition to this, submit to the Owner two additional copies of the list, distributed to:

1. Project Manager, Office of Facilities Management, Sideburn Support Center, 5025 Sideburn Road, Fairfax, Virginia, 22032.
2. Coordinator, Mechanical Maintenance Division, Maintenance Services, 5025 Sideburn Road, Fairfax, Virginia, 22032.

F. Supply and return air ductwork connecting to package rooftop units setting on steel framing shall have flexible connections in the ductwork located inside the building, just below the roofline or inside of wall for horizontal discharge units. Package rooftop units setting on roof curbs which discharge horizontally shall have the flexible connection located within the building.

3.03 INSTALLATION

A. Factory Start-up - The manufacturer shall supply complete factory start-up by a factory approved start-up agent. Manufacturer shall provide on-site startup and commissioning assistance through job completion. Complete installation and startup checks according to manufacturer's written instructions. This shall include a factory startup for factory provided control devices as well as configuring control points for other DO devices. Service representative shall completely configure all control devices.

B. Demonstration - Engage manufacturer or factory authorized service representative to train Owner's maintenance personnel to adjust, operate and maintain individual units and complete system. This shall include training of the Owner's energy management department representatives as to establish control system programming, scheduling routines, alarm reporting, system topography, communication protocols and password level assignments.

C. The rooftop units shall be installed complete with all accessories in accordance with the manufacturer's recommendations, as listed in the specifications and as shown on the drawings.

D. Two sets of spare filters shall be provided in addition to the set used during construction with each unit. The filters shall be changed after the construction dust has been eliminated and before final inspection. The other set of filters shall be stored in the respective mechanical rooms or spaces.

E. Provide a typed list of all the different units and their filter and belt sizes to be included in the O & M manuals. The list shall include the unit designation, filter size and the number of filters required for each unit, and belt size and number of belts for each unit. In addition to this, submit to the Owner two additional copies of the list, distributed to:

1. Project Manager, Office of Design and Construction Services, Gatehouse Administrative Center, 8115 Gatehouse Road, Suite 3500, Falls Church, VA 22042.
2. Coordinator, Mechanical Maintenance Division, Maintenance Services, 5025 Sideburn Road, Fairfax, Virginia, 22032. Provide one set of spare fuses for each rooftop unit.

F. Provide one spare set of belts per unit per drive.

G. Warranty Tag - The Contractor shall attach an engraved weatherproof Guarantee or Warranty tag to the exterior of each unit. Identification tag shall be black with engraved 1/2" white letters which reads:

UNIT #: DOAS#_____
INSTALLED BY:_____
2-YEAR WARRANTY EXPIRES: (month/day/year)
5-YEAR ENERGY WHEEL WARRANTY: (month/day/year)
SERVICE PROVIDER: (Service Providers Name
PHONE: (Service Providers Phone Number)
ESSER II FUNDED

END OF SECTION

SECTION 16010

ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.01 DESCRIPTION

A. It is the intent of this Specification that this Contractor furnish and install all material, labor, equipment, apparatus, tools, transportation, and other incidentals required to provide the following: power distribution; branch circuit wiring; low voltage wiring; wiring devices; grounding; as shown on Drawings and as described in these Specifications.

1.02 REQUIREMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

B. Provisions of this Section apply to each and every Section of this Division.

1.03 SCOPE

A. It is the intention of these Specifications and the Contract Drawings to call for finished work, tested and ready for operation.

B Any apparatus, appliances, materials, or work not indicated but mentioned in these Specifications, or vice versa, or any incidental accessories necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be furnished, delivered, and installed by this Contractor at no additional expense to the Owner.

C. Minor details not usually shown or specified, but necessary for the proper installation and operation shall be included the same as if herein specified or shown on the Drawings.

D. With submission of bid, this Contractor shall give written notice to the Architect/Engineer of any materials or apparatus believed: inadequate or unsuitable; in violation of federal, state, and local laws, codes, and ordinances, including Fairfax County's electrical inspection rules or regulations; and any necessary items of the work which have been omitted. In the absence of such written notice, it shall be mutually agreed that the Contractor has included the cost of all required items in the proposal and that the Contractor shall be responsible for the approved satisfactory functioning of the entire electrical system and low voltage electrical systems at no additional expense to the Owner.

1.04 APPLICABLE SPECIFICATIONS, CODES, STANDARDS, AND PERMITS

A. Materials, equipment, and installation shall be in accordance with the requirements of the latest adopted editions of the National Electrical Code (NEC), the Virginia Uniform Statewide Building Code, and these Specifications.

B. Unless otherwise specified herein the work and material shall conform to the applicable requirements of the (latest editions or currently adopted) following codes, standards, and regulations:

1. American National Standards Institute (ANSI).
2. Americans with Disabilities Act Code of Federal Regulation (ADA).
3. Canadian Standards Association (CSA).
4. Electronic Industries Association / Telecommunications Industry Association (EIA/TIA).
5. Fairfax County Fire Marshal's Office.
6. Illuminating Engineering Society (IES).
7. International Building Code (IBC).
8. International Code Council (ICC).
9. National Electrical Code (NEC).
10. National Electrical Contractor's Association (NECA).
11. National Electrical Manufacturer's Association (NEMA).
12. National Fire Protection Association (NFPA).
13. Occupational Safety and Health Association (OSHA).
14. Underwriters Laboratories, Inc. (UL).
15. Virginia Occupational Safety and Health Program (VOSH).
16. Virginia Uniform Statewide Building Code (VUSBC).

C. All electrical materials and equipment shall be new, listed by UL, and bear the UL label. This applies to all equipment for which UL standards have been established and label service is regularly furnished.

D. Equipment not UL (or other testing agencies recognized by VUSBC) labeled and equipment assembled in the field using UL components and not UL labeled as an "assembly", for which standards have not been promulgated, shall be accepted upon certification by A.B.M. ELECRICAL POWER SOLUTIONS (MET ELECTRICAL TESTING), 4390 Parliament Place, Suite Q, Lanham, MD 20706 telephone: 240-487-1900 or ELECTRICAL TESTING CORPORATION, 1701 Edmondson Avenue, #201, Baltimore, Maryland, 21228, telephone 410-526-4700. Cost of such certification shall be included in the base bid and in each quoted cost for alternates and proposed change orders. Electrical equipment that requires certification shall be tested by this Contractor at no additional cost to the Owner.

E. Workmanship shall conform to the "Standard of Installation" published by the NECA. This Contractor shall provide a minimum of one (1) valid licensed journeyman electrician (Foreman) to be present at all times while work is being performed. License shall be issued by the Commonwealth of Virginia. Such certification shall be provided to the Architect/Engineer upon request.

F. This Contractor shall: give all necessary notices; obtain all permits (including a

low voltage wiring permit); pay all government taxes, fees, and other costs including, but not limited to the Fairfax County Fire Marshals Office shop drawing review fees; file all necessary plans; prepare all documents; and obtain required certificates of inspection for work and deliver same to the Architect/Engineer before any request for acceptance and final payment for the work.

G. This Contractor shall be responsible for purchasing equipment and appliances that bear the label of an agency as approved by the Fairfax County Department of Public Works and Environmental Services (DPWES). It shall be the responsibility of the Contractor to pay for any label testing of equipment or appliances that are installed without the label of a DPWES approved agency.

1.05 REVIEWS AND SHOP DRAWINGS

A. The materials, workmanship, design, and arrangement of all work installed under this contract shall be subject to the review of the Architect/Engineer and Owner.

B. Where any specified materials, process, or method of construction or manufactured article is specified by name, or by reference to the catalog number of a manufacturer, the specifications are to be used as a guide and are not intended to take precedence over the basic duty and performance specified or noted on the Drawings.

C. In all cases, the Contractor shall verify the duty and available electric characteristics with the specific characteristics of the equipment offered for review.

D. All component parts of each item of equipment or device shall bear the manufacturer's name plate giving name of manufacturer, description, size, type, serial or model number, electrical characteristics, etc., in order to facilitate maintenance or replacement. The nameplate of a Contractor will not be acceptable.

E. If materials or equipment are installed before they have been reviewed by the Architect/Engineer, the Contractor shall be liable for their removal and replacement at no additional expense to the Owner, if in the opinion of the Architect/ Engineer, material or equipment does not meet the intent of the Drawings and Specifications.

F. This Contractor shall call to the attention of the Architect/Engineer by letter or on shop drawing submittals, any instance in which the shop drawings differ from the requirements of the Drawings and Specifications.

G. Data and shop drawings shall be coordinated and included in a single submission in a bound format. Multiple submissions are not acceptable except where prior approval has been obtained from the Architect/Engineer. In such cases, a list of data to be submitted later shall be included with the first submission. No delays in construction occasioned by the Contractor's failure to submit material in accordance with the approval schedule will be excused.

H. Catalogs, pamphlets, or other documents submitted to describe items on which

review is being requested shall be specific and identifications in catalog, pamphlets, etc., of items submitted shall be clearly made in a contrasting ink. Data of a general nature shall not be acceptable.

I. Submitted samples, drawings, specifications, catalogs, and the like shall be properly labeled and shall indicate: specified service for which the material or equipment is to be used; Section and Article number of Specifications governing; contractor's name; and name of the job.

J. Data and shop drawings shall be identified in accordance with General Conditions paragraph 18. In addition, shop drawings shall be identified by the name of the item and system and the applicable Specification paragraph number. This Contractor shall submit the following components/systems described herein and as specified in other Sections of this Specification.

1. Boxes including device, junction, outlet, and pull types.
2. Conduit and associated fittings.
3. Disconnect /safety switches.
4. Fuses and spare fuse cabinet.
5. Panelboards, including distribution and branch circuit.
6. Rooftop conduit support system.
7. Wires, cables, and connectors.
8. Wiring devices.

K. No item or system listed in the schedule above shall be delivered to the site or installed until successful completion of the review. After review of the proposed materials has been successfully completed, no substitution shall be permitted except where approved by the Architect/Engineer in writing. Should the Contractor fail to comply with the requirements of this paragraph, the Owner reserves the right to select any and all items and systems required by this Specification. Materials so selected shall be used in the work at no additional expense to the Owner.

L. The successful review rendered on shop drawings shall not be considered as a guarantee of building conditions. Where shop drawings have been successfully reviewed, said review does not mean that the drawings have been checked in detail and does not in any way relieve the Contractor from the responsibility, nor the necessity of furnishing the material or performing the work as required by the Drawings and Specifications.

M. Failure to submit shop drawings that meet the requirements of the Drawings and Specifications in ample time for review shall not entitle the Contractor to an extension of contract time, and no claim for extension by reason of such default shall be allowed.

N. All equipment and materials to be furnished under this Division of these Specifications shall be as manufactured by the manufacturer(s) listed on the Drawings or herein specified. All requests by any bidder to provide equipment and/or material manufactured by a manufacturer not listed on the Drawings or specified herein, including equipment identified as "OR EQUAL" to a listed

review is being requested shall be specific and identifications in catalog, pamphlets, etc., of items submitted shall be clearly made in a contrasting ink. Data of a general nature shall not be acceptable.

I. Submitted samples, drawings, specifications, catalogs, and the like shall be properly labeled and shall indicate: specified service for which the material or equipment is to be used; Section and Article number of Specifications governing; contractor's name; and name of the job.

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1. Boxes including device, junction, outlet, and pull types.
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8. Wiring devices.

K. No item or system listed in the schedule above shall be delivered to the site or installed until successful completion of the review. After review of the proposed materials has been successfully completed, no substitution shall be permitted except where approved by the Architect/Engineer in writing. Should the Contractor fail to comply with the requirements of this paragraph, the Owner reserves the right to select any and all items and systems required by this Specification. Materials so selected shall be used in the work at no additional expense to the Owner.

L. The successful review rendered on shop drawings shall not be considered as a guarantee of building conditions. Where shop drawings have been successfully reviewed, said review does not mean that the drawings have been checked in detail and does not in any way relieve the Contractor from the responsibility, nor the necessity of furnishing the material or performing the work as required by the Drawings and Specifications.

M. Failure to submit shop drawings that meet the requirements of the Drawings and Specifications in ample time for review shall not entitle the Contractor to an extension of contract time, and no claim for extension by reason of such default shall be allowed.

N. All equipment and materials to be furnished under this Division of these Specifications shall be as manufactured by the manufacturer(s) listed on the Drawings or herein specified. All requests by any bidder to provide equipment and/or material manufactured by a manufacturer not listed on the Drawings or specified herein, including equipment identified as "OR EQUAL" to a listed

manufacturer, must be submitted to the Architect/Engineer not less than ten (10) calendar days prior to the bid date. Any and all replies to said requests will be made in the form of an addendum which shall be made available to all bidders. Any equipment and/or materials installed by this Contractor not manufactured by a specified manufacturer or covered under an addendum shall be removed by this Contractor and the proper equipment or materials installed at no additional expense or delay to the Owner.

1.06 EQUIPMENT DEVIATIONS

A. Where this Contractor proposes to use, and/or uses, an item of equipment other than that specified or detailed on the Drawings, which requires any redesign of any other part of the electrical, mechanical, or architectural layout, all such redesign and all new drawings and detailing required shall be prepared by this Contractor at no additional expense to the Owner and shall be reviewed by the Architect/Engineer.

B. Where such approved deviation requires a different quantity and arrangement of duct work, piping, wiring, conduit, and equipment, this Contractor shall furnish and install any such duct work, piping, structural supports, insulation, controllers, motors, starters, electrical wiring and conduit, and any other additional equipment required by the system at no additional expense to the Owner.

1.07 QUALIFICATIONS FOR BIDDERS

A. This Contractor shall examine drawings and Specifications relating to the work of all trades and become fully informed as to the extent and character of work required and its relation to all other work in the project prior to submission of bid or prior to the start of any construction.

B. Before submitting bid, this Contractor is encouraged to visit the site and examine all adjoining existing buildings, equipment, and space conditions including areas above accessible ceilings on which his work is in any way dependent, for the best workmanship and operation according to the intent of the Specifications and Drawings. This Contractor shall verify dimensions and become fully informed as to the nature and scope of the proposed work and also the conditions under which it is to be conducted. This Contractor shall report to the Architect/Engineer any conditions which, in their estimation, might preclude them from installing the equipment and work in the manner as intended and noted on the Drawings and in this Specification. Failure to take the above precaution shall in no way relieve this Contractor from his obligation to provide the material and work as indicated and as specified at no additional expense to the Owner within the stipulated completion time period.

C. No consideration or allowance shall be granted for failure to visit the site, or for any alleged misunderstanding of materials to be furnished, or work to be done, it being agreed that tender of proposal carried with it agreement to items and conditions referred to herein or indicated in the Drawings.

1.09 DRAWINGS

A. The Drawings are diagrammatic and indicate the general arrangement of systems and work included in the Contract. Do not scale the drawings. Consult the Drawings for the exact location of fixtures and equipment. Where same are not definitely located, this Contractor shall obtain this information from the Architect/Engineer.

B. This Contractor shall follow the Drawings in laying out work and check the Drawings of other trades to verify spaces in which work is to be installed. This Contractor shall maintain maximum headroom and space conditions at all points. Where headroom or space conditions appear inadequate, this Contractor shall notify the Architect/Engineer before proceeding.

C. This Contractor shall call to the attention of the Architect/Engineer of any conflicting information in the Contract Drawings and/or Specifications, by letter or Request for Information (RFI) process. Contractor shall not proceed in error. Conflicts must be resolved.

D. If directed by the Architect/Engineer, this Contractor shall, at no additional expense to the Owner, make reasonable modifications in the layout as needed to prevent conflict with other trades for proper execution.

E. When failure by this Contractor to comply with the work set forth in the above paragraphs results in a conflict, the work shall be modified by this Contractor as directed by the Architect/Engineer at no additional expense to the Owner.

1.10 CONTRACTOR'S WARRANTY

A. This Contractor shall warrant the workmanship, materials, and equipment against defects and/or non-operation as described in General Requirements, Warranty paragraph 7.

1.11 COOPERATION WITH OTHER TRADES

A. This Contractor shall give full cooperation to other trades and shall furnish in writing to the Architect/Engineer any information necessary to permit the work of all trades to be installed satisfactorily with the least possible interference or delay.

B. Where the work of this Contractor will be installed in close proximity to work of other trades, or where there is evidence that work shall interfere with the work of other trades, this Contractor shall assist in working out space conditions to make a satisfactory adjustment. This Contractor shall prepare composite working drawings at a scale not less than 1/4 inch equals 1'-0", clearly showing how the work is to be installed in relation to the work of the other trades. If this Contractor installs the work before coordinating with other trades or as to cause any interference with work of other trades, this Contractor shall make necessary changes to the work to correct the condition at no additional expense to the Owner.

C. This Contractor shall furnish to other trades, all necessary templates, patterns, setting plans, and shop details for the proper installation of the work and for the purpose of coordinating adjacent work.

PART 2 - PRODUCTS

2.01 STANDARD PRODUCTS

A. Unless otherwise shown on the Drawings or herein specified, each item of equipment furnished by this Contractor shall be essentially the standard product of the manufacturer. Where two (2) or more equipment items of the same kind or class or equipment are required, they shall be the product of a single manufacturer.

B. For equipment consisting of an assembly of multiple components, such multiple components do not have to be the products of a single manufacturer.

2.02 PERFORMANCE DATA

A. All performance data specified herein shall be considered actual performance of equipment as installed. If installation details are such that actual operating conditions unfavorably affect performance as compared to conditions under which the equipment was rated, suitable allowance shall be made by this Contractor.

2.03 QUIET OPERATION

A. All equipment, including the emergency engine generator set, shall operate under all conditions of load without transmission of sound and/or vibration which is found to be objectionable in the opinion of the Architect/Engineer. In case of sound or vibration noticeable outside of the room or space in which it is installed, or annoyingly noticeable inside its' own room or space, it shall be considered objectionable. Sound or vibration eliminators as recommended to eliminate any objectionable sound or vibration shall be furnished and installed by this Contractor if deemed necessary by the Architect/Engineer.

2.04 ELECTRICAL WORK

A. All electrical motors for plumbing and mechanical equipment shall be furnished and installed under Division 15.

B. All starters and phase failure relays required for equipment shall be furnished under Division 15 and shall be installed and wired under this Division of these Specifications.

C. All other electrical devices such as variable frequency drives (VFD), pushbutton stations, selector switches, flow switches, pilot lights, thermostats, etc., for the control or operation of mechanical and plumbing equipment shall be furnished and installed under Division 15. These items shall comply with all Sections of this Division of these Specifications.

D. In all cases where VFD's or starters are actuated by automatic controls or other devices specified, all necessary components to actuate VFD's or starters shall be furnished and installed under Division 15.

E. Wiring for automatic temperature control and boiler emergency shut-off shall be furnished and installed under Division 15. All other line voltage control wiring, including interlock wiring for equipment, shall be furnished and installed under this Division unless otherwise noted.

F. Power supply wiring for all equipment shall be furnished and installed under this Division of these Specifications.

G. This Contractor shall coordinate with Division 15 for wiring of approved equipment and shall coordinate specified control functions.

H. This Contractor shall install all starters furnished under Division 15, and provide all wiring from the power source, through the starter, to the motor. Starters shall not be located above ceilings or other concealed locations. If locations are not shown on the Drawings, this Contractor shall locate starters in utilitarian locations such as electrical rooms, janitor closets, etc., as approved by the Architect/Engineer.

I. This Contractor shall provide all power wiring for VFD's from the power source, through the VFD, to the motor.

J. This Contractor shall make final power connections to all items of equipment and electrical heat furnished under Division 15.

2.05 PLATES AND SLEEVES

A. All electrical system conduit shall have sleeves for passing through slabs except concrete slabs in contact with grade. All conduit 1-1/2 inch and larger shall have sleeves where the conduit passes through masonry, concrete, tile, and gypsum wall construction. Conduit passing through concrete slabs on grade shall not require sleeves.

B. This Contractor shall furnish and install sleeves in exterior walls below grade for conduits and, the space between the conduit and the sleeve shall be packed with silicon and made completely watertight.

C. This Contractor shall fasten sleeves securely in floors and walls so that they will not become displaced when concrete is poured or when other construction is built around them. This Contractor shall take precautions to prevent concrete, plaster, or other materials from being forced into the space between the conduit and sleeve during construction.

1. This Contractor shall terminate sleeves flush with walls, partitions, and ceilings.
2. In areas where conduits are concealed, this Contractor shall terminate

sleeves flush with the floor.

3. In finished areas, where conduits are exposed, this Contractor shall terminate sleeves below the floor and cap. In rooms having floor drains, this Contractor shall extend sleeves 3/4 inch above the floor.

D. Escutcheon plates shall be furnished and installed by this Contractor for all exposed conduits passing through walls, floors, and ceilings. Plates shall be nickel-plated, of the split ring type, and of a size to match the conduit. Where plates are provided for conduits passing through sleeves that extend above the floor surface, this Contractor shall furnish and install deep recessed plates to conceal the sleeves.

E. Sleeves shall be constructed of galvanized rigid steel conduit unless otherwise indicated on Drawings.

PART 3 - EXECUTION

3.01 INSTALLATION OF WORK

A. This Contractor shall examine the site and all Drawings before proceeding with the layout and installation of this work.

B. This Contractor shall arrange the work essentially as shown on the Drawings, exact layout shall be made on the job to suit actual conditions. This Contractor shall confer and cooperate with other trades on the job so all work shall be installed in proper relationship. Precise location of parts to coordinate with other work shall be the responsibility of this Contractor.

C. This Contractor shall arrange for required sleeves and openings. This Contractor shall be liable for cutting or patching made necessary by failure to make proper arrangements in this respect.

D. This Contractor shall provide a full time Job Foreman who shall oversee and coordinate the work with other trades and make proper layout of the work to suit the job conditions and to satisfy the general requirements of the Contract.

3.02 DELIVERY AND STORAGE

A. All materials and equipment shall be delivered in the manufacturer's original packages with seals unbroken and with manufacturer's name and contents legibly marked thereon. This Contractor shall store all materials off the ground, under cover, and protected from the weather and construction.

3.03 SCAFFOLDING, RIGGING, AND HOISTING

A. Unless otherwise specified, this Contractor shall furnish all scaffolding, rigging, hoisting, shoring, and services necessary for the erection and delivery into the premises of any equipment and apparatus furnished and removal of same from premises when no longer required.

3.04 ACCESSIBILITY

A. This Contractor shall be responsible for the sufficiency of the size of shafts and chases, the adequate thickness of partitions, and the adequate clearance in double partitions and hung ceilings for the proper installation of the work. This Contractor shall cooperate with all other trades whose work is in the same space and shall advise each trade of their requirements. Such spaces and clearances shall, however, be kept to the minimum size required.

B. This Contractor shall locate all equipment that must be serviced, operated, or maintained in fully accessible positions. This equipment shall include, but not be limited to, disconnect switches, panelboards, transformers, controllers, switchgear, motor control centers, generators, junction boxes and pullboxes, and the like. If required for better accessibility, this Contractor shall furnish access doors or panels for this purpose. Minor deviations from the Drawings may be made to allow for better accessibility, and all changes shall be approved by the Architect/Engineer.

C. This Contractor shall furnish and install access panels as required for access to junction boxes, etc. The panels shall be twelve (12) inches square, unless otherwise required to be larger, with hinged metal door and metal frames. Door and frame shall be not lighter than sixteen (16) gauge sheet steel. Access panels shall be the flush type with screwdriver latching device. The frame shall be constructed so that it can be secured to the building material. Access panels and their locations shall meet with the approval of the Architect/Engineer.

3.05 DEMOLITION

A. This Contractor shall perform all demolition work as shown on the Drawings and specified herein.

B. The procedures used for the accomplishment of demolition work shall provide for safe conduct of the work, careful removal and disposition of material specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services.

C. Work shall be performed in sequence, locations, and time periods as agreed to by the Owner prior to commencement of work.

D. The amount of dust resulting from demolition shall be controlled to avoid creation of a nuisance in the surrounding area. Masks shall be worn for protection against dust inhalation by all persons in the vicinity of work involving removal of masonry.

E. Protection of existing work:

1. Existing work and finishes to remain shall be protected from damage. Work damaged by this Contractor shall be repaired to match existing work at no additional expense to the Owner.

2. This Contractor shall cover equipment as necessary to protect it from dust.
3. Floors shall be protected by this Contractor from damage.
4. At the end of each workday and during inclement weather, this Contractor shall close exterior openings with weatherproof covers.
5. At the end of each workday this Contractor shall broom clean the entire project.

F. This Contractor shall comply with all Federal and local regulations pertaining to environmental protection.

G. Existing equipment and materials shall be dismantled and/or cut-up so as to be removable through existing access passages. No alterations to the building shall be made for the purpose of removing existing equipment and material.

H. All equipment removed shall remain in the property of the Owner and shall be stored or disposed of as directed.

I. Clean-up:

1. This Contractor shall remove debris and rubbish from the site. Do not allow to accumulate in building or on site.
2. This Contractor shall remove and transport debris in a manner so as to prevent spillage on site or adjacent areas.

3. Local regulations regarding hauling and disposal shall apply.

J. Modifications to Existing Electrical Systems:

1. This Contractor shall ensure that all demolition and modifications to existing electrical systems and associated equipment shall be by a qualified electrician.
2. This Contractor shall remove such existing work as called for on the Drawings and/or as required to clear the areas for new construction. Remove each item of equipment, devices including low voltage devices, luminaires (lighting fixtures), etc. and its associated circuitry back to the source of power (switchboard, panelboard, controller, control panel, equipment rack, etc.). Associated circuitry includes conduit, conductors, boxes, wiring devices, coverplates, lamps, ballasts, wireways, switches, starters, etc. which are associated with the item being removed.
3. Except as otherwise noted on the Drawings, all existing electrical work which will not be rendered obsolete and which may be disturbed due to any changes required under this Contract shall be restored to it's original operating condition. Contractor shall make all necessary provisions to maintain **ALL** electrical systems, including communications and other low voltage systems, by extending wiring, conduit, relocating equipment, installing new temporary equipment and/or wiring, etc.
4. Electrical work or material rendered obsolete shall be abandoned where concealed in walls and floor slabs and removed where exposed, and/or where made exposed by the removal of walls and/or ceilings. Where a

concealed conduit is abandoned, and the terminated end is exposed above an accessible ceiling the end shall be capped or sealed in an approved manner. Where a concealed abandoned conduit is terminated in a finished space the conduit shall be removed to below the finished surface (minimum three inches for concrete floor slabs) and the void filled with non-shrinking grout and finished to match the surrounding surfaces.

5. Unused flush device outlet boxes or junction boxes shall be provided with blank coverplates.
6. Where equipment is identified or required to be relocated its associated circuitry shall also be removed, as herein before described, along with it's associated devices, etc. Provide all electrical connections to the relocated equipment to new or extended circuitry as indicated on the Drawings and/or required to make the equipment fully functional.
7. Power, communications and other low voltage systems that will be reconnected or extended permanently or temporarily shall be identified and marked above the ceiling during the demolition and phased construction periods.
8. Where existing electrical work interferes with new work, and where such installations are to remain in use, the installation shall be disconnected and/or reconnected to coordinate with the work indicated on the Drawings and as herein specified.
9. Except as otherwise indicated, panelboard cabinets shall not be used for other purposes than circuit protection and distribution points and shall not be used as junction or pullboxes.

3.06 CUTTING AND PATCHING **NOT APPLICABLE**

A. All cutting and patching of existing construction required for work under this DIVISION of these Specifications shall be performed by this Contractor in accordance with SECTION 01045 CUTTING AND PATCHING.

3.07 PERSONNEL INSTRUCTION AND OPERATING INSTRUCTIONS

A. This Contractor shall furnish to the Architect/Engineer for delivery to the Owner, four (4) bound and indexed copies of an approved operations and maintenance instruction booklet along with a copy of the submittal data for each item of equipment installed under this Contract. The submittal data shall include all low voltage "special systems" drawings and floor plans, updated to include any deviations to the system(s) and/or the building layout to properly reflect "as built" conditions.

B. After all tests are conducted and approved as specified below, this Contractor shall furnish a competent operations engineer for a period of two (2) days to instruct and demonstrate to the Owner, or his authorized representative, the operation of each system. This Contractor shall notify the Architect/Engineer in writing of the person to whom this instruction was given, and the date given. This Contractor shall provide at least one (1) week's notice to the Owner when conducting tests or demonstrations of equipment.

C. This Contractor shall furnish to the Owner as part of the Owner's operating and personnel instruction package, one (1) bound set of marked up drawings indicating any changes made during construction to the original contract drawings. The set shall be clearly labeled, "As Built Plans."

D. This Contractor shall furnish complete Technical Service Manuals with component schematics and parts lists as indicated in appropriate section for each system.

3.08 TESTS

A. This Contractor shall, at his expense, conduct a capacity and general operating test on each system. The test shall demonstrate the specified capacities of the various pieces of equipment and shall be conducted in the presence of the Architect/Engineer and the Owner. The general operating tests shall demonstrate that the entire equipment system is functioning in accordance with the Drawings and Specifications. This Contractor shall furnish all instructions, test equipment, and utilities.

B. After all systems are completely tested, this Contractor shall submit four (4) copies of the test results to the Architect/Engineer for review. Final inspection shall not be made until test results have been reviewed by the Architect/Engineer.

3.09 CLEANING

A. This Contractor shall thoroughly clean all electrical equipment installed under this DIVISION of these Specifications after the system has been completed or used for temporary service, but in any case, prior to final inspection by the Owner's representatives.

B. Cleaning shall include, but not be limited to, luminaires (lighting fixtures), wiring devices, cover plates, distribution equipment, and the like.

3.10 GUARANTEE

A. This Contractor shall guarantee by acceptance of the contract that all work installed shall be free from any and all defects in workmanship and/or materials, and that all apparatus shall develop capacities and characteristics specified, and that if during the phased construction and warranty period such defects in workmanship, materials, or performance appear, this Contractor shall with no additional expense to the Owner, remedy such defects within a reasonable time. In default thereof, Owner may have such work done and charge the cost to this Contractor.

3.11 IDENTIFICATION

A. This Contractor shall furnish an "As-Built" power systems riser diagram indicating service entrance switchboard, panelboards, emergency engine generator set, automatic transfer switch, dimming systems, and safety switches. Diagram shall

indicate size of feeders and conduit, breakers, circuit, and fuses. The diagram shall be neatly drawn, using mechanical drafting methods, at least 24 inches x 36 inches, laminated, and hung from the wall adjacent to service entrance switchboard as directed by the Owner.

B. This Contractor shall refer to the appropriate sections of these Specifications for identification requirements for junction boxes, branch and feeder conductors, underground wiring, low voltage special systems wiring and the like.

3.12 LOCK-OUT/TAG-OUT PROCEDURES

A. This Contractor shall have an established lock-out/tag-out procedure which meets the requirements of VOSH Standard 29 CFR Part 1910, Subpart J, Subsection 147, entitled "Control of Hazardous Energy Sources". This Contractor shall coordinate with the Owner's representative to insure conformance with the Owner's lock-out/tag-out program requirements.

END OF SECTION

SECTION 16110

CONDUITS, RACEWAYS, FITTINGS AND CABLE TRAYS

PART 1 - GENERAL

1.01 REQUIREMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.02 SCOPE

A. The work covered under this Section shall consist of furnishing and installing conduits, raceways, cable trays, and fittings for all systems as shown on the Drawings and herein specified.

1.03 QUALITY ASSURANCE

A. All equipment, materials, and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements, and these Specifications

B. All equipment and materials shall be listed by Underwriters Laboratories, Inc. (UL) for their intended use and shall bear the UL label.

C. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.

D. Submittals are required in accordance with SECTION 16010 of these Specifications for conduits, raceways, fittings, wiring troughs, cable hooks, cable trays and associated support systems.

1. Cable tray submittals shall include product data and drawings of cable tray and accessories including clamps, brackets, hanger rods, splice plate connectors, expansion joint assemblies and fittings showing accurately scaled components.
2. Cable tray product data shall include, but not be limited to, types of materials, finishes, rung spacing, inside depths, and fitting radii. For side rails and rungs, submit cross sectional properties including Section Modulus (Sx) and Moment of Inertia (Ix).

PART 2 - PRODUCTS

2.01 CONDUITS

A. Minimum conduit size shall be ½-inch. No more than six (6) No. 12 AWG conductors shall be pulled in ½-inch conduit. For conductors larger than No. 12

AWG or quantities of No. 12 greater than six (6) conductors, ¾-inch conduit shall be the minimum size. Other sizes shall be as indicated on the plans, or as required by the NEC for number and size of conductors installed. Materials shall be new and full length. Crushed and/or deformed conduits shall not be used.

B. The conduits for the fire alarm system shall be red in color.

C. Rigid steel and intermediate metal (IMC) conduits shall be full weight threaded and galvanized steel pipe of standard pipe dimensions.

D. Electrical metallic tubing (EMT) shall be threadless thin wall conduit, galvanized or zinc metallized.

E. Flexible steel conduit shall be single-strip type, galvanized. Use for short connections where rigid type conduits are impractical, for expansion joint crossing, from outlet box to a recessed luminaire (lighting fixture) (minimum, 4 feet; maximum, 6 feet in length), for final connections to motor terminal boxes or other vibrating equipment. Use only steel connectors approved for flexible conduit. Provide an internal ground wire with proper fittings. Other uses on the project shall not be permitted.

F. Flexible weatherproof conduit shall have polyvinyl sheathing similar to AMERICAN METAL HOSE "Sealtite" type "UA" and shall be used where exposed to the weather to connect all motors; all rooftop mounted equipment, and all other wet locations, where rigid type conduits connections are impractical. Weatherproof flexible conduit installations shall have maximum lengths of ± twenty-four (24) inches. Use only steel connectors approved for flexible weatherproof conduit. Provide an internal ground wire with proper fittings. Other uses on the project shall not be permitted, except where indicated hereinafter in these specifications or as shown on the drawings.

G. Plastic conduits shall be installed only underground or in a concrete slab on grade. Only heavy wall (Schedule 40) plastic conduit shall be used. Where conduit turns out of a concrete slab or finished grade, inside or outside the building, provide a rigid steel conduit elbow and suitable adaptor between plastic and steel conduits. No plastic conduit shall be used inside the building or exposed outside the building, unless otherwise noted on the Drawings.

2.02 FITTINGS

A. Fittings, couplings, and accessories shall be compatible with the conduit material.

B. Unions, couplings, and fittings for rigid and IMC conduits shall be of galvanized steel of conventional dimensions and shall be internally threaded at each end to fit the nontapered thread standard for the corresponding size conduit. Couplings and fittings for electrical metallic tubing shall be of steel and shall be of the compression or setscrew type. Cast pot metal and crimp types are not acceptable.

C. Conduit bodies used with conduits 1-½ inches and larger shall be galvanized cast

iron "mogul conduit bodies" complete with a domed and angled cover, neoprene gasket, stainless steel screws, and rated for "wet locations".

2.03 BUSHINGS AND LOCKNUTS

A. Use OZ/GEDNEY type 'B' insulated or type 'BLG' bushing where necessary to bond conduit to ground connection. Bushings shall be as manufactured by OZ/GEDNEY, THOMAS & BETTS, or CROUSE-HINDS.

B. Locknuts shall be used on both sides of conduit connections to a box or a panelboard in addition to the bushing. Where a larger size opening occurs than the size of the conduit, use reducing locknuts. Do not use reducing washers.

2.04 WIRING TROUGHS

A. Wiring troughs complete with screwed covers shall be used where indicated and for mounting groups of switches and/or starters. Wiring troughs shall be the standard manufactured product of a company regularly producing wiring troughs and shall not be a local shop assembled unit. Wiring trough shall be UL listed and of sizes indicated or as required by NEC, if not indicated. The interior, including couplings shall be completely open without interference. Finish shall be ASA #49 medium light gray enamel over a rust inhibitor. Wiring troughs shall be UL listed "Suitable For Wet Locations" and so labeled where indicated "WP" on the Drawings.

B. Wiring connection taps within wiring troughs shall be made using clear self-sealing, self-insulating, multi-tap connectors with transparent flexible insulating covers. The connectors shall be securely fastened. The multi-tap connector shall be manufactured by ILSCO, Series "PCT" ClearTap or approved equal.

2.05 CABLE HOOK SUPPORT SYSTEMS

A. Cable hooks (also known as "J" hooks) shall be provided for low voltage cable systems as hereinafter specified in other sections of these specifications.

B. Cable hooks shall provide a flat bottom bearing surface of sufficient width to comply with required bend radii of high-performance cables.

C. Cable hooks shall have flare edges to prevent damage while installing cables.

D. Cable hooks shall be designed so the mounting hardware is recessed to prevent cable damage.

E. Cable hooks sized 1-5/16 inches and larger shall have a stainless-steel cable latch retainer to provide containment of cables within the hook. The retainer shall be removable and reusable and be suitable for use in air handling spaces.

F. Cable hooks shall be factory assembled for direct attachment to walls, hanger rods, beam flanges, purlins, strut, floor posts, etc. to meet job conditions.

G. Multi-tiered cable hook assemblies shall be used where required to provide separate cabling compartments, or where additional capacity is needed. Assemblies may be factory assembled or assembled from pre-packaged kits. Assemblies shall consist of a steel angled hanger bracket holding up to six (6) cable hooks.

H. Cable hooks for non-corrosive areas shall be pre-galvanized steel, ASTM A653. Where additional strength is required, cable hooks shall be spring steel with a zinc-plated finish, ASTM B633, SC3. Cable hooks for corrosive areas shall be stainless steel, AISI Type 304.

I. Cable hooks shall be capable of supporting a minimum of 30 pounds with a safety factor of 3. Spring steel cable hooks shall be capable of supporting a minimum of 100 pounds with a safety factor of 3 where extra strength is required.

J. Cable hook manufacturer shall be B-LINE SYSTEMS, INC. Series BCH21, BCH32, BCH64, or equal as manufactured by ERICO CADDY.

2.06 PULL-LINES (CORDAGE)

A. Pull-lines (rope and cordage) types and strengths must be selected and calculated by the Contractor. The selection must be based on the intended use and expected pulling load applications. Design Factor (DF) selections and Working Load Limits (WLL) must be calculated with consideration of exposures to risk and actual conditions of use for each application. Pull-lines shall be in compliance with the latest Cordage Institute Standards and Guidelines.

B. The minimum pull-line tensile strength for insertion into conduits shall be 500 pounds and of the low-friction type.

C. Each utility service entrance conduit (raceway) for power company, telephone company and/or cable television (CATV) company shall have a MULETAPE® pulling tape with numerical values having sequential footage (feet and inches) markings, without splices. The MULETAPE® shall have a minimum tensile strength of 2500 pounds and shall be of the low-friction type with prelubrication, high abrasion resistant yarns.

D. Where minimum pull-line strengths are given, they do not negate the Contractor's responsibility for proper selections and calculations for higher strength pull-lines to suit the application.

2.07 ROOFTOP CONDUIT SUPPORT STRUT SYSTEM

A. Provide rooftop conduit support strut systems that will absorb thermal expansion and contraction of conduits, thus preventing damage to the roof membrane. This Contractor must select the support strut system's load capacity necessary to carry the weights and sizes of conduits.

B. The conduit support base shall have gently rounded edges to prevent damage to the roof and shall be UV resistant polycarbonate resin or 100% recycled rubber and polyurethane prepolymer, and all other metal parts made of hot-dip galvanized or stainless steel.

C. Conduits shall rest on the strut system made of hot-dip galvanized or stainless steel. Provide fasteners sized for the conduit.

D. Rooftop conduit support system manufacturers shall be MIRO INDUSTRIES, INC. or equal as manufactured by CABLOFIL (CABLO-PORT), COOPER B-LINE (DURA-BLOK™) or approved equal.

PART 3 - EXECUTION

3.01 CONDUITS

A. Panelboard feeders shall be run in electrical metallic tubing (EMT), galvanized rigid steel conduit, intermediate grade metal conduit, or plastic conduit as described herein.

B. Branch circuit raceways for motors twenty (20) horsepower (or tons) and larger, or a combination of motors totaling twenty (20) horsepower and larger requiring a single point connection shall be EMT, galvanized rigid steel conduit, intermediate grade metal conduit, or plastic conduit as described herein.

C. Branch circuit raceways for motors served by variable frequency drives (VFD) shall be electrical metallic tubing (EMT), galvanized rigid steel conduit, or intermediate grade metal conduit from the load side of the VFD to the line side of the motor. Do not use plastic conduit.

D. Feeders, branch circuits, fire alarm system wiring, and other low voltage systems wiring (required to be in conduit) installed indoors in dry locations shall be run in electrical metallic tubing (EMT), galvanized rigid steel conduit, or intermediate grade metal conduit above hung ceilings (accessible and non-accessible), in hollow block walls, in furred spaces, in vertical and horizontal pipe chases, and in exposed dry locations as describe herein and other sections of these specifications.

E. Feeders, branch circuits, fire alarm system wiring, and other low voltage systems wiring installed underground, under slab on grade, in concrete, in crawl spaces, or in wet locations shall be run in galvanized rigid steel conduit, intermediate grade metal conduit, or plastic conduit as described herein.

F. Low voltage systems plenum rated wiring or cables run indoors in dry locations shall be in electrical metallic tubing (EMT), galvanized rigid steel conduit, or intermediate grade metal conduit when run above non-accessible ceilings, in hollow block walls, and in exposed dry locations other than communications rooms or in a cable tray. Refer to the respective low voltage systems sections of the specifications for other conduit requirements.

G. Conduits run exposed in boiler rooms, elevator machine rooms, mechanical rooms, pump rooms, fire sprinkler service room, and all other similar spaces, located between the floor and a height of 10'-0" above the finished floor, shall be galvanized rigid steel conduit, or intermediate grade metal conduit as described herein. Conduits above 10'-0" may be EMT, unless otherwise indicated on the Drawings, or required by codes.

3.02 RACEWAY SYSTEM

A. Raceways shall be continuous from outlet to outlet; from outlet to cabinets, junction boxes, or pullboxes; and secured to all boxes so that each system is electrically continuous from service to outlets. Provide termination of raceways with double lock nuts and bushings.

B. Raceways shall be securely and rigidly supported to the building structure in a neat and workmanlike manner, and wherever possible, parallel runs or horizontal conduit shall be grouped together on adjustable trapeze hangers. Raceways shall be supported independently from other disciplines (i.e. mechanical, sprinkler, etc). Support shall be provided at appropriate intervals not exceeding ten (10) feet with straps, hangers, and brackets specifically designed for the application. Channels shall be 1 inch for 24-inch wide trapeze and 1-1/2 inch for larger than 24 inch. Perforated steel straphangers or tie-wire supports are not acceptable. Conduits installed along wall surfaces shall be supported with galvanized steel brackets specifically designed for conduits and sized for the conduit used. Conduit brackets shall be fastened to the wall using appropriate anchors and screws, the use of drive pins and/or other methods using compressed air or gases are not acceptable. Raceways and supports shall not terminate or be fastened directly to the roof decking. Raceways under roof decking shall not be less than 1-½ inches from the nearest surface of the roof decking. Supports attached to structural steel joists shall only be attached within 3" of the top of the joist panel points. Supports attached at the bottom or beyond 3" of the joist panel points must be approved, in writing, by the Structural Engineer of record and the Owner before attaching.

C. Run exposed raceways parallel with or at right angles to walls. In mechanical rooms and similar utilitarian spaces where exposed conduits are used, provide "condulets", and similar fittings in lieu of junction boxes. Exposed outlet boxes of adequate size, however, shall be used to contain wire junctions.

D. No raceway shall be installed within three (3) inches of hot water pipes, or appliances, except at crossings where raceway shall be at least one (1) inch from pipe cover.

E. Install raceway to prevent collection of trapped condensation and be devoid of traps. Slope underground raceways away from the building or provide weep holes when sloping away from the building is not possible.

F. Do not terminate in, or fasten raceways to, motor foundations.

G. Raceways installed outside underground shall have a minimum of twenty-four (24) inches top cover. Separate electric raceways from telephone (and other low voltage systems) raceways with a minimum of twelve (12) inches of well-tamped earth, or six (6) inches of concrete.

H. Joints in raceways in concrete or underground shall be watertight. Steel conduits shall have ends cut square. Ream smooth and paint male threads with graphite-base pipe compound and draw up tight with conduit couplings. Do not paint female threads; where required, use Erickson, or equal, conduit fittings. Running threads shall not be permitted. Place caps in ends of conduits as soon as located to prevent entry of foreign material. Screwed on caps shall be used for threaded conduits. Unused (abandoned) conduits shall be capped. The use of tape, paper or rag wads in not acceptable for conduit caps.

I. After conduit installation, clean and paint marred surfaces affecting galvanizing with asphaltum, galvanized-iron primer.

J. Run conduit above suspended ceilings for outlets in suspended ceilings. Keep clear of planned ductwork where turning down from slab into suspended ceiling.

K. Horizontal or cross runs in solid partitions and walls shall not be permitted.

L. Conduits designated on the Drawings as empty conduits (EC) shall have a properly sized pull-line.

M. Flexible metal conduit used for connection of luminaires (lighting fixtures), receptacles outlets, telepower poles, and as otherwise shown on the Drawings, shall be supported and bonded in accordance with NEC Article 348.

N. Conduit runs in under concrete slabs shall be installed only where shown on the Drawings or approved by the owner and shall be limited to 3/4-inch conduit. Conduit shall be run in the gravel under the slab not in the slab.

O. Where embedded conduits cross building expansion joints, the Contractor shall furnish and install an offset expansion joint or a sliding expansion joint. Sliding expansion joints shall be provided with bonding strap and clamp. Where conduits are exposed, provide expansion fittings or flexible conduit as required.

P. In all wet and damp locations, boiler rooms, elevator machine rooms, kitchens, mechanical rooms, pump rooms, fire sprinkler service room, and all other similar spaces, all final electrical connections to any and all equipment, regardless of the type, shall consist of conductors run in polyvinyl sheathed flexible metal conduit ("Sealtite") with maximum lengths as hereinbefore specified.

Q. Conduits/raceways shall not be permitted to be run exposed on top of finished floors or grade, unless specifically shown on the drawings or approved by the Owner in advance.

R. Raceways or sleeves known to be subjected to different temperatures and where

condensation is known to be a problem, as in cold storage areas of (or in) the building or where passing from the interior to the exterior of the building, the raceway or sleeve shall be filled with an approved material to prevent the circulation of warm air to a cold section of the raceway or sleeve, per NEC 300.7.

3.03 CABLE HOOK SUPPORT SYSTEM

A. Installation and configurations shall conform to the requirements of the current revision levels of ANSI/EIA/TIA Standards 568 & 569, NEC, the manufacturer's installation instructions and other sections of these project specifications.

B. Cable hook assemblies shall be supported from the building structure. Where fastened to walls use appropriate anchors and screws, the use of drive pins and/or other methods using compressed air or gases are not acceptable. Supports shall not terminate or be fastened directly to the roof decking Cables installed under roof decking shall not be less than 1½ inches from the nearest surface of the roof. Cable hook supports attached to structural steel joists shall only be attached within 3" of the top of the joist panel points. Supports attached at the bottom or beyond 3" of the joist panel points must be approved, in writing, by the Structural Engineer of record and the Owner before attaching.

C. Install cables using techniques, practices, and methods that are consistent with Category 5 cables or higher requirements and that support Category 5 or higher performance of completed and linked signal paths, end to end.

D. Install cables without damaging conductors, shield, or jacket.

E. Do not bend cables, in handling or in installing, to smaller radii than minimums recommended by cable manufacturers.

F. Do not exceed load ratings and allowable fill capacity specified by the cable hook manufacturer.

G. Install cable hooks to maintain a minimum three (3) inch clear or higher vertical space above the accessible ceiling tiles for the horizontal cabling and pathway.

3.04 CUTTING AND HOLES

A. Locate holes in advance where they are proposed in structural sections such as ribs or beams. Prior to drilling through any structural section or member, obtain the written approval of the Architect/Structural Engineer of Record and the Owner.

B. Cut holes through concrete and masonry structures with a diamond core drill or concrete saw. Pneumatic hammer, impact electric, hand or manual hammer type drills are not allowed, except where permitted in advance by the Architect/Engineer and Owner, do to limited working space.

C. Openings in floor slabs or fire-rated walls or partitions for raceways and other electrical equipment shall, after installation of the raceway, be fire stopped using a

product similar to THOMAS & BETTS "Flame-Safe" fire retardant.

3.05 ROOFTOP CONDUIT SUPPORT STRUT SYSTEM

A. Rooftop conduit support struts shall be installed in accordance with manufacturer's instructions and recommendations.

B. Determine that the structure, roof insulation, and roof membrane are structurally adequate to support weight of conduits (with conductors), supports and hangers.

C. Install supports at maximum spacing of 10 feet, unless closer spacing is required due to weight of conduits or as shown on the Drawings. Do not exceed manufacturer's recommended load limits.

D. Support pads: Remove rock or gravel from area to be covered by pad, apply on clean area, and center bases on top of support pads.

E. Set conduit in support without dropping or causing undue impact. Install properly sized clamps to suit conduit sizes.

F. Always consult roofing manufacturer for roof membrane compression capacities. If necessary, a compatible sheet of roofing material (rubber pad) may be installed under rooftop support to disperse concentrated loads and add further membrane protection.

G. Contractor shall adjust conductor sizes in raceways in accordance with the National Electrical Code section 310.15(B)(2)(c) based on an average ambient temperature of 84°F.

END OF SECTION

SECTION 16120

WIRE, CABLE, AND CONNECTORS

PART 1 - GENERAL

1.01 REQUIREMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.02 SCOPE

A. The work covered under this Section shall include furnishing and installing wire, metal-clad cable, two-hour fire rated conduit cable, and connectors for all power wiring systems as shown on the Drawings and herein specified.

B. Wiring for data, communication, electronic, fire alarm, or other low voltage and special systems shall be provided as specified in the appropriate specialty Section of these Specifications.

1.03 QUALITY ASSURANCE

A. All equipment, materials, and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements, and these Specifications.

B. All equipment and materials shall be listed by Underwriters Laboratories, Inc. (UL) for their intended use and shall bear the UL label.

C. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.

D. Submittals are required in accordance with SECTION 16010 of these Specifications.

1. Submittals shall include a preliminary schedule to perform the infrared scans described in Part 3 of this specification. The schedule shall be based on the contractual substantial completion date for this project.

PART 2 - PRODUCTS

2.01 MATERIALS AND COMPONENTS

A. All conductors shall be new soft drawn high conductivity copper and shall be delivered to the site in their original unbroken packages plainly marked as follows:

1. UL Label.
2. Size, type and insulation rating of the wire marked every four (4) feet along the length.
3. Name of the manufacturing company and the trade name of the wire.

B. All conductors shall have 600 volt insulation, unless specified otherwise. The minimum operating temperature of the conductor's insulation shall be 75° C.

C. Where conductors are installed in a raceway, in dry and damp locations, conductor insulation shall be rated 75° C. Type THWN or dual rated THWN/THHN.

D. Where conductors are installed in a raceway, exposed to excessive temperatures, conductor insulation shall be rated 90° C. Type THHN, THWN/THHN (dual rated), XHHW or XHHW-2.

E. Where conductors are installed in a raceway, in wet locations, conductor insulation shall be rated 75° C. Type XHHW (wet locations), or XHHW-2 rated 90° C. (dry and wet locations) as appropriate.

F. Conductors on the secondary side of variable frequency drives (VFD) shall be Type XHHW or XHHW-2 as appropriate.

G. The minimum conductor size shall be No. 12 AWG, except for control wiring (minimum size shall be No. 14 AWG), and as stated in other Sections of these Specifications, or as shown on the Drawings. Conductors for 120/277-volt control signals shall not be considered as control wiring.

H. Branch circuits for emergency lighting, including illuminated exit signs, shall be a minimum of No. 10 AWG.

I. Conductors smaller than No. 8 shall be solid; No. 8 and larger shall be stranded.

J. All conductors throughout the project shall be color coded to identify phases, neutral, and ground. Color-coding shall be as follows:

	SYSTEM VOLTAGE	
CONDUCTORS	120/208	277/480
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Gray
Ground	Green	Green

K. Insulated conductors size No. 6 A.W.G. and smaller shall have the insulation color-code identification factory applied for the entire length of the conductor. On larger sizes, provide color-coded phasing tape at each box and connection. White or gray colored insulation shall only be used for grounded (neutral) conductors. For multiple neutrals run in the same conduit, provide separate neutral conductors with

a continuous, factory applied tracer stripe matching the color of the respective phase conductor. Green colored insulation shall only be used for equipment grounding conductors.

L. Where conductor size is not indicated, its current carrying capacity shall be equal to or greater than the rating of its overcurrent protective device.

M. Where conductor sizes are increased for voltage drop or other reasons the equipment grounding conductor (when provided) shall be increased in size proportionately.

N. Where conductor sizes are increased for voltage drop they may be reduced in size within ten feet of the termination in order to fit under the lugs available on the overcurrent protective device but not less than the ampacity of the frame size of the overcurrent protective device.

2.02 METAL-CLAD CABLE

A. The Contractor shall furnish and install where shown on the Drawings or specified herein, metal-clad cable, type "MC", of the size and number of conductors noted on the Drawings. The metal-clad cable shall be a factory assembly of one or more conductors, including a green insulated ground wire enclosed in a galvanized steel interlocked metallic sheath. Metal-clad cable with an aluminum sheath will not be acceptable.

B. Conductors shall be copper with a minimum size of No. 18 A.W.G., solid (through No. 10 A.W.G.) or stranded (No. 8 and larger), Type THHN/THWN (90° C.), and 600 volt. Color-coding of conductors shall be as hereinbefore described.

C. Fittings for metal-clad cable shall be all steel, approved for use with metal-clad cable. Cast pot metal types are not acceptable.

D. Metal-clad cable shall be UL listed and marked in accordance with NEC Article 310.120. Manufacturer's standard color-coding on the exterior sheath may be used. Metal-clad cable shall be as manufactured by AFC CABLE SYSTEMS or CM & ELKINS (CME) WIRE AND CABLE or SOUTHWIRE COMPANY.

PART 3 - EXECUTION

3.01 IDENTIFICATION OF CONDUCTORS

A. All branch circuits, including grounded (neutral) conductors, shall be tagged in the panelboards, in all gutters, and in all junction boxes where circuits terminate for the purpose of identifying the various circuits.

B. Feeders and mains shall be tagged in the distribution switchboards, panelboards, and within junction and pull boxes.

C. The method of tagging shall be with an adhesive type of marker. Tagging shall

clearly distinguish between 120/208 volt and 277/480-volt conductors.

D. Tags shall be applied after wire is installed in conduit.

E. Where it is impractical to use printed markers on certain wires or cables, use blank type with identification marked thereon in indelible pencil.

3.02 INSTALLATION

A. Conduit/raceway system shall be complete prior to pulling in wires.

B. Any run of conduit/raceway which does not permit conductors to be pulled in readily shall be condemned and replaced to the satisfaction of the Architect/Engineer and Owner.

C. Conductors shall be continuous between outlets or junction boxes and no splices shall be made except in outlet boxes, junction boxes, and handholes.

D. Do not combine systems of various voltages or circuits from separate sources in the same raceway or conduit system, regardless of the voltage rating of the conductors, unless otherwise shown on the Drawings.

E. All joints, splices and taps for conductor sizes No. 10 and smaller (including luminaire pigtails) shall be connected with approved type crimp connectors, or spring type screw-on connectors (wire-nuts) with insulating skirts; No. 8 and larger shall be connected with solderless THOMAS & BETTS high pressure connectors with heat shrink insulation that possess equivalent or better mechanical strength and insulation ratings than that of the unspliced conductor. Refer to Specification Section 16110 for splices and taps within wiring troughs. The use of pressure connectors is **not** acceptable.

F. Oil, grease or silicon, which could damage the insulation of the conductors or cables, shall not be used when pulling conductors. Use only UL approved cable lubricants approved for the purpose.

G. Train conductors neatly in panelboards, cabinets, and other electrical equipment. Installed conductors shall allow for a minimum of one (1) future re-termination.

H. Tighten pressure type lugs on switchboards, panelboards, motors and other equipment to the manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and 486B.

I. Conductors in vertical conduit runs shall be supported with split-wedge type fittings that clamp each conductor and tighten under the weight of the conductors at intervals required by the NEC.

J. All wiring within the building structure, crawlspaces, and slabs shall be installed in conduit unless indicated or specified otherwise.

K. Homeruns longer than seventy-five (75) feet from a 120/208 volt panelboard or one hundred seventy five (175) feet from a 277/480 volt panelboard shall be not less than No. 10 AWG, copper.

L. No more than three (3) current carrying phase conductors shall be installed in any one conduit, unless explicitly shown on the drawings.

M. Connect circuits and feeders as shown on the Drawings. Drawings are diagrammatic and do not show every detail required in the wiring system.

N. Install wiring so conductors are not in tension in completed systems.

O. All conductors making up parallel feeders shall be the same size, same type, same insulation and all cut the same length. Bond each group of conductors making up a phase or neutral at both ends in an approved manner. Parallel conductors shall not be run in the same raceway.

P. Provide a separate neutral and grounding conductor (or conduit ground) for all GFI circuits or GFI devices to ensure an adequate ground-fault path.

Q. Branch circuits requiring a neutral conductor shall have one neutral conductor per phase conductor when installed in a common raceway, unless specifically shown otherwise on the Drawings.

R. Conductors or cables installed in conduit or tubing exposed to direct sunlight on rooftops require temperature adjustment factors in accordance with the values in NEC 2008 Table 310.15(B)(2)(c).

3.03 METAL-CLAD CABLE

A. Metal-clad cable may be used in dry locations for connections in casework, for "fished" applications in existing partitions or walls, above accessible ceilings in classrooms, offices and similar locations and within newly installed drywall partitions. Metal-clad cable may also be used as a "whip" connection from an outlet box (secured to the building structure) to a recessed luminaire (lighting fixture) (minimum, 4 feet; maximum, 6 feet in length) above accessible ceilings in lieu of flexible metal conduit as stated in Section 16110.

B. Metal-clad cable may not be used for feeders, homeruns or within corridors, except for recessed luminaire (lighting fixture) connections as described above. Metal-clad cable shall not be used in areas without a ceiling, in areas without an accessible ceiling or from corridors into adjacent rooms.

C. Metal-clad cable shall be installed and supported in accordance with NEC Article 330.30 and these specifications. Supports shall be zinc-coated or equivalent corrosion protection. Individual hangers, straps or similar fittings shall be used and installed at intervals so as not to damage the cable. Where fastened to walls use appropriate anchors and screws, the use of drive pins and/or other methods using

compressed air or gases are not acceptable. Supports shall **not** terminate or be fastened directly to the roof decking. MC Cable under roof decking shall not be less than 1-½ inches from the nearest surface of the roof decking. Supports attached to structural steel joists shall only be attached within 3" of the top of the joist panel points. Supports attached at the bottom or beyond 3" of the top of the joist panel points must be approved, in writing, by the Structural Engineer of record and the Owner before attaching. Staples are not permitted to be used for supports.

D. Bending radius for the metal-clad cable shall be in accordance with NEC Article 330.24.

E. Fittings used for connecting the metal-clad cable to boxes, cabinets, or other equipment shall be all steel UL listed and identified for such use.

F. Metal-clad cable shall be installed parallel or perpendicular to walls. No diagonal runs shall be permitted.

G. Metal-clad cable shall not be installed within three (3) inches of hot water pipes, or appliances, except at crossings where metal-clad cable shall be a least one (1) inch from pipe cover.

H. Metal-clad cable shall not interfere with accessible ceiling tiles. Access to electrical or other equipment shall not be denied by runs of MC cable that prevents removal of panels, including suspended ceiling panels.

I. Flattened, dented, deformed, or open armor is not permitted. If damaged during installation, damaged cables shall be replaced with new undamaged material.

J. Horizontal or cross runs in solid masonry partitions or walls shall not be permitted.

K. All horizontal penetrations through new or existing walls shall be sleeved. No other type of wiring systems shall occupy the same penetration sleeve with the MC cable. Sleeve penetrations through fire-rated walls, after installation of MC cables, shall be fire stopped using a product similar to THOMAS & BETTS "Flame-Safe" fire retardant.

3.04 FIELD QUALITY CONTROL

A. After installing conductors and cables and before electrical circuitry has been energized, perform the following visual and mechanical inspections:

1. Verify cables and conductors comply with the contract documents.

2. Verify cables and conductors are braced for short circuit stresses where specified.
3. Verify cables and conductors are correctly identified at each termination, splice and tap where applicable.
4. Verify correct phase rotation is maintained throughout project.
5. Verify color coding and identification complies with specifications and the

National Electrical Code.

6. Inspect all exposed sections of cables and conductors for physical damage and correct connection.
7. Inspect all bolted and compression connections.

B. Verify phase identification is A, B, C, left to right, front to back and top to bottom. If corrections are required change feeder and branch circuit identification at each end of circuit so that correct phase identification is maintained throughout the project. If incorrect identification is noted on existing systems notify the Architect/Engineer and Owner for action to be taken.

C. Infrared Scanning: After Substantial Completion, but not more than sixty (60) days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger and a complete infrared scan of each panel board, switchboard, and lug terminations of each chiller and motor terminations 20 HP and larger. Remove box and equipment covers so splices and lugs are accessible to portable scanner.

1. Perform a follow-up infrared scan for all splices and terminations previously described approximately eleven (11) months after date of Substantial Completion but must be during normal school (business) operating hours.
2. Contractor shall submit to the Architect/Engineer and Owner, at time of final inspection, a schedule to perform the infrared scans during normal school (business) operating hours while the building is in full operation, under load. Re-terminations requiring any power shut downs must be coordinated with the Owner and performed during non-school (business) hours.
3. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
4. Record of Infrared Scanning: Prepare a certified report that identifies equipment and splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken and observations after remedial action.

D. Remove and replace malfunctioning units then verify, inspect and retest as specified above.

END OF SECTION

SECTION 16130

WIRING DEVICES

PART 1 - GENERAL

1.01 REQUIREMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.02 SCOPE

A. The work covered under this Section shall include furnishing and installing wiring devices, for all electrical systems as shown on the Drawings and herein specified.

1.03 QUALITY ASSURANCE

A. All equipment, materials, and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements and these Specifications.

B. All equipment and materials shall be listed by Underwriters Laboratories, Inc. (UL) for their intended use and shall bear the UL Label.

C. All 125 volt and 250-volt, 15 amp and 20-amp receptacles (NEMA 5-15R, 5-20R, 6-15R, 6-20R, L5-15R, and L5-20R) shall be FSUL WC-596-G compliant and bear the FSUL label.

D. All non-locking 125 volt and 250-volt, 15 amp and 20-amp receptacles (NEMA 5-15R, 5-20R, 6-15R and 6-20R) located in damp or wet locations shall be UL Listed as "weather resistant".

E. All lighting switches shall be FSUL WS-896 compliant and bear the FSUL label.

F. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.

G. Submittals are required in accordance with SECTION 16010 of these Specifications.

1. Certain wiring devices and other equipment listed hereinafter may not be part of this project. This Contractor shall select from the listed devices the equipment necessary to be compliant with the Contract Documents and include in the submittals only the devices and equipment specific for this project.

PART 2 - PRODUCTS

2.01 MOTOR SWITCHES

A. Motor switches shall be totally enclosed, 30-amp, 600 volt with screw-type wire terminals to accept solid copper conductors and a grounding terminal. Motor switches shall be as follows:

1. Single phase, Double pole P&S Cat. No. 7802MD.
2. Three phase, Three pole P&S Cat. No. 7803MD.

B. Motor switches shall include a red pilot light with the switch or on a separate mounting strap in a two-gang outlet box and suitable coverplate. Pilot light shall glow red when switch is ON. Pilot lights shall be suitable for the voltage supplied to the motor switch. Pilot light on a separate mounting strap shall be P&S Cat. No. 2151RED or approved equal.

C. Mechanical door limit switches shall be Mars Corporation Part No. 99-014 – 250-volt, 1 phase, 20-amp, 1 HP max or approved equal.

2.02 RECEPTACLES

A. Receptacles shall be manufactured by PASS & SEYMOUR (P&S) as listed below or the equivalent as manufactured by COOPER (ARROW HART), HUBBELL, or LEVITON.

B. Receptacles shall be of the types listed below, complete with an impact resistant nylon face, screw type wire terminals to accept copper conductors, high strength thermoplastic back body, and grounding terminal, or Plug Tail Type.

1. Duplex 2P, 3W, 20A, 125V, NEMA 5-20R:
   P&S Cat. No. 5362-AI.
2. Duplex 2P, 3W, 20A, 125V, NEMA 5-20R.
   Weather-Resistant:
   P&S Cat. No. WR5362I.
3. Duplex 2P, 3W, 20A, 125V, NEMA 5-20R.
   Ground Fault Circuit Interrupter type with Safe Lock:
   P&S Cat. No. 2097I.

C. All PlugTail receptacles shall come complete minimum six (6) inch solid THHN Connector. Stranded connectors shall not be acceptable.

2.03 COVER PLATES

A. A cover plate shall be furnished and installed over each wiring device Plates shall be PASS & SEYMOUR Type 302 (non-magnetic) stainless steel with satin finish, 0.032" nominal thickness or the equivalent as manufactured by COOPER (ARROW HART), HUBBELL, LEVITON or MULBERRY for all the wiring devices including low voltage devices. All cover plates shall be UL listed.

B. Cover plates shall be of a configuration to match the type of wiring device to be covered. Where more than one flush outlet (switch, receptacle, etc.) is indicated in the same location and at the same mounting height, all (except dimmer switches) shall be ganged in a single multi-gang outlet box under a common cover plate.

C. Wiring devices located in wet or damp locations or noted "WP" on the Drawings shall be complete with a die-cast weatherproof metallic cover plate. Receptacles in damp locations only, may use this type of weatherproof cover plate. All weatherproof cover plates shall be UL listed.

D. All 15 amp and 20-amp receptacle type wiring devices located in wet locations, or noted "WP" on the Drawings, shall have hinged weatherproof "while-in-use" covers. Other receptacle type wiring devices located in wet and damp locations where equipment is intended to be plugged into it and not attended while in use shall also have hinged weatherproof "while-in-use" covers. Provide these types of weatherproof covers at other locations identified on the Drawings. Covers, body and plates shall be gray die-cast aluminum, fully gasketed and suitable for mounting horizontally and vertically. Mounting screws shall be 302 stainless steel. Cover assembly shall be UL listed.

E. Cover plates for receptacles shall be labeled with the circuit number including panelboard designations. Labeling shall be done with a BROTHER® Model No. PT-1400 (P-touch) professional label maker, or approved equal, using a laminated type extra strength adhesive tape, Letters/numerals shall be black with a white background, minimum 3/16" high.

PART 3 - EXECUTION

3.01 WIRING DEVICES

A. This Contractor shall furnish and install all wiring devices, material, and hardware as indicated on the Drawings, as specified, or as required for a complete installation.

B. Before installation, the exact type of wiring devices shall be coordinated with all associated trades.

C. This Contractor shall check all wiring devices for damages during construction and replace where necessary. All devices shall be cleaned and left in a complete operable condition.

D. This Contractor shall verify all door swings before installing lighting switches.

E. Receptacles shall be installed only on clear wall spaces, <u>not</u> in tackboards, chalkboards, pipe chases, mechanical equipment, or built-in type furniture and cabinets. If receptacles are shown on the Drawings to be installed therein, this Contractor shall call it to the attention of the Architect/Engineer and obtain a new location.

3.02 CONNECTIONS

A. Ground equipment according to Specification Section 16460 "Grounding" and the National Electrical Code.

B. Connect wiring according to Specification Section 16120 "Wire, Cables and Connectors".

C. Tighten electrical connections and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A/B.

3.03 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections:

1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

B. Remove malfunctioning units, replace with new units, and retest as hereinbefore specified.

END OF SECTION

SECTION 16140

DEVICE AND OUTLET BOXES

PART I - GENERAL

1.01 REQUIREMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.02 SCOPE

A. The work covered under this Section shall include furnishing and installing device and outlet boxes complete for all electrical systems as shown on the Drawings and herein specified.

1.03 QUALITY ASSURANCE

A. All equipment, materials, and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements, and these Specifications.

B. All equipment and materials shall be listed by Underwriters Laboratories, Inc. (UL) for their intended use and shall bear the UL label.

C. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.

D. Submittals are required in accordance with SECTION 16010 of these specifications.

PART 2 - PRODUCTS

2.01 MATERIALS AND COMPONENTS

A. Boxes shall be steel, hot-dipped galvanized after fabrication, of the type and size for the intended use, and shall have only the holes necessary to accommodate the conduits at point of installation. Multi-gang boxes shall be used for multiple device locations utilizing a single multi-gang cover plate. Sectionalized boxes are not permitted. Boxes shall have barrier separations for conductors using different voltages within the same box.

B. Single gang outlet boxes installed in concrete, masonry or gypsum wall board shall be a minimum four (4) inches square, 1-1/2 inches deep with appropriate tile ring, set flush with wall surface and provided with a single gang cover plate.

C. Outlet boxes for exposed lighting switches and receptacles shall be of the cast "FS" type or "FD" type (when required for code required box volume).

D. Outlet boxes for devices shown on the Drawings to be flush mounted in existing gypsum wallboard partitions shall be minimum three (3) inches by two (2) inches by 2-3/4 inches deep gangable switch box type complete with ears and conduit knockouts.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Before locating outlet boxes, check all of the Drawings for the type of construction and to make sure that there is no conflict with other equipment. The outlet boxes' location shall not interfere with other work or equipment and shall be accessible after completion.

B. Outlet boxes shown on the Drawings to be flush mounted in existing gypsum wallboard partitions shall be installed using metal switch box supports similar to STEEL CITY Cat. No. 820-D.

C. Outlet boxes for devices shown on the Drawings to be installed on opposite sides of the same wall shall be separated horizontally by not less than six (6) inches and if connected with each other, the ends of the raceway shall be filled with sound insulating material after wiring has been installed to fill the voids around the wire. For fire rated walls provide minimum 24" separation or use approved fire assembly.

D. Provide only the conduit openings necessary to accommodate the conduits at the individual location. Plug any unused openings.

E. Device and outlet boxes shall not be fastened in place with drive pins and/or other methods using compressed air or gases.

F. Device and outlet boxes located under roof decking shall not be less than 1½ inches from the nearest surface of the roof decking.

END OF SECTION

SECTION 16150

JUNCTION AND PULL BOXES

PART I - GENERAL

1.01 REQUIREMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.02 SCOPE

A. The work covered under this Section shall include furnishing and installing junction and pull boxes complete for all electrical systems as shown on the Drawings and herein specified.

1.03 QUALITY ASSURANCE

A. All equipment, material, and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements, and these Specifications.

B. All equipment and materials shall be listed by Underwriters Laboratories, Inc. (UL) for their intended use and shall bear the UL label.

C. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.

D. Submittals are required in accordance with SECTION 16010 of these specifications.

PART 2 - PRODUCTS

2.01 MATERIALS AND COMPONENTS

A. Junction and pull boxes shall be provided where indicated and required and shall be of the type and size for the installation of the electrical system. Junction or pull boxes not over one hundred (100) cubic inches in volume shall be constructed in accordance with the requirements of NEC. All junction boxes shall have removable screwed covers and be accessible after completion of the building. Removable covers shall not exceed three (3) feet in size in any direction and split covers shall be used for boxes larger than three (3) feet in any direction. Where several feeders pass through a common pull box, the feeders shall be tagged to indicate clearly their electrical characteristics and branch circuit numbers and panelboard designation. This same information shall be stenciled in paint on the cover of each box.

B. Pull and junction boxes shall be made of code gauge galvanized sheet steel with removable screw covers. Minimum size shall be 4 inch x 4 inch x 2-1/8 inches deep.

C. Cast metal pull boxes shall be provided in damp or wet locations, with a gasketed screwed cover, and drilled and tapped holes as required. Screws shall be brass or bronze.

D. Pull boxes shall be provided in any conduit run which exceeds one hundred (100) feet in length, or any run having more than two hundred seventy (270) total degrees of bend.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Pull and junction boxes shall be installed where indicated on the Drawings or as herein specified. Boxes shall be located so as to be inaccessible to the general public.

B. All boxes and conductors therein shall be marked as hereinbefore specified to indicate the voltage and circuit numbers.

C. Boxes shall not be fastened in place with drive pins and/or other methods using compressed air or gases.

D. Boxes located under roof decking shall not be less than 1-½ inches from the nearest surface of the roof decking.

E. Pull and junction boxes shall be concealed except in electrical and mechanical equipment rooms, spaces architecturally designed to have an open structure without ceilings or as otherwise indicated on the Drawings.

F. All system pull and junction box covers shall be painted as follows:

1.	120/208 Volt	- Black
2.	277/480 Volt	- Orange
3.	Clocks and Program Clocks	- Green
4.	Emergency	- White
5.	Fire Alarm	- Red
6.	Security System	- Gray
7.	Sound	- Blue
8.	Telecommunications	- Yellow
9.	Cable Television/Broadband	- Tan
10.	Cox Communications I-NET (fiber)	- Purple

3.02 CONDUCTORS

A. All conductors entering junction and pull boxes shall be of the same voltage. Do not mix voltages regardless of the conductors' voltage rating, unless specifically shown on the Drawings.

B. Branch circuit conductors and feeder conductors shall not occupy the same junction or pull box. Maintain separate boxes for branch circuits and separate boxes for feeders, unless specifically shown otherwise on the drawings.

3.03 ARC-PROOFING

A. All feeders entering a pull box containing more than one (1) feeder, or more than one (1) parallel feeder, shall be arc-proofed as follows. Conductors of the same feeder, including each set of a parallel feeder, shall be tightly grouped together and held in place with random wrapped 3M No. 33 Tape. Grouped cables shall be arc proofed using spirally wound one half-lapped layer of 3M No. 77 Fire and Arc-Proofed Tape which shall be held in place with random wrapped 3M No. 69 Glass Cloth Electrical Tape.

END OF SECTION

SECTION 16160

FUSES

PART I - GENERAL

1.01 REQUIREMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.02 SCOPE

A. The work covered under this Section shall include furnishing and installing fuses complete for all electrical systems and a spare fuse cabinet as shown on the Drawings and herein specified.

1.03 QUALITY ASSURANCE

A. All equipment, materials, and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements, and these Specifications.

B. All equipment and materials shall be listed by Underwriters Laboratories, Inc. (UL) for their intended use and shall bear the UL label.

C. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.

D. Submittals are required in accordance with SECTION 16010 of these Specifications.

PART 2 - PRODUCTS

2.01 MATERIALS AND COMPONENTS

A. Fuses shall be listed and meet UL and/or NEMA Standards for Class K5, J, L, and RK1 fuses, or as indicated on the Drawings.

B. Dual element cartridge fuses shall be Class K5, or as indicated on the Drawings, high interrupting capacity with current limiting effect, 200,000 ampere RMS symmetrical at rated voltage minimum, and a minimum time delay of ten (10) seconds at five hundred percent (500%) load. Unless otherwise indicated on Drawings, Class K-5 fuses shall be used for individual motor circuit protection, for motor control centers, and motor starter panelboard protection.

C. Class J and L fuses shall be provided as indicated on the Drawings for protection

of non-motor loads.

D. Fuse voltage rating shall be 250 volts for 120/208-volt system and 480 or 600 volts for 277/480 volt system.

E. Fuses shall be as manufactured by COOPER BUSSMANN, GENERAL ELECTRIC, LITTLEFUSE or MERSEN (FERRAZ SHAWMUT).

F. Fuses over 600 amps up to 6,000 amps shall be UL Class 'L' time-delay fuses equal to BUSSMANN "HI-CAP" KRP-C. The fuses shall hold five hundred percent (500%) of rated current for a minimum of four (4) seconds and clear twenty (20) times rated current in .01 seconds or less.

G. Fuses up to 600 amps used for service entrance equipment shall be UL Class RK1 dual-element fuses equal to BUSSMANN "LOW-PEAK" LPN-RK for 250 volts or LPS-RK for 600 volts. The fuses shall hold five hundred percent (500%) of rated current for a minimum of ten (10) seconds.

H. Fuses protecting other than service entrance equipment rated over 100 amps up to 600 amps shall be UL Class K5 dual-element fuses equal to BUSSMANN "FUSETRON" FRN-R for 250 volts or FRS-R for 600 volts unless otherwise noted on the Drawings.

I. Fuses 100 amps and under shall be UL Class K5 dual-element fuses equal to BUSSMAN "FUSETRON" FRN-R for 250 volts or FRS-R for 600 volts unless otherwise noted on the Drawings.

2.02 SPARE FUSE CABINET

A. All spare fuses shall be stored in their original cartons in the spare fuse cabinet furnished and installed by this Contractor. The cabinet shall be steel, surface mounted, with a hinged door and flush lock, finished with gray baked enamel, and sized as required to house all spare fuses. A directory listing type and location of each fuse shall be mounted on the inside of the door. Spare fuse cabinet shall be similar to BUSSMANN Cat. No. SFC.

PART 3 - EXECUTION

3.01 INSTALLATION

A. This Contractor shall furnish and install all fuses required for the electrical equipment furnished under this Division of these Specifications including all fusible safety switches, switchboards, distribution panels, motor control centers, etc.

B. Fuses shall be of the proper size, type and ampere rating required by the device accepting the fuses. The use of fuse reducers will not be allowed.

3.02 SPARE FUSES

A. This Contractor shall provide one set of spare fuses for every set installed and shall be stored in the original boxes in the spare fuse cabinet.

END OF SECTION

SECTION 16435

BRANCH CIRCUIT PANELBOARDS

PART 1 - GENERAL

1.01 REQUIREMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.02 SCOPE

A. The work covered under this Section shall include furnishing and installing circuit breaker type branch circuit panelboards complete for all systems as shown on the Drawings and herein specified.

1.03 QUALITY ASSURANCE

A. All equipment, materials, and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements, and these Specifications.

B. All equipment and materials shall be listed by Underwriter's Laboratories, Inc. (UL) for their intended use and shall bear the UL label.

C. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.

D. Submittals are required in accordance with SECTION 16010 of these Specifications. The manufacturer shall furnish, but not be limited to the following:

1. Circuit breaker layout with dimensions and nameplate designation.
2. Circuit breaker trip ratings and frame sizes.
3. Component list.
4. Conduit entry/exit locations.
5. Assembly ratings, including short-circuit rating, voltage, and continuous current rating.
6. Bus material, including ground bar.
7. Cable terminal sizes.
8. Product data for each type of panelboard.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver material and products in factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations.

B. Each panelboard section shall be delivered in individual shipping cases and individually wrapped for protection.

C. Store in a clean, dry space. Maintain factory protection and /or provide an additional heavy canvas or heavy plastic cover to protect panelboards from dirt, water, construction debris, and traffic. Where applicable, provide adequate heating within enclosures to prevent condensation.

D. Handle in accordance with NEMA PB1.1 and manufacturer's written instructions. Handle carefully to avoid damage to panelboards internal components, enclosure and finish.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. The branch circuit panelboards shall be as manufactured by CUTLER-HAMMER, GENERAL ELECTRIC or SIEMENS.

2.02 PANELBOARDS

A. This Contractor shall furnish and install where indicated on the Drawings, deadfront branch circuit panelboards incorporating switching and branch circuit protective devices of the number, ratings, and type noted herein or as shown on the Drawings. Branch circuit panelboards shall have NEMA 1 general purpose enclosures and shall be surface or flush mounted as noted. All branch circuit panelboards shall be rated for the intended voltage and shall be in accordance with UL's "Standard for Panelboards" and "Standard for Cabinets and Boxes" and shall be so labeled. Branch circuit panelboards shall also comply with NEMA "Standard PB1 for Panelboards" and the NEC.

B. Ratings:

1. Panelboards rated 240 Vac or less shall have short-circuit ratings as shown on the drawings but not less than 10,000-amperes RMS symmetrical.
2. Panelboards rated 480 Vac shall have short-circuit ratings as shown on the drawings but not less than 14,000-amperes RMS symmetrical.
3. Panelboards shall have a fully rated short-circuit rated interrupting ratings as indicated on the drawings and shall be labeled with a UL short-circuit rating.

C. Interiors:

1. All interiors shall be completely factory assembled with switching and protective devices, wire connectors, etc. All conductor connectors, except screw terminals, shall be of the anti-turn solderless type and all shall be suitable for copper conductors of the sizes indicated on the Drawings.

2. Interiors shall be designed so that switching and protective devices can be replaced without disturbing adjacent units and without removing the main bus connectors and shall be so designed that circuits may be changed without matching, drilling, or tapping.

D. Branch circuits shall be arranged using double row construction except where a narrow column width panelboard is required or noted on the Drawings. Branch circuits shall be numbered by the manufacturer.

E. Furnish and install three (3), ¾-inch and two (2), one inch empty conduits up through the wall and turned out above the ceiling; and three (3), ¾-inch and two (2), one inch empty conduits down into the ceiling space below the floor for all flush mounted branch circuits panelboards. Where floor slab is on grade, provide only empty conduits to the ceiling.

F. All surface mounted branch circuit panelboards shall be mounted on twelve (12) gauge formed steel channel having a cross section dimension at least 1-1/2 inches x 1-1/2 inches on walls. The channel and fittings shall have a hot dipped galvanized finish to resist rust formation. Channels shall be installed vertically and as detailed on the Drawings.

G. Bus Bars:

1. Bus bars for the mains shall be of copper sized in accordance with UL 67 Standards for temperature rise to limit temperature rise on any current carrying part to a maximum of 65 degrees C above an ambient of 40 degrees C maximum. The bus bars shall be standard density rated for 1000 amperes per square inch copper. Bus bar taps for branch circuit panelboards with single pole branches shall be arranged for sequence phasing of the branch circuit devices. Busing shall be braced throughout to conform to industry standard practice governing short circuit stresses in panelboards. Phase busing shall be full height without reduction. Cross connectors shall be copper. A non-insulated copper ground bus shall be provided for each panelboard.
2. Phase busing shall be manufactured to accept bolt-on circuit breakers only.
3. Spaces for the addition of future switching and protective devices in branch circuit panelboards shall be bussed for the maximum number of devices possible complete with pre-drilled mounting holes and knockouts in the front cover.
4. A non-insulated copper ground bus shall be provided for each branch circuit panelboard.
5. Full size (100% rated) insulated neutral busing shall be included for panelboards shown with a neutral. Neutral busing shall have a suitable lug for each outgoing feeder or branch circuit requiring a neutral connection.
6. Lugs shall be rated for 75 degrees C terminations and shall bolt in place.

H. Backboxes:

1. Backboxes shall be made from unpainted galvanized code gauge steel having no knockouts.
2. Boxes shall have gutter and wiring space sized as required per NEC but not less than four (4) inches on all sides. Where feeder cables supplying the mains of a panelboard are carried through the box to supply other electrical equipment, the box shall be so sized as to include this wiring space. This wiring space shall be in addition to the minimum gutter space specified above and the limiting width may be increased accordingly.
3. Backboxes shall also have sufficient space to safely attach clamp-on or split-core current transformers to the feeders for future portable or permanent check metering.
4. Backboxes for multiple (two or more) sections shall be of the same dimensions.
5. Each backbox shall include at least four (4) interior mounting studs.
6. The branch circuit panelboard identification number shall be on the backbox.
7. Branch circuit panelboard backboxes shall be of one (1) piece construction.

I. Trim:

1. Hinged doors shall be the door-in-door type covering all switching device handles and all live parts and shall be included in all branch circuit panelboard trims. The use of door in a hinged cover type panelboard is prohibited.
2. Doors in branch circuit panelboard trims shall conform to the following:

    a. In making device handles accessible, inboard doors shall not uncover any live parts. Outboard doors shall allow hinged access to the interior panel wiring without removal of the panel door assembly.
    b. Doors shall have a semi-flush type cylinder lock and catch. Door hinges shall be concealed. Two (2) keys shall be furnished for each panelboard door and all locks shall be keyed as requested by the Owner to match current standard. The outer door shall be keyed separately. Directory frame and card, having a transparent cover, shall be furnished on the inside of each door.
    c. Directory cards shall be neatly typewritten indicating each branch circuit number and assignment. The assignment designation shall include the final room number(s) assigned by the Owner. Do not use the architectural room numbers shown on the Drawings. The director cards shall also include the source (switchboard, panelboard, etc. with circuit number) feeding the panel.

3. The trims shall be fabricated from code gauge sheet steel.
4. All of the panelboard's steel surfaces, exterior and interior shall be properly cleaned and finished with the manufacturer's standard paint over a rust-

inhibiting phosphatized coating. The finish paint shall be of a type to which field applied paint will adhere.

5. Trims for flush mounted branch circuit panelboards shall overlap the box by at least 3/4 inches on all sides. Surface trims shall be mountable by a screwdriver without the need for special tools.

J. Conduit skirts shall be provided on surface mounted branch circuit panelboards, where shown on the drawings. Skirts shall be the same width and depth as the panelboard backbox. Screw on skirt covers shall be the same code gauge sheet steel as the panelboard trim and painted with the same finish and color as the panelboard. Skirts shall be from the top of the panelboard to the underside of the finished ceiling and/or from the bottom of the panelboard to the finished floor concealing all conduits.

2.03 CIRCUIT BREAKERS

A. Electrical circuits shall be protected by molded case circuit breakers as indicated on the Drawings.

B. The circuit breakers shall be operated by a toggle type handle and shall have a quick-make, quick-break over-center switching mechanism that shall be mechanically trip free from the handle so that the contacts cannot be held closed against short circuits and abnormal currents. Tripping due to overload or short circuit shall be clearly indicated by the handle automatically assuming a position midway between the manual "ON" and "OFF" positions. All latch surfaces shall be ground and polished. All poles of a multi-pole breaker shall be so constructed that they open, close, and trip simultaneously.

C. The circuit breakers shall be completely enclosed in a molded case. Non-interchangeable trip breakers shall have their covers sealed; interchangeable trip breakers shall have the trip unit sealed to prevent tampering. Ampere ratings shall be clearly visible. Contacts shall be non-welding silver alloy. Arc extinction shall be accomplished by means of arc chutes consisting of metal grids mounted in an insulating support. Breakers shall be of the bolt-on type; plug-in, plug-on, blow-on, and clamp-on circuit breakers shall not be acceptable.

D. Circuit breakers shall be 80% rated unless indicated on the Drawings to be 100% rated.

E. Circuit breakers shall have a minimum symmetrical interrupting capacity as indicated on the Drawings. The interrupting ratings of the circuit breakers shall be at least equal to, or greater than, the available short circuit at the line terminals and not less than those values shown on the Drawings and specified in this specification section.

F. Circuit breakers shall be listed with UL, conform to the applicable requirements of the latest issue of NEMA Standards Publication No. AB1.

G. Circuit breakers shall have thermal-magnetic trip units, with inverse time-current characteristics, unless otherwise noted on the Drawings and/or specified herein.

1. Automatic operation of all circuit breakers shall be obtained by means of thermal-magnetic tripping devices located in each pole providing inverse time delay and instantaneous circuit protection. Instantaneous pick-up settings for each phase shall be adjustable on all frames 250A and above.
2. Circuit breakers shall be ambient compensating in that, as the ambient temperature increases over 40° C, the circuit breaker automatically derates itself to better protect its associated conductor.
3. Circuit breakers 250A and above shall have thermal magnetic interchangeable trip units,

I. Where a circuit breaker is the disconnecting means for fire alarm equipment, a listed breaker locking device shall be installed.

J. Circuit breaker accessories: Provide shunt trips, bell alarms and auxiliary switches, etc. as may be shown on the drawings. All accessories shall be UL Listed for field installation.

K. Circuit breakers shall be manufactured by the same manufacturer as the panelboard and factory installed.

2.04 NAMEPLATES

A. Branch circuit panelboards shall have nameplates of 1/16-inch thick laminated plastic with 3/16-inch high white letters on a black background. Nameplates shall identify the branch circuit panelboard and shall be mounted on the front top of the enclosure.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Before installing branch circuit panelboards, this Contractor shall check all of the Drawings for possible conflict of space and adjust the location of the branch circuit panelboard to prevent such conflict with other items. Panelboard locations in electrical rooms and other spaces shall closely follow the layouts shown on the Drawings, leaving sufficient space on walls for future installations of panelboards and/or other electrical equipment.

B. Surface mounted branch circuit panelboards shall be securely mounted to steel framing channel at locations shown on Drawings. Construction shall be such that additional conduits can be added for future requirements.

C. The cabinets and enclosures shall be mounted in accordance with the NEC. This Contractor shall furnish all materials necessary for mounting the branch circuit panelboards.

D. Install units' plumb, level and rigid without distortion to the branch circuit panelboard.

E. Branch circuit panelboard interiors shall be factory assembled with circuit breakers, wire connectors, etc. Circuit breakers shall be sequence numbered to correspond with the panelboard directory.

F. Contractor shall install required safety labels.

G. The mounting of junction boxes, wire troughs, and auxiliary gutters to the top, bottom or sides of a branch circuit panelboard is prohibited unless approved by the FCPS technical inspection staff on a case by case basis.

3.02 FIELD TESTS

A. Check tightness of all accessible mechanical and electrical connections to assure they are torqued to the minimum acceptable manufacturer's recommendations.

B. Check all panelboards for proper grounding, fastening and alignment.

3.03 FIELD ADJUSTMENTS

A. This Contractor shall perform field adjustments of the protective devices as required to place the equipment in final operating condition. Necessary field settings of devices and adjustments and minor modifications to equipment shall be carried out by this Contractor at no additional cost to the Owner.

3.04 CLEANING

A. Remove debris from panelboards and wipe dust and dirt from all components.

B. Repaint marred and scratched surfaces with touch-up paint to match original finish.

3.05 EXISTING BRANCH CIRCUIT PANELBOARDS

A. This Contractor shall clean, adjust, and tighten all feeder and branch circuit connections (new and existing) and provide new typewritten directories (as described above) in all existing branch circuit panelboards that are associated with work on this project. Panelboard's not associated with work on this project are not subject to this requirement.

END OF SECTION

SECTION 16440

DISCONNECT SWITCHES

PART 1 - GENERAL

1.01 REQUIREMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.02 SCOPE

A. The work under this Section shall include furnishing and installing safety switches and/or bolted pressure switches as shown on the Drawings and herein specified.

1.03 QUALITY ASSURANCE

A. All equipment, materials, and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements, and these Specifications.

B. All equipment and materials shall be listed by Underwriter's Laboratories, Inc. (UL) for their intended use and shall bear the UL label.

C. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.

D. Submittals are required in accordance with SECTION 16010 of these Specifications.

PART 2 - PRODUCTS

2.01 SAFETY SWITCHES

A. This Contractor shall furnish and install where shown on the Drawings, heavy- duty type safety switches. Safety switches shall be NEMA heavy-duty type HD only and shall be UL listed. The heavy-duty safety switches shall be manufactured by CUTLER-HAMMER, GENERAL ELECTRIC or SIEMENS.

B. Switches shall have a quick-make and quick-break operating handle and mechanism that shall be an integral part of the enclosure. Switches shall be horsepower rated 250 volt for 120/208 volt systems or 600 volt for 277/480 volt system. The lugs shall be UL listed for copper conductors and be front removable. Ampere ratings shall be as indicated on the Drawings.

C. Safety switches required and/or noted on the Drawings to be "four wire" shall be

furnished by the manufacturer complete with a solid neutral assembly.

D. Safety switches shall have defectable door interlocks that prevent the door from opening when the handle is in the "ON" position. Defeater mechanism shall be front accessible.

E. Enclosures for the switches shall generally be NEMA 1 or NEMA 3R (rainproof) for exterior locations, or where noted "WP" on the Drawings.

2.02 NAMEPLATE

A. Disconnect switches, including exterior locations, shall have nameplates of 1/16-inch thick laminated plastic with 3/16-inch high white letters on a black background. Nameplates shall identify each piece of equipment and shall be mounted on the front top of the enclosure. Nameplates shall be screw fastened using stainless steel screws.

B. Disconnect switches for elevator equipment shall also provide nameplates and signage to identify the location of the supply side overcurrent protective device, including circuit numbers, per NEC Article 620. Nameplates and signage shall be laminated plastic as hereinbefore described.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The disconnect switches shall be securely mounted in accordance with the NEC, approximately forty-eight (48) inches but no less than twelve (12) inches above the finished floor to the bottom unless otherwise noted.

B. Mounting brackets and hardware exposed to weather shall be galvanized or otherwise suitably protected from corrosion.

1. All NEMA 3R disconnect safety switches mounting openings not used must be permanently sealed to keep rain, moisture, insects, etc. from entering the switch housing. The use of stainless-steel screws/nuts with rubber washers and silicone sealant may be used, or another approved method for a completely sealed switch housing.

C. The fuses (type and size as noted on the Drawings) as specified shall be installed in disconnect switches requiring fuses. Rejection fuse clips shall be installed where called for on the Drawings or in these Specifications.

D. Contractor shall install required safety labels.

END OF SECTION

SECTION 16460

GROUNDING

PART 1 - GENERAL

1.01 REQUIREMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.02 SCOPE

A. The work under this Section shall consist of furnishing and installing grounding systems as shown on the Drawings and herein specified.

1.03 QUALITY ASSURANCE

A. All equipment, materials, and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements, and these Specifications.

B. All equipment and material shall be listed by Underwriter's Laboratories, Inc. (UL) for their intended use and shall bear the UL label.

C. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.

1.04 DESCRIPTION

A. The equipment grounding system shall be designed so all building steel, metallic structures, raceways, enclosures, cabinets, machine frames, junction boxes, outlet boxes, portable equipment, and all other conductive items in close proximity with electrical circuits operate continuously at ground potential providing a low impedance path for possible ground fault currents.

PART 2 - PRODUCTS

2.01 MATERIALS AND COMPONENTS

A. The equipment grounding conductors and straps shall be sized in compliance with the NEC. All equipment grounding conductors shall be provided with green insulation equivalent to the insulation on the associated phase conductors. The related feeder and branch circuit grounding conductors shall be connected to the ground bus with pressure connectors. A feeder serving several panelboards shall have a continuous grounding conductor which shall be connected to each related

cabinet ground bus.

B. This Contractor shall furnish and install a separate green insulated equipment grounding conductor for each single or three-phase feeder and each branch circuit with a two-pole or three-pole protective device. The required grounding conductor shall be installed in the same raceway with the related phase and/or neutral conductors. Where there are parallel feeders installed in more than one raceway, each raceway shall have a green insulated equipment ground conductor. Single-phase branch circuits required for 120- and 277-volt lighting, receptacles, and motors shall consist of phase and neutral conductors installed in a common metallic raceway, which shall serve as the grounding conductor. Flexible metallic conduit equipment connections utilized in conjunction with the above single-phase branch circuits shall be provided with suitable green insulated grounding conductors connected to grounding terminals at each end of the flexible conduit.

C. This Contractor shall furnish and install in the same raceway with the associated phase and/or neutral conductors, a green colored equipment ground conductor having the same type insulation and connected as described below:

1. Where electrical devices, such as heaters, are installed in air ducts, provide a green insulated equipment ground conductor sized in accordance with the NEC based on the rating of the overcurrent device supplying the unit. This conductor shall be bonded to the ground bus in the associated panelboard.
2. From the equipment ground bus in panelboards through raceways and flexible metallic conduit to ground terminal in a connection box mounted on three-phase motors, furnish and install a ground conductor sized as herein specified. Where the motor has a separate starter and disconnecting device, the ground conductor shall originate at the ground bus in the panelboard. Motors shall be bonded to each starter and disconnecting device enclosure.

PART 3 - EXECUTION

3.01 POWER SYSTEM GROUNDING

A. This Contractor shall furnish and install green insulated ground conductor(s) in a raceway to the main ground and domestic metallic water main with ground clamps designed specifically for that purpose.

B. Branch circuit grounding: This Contractor shall furnish and install grounding bushings, ground terminal blocks, and grounding jumpers at distribution centers, pullboxes, panelboards, and the like.

C. Bonding jumpers: This Contractor shall furnish and install a green insulated bonding conductor (size shall correlated with the over-current device protecting the conductor) attached to grounding bushings on the raceway, to lugs on boxes, and other enclosures.

D. Bonding conductors: This Contractor shall furnish and install a bonding conductor in all flexible conduits connected at each end to a grounding bushing.

E. All electrical outlets shall be connected from the device grounding terminal to the outlet box with No. 12 AWG green insulated conductor. This Contractor shall furnish and install a green screw terminal in the outlet box and a continuous green ground conductor from the green terminal screw to the grounding systems as indicated on the Drawings.

3.02 COMMUNICATION GROUNDING

A. Telephone

1. This Contractor shall furnish and install one (1) No. 2 AWG green ground conductor in a ¾-inch raceway from the telephone equipment demarcation space to the main service ground or building secondary grounding electrode system.
2. This Contractor shall furnish and install one (1) No. 2 AWG type green ground loop between each raceway terminating at the telephone equipment demarcation backboard by means of a grounding bushing.

B. Fire detection and alarm systems: This Contractor shall furnish and install one (1) No. 8 AWG green ground conductor in a 3/4 inch raceway from system equipment enclosures to the main service ground or building secondary grounding electrode system.

C. Ancillary communication systems: Provide additional grounding of other building systems as described elsewhere in these specifications.

END OF SECTION

SECTION 16610

FIRE DETECTION AND ALARM SYSTEM

PART 1 - GENERAL

1.01 REQUIREMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.02 SCOPE

A. The work covered under this Section shall include engineering, designing, testing, furnishing and installing a complete and operable addressable type analog fire detection and alarm system shown on the Drawings and herein specified. The system shall include, but not be limited to: Alarm initiating and indicating peripheral devices; outlet boxes; conduit; line and low voltage wiring; and all accessories required.

1.03 QUALITY ASSURANCE

A. All devices and equipment for this system shall be listed by the Underwriter's Laboratories, Inc. (UL), bear the UL label and shall conform to the applicable sections of National Fire Protection Association (NFPA) 72 and 90A, and the Americans with Disabilities Act (ADA) Code of Federal Regulation.

B. The installation shall be in accordance with all requirements of NFPA, the National Electrical Code (NEC), all state and local codes and requirements, and these Specifications.

C. This Contractor shall furnish shop drawings submittals for all components of this system in accordance with SECTION 16010 of these specifications. Submittals shall include the following for review. Submittals not containing all of the information listed below will be rejected.

1. A complete list by model number of each component of the system with a statement of how many pieces of each model are to be furnished and a listing of the specific data sheet.
2. A description of the system as it functions by component in the system using model numbers where applicable.
3. A complete battery calculation listing by module for the system.
4. A data sheet shall be furnished for each component of the system. The specific information shall be highlighted.
5. A detailed drawing of the control panel shall be furnished showing all modules in their specific location with the specific terminal terminations shown.

6. A detailed set of floor plans for the complete building shall be furnished showing the locations of all equipment and devices, their addresses, and their required interconnections. The interconnections shown shall indicate the system manufacturer's recommended number, size, and type of wires as described in this Specification. The plans shall show the locations of all required control and monitor modules and their addresses. The layout of all fire detection and alarm system equipment, devices, and conduit routings shall closely follow that shown on the Drawings.
7. A detailed drawing shall be furnished of each type of device showing the exact terminal designations.
8. A detailed list shall be furnished of each type of device in the system stating its program function in the system.
9. A detailed list shall be furnished of the relays in the system and their program function.
10. Certification by the equipment distributor of the required service response time.

D. Following review of the submittals by the Architect/Engineer and Owner, and prior to release of the fire alarm equipment, this Contractor shall submit to the Fairfax County Fire Marshal's office all copies of the corrected submittals for review, comment, and approval. This contractor shall not release any equipment prior to receiving the Fairfax County Fire Marshall approved shop drawing. This contractor shall be responsible for paying all fees associated with the Fire Marshall's review.

E. The installation of all equipment and the final connection of all components and wiring shall be performed under the direct supervision of the system manufacturer's technical staff.

F. Upon completion, the system shall be thoroughly tested by this Contractor to assure proper interfacing of all components.

G. Prior to final inspection, this Contractor shall furnish to the prime Contractor, five (5) copies of the manufacturer's submittal drawings up-dated to reflect: any and all revisions to the system made during construction; and the final addresses of all devices. A printed list of system devices, which will include the following: device type, address, and custom message.

H. The equipment to be furnished by this Contractor under these Specifications shall be the standard product of one manufacturer. Acceptable manufacturers shall be engaged in the manufacture of multiplexed fire alarm equipment for at least seven (7) years and have a fully equipped, factory trained and authorized service organization that will have a response time of four (4) hours or less to the job site The acceptable manufacturers shall be as follows EDWARDS SYSTEMS TECHNOLOGY (EST); NOTIFIER; and SIMPLEX TIME RECORDER CO.

I. The fire detection and alarm system shall be furnished by a factory authorized distributor certified to design, program, and service the system. This distributor must show evidence of successfully furnishing systems as specified for at least five (5) years. This distributor shall provide twenty-four (24) hour, seven (7) day a week (including holidays) service capability with a maximum four (4) hour response time. This distributor shall provide certification of this capability as part of the submittals.

1.04 DESCRIPTION OF SYSTEM

A. The fire detection and alarm system shall be individual point addressable, general alarm, electrically supervised, continuously sounding temporal tone signal with audible and visual alarm and trouble indications.

1. Each individual alarm initiating device shall report to the control panel as a separate "address".
2. The remote graphic annunciator panel's fire zone, and sprinkler zone boundaries shall be in accordance with the Fairfax County's regulations and the Architect/Engineer's detail on the Drawings.

B. Activation of a sprinkler valve tamper switch; dry pipe HI/LO air; air duct type detector; fire pump fault; or generator fault shall cause the following:

1. The appropriate amber alarm source indicating lamp shall energize on the remote graphic annunciator panel and the integral audible trouble signal shall sound.
2. Auxiliary contacts shall activate the security intrusion system.
3. The system shall identify all off normal conditions and log each condition into the system as an event.

a. The system shall automatically display on the control panel Liquid Crystal Display (LCD) the first (oldest) event of the highest priority by type. The event priority shall be alarm, supervisory, trouble, and monitor.
b. The system shall utilize four event queues and shall not require event acknowledgment by the system operator. Labeled, color coded indicators shall be provided for each type of event queue: alarm - red, supervisory - yellow, trouble - yellow, monitor - yellow. When an unseen event exists for a given type, the indicator shall be lit.
c. For each event, the display shall include the current time, the total number of events, the type of event, the time the event occurred and up to a 42-character custom user description.
d. The user shall be able to review each event queue by simply selecting scrolling keys (up-down) for the event type.

e. New alarm, supervisory, or trouble events shall sound a distinct, silenceable audible signal at the control panel.

f. The LCD shall show the number of active alarm, supervisory, trouble and monitor events

g. The LCD shall show the system time and the number of active and disabled points in the system.

h. Specific input/output devices shall operate in accordance with the alarm, supervisory, trouble, monitor sections that follow and the input/output matrix.

4. Operation of any air duct type smoke detector shall automatically shut down the associated air-handling unit and units which serve the same area, such as gymnasiums, cafeteria, auditoriums, etc.

C. The system, including the remote graphic annunciator panel, shall remain in alarm condition until the initiating device is reset to normal and the control panel is reset. System reset shall be accomplished on a single key-operated switch on the remote graphic annunciator panel.

D. The system shall use 120-volt commercial power as its normal source of power. Upon failure of the normal source, the system shall automatically transfer to the standby power supply which shall be capable of supporting all system supervisory functions for all initiation and signal circuits for a period of four (4) hours as required by NFPA 72A.

E. In the event of failure of operating power, an open, or ground condition on the system wiring, the trouble signals (both audible and visual) shall actuate at the remote graphic annunciator panel. It shall be possible to silence audible trouble signals by means of silencing switches; however, it shall not be possible to extinguish the visual signals until the disarrangement has been corrected. Upon correction of the trouble condition, the audible trouble signal shall sound until the silencing switch is returned to normal or the system automatically resets the trouble indication. Alarm or trouble indication shall cause an auxiliary contact operation connected to the security system Field Interface Device.

F. The system shall allow for trouble monitoring of each booster panel using a SIGA CT1 intelligent monitoring module.

G. Each output function shall be bypassable via switch at the FACP. Any bypass feature shall generate a trouble condition on the FACP and to school security. Each bypass feature shall be grouped by type, Audio/Visual, Door holders, elevator recall and any other outputs. One switch shall be programmed per type of output event.

1.05 TESTING

A. Upon final completion of the installation, and acceptance of each construction

phased space, and after satisfactory testing of the system by this Contractor in the presence of the equipment supplier, this Contractor shall test the system in the presence of the Architect/Engineer, Fire Marshall, Owner, and other authorities having jurisdiction. The manufacturer shall furnish to the Owner a two (2) year contract effective from the date of acceptance, for maintenance and inspection service of the manufacturers' equipment. The manufacturer shall maintain an adequate supply of spare parts for ten (10) years and shall provide supervision of the installation. The manufacturer and/or their distributor shall provide twenty-four (24) hour/seven (7) day (including holidays) service to the system as hereinbefore described.

1.06 WARRANTY

A. This Contractor shall deliver the work described herein in a first-class operating condition in every respect. This Contractor shall also warrant that the material, equipment, and workmanship furnished shall be entirely free from defects. Any materials, equipment, or workmanship in which defects may develop before or during the warranty period shall be repaired or replaced at the Contractor's own expense. Refer to General Requirements, Warranty paragraph 7 for the start of the warranty period. The contractor shall further warrant that all material, equipment, and workmanship used in the installation, but not specifically mentioned in the Drawings and Specifications, is the best of their respective kinds and that the construction and installation was performed in accordance with the best accepted standard practices in all details.

B. It is the intention of this Specification that a complete life-safety system be furnished from a single manufacturer. Equipment shall be UL listed for fire alarm use.

1.07 INSTRUCTION AND MANUALS

A. The equipment manufacturer shall provide eight (8) hours of instruction to the Owner's maintenance personnel and shall furnish three (3) complete field service manuals.

1.08 SPARE PARTS

A. This Contractor shall furnish to the Owner spare parts as follows. Spare parts shall be furnished prior to the installation of the system.

1. Two (2) Air duct type smoke detectors.

PART 2 - PRODUCTS

2.01 AIR DUCT TYPE SMOKE DETECTORS

A. This Contractor shall furnish photoelectric duct smoke detectors as shown on the Drawings and herein specified. The intelligent duct smoke detector shall operate

in ducts having from 100ft/min to 4,000ft/min air velocity. The detector shall be suitable for operation over a temperature range of –20 to 158F° and offer a harsh environment gasket option. The detector shall utilize an air exhaust tube and an air sampling inlet tube that extends into the duct air stream up to ten (10) feet. Design of the detector shall permit sampling tube installation from either side of the detector and permit sampling tube installation in 45- degree increments to ensure proper alignment with duct airflow. Drilling templates and gaskets to facilitate locating and mounting the housing shall be provided.The intelligent duct smoke detector shall obtain information from a photoelectric sensing element. The detector shall be able to differentiate between a long term drift above the pre alarm threshold and fast rise above the threshold. The detector shall monitor the sensitivity of the smoke sensor. If the sensitivity shifts outside the UL limits, a trouble signal shall be sent to the panel. Each detector shall utilize an environmental compensation algorithm that shall automatically adjust for background environmental conditions such as dust, temperature, and pressure. The detector shall provide a maintenance alert signal when 80% (dirty) of the available compensation range has been used. The detector shall provide a dirty fault signal when 100% or greater compensation has been used. Each duct detector shall be installed and tested in accordance with manufacturer's instructions.

B. The detectors shall be furnished complete with auxiliary relay contacts to shut down the associated air handling unit upon activation of the duct detector and to provide contact closure for connection to building ATC system for associated HVAC unit(s) shutdown. The intelligent duct smoke detector shall provide a form "C" auxiliary alarm relay rated at 2amps @ 30Vdc. The position of the relay contact shall be supervised by the control panel software. Operation of the relay shall be controlled either by its respective detector processor or under program control from the control panel as required by the application. Detector relays not capable of programmed operation independent of the detector's state shall not be considered as equal. The detector shall be equipped with a local magnet-activated test switch.

C. Air duct type smoke detectors shall be furnished by this Contractor and installed in the air duct under DIVISION 15. Motor control wiring shall be furnished and installed under DIVISION 15. The detector shall be made part of the fire detection and alarm system by this Contractor.

D. Where duct detectors are installed in area with a suspended ceiling, this contractor shall furnish and install a label on the ceiling grid below where the duct detector is installed.

E. This Contractor shall furnish and install a remote alarm indicator for each air duct type smoke detector. Each alarm indicator shall be complete with an engraved nameplate mounted adjacent to the indicator by this Contractor and lettered with the air handling unit number.

F. An air duct type smoke detector, which will meet this Specification, shall consist of the following.

1. One (1) EST Model No. SIGA-SD intellegent photoelectric duct type detector.
2. One (1) EST Model No. ST sampling tube of the length required to suit the duct dimension.
3. One (1) EST Model No. SIGA-CRH intelligent control module for shutdown of the air handling equipment.
4. One (1) EST Model No. SIGA-LED remote indicator.

2.02 FIELD WIRING

A. Field wiring for each intelligent loop shall consist of cables furnished and installed by this Contractor in minimum ½-inch conduit and as hereinbefore specified. The type, size, and number of conductors in the cable shall be in strict compliance with the manufacturer's requirements.

B. Field wiring for all alarm signals shall consist of cables furnished and installed by this Contractor in minimum ½-inch conduit and as hereinbefore specified. The type, size, and number of conductors in the cable shall be in strict compliance with the manufacturer's requirements.

PART 3 - EXECUTION

3.01 AIR DUCT TYPE SMOKE DETECTORS

A. Air duct type smoke detectors shall be furnished under this DIVISION and mounted into ducts and connected to the air handler control circuit under DIVISION 15. This Contractor shall perform all wiring connections to the fire detection and alarm system and complete system test.

B. Air duct type smoke detectors shall be thoroughly cleaned at the end of the project prior to the system being turned over to the Owner.

3.02 FIELD WIRING

A. All line and low voltage wiring, conduit, backboxes, device mounting boxes, and junction boxes required for the fire detection and alarm system shall be furnished and installed by this Contractor.

B. All low voltage field wiring shall be installed, by this Contractor, in ½" conduit and/or surface metal raceway.

C. This Contractor shall make all connections to panels, devices, and detectors with crimp type spade terminal connectors. Splices in station circuits shall be made only in junction boxes and shall be crimp connected.

D. All wiring shall be checked and tested by this Contractor to ensure the system is free from grounds, opens, and shorts.

E. The installation and final connections of all components and devices shall be performed in accordance with manufacturer's instructions and recommendations. Manufacturer's technical staff shall verify proper installation during testing.

F. A maximum of ten (10) T-taps on the Signalling Line Circuit (SLC) shall be allowed only at the FACP head end cabinet location. (Note: T-taps in the field are prohibited).

G. A copy of the SLC device map shall be provided to the owner upon completion and acceptance of the system.

H. The end of line (EOL) resistor shall be terminated on barrier strip and from barrier strip, #14AWG wiring shall go to to the fire alarm device.

3.03 FIELD PROGRAMMING

A. The manufacturer's technical representative shall field program the fire detection and alarm system after all related equipment has been installed and prior to any final testing. The technical representative shall be factory certified for programming. The initial program shall be developed by the equipment supplier in conjunction with the Owner and Fire Marshal.

B. In addition to the initial field programming described above, the manufacturer shall furnish an additional two (2) sessions of field programming changes to be performed at any time during the warranty period at no additional expense to the Owner.

3.04 ON-SITE AS-BUILT DRAWINGS

A. The Contractor shall provide one (1) set of the fire alarm system supplier's as-built drawings for permanent use on-site. The Contractor shall: laminate each page of these drawings; provide a rigid means for mounting such as ¼-inch thick x two (2) inch wide x width of the drawings through-bolted wood along the left edge of the drawings; furnish and install hanging hooks on the back of the Communications Room door; and hang the bound set of drawings.

END OF SECTION