Fairfax County
PUBLIC SCHOOLS
ENGAGE • INSPIRE • THRIVE

**BOILER REPLACEMENT**

**AT**

**W. T. WOODSON SCHOOL**
9525 MAIN STREET
FAIRFAX, VA 22031

**INVITATION FOR BID #MMB-021-24**

INTENT:

It is the intent of this Contract to secure services to remove two (2) commercial boilers, hot water heating system pumps, unit heaters and all associated piping, and components. The existing boilers shall be replaced with three (3) new condensing boilers, new hot water heating system pumps, unit heaters, and all associated piping and components for the hot water heating systems. Work shall include 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 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 awarded to the Owner from the Coronavirus State and Local Fiscal Recovery Funds (CSLFRF) pursuant to section 9901 of the American Rescue Plan Act, which amends Title VI of the Social Security Act (42 U.S.C. 801 et seq.) by adding sections 602 and 603 to establish the CSLFRF, enacted on January 27, 2022.

Consequently, the successful bidder will be required to comply with all federal requirements relating to use of CSLFRF 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**
**Woodson High School**

Fairfax County PUBLIC SCHOOLS
ENGAGE • INSPIRE • THRIVE

## Table of Contents

**BIDDING REQUIREMENTS, CONTRACT FORMS, AND CONDITIONS OF THE CONTRACT**

# 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 Boiler Replacements to perform the removal of two (2) commercial boilers, hot water heating system pumps, unit heaters and all associated piping, and components. The existing boilers shall be replaced with three (3) new condensing boilers, new hot water heating system pumps, unit heaters, and all associated piping and components for the hot water heating systems. Work shall include 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 these 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 Coronavirus State and Local Fiscal Recovery Funds (CSLFRF) pursuant to section 9901 of the American Rescue Plan Act, which amends Title VI of the Social Security Act (42 U.S.C. 801 et seq.) by adding sections 602 and 603 to establish the CSLFRF, enacted on January 27, 2022.

Bidders are further advised that the federal stimulus funding process under CSLFRF is still evolving and that new requirements for compliance with CSLFRF 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 CSLFRF 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

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 September 26, 2023**. 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:

A mandatory pre-bid meeting will be held September 12, 2023* at 9:30 a.m. at **Woodson High School**, 9525 Main Street, Fairfax, Virginia 22031. Contractors shall meet in the Lobby of the buildings front entrance to sign the meeting roster. **NO ONE WILL BE ADMITTED AFTER 9:35 A.M.**

** 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. COMPLIANCE WITH AMERICAN RESCUE PLAN ACT

The successful bidder shall specifically be required to comply with Section A of 31 CFR Part 35 of the American Rescue Plan Act, as amended.

24. 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.

25. 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:

**Boiler Replacements**
**at**
**Woodson High 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 WOODSON HIGH SCHOOL:

_____ Dollars $_____

**The undersigned agrees to bid and to use <u>only one Manufacturer</u> 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 CSLFRF 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 1, 2024.

2. Substantial Completion on or before August 31, 2024. *(See Definition)*

3. Final Completion on or before September 15, 2024. *(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.(1) **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.

**11. 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.

**12. 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.

## 13. Compliance with Federal Law, Regulations, and Executive Orders

The parties acknowledge that that CSLFRF 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 CSLFRF funds.

## 14. American Rescue Plan Act – 31 CFR § 35 Subpart A

The Contractor acknowledges that the provisions of the American Rescue Plan Act, 42 U.S.C. § 801 et seq. and all applicable regulations apply to its actions related to this project. The Contractor agrees to comply with all related statutes, regulations, executive orders and other guidance related to provisions of the American Rescue Plan Act.

This compliance includes but is not limited to the enumerated eligible uses of the funds related to this Grant as designated in Subpart A of 31 Part 35.

## 15. Incorporation of Additional Requirements

The Contractor acknowledges that the federal funds were appropriated by the Virginia General Assembly to support qualifying ventilation replacement and improvement projects in public school facilities as described in HB 7001 of the 2021 Special Session of the General Assembly.

The Contractor agrees to comply, where applicable, with section 14 of these Terms; provisions of Education Department General Administrative Regulations (EDGAR) 34 CFR Parts 76, 77, 81, 82, 84, 97, 98, and 99; section 442 of the General Education Provisions Act; 34 CFR Parts 100, 104, 106, and 110; the OMB Guidelines to Agencies on Governmentwide Debarment and Suspension (Nonprocurement) in 2 CFR part 180, as adopted and amended as regulations of the U.S. Department of Education in 2 CFR part 3485 2 CFR Part 180, as amended; and the Uniform Guidance in 2 CFR Part 200 et seq.

## 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).

## 18. Preference For Domestic Goods

Pursuant to Section 2CFR § 200.322, the following regulation applies to this Contract:

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.

## 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 **Zhongyuan (Eddie) Ding** as the point of contact (703) 764-2419. 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)

# TECHNICAL REQUIREMENTS

## TABLE OF CONTENTS

# SECTION 02070

# SELECTIVE DEMOLITION

## PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General Conditions and Division 1 Specifications Sections, apply to the Work of this Section, with special attention to the following:

1. Summary of Work: Section 01010

2. Temporary Utilities: Section 01510

3. Construction Aids: Section 01520 (Temporary Enclosures)

4. Barriers: Section 01530

1.02 REFERENCE STANDARDS

A. Occupational Safety and Health Standards for the Construction Industry (29 CFR Part 1926) as promulgated by OSHA.

1. Subpart D – Occupational Health and Environmental Controls, 1926.62-Lead.

2. Subpart T – Demolition.

B. Virginia Erosion and Sediment Control Handbook

C. Fairfax County Public Facility Manual

1.03 WORK EXCLUDED

A. Information related to asbestos abatement/removal and materials and finishes containing asbestos is indicated on the Drawings, and in the school's Asbestos Containing Materials (ACM) Management Plan, available on site and included at the end of this section. Removal of asbestos containing materials shall be performed by a licensed asbestos abatement/removal contractor retained by the Owner, except as noted in 1.06 below

B. It shall be the responsibility of the Contractor to notify the Owner prior to initiating selective demolition in existing building areas where the presence of asbestos

has been identified. Selective demolition shall not commence until asbestos-containing material has been removed.

C. The Contractor shall include a time allowance for notification and abatement/removal operations for identified ACM in his work schedule.

1. A minimum 20-day notification to the EPA and the Virginia State Department of Labor and Industry is required where removal and disturbance of more than 10 LF per 10 SF of ACM is required.

1.04 CONTRACTOR QUALIFICATIONS

A. The Contractor shall have personnel on site during performance of selective demolition who are trained to identify ACM and other hazardous material, and who are familiar with removal procedures for non asbestos containing hazardous materials (See 1.06 below). The Contractor shall provide evidence of certification for these personnel.

1.05 DESCRIPTION OF WORK

A. General:

1. The contractor shall remove and legally dispose of all equipment and materials indicated on the drawings, including those items that contain regulated hazardous materials, including asbestos containing materials (ACM) as noted below. Regulated hazardous materials shall require specialized disposal in accordance with applicable regulations. The Contractor will coordinate the scheduling of the removal of all hazardous materials with the Owner and provide the Owner with documentation that the hazardous waste is disposed at an authorized waste disposal facility.

a. Regulated hazardous materials include the following:

1) Fluorescent lamps and PCB containing ballasts.

2) Lead paint, glazed surfaces, putty and sealants in windows/frames.

a) Remove primer from existing steel prior to making modifications required by the structural drawings. Where modifications run along the structural steel completely, remove primer from area or work. Where modifications intersects at 90 degrees+/-, remove primer 1 foot each side of the connection for a minimum of 2 feet total.

3) Metal primer on structural steel and steel windows.

4) CFC type refrigerants such as R-12 ("Freon").

5) ACM putty and caulk at steel windows. The Contractor must coordinate removal activities to allow the Owner to schedule the presence of a project monitor. Provide the Owner with documentation that the ACM waste generated is disposed at an authorized waste disposal facility.

6) Wood utility poles treated with creosote.

2. Lead-containing painted and glazed surfaces that contain detectable concentrations of lead, including concentrations less than the definition of LBP, must be handled in accordance with the OSHA Lead in Construction Standard. Contractors performing work that could impact paint films or glazing that have detectable concentrations of lead should be informed of the testing results, and should take appropriate actions to comply with the OSHA Lead in Construction Standard. Appropriate actions would include but not limited to performing air monitoring to measure worker exposure; assuring that the workers are provided with adequate respiratory protection; and assuring that workers are provided with appropriate training.

3. Workers performing demolition of LCSC (lead-containing surface coatings) must have, at a minimum, two-hour lead awareness training in accordance with OSHA Standard 29 CFR Part 1926.62. If LCSC are required to be stripped or removed from the building component substrate, then additional training would be required based upon the measured lead concentration of the surface coating and the airborne lead concentrations measured or anticipated to be generated during the each work activity.

4. The disposal of waste generated during any restoration, renovation, or demolition operations, including items coated with lead paint, is regulated by EPA Standard 40 CFR Part 261, Subpart C.

B. Performance of Work

1. Construction of the proposed work will be performed while school is in use. The Contractor shall give full cooperation to the school administration and staff in scheduling and performing the work.

2. The Contractor shall provide, install and maintain safety and dust barriers as required by applicable health and safety regulations and as specified in Section 01520.

3. The Contractor shall schedule his work and deliveries so as not to interfere with the normal operation of the school, including morning arrivals and afternoon departures.

4. The Contractor shall give seventy-two hours advance written notice to Owner when work is to be performed that might endanger and inconvenience occupants.

5. The Contractor shall provide all erosion and sediment control devices as required by site inspector, owner, owner's agent, architect or engineer.

6. The Contractor shall keep open, protect and maintain all existing fire exits and fire lanes during the entire course of construction.

C. Protection

1. Erect barriers, fences, guard rails, enclosures, chutes, and shoring to protect personnel, structures, and utilities remaining intact.

D. Maintaining Traffic

1. Minimize interference with normal use of roads, streets, driveways, sidewalks, and adjacent facilities.

2. Do not close or obstruct streets, sidewalks, alleys, or passageways without written permission from authorities having jurisdiction.

3. If required by governing authorities, provide alternate routes around closed or obstructed traffic ways.

## PART 2 - PRODUCTS

NOT APPLICABLE

## PART 3 - EXECUTION

3.01 INSPECTION

A. Verify that areas to be demolished are unoccupied and discontinued in use.

B. Verify that all utilities within the area to be demolished have been cut off and capped.

C. Do not commence work until conditions are acceptable to Architect and Owner.

3.02 PREPARATION

A. Remove items scheduled to be salvaged for Owner, and place in designated storage area. (See 3.05, Salvage).

3.03 DEMOLITION

A. Demolition shall be carried out with care so that portions of building that are to remain will be undamaged. Work on exterior of building shall be done with extreme care to prevent risk or harm to persons or property. Install temporary floors consisting of sisal kraft paper over existing floors that are to remain in areas of work. Do not allow debris to accumulate.

B. Coordinate demolition with work of other trades. Supervise and assist in removal and replacement of existing materials for installation of new mechanical and electrical items. Remove and replace or re-route mechanical, electrical installation as indicated on the drawings and specified or required for installation of new work or remodeling.

C. Walls

1. At areas where windows are removed, protect adjacent work which shall remain.

2. Where openings are cut in walls, such openings shall be cut with care to avoid damage to work that shall remain.

3. Infill masonry shall be toothed, with the exception of face brick which shall be flush vertically with adjoining existing work.

4. New work shall be carefully installed with materials that match existing, and shall conform to existing planes unless indicated otherwise.

D. Finishes

1. Existing ceiling, wall and floor finish or trim that is disturbed or destroyed by these operations shall be replaced to abut adjoining walls, floors, ceiling and new construction with material to match existing.

2. At locations where existing tile floors are disturbed by new construction, existing tile shall be removed to nearest tile joint that parallels new construction and shall be replaced.

E. Connecting work and new work in extension of existing work shall correspond in all respects with that to which it connects, or similar existing work, unless otherwise indicated or specified. Existing work shall be cut, drilled, altered or temporarily removed and replaced as necessary for performance of Contract.

F. No structural member shall be cut or altered without written authorization of Architect.

G. Work remaining in place that is damaged or defaced by work under this contract shall be restored to the original condition at the time of award of contract.

H. If removal of existing work exposes discolored, unfinished surfaces or work out of alignment, such surfaces shall be refinished or material replaced as necessary to make contiguous work uniform and harmonious.

3.04 DISPOSAL

A. Remove demolition debris daily.

B. Do not store or burn materials on site.

C. Transport demolition debris to off-site legal disposal facilities.

1. Hazardous materials such as fluorescent lamps and PCB-containing ballasts shall be disposed of at special collection centers offering specialized recycling and treatment procedures.

3.05 SALVAGE

A. Owner assumes no responsibility for loss or damage to materials or structures on site, salvage value of which Contractor may have reflected in his bid.

B. Right of first refusal: All existing items of construction, building materials and furnishings (doors, frames, hardware, windows, chalkboards, tackboards, kitchen, heating ventilation, air conditioning, plumbing and electrical equipment, etc.) located in renovated or altered areas of the project shall be carefully removed without damage and remain the property of the Owner unless indicated for re-use in the new work. Any equipment not desired to be retained by the Owner shall be removed from the site and legally disposed of by the Contractor.

END OF SECTION

# SECTION 03300

# CAST-IN-PLACE CONCRETE

## PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General Conditions and other Division 1 Specification Sections, apply to the Work of this Section.

1.02 QUALITY ASSURANCE

A. Perform cast-in-place concrete work in accordance with ACI C94 (latest edition), unless specified otherwise in this Section.

1. The Owner will employ a testing laboratory to conduct tests and provide test results.

2. The testing laboratory shall conduct testing in accordance with the requirements of the Fairfax County Special Instructions Manual and other Fairfax County standards, review test results, and submit reports indicating whether test specimens comply with or deviate from applicable requirements.

1.03 TESTING LABORATORY SERVICES

A. Provide free access to work and cooperate with appointed firm.

B. Submit proposed Ready-mix design to inspection and testing firm for review prior to commencement of work.

C. Cast the following number of test cylinders for each 150 C.Y. or 5,000 S. F. (not less than one set of test cylinders for each days pour):
1. Two (2) Lab Cured for 28 days

2. Two (2) Lab Cured for 7 days.

3. All field cured cylinders as directed by local building official.

E. One additional test cylinder will be taken and held in reserve as required for 56 day testing, and be cured on job site under same conditions as concrete it represents.

F. One slump test will be taken for each set of test cylinders taken.

G. At contractor's option, cylinders may be either 6 x 12 inch or 4 x 8 inch.

1.04 SUBMITTALS

A. Submit concrete mix design, including material certificates for cement, aggregate and admixtures. Certificates shall state compliance with the applicable referenced ASTM standards.

B. Submit catalog data and written application instructions for all concrete compounds.

1.05 REFERENCE STANDARDS

A. ASTM C33 - Concrete Aggregates.

B. ASTM C150 - Portland Cement.

C. ASTM C595 – Blended Hydraulic Cements

D. ASTM C989 – Blast Furnace Slag

E. ASTM C618 – Fly Ash

F. ACI 301 - Specifications for Structural Concrete for Building.

G. ACI 318 - Building Code Requirements for Reinforced Concrete.

H. ASTM C260 - Air Entraining Admixtures for Concrete.

I. ASTM C94 - Ready-Mixed Concrete.

J. ASTM D994 - Pre-formed Asphalt Expansion Joint Fillers for Concrete Paving and Structural Construction.

K. ACI 305 - Recommended Practice for Hot Weather Concreting.

L. ACI 306 - Recommended Practice for Cold Weather Concreting.

M. ASTM C309/C1315 - Liquid Membrane-Forming Compound for Curing Concrete.

N. ACI 347 - Recommended Practice for Concrete Formwork.

O. APA - American Plywood Association.

P. ACI 315 - Recommended Practice for Detailing Reinforced Concrete Structures.

Q. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.

## PART 2 - PRODUCTS

2.01 CEMENT

A. ASTM C150, Type I/II or ASTM C595 Type IS. Use only one of these types of cement for the entire project.

2.02 AGGREGATE

A. Coarse aggregate for stone concrete: ASTM C33, with maximum size 3/4 in. for reinforced concrete and 1-1/2 in. for plain (unreinforced) concrete.

B. Fine aggregate: Clean, durable sand, uncoated, grains free from silt, loam, and clay. Graded from fine to coarse with 95-100 percent by weight passing a No. 4 sieve and 3-8 percent passing a No. 100 sieve. ASTM C33 with following maximum permissible limits for deleterious substances, measured in percentage by weight: clay lumps 1.00; coal and lignite 0.25; materials finer than No. 200 sieve 3.00.

2.03 WATER

A. Mixing Water: Drinkable in accordance with ACI 318

2.04 ADMIXTURES

A. Hydration Control: (ASTM C494, Type B and Type D)

1. Pozzolith 100-XR; Master Builders; (Degussa Admixtures, Inc)Cleveland, OH, 1-800-628-9990 (www.degussa.com)
2. Plastiment; Sika Chemical Corporation, Lyndhurst, NJ, 1-800-933-SIKA (www.sikausa.com).

B. Air-Entraining: ASTM C260.

C. Water-reducing: ASTM C494, Type A.

D. Water reducing/retarding: ASTM C494, Type D.

E. Water reducing/accelerating: ASTM C494, Type E.

F. Use of calcium chloride as an additive is **not permitted.** (Admixtures for concrete shall contain not more than 0.1 percent chloride ions by weight).

2.05 FORMS

A. Formwork: Comply with Building Code and ACI 347. Design, erect, support and maintain forms to safely carry all superimposed loads until such time as such loads can be safely supported by the concrete work. Construct formwork to

shape, sizes and dimensions as shown on required to ensure accurate alignment and elevation, and level and plumb finished concrete work.

B. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces.

E. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible trademark of an approved inspection agency.

F. Form Ties: Steel Wire snap ties with positive breakbacks which will leave no metal closer than 1" from formed surface of concrete, leave a cone-shaped recess.

G. Form Coatings:

1. Where surfaces are painted

a. "Duogard Plus", W. R. Meadows, Inc., Hampshire, IL 1-800-342-5976, (www.wrmeadows.com)
b. "Majic Cote", Symons, DesPlaines, IL 1-800-733-7654 (www.symons.com).

2. Other Surfaces (Nonstaining form oil): "Duogard II", W. R. Meadows.

2.06 CONCRETE DESIGN MIX

A. Provide ready-mixed ASTM C94, high strength for equipment pad extensions.

2.07 FORMWORK FABRICATION

A. Fabricate formwork mortartight, braced to prevent displacement under vibration and sagging between supports. For surfaces exposed to view in finished work, use new, clean, smooth plywood free from blemishes, square-cut and in sizes as large as practical.

B. Fabricate forms for removal without hammering or prying against concrete.

2.08 MISCELLANEOUS MATERIALS

A. Porous Fill: Clean, water-worn tailings free from clay, dirt, wood and debris, graded from 2 in. to 3/4 in.

C. Expansion Joint Material: 1/2 inch (12.7mm) asphalt expansion joint filler complying with the following:

1. ASTM D994

2. FS HH-F-341F, Type III

3. AASHTO M33

4. FAA Specification P-610-2.7

D. Curing and Sealing Compound (for concrete floors scheduled to remain exposed only): Acrylic, water based curing compound, VOC compliant, non-yellowing, ASTM C-309/C1315, Type 1.

1. "Kure-N-Seal W", Sonneborn (Degussa Building Systems), Shakopee, MN, 1-800-443-9517 (www.DegussaBuildingSystems.com)

2. "VOCOMP-25-1315", W.R. Meadows, Inc.

E. Cement feathering compound: Ardex "SD-F Feather Finish", Portland cement-based, latex-modified; or comparable.

## PART 3 - EXECUTION

3.01 FORMS

A. Construct formwork to lines, dimensions, and shapes of concrete indicated, to a tolerance of 1/8 inch in 10 feet. Provide watertight joints in forms. Provide support to maintain tolerance specified during placing of concrete.

B. Coat forms with form release agent prior to each use of form.

D. Do not use pinch bars or other metal tools in exposed work to pry forms loose.

E. Use form ties to prevent form deflection, and to prevent spalling of concrete surfaces upon removal of forms.

3.02 PREPARATION

A. Prior to placing concrete, clean oil. Oil or wet form, as specified, and clean reinforcement of ice or other coatings. Remove water from areas to receive concrete.

B. Reinforcement, forms and earth in contact with concrete shall be free from frost. Do not place concrete during rainfall without adequate protection. Make preparation to protect newly placed concrete from rainfall until concrete has hardened sufficiently to preclude rainfall damage.

3.03 PLACING CONCRETE

A. Place concrete in continuous operation until panel or section is completed. Locate construction joints at point of minimum shear.

3.04 FORMS REMOVAL

A. Forms not supporting weight of concrete, such as sides of beams, walls, columns, and similar work, may be removed after cumulatively curing at not less than 50° F. for at least 24 hours after placing concrete, provided that concrete is sufficiently hard so as not to be damaged by form removal, and provided that curing and protection measures are maintained.

3.05 CURING AND PROTECTION

A. Curing:

1. Spray top surface of slabs with liquid membrane-forming compound in accordance with manufacturer's directions as soon as the newly placed surface has been finished and will not be marred by application.

2. Respray surfaces subjected to heavy rainfall within three hours of compound application.

3. Where practicable, keep forms in place for a seven-day curing period. Keep top exposed concrete surface wet and forms moist. Loosen forms to allow curing water to run down between concrete and forms.

4. If forms cannot remain in place for seven days, cover concrete with fabrics that have moisture-retaining properties. Examine fabrics to detect elements that might discolor concrete finish. Keep fabric moist continuously to ensure a film of water on concrete surface.

B. Cold weather protection:

1. Protection of concrete during cold weather shall comply with ACI 306; heating of concrete shall be in accordance with ASTM C94-78. Cold weather techniques shall be used where the mean daily temperature falls below 40 degrees F for at least two (2) consecutive days.

2. Temperature of the concrete at time of placement shall not be less than 50 degrees F. Temperature of the soil against which concrete to be placed shall not be less than 40 degrees F.

3. Concrete temperature shall be maintained at a minimum of 50 degrees F for at least seventy-two (72) hours after placement.

4. Contractor shall provide to the architect a description of cold weather protection procedures to be used, including the methods for determining the need for the procedures.

C. Hot Weather Protection:

1. Protection of concrete during hot weather shall comply with ACI 301 and ACI 305. Hot weather protection procedures shall be used when the temperature of the concrete mix exceeds 85 degrees F.
2. Temperature of the concrete mix may exceed 85 degrees F only if water reducing and retarding compound complying with ASTM C494 is used.

3. Hot weather precautions shall be instituted by the contractor when the anticipated rate of evaporation, as determined by guidelines in ACI 305, is expected to reach 0.2 pounds per square foot per hour (lb/sq. ft./hr.).

4. The contractor shall provide to the architect a description of hot weather protection procedures to be used, including the methods for determining when the procedures will need to be implemented. Provide written recommendations from the manufacturer for use of water reducing and retarding compounds.

3.06 FLOOR AND SLAB FINISHES

A. Measure floor finish tolerances in accordance with ASTM E1155. Individual floor sections shall be bounded by construction joints, contraction (control) joints, or column lines that form the smallest sections.

B. Floor Slab Tolerance: After final troweling operation slab shall have a surface place tolerance not exceeding 1/4 inch in 10 feet when tested with a loft straightedge, but 1/4 inch shall not be cumulative.

C. Where specified tolerances in surface elevation of slabs are exceeded, grind or patch the surface to obtain specified tolerance. Grind as soon as possible but not before 3 days of cure. Install patching material in accordance with manufacturer's instructions.

D. Finishes:

1. Broom finish: Light/medium broom, finish to be consistent.

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 Division 1 Specification Sections, apply to the Work of this Section.

1.02 RELATED WORK

A. Section 04200: Unit Masonry Work.

1.03 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.

1.04 SUBMITTALS

A. Provide product data and certifications for all mortar materials including mortar design mix, in order 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. Premix Mortar with Color Additive: ASTM C387, Type S, color as selected by Architect. For additions to existing buildings, match existing mortar, as approved in writing by Architect.

1. "Flamingo-Brixment", ESSROC Cement Corporation, Nazareth, PA 1-610-837-6725 (www.essroc.com)

2. Lehigh Cement Co., Allentown, PA, 1-800-523-5488.

H. 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 04270

# CAST STONE MASONRY

## PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Draw wings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Cast stone trim window sills.
2. Cast stone chimney cap.

1.03 RELATED WORK

A. Section 04200 Unit Masonry

1.04 SUBMITTALS

A. Product Data: Include dimensions of individual components.

B. Shop Drawings: Show fabrication and installation details for cast stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.

C. Samples: For each color and texture of cast stone required.

D. Colored Mortar Samples: For each mortar color required.

E. Qualification Data: For manufacturer.

F. Material Test Reports.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer of cast stone units similar to those indicated for this Project, with sufficient production capacity to manufacture the required units.

1. Manufacturer is a producing member of the Cast Stone Institute.

## PART 2- PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers:

1. Continental Cast Stone East; Russell, Inc.
2. Corinthian Cast Stone, Inc.
3. Arban Associates, Inc.
4. Architectural Cast Stone, Inc.
5. Advance Architectural Sone
6. Cast Stone Systems, Inc.
7. Stafford Stone Works, LLC
8. Hoyle Stone Products
9. Sun Precast Co., Inc.
10. Pre-bid approved manufacturer.

2.02 CAST STONE UNITS

A. Provide cast stone units complying with ASTM C 1364 using the vibrant dry tamp or wet-cast method.

1. Provide units that are resistant to freezing and thawing.

2. Slope exposed horizontal surfaces 1:12, unless otherwise indicated.

3. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.

4. Provide drips on projecting elements, unless otherwise indicated.

B. Cure units by one of the following methods:

1. Cure units with steam in enclosed curing room at temperature of 105 deg F (41 deg C) or above and 95 to 100 percent relative humidity for 6 hours.

2. Cure units with dense fog and water spray in enclosed warm curing room at 95 to 100 percent relative humidity for 24 hours.

3. Cure units to comply with one of the following:

a. Not less than 5 days at mean daily temperature of 70 deg F (21 deg C) or above.

b. Not less less than 6 days at mean daily temperature of 60 deg F (16 deg C) or above.
c. Not less than 7 days at mean daily temperature of 50 deg F (10 deg C) or above.

d. Not less than 8 days at mean daily temperature of 45 deg F (7 deg C) or above.

C. Acid etch units after curing to remove cement film from surfaces to be exposed to view.

D. Colors and Textures: Match Architect's samples.

2.03 ACCESSORIES

A. Anchors and Dowels: Type 304 stainless steel.

B. Proprietary Acidic Cleaner: Manufacturer's standard-strength, general-purpose cleaner complying with requirements in Division 04 Section "Unit Masonry" and approved for intended use by cast stone manufacturer and approved by cleaner manufacturer for use on cast stone and adjacent masonry materials.

2.04 MORTAR

A. Comply with requirements in Division 04 Section "Unit Masonry" for mortar materials and mixes.

1. For setting mortar, use Type S.
2. For pointing mortar, use Type N.
3. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required.

2.05 SOURCE QUALITY CONTROL

A. Employ an independent testing agency to sample and test cast stone units according to ASTM C 1364.

**PART 3- EXECUTION**

3.01 SETTING CAST STONE IN MORTAR

A. Install cast stone units to comply with requirements in Division 04 Section "Unit Masonry."

B. Set units in full bed of mortar with full head joints, unless otherwise indicated.

1. Fill dowel holes and anchor slots with mortar.

2. Fill collar joints solid as units are set.

3. Build concealed flashing into mortar joints as units are set.

4. Keep head joints in window sills with exposed horizontal surfaces open to receive sealant.

C. Point mortar joints by placing and compacting mortar in layers not greater than 3/8 inch (10 mm). Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.

D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless noted otherwise.

E. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated. Keep joints free of mortar and other rigid materials.

F. Prepare joints indicated to receive sealant and apply sealant sealant of type and at locations indicated to comply with applicable requirements in Division 07 Section "Sealants."

3.02 INSTALLATION TOLERANCES

A. Variation from Plumb: : Do not exceed 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum

B. Variation from Level: : Do not exceed 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum

C. Variation in Joint Width: : Do not vary joint thickness more than 1/8 inch in 36 inches (3 mm in 900 mm) or one-fourth of nominal joint width, whichever is less

D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch (1.5 mm), except due to warpage of units.

3.03 ADJUSTING AND CLEANING

A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.

1. Replace units in a manner that shows no evidence of replacement.

B. In-Progress Cleaning: Clean cast stone as work progresses.

1. Remove mortar fins and smears before tooling joints.
2. Remove excess sealant immediately, including spills, smears and spatter.

3.04 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. Apply cleaning agent to sample area of 20 square feet in location acceptable to the Architect if cleaning by water does not produce satisfactory results.

1. Do not proceed with cleaning until sample area is acceptable to Architect.

2. Follow manufacturer's recommendations.

3. Thoroughly wet surface of masonry on which no green efflorescence appears before using cleaning agent.

4. Scrub with acceptable cleaning agent.

5. Immediately rinse with clear water.

6. Work small sections at a time.

7. Work from top to bottom.

8. Protect sash, metal lintels, and other materials that may corrode when masonry is cleaned with acid solution.

9. Remove efflorescence in accordance with brick manufacturer's recommendations.

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

3.05 CLEAN UP

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

END OF SECTION

# SECTION 05500

# METAL FABRICATIONS

## PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General Conditions and other Division 1 Specification Sections, apply to the Work of this Section.

1.02 REFERENCE DOCUMENTS

A. ASTM A36 - Structural Steel.

B. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc-Coated Welded and Seamless.

C. ASTM A283 - Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars.

D. ASTM A501 - Hot Formed Welded and Seamless Carbon Steel Structural Tubing.

E. ASTM A512 - Cold-Drawn Buttweld Carbon Steel Mechanical Tubing.

F. AWS - American Welding Society Structural Welding Code.

G. "Metal Finishes Manual" Published by National Association of Architectural Metal Manufacturer's (NAAMM).

1.03 DESCRIPTION OF WORK

A. Miscellaneous metal work shall include items fabricated from iron and steel plates, bars, strips, tubes, pipes and castings that are not a part of structural steel or other metal systems.

B. Miscellaneous metal work shall include loose lintels or other supports that are not part of building structural system.

## PART 2 - PRODUCTS

2.01 METALS

A. Steel:

1. Structural shapes, bars, plates: ASTM A36.

2. Steel plates to be bent or cold-formed: ASTM A283, grade C.

3. Flat Rolled Steel Sheets: ASTM A611, class I (cold rolled), or ASTM A570 (hot rolled). Galvanized steel sheets: ASTM A525 and ASTM A526; G90 coating.

B. Stainless Steel:

1. Plates, Sheets and Strips: STM A167 or A176, type best suited for purpose.

C. Fasteners

1. General: Furnish all bolts, nuts, screws, clips, washers, and any other fastenings necessary for proper erection of items specified herein.

a. For ferrous metal use stainless steel on exterior. On interior match adjacent material, or if not applicable, provide zinc coated fasteners.

b. For stainless steel, AISI 300 Series Stainless Steel. Unless noted otherwise, exposed screws shall be Phillips flat head, countersunk.

2. Products:

a. Toggle Bolts: FS FF-W-84.

b. Bolts & Nuts: ASTM A 307, grade A, hex head.

c. Lag Bolts: FS FF-B-561, square head.

d. Machine Screws: Cadmium-plated steel, FS FF-S-92.

e. Wood Screws: Carbon Steel, FS FF-S-111, flat head.

f. Washers: Carbon Steel, FS FF-W-92, round.

g. Expansion Shields: FS FF-S-325.

h. Lock Washers: Carbon Steel, FS FF-W-84, helical spring type.

i. Powder Driven Fasteners: FS FF-P-395; comply with ANSI A10.3.

F. Welding Electrodes: As permitted by AWS Code D1.1.

2.02 LOOSE LINTELS AND SUPPORTS

A. Provide loose structural steel angles, bearing plates, channels, tees, plates, and other steel items as detailed for masonry opening lintels, roof and floor openings, and other locations shown on drawings. Provide galvanized steel for loose items exposed to weather.

B. Length of lintels shall be as required to provide minimum bearing of 4 inches at each end. Where minimum bearing cannot be obtained due to proximity of structural framing member, anchor lintel with clip angle expansion bolted to concrete framing member or welded to steel framing member.

C. Furnish loose lintels and other-support accessories as part of the work of this Section. Installation of loose lintels shall be under UNIT MASONRY SECTION 04200.

2.03 PAINT

A. Metal primer paint: Rust inhibitive primer, Fed. Spec. TT-P-86, Type II or TT-P-645 (zinc chromate type).

B. Galvanizing: Provide zinc coating for all items exposed to weather or otherwise specified for galvanizing,

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

2.05 FABRICATION

A. Use materials of size and thickness indicated, or if not indicated, of the required size and thickness to produce adequate strength and durability in the finished product for intended use. Work to dimensions indicated on drawings using industry proven details of fabrication and support.

B. Form exposed work with accurate angles and surfaces and straight sharp edges. Ease exposed edges to radius of approximately 1/32 in. unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or impairing work.

C. Weld corners and seams continuously and in accordance with recommendations of AWS. Grind exposed welds smooth and flush, to match and blend with adjoining surfaces.

D. Form exposed connections with hairline joints flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of the type indicated, or if not indicated, use Phillips flathead, countersunk screws or bolts.

E. Provide for anchorage of type required, coordinated with supporting structure and the progress schedule. Fabricate and space anchoring devices as required to provide adequate support for intended use.

F. Cut, reinforce, drill, and tap miscellaneous metal work to receive other items.

G. Shop Painting:

1. Shop paint miscellaneous metal work, except members or portions of members embedded in concrete or masonry, surfaces and edges to be field-welded, and galvanized surfaces.

2. Remove scale, rust and other deleterious materials before shop paint is applied. Clean surfaces in accordance with Steel Structures Painting Council, SP-3.

3. Apply one shop coat of metal primer paint to fabricated metal items.

H. Fabricate miscellaneous units to the sizes, shapes and profiles indicated or, if not indicated, of the required dimensions to receive adjacent grating, plates, doors or other work to be retained by framing. Except as otherwise shown, fabricate from structural steel shapes and plates and steel bars of welded construction using mitered corners, welded brackets and splice plates and minimum number of joints for field connections. Equip units with integrally welded anchor strips for casting into poured concrete. Furnish inserts if units must be installed after concrete is poured; except as otherwise indicated, space anchors 2 feet 0 inch o. c.

I. For fabrication of work exposed to view, use only materials which are smooth and free of surface blemishes such as pittings, seam marks, roller marks, trade names and roughness. Remove blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes including zinc coatings.

J. Preassemble items in shop to greatest extent possible to minimize field splicing and assembly of units at project site.

## PART 3 - EXECUTION

3.01 FIELD CONDITIONS

A. Verify measurements in field for work fabricated to fit job conditions.

B. Before starting work, examine adjoining work on which miscellaneous metal work is supported, or to which it is fitted or joined.

C. Provide anchorage devices and fasteners where necessary for securing miscellaneous metal items to in-place construction including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connections as required.

D. Perform cutting, drilling and fitting required for installation of miscellaneous metal items. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels.

E. Fit exposed connections accurately together to form tight hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind joints smooth and touch-up shop paint coat. Do not weld, cut or abrade the surfaces for exterior units that have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

3.02 FIELD WELDING

A. Comply with AWS Code for procedures for manual shielded metal-arc welding, the appearance and quality of welds made and the methods used in correcting welding work.

3.03 TOUCH-UP PAINTING

A. Immediately after erection, clean field welds, bolted connections and abraded areas of the shop paint, and paint exposed areas with same materials used for shop painting.

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 Division-1 Specification sections, apply to work of this section.

1.02 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. Metal wall flashing and expansion joints.

3. Exposed metal trim/fascia units/coping units.

4. Miscellaneous sheet metal accessories.

1.03 SUBMITTALS:

A. Product Data: Submit manufacturer's product data, installation instructions and general recommendations for each specified sheet material and fabricated product.

1.04 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.

1.05 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. Copper: ASTM B370, cold rolled unless soft temper required for forming and performance; 16 ounce (0.0216" thick), except as noted

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. Reglets: Metal or plastic units of type and profile indicated, compatible with flashing indicated, non-corrosive.

8. 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. Install reglets to receive counter-flashing in manner and by methods indicated. Where shown in concrete, furnish reglets for installation in work of Division 3 Sections. Where shown in masonry, furnish reglets for installation in work of Division 4 Sections.

D. Install counter flashing in reglets, either by snap-in seal arrangement, or by wedging in place for anchorage and filling reglet with mastic or elastomeric sealant, as indicated and depending on degree of sealant exposure.

E. All stainless steel or copper metal through wall flashing, gravel stops, pitch pockets, rain collars and expansion joints with lapped joints shall be soldered water tight.

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 Division 1 Specification Sections, apply to the Work of this Section.

1.03 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

A. FS TT-S-.001657 Sealing Compound, Single Component, Butyl Rubber Based Solvent Release Type.

B. ASTM C834 - Latex Sealing Compounds.

C. ASTM C920 – Elastomeric Joint Sealant Compounds

D. ASTM E90 – Airborne Sound Transmission Loss

1.04 SUBMITTALS

A. Comply with applicable provisions of Section 01340, 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.

1.05 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.

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 15010

# GENERAL PROVISIONS

## PART I - GENERAL

1.01 GENERAL

A. The Bidding and Contract Requirements and Division 1 -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 Division 1 - 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 Division 1 - 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 eight (8) copies of the 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 buried concrete or cast iron sewer piping installed in filled cuts over four (4) feet in depth the contractor shall provide brick or approved equal supports or piers under piping and fittings with piers or supports extending to a depth to provide sufficient firm and adequate support to overcome the possibility of any deflection in the piping system.

C. 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.

D. 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 EXCAVATION AND BACKFILL

A. The contractor shall be responsible for excavation, backfill, tamping, shoring, bracing, pumping, street cuts, repairing of finished surface and all protection for safety of persons and property as required for installing a complete mechanical/plumbing system. All excavation and backfill shall conform to the architectural section of the specifications.

B. It shall be the responsibility of the contractor to check the indicated elevations of utilities entering and leaving the building. If such elevations require excavations lower than the footing levels, the Owner shall be notified of such conditions and redesign shall be made before excavations are commenced. It is also the responsibility of the contractor to make the excavations at the minimum required depths in order not to undercut the footings.

C. The trench shall be excavated below the installation level of the bottom of the pipe. The trench shall be filled with sand or fine gravel so entire length of barrel of piping rests on solid bed of sand or fine gravel. The backfill shall be filled in layers of 6" max depth and such layers shall be compacted after each placement.

D. Excavation shall be made in a manner to provide a uniform bearing for pipes. The pipe elevation shall be determined by the contractor to meet the plumbing codes. Where rock is encountered, excavate 3" below pipe grade and back fill with sand to the installation level of the pipe. The pipe, including the joints, shall not rest on rock at any point.

E. After required test and inspections, backfill the ditch and tamp. The first foot above the pipe shall be hand backfilled with rock free clean earth. The backfill in the ditches on the exterior and interior of the building shall be tamped to 95% of the standard Proctor maximum dry density (ASTM D-698). The contractor shall be responsible for any of his ditch walls that cave in.

1.14 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.

1.15 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.

1.16 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.

1.17 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.

1.18 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.

1.19 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.

1.20 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 Section 01740) 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 Section 01740.1.05). Once the entire project is substantially complete, periodic maintenance shall be the responsibility of the owner.

1.21 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.

1.22 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.

1.23 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, Division 1 - 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

Piping Specialties shall be designed and installed to meet the intended use including pressures and temperature.

A. 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.

B. Strainers - HONEYWELL-BRAUKMAN, ARMSTRONG or SARCO.

C. Unions:

1. 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.
2. Brass Couplings - Shall be used for connecting steel pipe to copper tubing.
3. Die-electric unions or waterways shall not be permitted.

D. 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.

E. Gauges and Thermometers - Shall be as listed below unless otherwise specified under other sections of the specifications.

1. 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.
2. 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.
3. 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" |

4. Type 'L' Copper Tubing:

| | |
|---|---|
| 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

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.

A. 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.

B. 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.

C. 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.

D. 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. Flanged joint - The flanged joint shall be made with the proper number and size of bolts and with the proper gasket between the flanges.

6. 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.

END OF SECTION

# SECTION 15250

# INSULATION

## PART I - GENERAL

1.01 GENERAL

The Bidding and Contract Requirements, Division I - 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 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

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. Hot Water Heating Supply and Return

a. Pipe Size 1-1/2" and Under - 1".
b. Pipe Size 2" and larger - 2".

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. Hot water heating supply and return.

C. Finish - Insulation on exposed piping fittings, valves and specialties shall be covered with an 8-oz. canvas jacket.

## 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. 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.

D. 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.

E. Sheet Metal Saddles shall be provided and installed on all pipe hangers as stated under section 15050, 2.03.

F. 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 manufacture

3.03 PIPE IDENTIFICATION

A. Paint insulation and provide pipe identification to match existing color, identification size, type and to match Fairfax County Public Schools identification standards.

END OF SECTION

# SECTION 15350

# NATURAL GAS PIPING

## PART 1 - GENERAL

1.01 GENERAL

A. The Bidding and Contract requirements, Division 1 - 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

Provide shop drawings on all piping and valves as described in Section 15010 – 1.04. 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.

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 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.

D. Unions shall not be located in plenum spaces.

END OF SECTION

# SECTION 15401

# DOMESTIC WATER PIPING SYSTEM

## PART I - GENERAL

1.01 GENERAL

The Bidding and Contract Requirements, Division 1 - 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 make-up water piping systems.

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.

## 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 15616

# BOILER AND WATER HEATER VENT

## PART 1 - GENERAL

1.01 GENERAL

The Bidding and Contract Requirements, Division 1 - 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 BOILER VENTS

Provide and install the boiler 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 GAS FIRED BOILER VENTS

The boiler vents shall be installed in accordance with the manufacturer's recommendations and to meet the requirements of NFPA No. 211, state and local codes

END OF SECTION

# SECTION 15620

# HIGH EFFICIENCY BOILERS

## PART 1 - GENERAL

1.01 GENERAL

A. The Bidding and Contract requirements, Division 1 - General Requirements, Section 15010 - General Provisions, and Section 15050 - Basic Materials and Methods, shall apply to this section.

1.02 SCOPE

A. Provide a complete packaged condensing boiler arranged for operation with natural gas.

1.03 QUALITY ASSURANCE

A. The boiler shall be constructed in accordance with the provisions of Section IV of the ASME Boiler and Pressure Vessel Code and shall be stamped with the ASME symbol. The burner shall comply with the requirements of AGA.

B. Equipment installer shall attend a controls coordination meeting with the Section 15900 contractor as described in 15900, 1.03.

1.04 SUBMITTALS

A. Provide shop drawings on this equipment as described in Section 15010 - 1.04. .

1.05 WARRANTY

A. The boiler manufacturer will repair or replace any part of the boiler that is found to be defective in workmanship or material within eighteen (18) months of shipment from the factory or twelve (12) months from start-up, whichever comes first.

B. The boiler's pressure vessel is warranted against failure due to thermal shock for a period of ten (10) years from the date of shipment from the factory is installed, controlled, operated and maintained in accordance with the Installation, Operation and Maintenance Manual.

C. The pressure vessel and heat exchanger is covered against failures resulting from flue gas corrosion and/or defective material or workmanship for a period of ten (10) years from the date of shipment from the factory. Waterside corrosion or scaling is not covered. The manufacturer will repair, replace, exchange or credit at their option, FOB factory, the pressure vessel as defined above, provided this equipment has been installed, operated and maintained by the buyer in accordance with the Installation, Operation and Maintenance Manual.

## PART 2 - PRODUCTS

2.01 HIGH EFFICIENCY BOILER

The boiler assembly shall consist of packaged condensing boiler, a natural gas burner, controls and an insulated jacket. Capacity shall be as shown on the drawings. Boiler shall be manufactured by Viessmann Manufacturing, Inc. Boilers by AERCO International, Inc. and Lochinvar are acceptable providing capacities and arrangement can be furnished.

A. Boiler:

1. The boiler shall be completely factory assembled as a self-contained unit.
2. The pressure vessel design and construction shall be in accordance with Section IV of the ASME Code for heating boilers. The boiler shall comply with CSD-1 code requirements.
3. The combustion area of the heat exchanger where the flue gases will condense shall be constructed using duplex alloys of stainless steel.
4. Heat exchange capability shall be maximized within the pressure vessel via the use of corrulator fire tube technology. All heat transfer enhancements shall be stainless steel; aluminum heat transfer enhancers are unacceptable.
5. Boilers with heat exchangers using cast aluminum, cast iron or copper finned tube design platforms are unacceptable.
6. The boiler shall be a pre-mix modulating cylinder furnace design. The furnace locations shall be such that all furnace components are within water-backed areas.
7. The burner shall be a premix low emission design with a build in flame arrestor functionality.
8. The burner shall feature direct spark ignition.
9. A zero flow or low flow condition shall not cause any harm to the pressure vessel or heat exchanger of the boiler. Flow switches, dedicated circulator pumps, or primary/secondary piping arrangements are not required to protect the heat exchanger or pressure vessel from thermal shock or other system related considerations. Boilers requiring the use of flow switches or primary/secondary piping arrangements are unacceptable.
10. A lock up regulator upstream of the fuel train shall be furnished by the boiler manufacturer as a standard component integral to the boiler cabinet. Factory test fire of the boiler with the provided lock up regulator is required.

B. Boiler Controls:

1. The control shall provide a prepurge and postpurge cycle. The control shall maintain a running history of operating hours, number of cycles, and the most recent sic flame failures.
2. The boiler shall be equipped for modulated gas input. Fuel flow shall be controlled by a valve in the fuel train. Air flow shall be controlled by a butterfly valve located in the exhaust vent. Both valves shall be connected to a modulation motor. Turn down shall be 16:1.

3. Combustion controls shall be of on/off operative type and are to include:

   a. Operating temperature controller for automatic start and stop of the combustor.
   b. High limit temperature controller with manual reset.
   c. One low water cutoff probe in the boiler shell with manual reset and push-to-test capability.
   d. Air safety switch to prevent operation until sufficient prepurge air is assured.
   e. High condensate cut-off switch located in the exhaust decoupler.
   f. Proof of flame switch to prove combustion based on pressure.
   g. Gas pressure regulator shall be furnished factory, field installed.
   h. Full modulation combustion control system shall be furnished which shall provide a turndown rate of 16 to 1 over the input range from low to high fire. The supply temperature and setpoint temperature shall be displayed at all times by an LED readout.
   i. All controls shall be panel mounted and located on the boiler to provide ease of servicing the boiler without disturbing the controls. All controls shall be mounted and wired according to AGA requirements.

## PART 3 - EXECUTION

3.01 INSTALLATION

A. The boiler shall be assembled as recommended by the boiler manufacturer and set above the boiler room floor on a 4" high concrete pad where shown on the drawing.

B. The boiler shall be mounted on vibration isolators. Piping shall be supported with hangers with vibration isolation.

C. Intake and exhaust mufflers shall be installed. When required by the boiler manufacturer.

D. The condensate drain shall be trapped, treated and extended to a floor drain.

3.02 VENTING

Boilers shall be vented per manufacturer's requirements as shown on the drawings and described in Section 15616.

3.03 GAS PIPING

Gas piping shall be installed as shown on the drawings and described in Section 15350.

3.04 START-UP

Service shall be provided by the equipment manufacturer's authorized representative and shall complete testing of all controls, burner adjustment and overall boiler operation. The Contractor is responsible for a monitored start-up. The monitoring agency (Washington Gas Light Company or owner approved company) shall record the main gas supply pressure at inlet of gas line control assembly, gas manifold pressure, and control settings. Copies of this data shall be supplied to the Owner.

3.05 COMBUSTION TESTS

The contractor, upon completion of the fuel burning system, shall submit a written report on the operating of each burner to the engineer and will include the following information:

**COMBUSTION TEST REPORT**

Job Name:
Manufacturer:
Model #
National Board #

Operating Set Point: _____
High Limit Set Point: _____

Gas Supply Pressure LF _____ / HF _____
Last Elbow Pressure LF _____ / HF _____

**Low Fire**
$O_2$ _____
CO _____
$CO_2$ _____
Stack Temp _____

**Mid Fire**
$O_2$ _____
CO _____
$CO_2$ _____
Stack Temp _____

**High Fire**
$O_2$ _____
CO _____
$CO_2$ _____
Stack Temp _____

END OF SECTION

# SECTION 15702

# HYDRONIC HOT WATER SUPPLY AND RETURN PIPING SYSTEM AND SPECIALTIES

## PART 1 - GENERAL

1.01 GENERAL

The Bidding and Contract Requirements, Division 1 - 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 hot water piping systems.

1.03 QUALITY ASSURANCE

The piping system shall be tested for leaks before the insulation is applied and before the piping system is covered up. The test shall be at least 100 psi of water pressure for a 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 castings used for coupling housings, fittings, valve bodies, etc., shall be date stamped for quality assurance and traceability.

1.04 SUBMITTALS

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 PIPING AND FITTINGS

A. Hot water supply and return: Shall be schedule 40 black steel pipe with 125 psi cast iron screwed fittings or 150 psi steel weld fittings.

1. Type "L" copper tubing with copper fittings is acceptable for piping 2" and under.

B. Cold water make-up - Shall be type 'L' copper tubing with copper fittings.

C. Grooved mechanical pipe couplings, fittings, valves and other grooved components may be used as an option to welding, threading 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 VICTAULIC. Grooved components manufactured by GRINNELL or ANVIL INT. are acceptable providing all aspects of the specification are met. No substitutions.

1. Carbon steel piping shall be roll grooved in accordance with manufacturers current listed standard.

2. Mechanical couplings for grooved piping shall be cast of ductile iron conforming to ASTM A-395, grade 65-45-15, and ASTM A-536, grade 65-45-12. Couplings shall be rigid style and be of the angle patterned bolt pad type, and shall provide system support and hanging requirements in accordance with ANSI B31.1, ANSI B31.4 and NFPA 13. Coupling bolts and nuts shall be zinc plated (ASTM B-633) heat treated carbon steel track head conforming to physical properties of ASTM A-183. Mechanical couplings shall be coated with an alkyd enamel finish.

3. Gaskets for grooved pipe and fittings shall be grade "E" EPDM compound conforming to ASTM D-2000 designation 2CA615A25B24F17Z.

4. Rigid Type: Coupling housings with offsetting, angle-pattern bolt pads shall be used to provide system rigidity and support and hanging in accordance with ANSI B31.1, B31.9, with Victaulic Style 107H/107N (Quick-Vic), Installation ready rigid coupling for direct stab installation without field disassembly. Gasket shall be Grade "EHP" EPDM designed for operating temperatures from -30 deg F to +250 deg F.

5. Grooved fittings shall be cast of ductile iron conforming to ASTM A-395, grade 65-45-15, and ASTM A-536, grade 65-45-12, wrought steel to ASTM A234, Grade WPB; or factory-fabricated from ASTM A53 steel

pipe. Grooved fittings shall be coated with an alkyd enamel finish. Grooved fittings shall be full flow.

D. Condensate drain piping: Shall be type 'L' copper tubing and fittings.

E. Runouts to terminal units with copper pipe connections: Type 'L' hard drawn copper tubing shall be used for runouts where required. A brass coupling shall be used between the steel pipe and copper tubing connection.

F. Hot water supply and return under slab - Each piece of equipment shall have separate runouts and shall be type 'K' continuous copper pipe with no joints allowed below slab. All joints above slab shall be made with copper brazing rods. The entire underground pipe system shall be inside a minimum 6" round schedule 40 plastic pipe sleeve. Pipe shall be insulated; see section 15250.

G. The use of running or close nipples is prohibited.

2.02 VALVES

Valves shall be manufactured by VICTAULIC, STOCKHAM, JENKINS, HAMMOND, JOMAR, MILWAUKEE, FAIRBANKS, CRANE, CONBRACO INDUSTRIES, INC., APOLLO VALVES, LUNKENHEIMER, WALWORTH, NIBCO, JAMESBURY or ROCKWELL unless otherwise noted. STOCKHAM catalog numbers are listed to identify quality and style Valves shall be rated for the medium served.

A. Gate valves 2 1/2" and smaller: Shall be cast bronze body, sweat type or screwed ends and solid wedge disc with rising stem, STOCKHAM #B108.

B. Gate valves larger than 2 1/2" - Shall be iron body flanged ends and solid wedge disc with rising stem (O S & Y type),STOCKHAM #G623.

C. Globe valves 2 1/2" and smaller: Shall be cast bronze body, sweat type or screwed ends and replaceable composition disc,STOCKHAM #B24T.

D. Check valves 2 1/2" or smaller: Shall be cast bronze body swing check with either screwed ends or sweat type and with regrinding disc,STOCKHAM #B319 or B309.

E. Check valves larger than 2 1/2" - Shall be flanged iron body with bronze disc and ring,STOCKHAM #G931.

F. Non-Slam check valves - Shall be used for all vertical applications and on pump discharge piping and shall be flanged iron body with bronze disc, wafer check, NIBCO #F-910 for 2 1/2" and larger or W-910 for under 2" and smaller.

G. Butterfly valves - 2" and larger may be used in lieu of gate or globe valves except at boiler supply and return pipe. These valves shall be rated at not less than 150 psi WOG Class and be suitable for use with 180°F water. Shall be lug type for

pipe removal on either side of valve, shall have stainless steel shafts and shall have 4" extended stem lengths for all size valves. Stockham #LD611.

H. Ball valves: 2" and smaller may be used in lieu of gate or globe valves. These valves shall be bronze, rated at not less than 150 psi WOG Class,full port, solid chrome plated ball design and stem, blow out proof stem. Be suitable for use with 180-degree water and provided with extended insulated handles. Stockham #S216. Extended insulated handles shall be APOLLO VALVES "Therma-Seal" or NIBCO " Nib-seal".

I. Balancing valves: Valves manufactured by FLOWSET, GRISWOLD, GERAND, DANFOSS, FLOW-PAC, NUTECH, BARCO or PRESO with memory stop, positive shutoff, extended insulated handle and P/T type ports for balancing. Flowset model AS size 1/2" to 2" flow .25 GPM to 100 GPM. For all units with runouts 2" and smaller.

J. Constant volume flow valves – VICTAULIC, GRISWOLD, AUTOFLOW or FLOWSET, automatic pressure-connecting spring and cartridge type valves with quick disconnect pressure taps. For all units with pipe size 2 1/2" and larger with GPM capacity shown.

K. Valve Operating Chains: Valves installed six feet or more above finished floor in boiler rooms or mechanical rooms shall be chain operated. Provide chain and chain wheel with chain guide of size required, as manufactured by STOCKHAM.

L. Balance valve for pump: Eccentric, combination shut-off and balancing with memory stop valve as manufactured by DEZURIK or ROCKWELL.

M. Provide metering device in boiler room or in pump room for measuring pump flow rates, for systems piping a minimum of 20 feet (measured along pipe length) from pump discharge or just before pipe exits room, whichever is greater. Provide extended metering taps on metering devices. Flow metering devices and elements shall be as manufactured by FLOWSET, GERAND, GRISWOLD, PRESO or BARCO.

N. Valves for flushing piping mains - Provide 1 1/2" full port ball valves on the supply and return mains of each piping system for the purpose of flushing debris and other foreign mater out of piping. Valves shall be rated at not less that 150 PSI WOG, shall be suitable for 180 degree water and provided with extended insulated handle. Provide adapter for valve to accept a fire hose and provide a removable cap. STOCKHAM # S207.

2.03 SPECIALTIES

A. Pipe Hangers and Supports: See section 15050.
B. Unions: Shall be provided for the assembly, dismantling or service to any portion of the piping system.

1. Unions 2" and Smaller: Shall be malleable iron ground joint unions with brass to iron seals. Stockham Fig. #694.

2. Unions 2-1/2" and Larger: Shall be of the companion flange type with ring type gasket painted with graphite before installation. Stockham Fig. #799.

3. Brass Couplings: Shall be used for connecting steel pipe to copper tubing.

C. Thermometers: Shall be provided and installed in the supply and return piping of the system. Thermometers mounted at heights other than 5 feet from the floor shall be the adjustable angle type and located so they may be read from the floor.

The body of the thermometer shall be brass or die-cast aluminum and at least 9" long. The thermometer shall be blue organic fill type with an appropriate scale for the medium being measured. The thermometer shall be mounted in the pipe in a separate well. Manufacturer – TRERICE BX 91406 or equivalent by WEKSLER, TAYLOR, or WEISS.

D. Pressure Gauges: Shall be installed in the piping system at the pumps. Connect the gauge to the piping system with 1/4" iron pipe. Provide 1/4" rough brass cock between the gauge and piping system.

The pressure gauge shall be of the liquid filled, bourdon-tube type with at least a 4" diameter dial with an appropriate scale. The gauge shall be the dust, corrosion and moisture resistance type with a cast aluminum case. Manufacturers – ASHCROFT, WEKSLER, TAYLOR, or TRERICE.

E. 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, TACO, JOHN WOOD, WESSELS, or ARMSTRONG.

F. Air Separator: Shall be ASME labeled and the same size as connecting pipe. Provide separator with strainer. The air separator shall be BELL & GOSSETT, TACO, THRUSH, AMTROL, JOHN WOOD, or ARMSTRONG.

G. Flexible Connection: Flexible pipe connection shall be installed on all pipes connecting to equipment where indicated on the drawings. The isolated equipment shall be provided with flexible connections for all piping connections immediately adjacent to the equipment. The hose shall be flexible, braid-reinforced, seamless metal hose within the pressure and temperature range applicable. Hose lengths shall be a minimum of ten inches and as recommended by the manufacturer, whichever is greater. Short style will not be acceptable. Provide control rods for stabilization. Flexible connections shall be as

manufactured by TWIN CITY HOSE, METRAFLEX, SSI, KEFLEX, or METRASPHERE.

H. Air Vents: Provide at high points of systems, on trapped sections of piping with automatic air vents or other locations as required for air removal from the system. Manual air vents shall be used on piping above ceilings in all finished spaces. Each air vent shall be accessible. Provide Hoffman No. 77 manual air vents for unit heaters, fan coil units, unit ventilators, piping mains above ceilings, etc. Provide Hoffman No. 79 automatic air vents for all exposed piping mains, air handling units, etc. Air vents as manufactured by SPIROTHERM shall also be acceptable.

I. Strainers: Shall be VICTAULIC, CONBRACO INDUSTRIES, INC., APOLLO VALVES, ARMSTRONG, TACO, or SARCO. Iron or brass body 'Y' pattern sediment strainers shall be installed. These strainers shall be provided with stainless steel or non-ferrous straining elements with heads for removal of the elements.

1. Iron body 'Y' pattern sediment strainers shall be installed with steel pipe.

2. Brass body 'Y' pattern sediment strainers shall be installed with copper or brass pipe.

3. Area of strainer openings shall not be less than four (4) times the pipe area. All strainers shall have blow-off valves with hose ends.

4. Strainer elements shall be No. 10 (ten), mesh screen or perforated stainless steel.

5. Each strainer body shall be cast with the manufacturer's name, an arrow indicating the direction of flow, strainer size, and pressure classification.

6. Each strainer shall be of the operating pressure, temperature and service rating of the respective systems.

J. Low point drains shall be provided for sections of trapped piping. Low point drains shall be a ¾ ball valve with a hose end connection and cap.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

A. The piping systems shall be installed as described in section 15050 - Basic Materials and Methods.

3.02 PIPING SYSTEM CLEANING

A. The piping systems shall be cleaned and flushed with chemicals in accordance with the following sequences:

1. Initial Flush - The initial flush shall be performed on the piping mains, with pumps running and before any branch piping or equipment has been connected. This initial flush is to remove debris and other foreign objects out of the piping systems. Flush systems until all matter has been removed from piping. After this flushing, the strainers shall be opened, screens removed and the entire unit cleaned and re-installed.

2. Pre-Cleaning - After the initial flush, the piping mains shall then be pre-cleaned for a minimum of eight hours with the pumps running and before any branch piping or equipment has been connected with cleaning chemicals provided by the water treatment contractor. After the pre-cleaning, the strainers shall be opened, screens removed and the entire unit cleaned and re-installed.

3. Cleaning - After equipment and branch piping has been installed, the entire piping systems shall then be cleaned out for a minimum of eight hours with the pumps running, all 3-way valves open to equipment coils and all valves open in the systems to allow complete circulation of cleaning chemicals. The water treatment contractor shall provide the cleaning chemicals required to perform this cleaning. After piping system cleaning, all strainers shall be opened, screens removed and the entire unit cleaned and re-installed.

4. Flushing - After the piping systems cleaning, the systems shall then be re-filled with water and circulated for a minimum of two hours, followed by draining the entire systems. The hot water system shall be brought up to operating temperature for this procedure. After systems draining, the air control tank strainer shall be removed and cleaned.

5. pH Balance and Treatment - After the two hour flush but before the water balance, the piping systems shall be flushed until the total alkalinity of the rinse water is equal to that of the make-up water. Once this has been completed, the systems shall be refilled with clean water and shall be treated per Section 15705. The treatment shall be performed by the water treatment contractor.

B. The piping systems cleaning and flushing shall be witnessed and verified by the owners representative. The contractor shall verify in writing that the cleaning and flushing of the piping systems has been performed and shall have the signature of the owner's representative.

C. The mechanical contractor shall provide the water treatment contractor the capacities of the systems so that proper dosages of products will be used.

D Valves for flushing piping mains shall be located at the low points in the mains. Mains shall be flushed before any branch piping or equipment is connected. Renewal projects, which must have piping mains installed in phases, shall have separate valves installed for each phase.

3.03 GROOVED PIPING

A. Pipe Ends shall be clean and free from indentations, projections and roll marks in the area from the pipe end to groove for proper gasket sealing.

B. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service.

C. The use of bolted branch outlets is not permitted.

D. Outlets for wells and gauges etc. shall be made using welded "thread-o-lets".

E. All grooved components shall be of one manufacturer.

F. Grooved connections shall not be installed in inaccessible concealed locations.

G. Grooved joints shall be installed in accordance with the manufacturer's latest published installation instructions.

END OF SECTION

# SECTION 15725

# BASE MOUNTED PUMPS

## PART 1 - GENERAL

1.01 GENERAL

The Bidding and Contract Requirements, Division 1 - 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 base mounted pumps as shown on the drawings and specified herein.

1.03 QUALITY ASSURANCE

A. Pumps must be selected from published test curves showing actual brake horsepower. The selection point shall be confined to the left of the center of the efficiency curve for the impeller being furnished.

B. All pump motors shall meet NEMA Standards.

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 BASE MOUNTED PUMPS

The base mounted pump shall be of the centrifugal base mounted type and of the size, capacity and voltage shown on the drawings. The pump shall be series 1510 as manufactured by BELL & GOSSETT. Pumps fully equal to the specified pump and manufactured by ARMSTRONG, PATTERSON or WEINMANN are acceptable.

A. Pump - Shall be of the vertical split case design for servicing without disturbing piping connections or motor. Motor to pump connections shall be of the flexible spacer spring coupler type, to dampen noise transmission and protect pump and motor from stress and strain of high starting torque. The pump shall use a mechanical rotating type carbon seal and shall face against a ceramic insert. The pump shall have a seal flush line of copper and shall be equipped with regreasable ball bearings. Extend grease fitting with permanently attached tube to extend

through insulation. Provide variable speed drive coupler for variable speed drive pumps.

B. Motor - Shall be drip-proof, 1750 rpm, and shall be especially selected for quiet operation, and shall be so stamped. Motor shall be rated for use with a variable frequency drive. 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.

C. Base - Shall be of the size suitable for the pump, motor and shaft, and shall be constructed of cast iron or welded steel.

D. Starter - Connect pump to variable frequency drive. Refer to specification section 15905 "Variable Frequency Drive".

2.02 SUCTION DIFFUSER

A. Provide suction diffuser at each pump. Units shall consist of an angle type body with inlet vanes and combination diffuser - strainer - orifice cylinder with 3/16" diameter openings for pump protection. A permanent magnet shall be located within the flow stream and shall be removable for cleaning. The orifice cylinder shall be equipped with a disposable fine mesh strainer that shall be removed after start-up. Orifice cylinder shall be designed to withstand a pressure differential equal to pump shutoff head and shall have a free area equal to five times the cross section area of the pump to suction opening. Vane length shall be not less than 2 1/2 times the pump connection diameter. Unit shall be provided with adjustable support foot to carry weight of suction piping. Manufacturer shall be Bell & Gossett. Suction diffusers manufactured by Patterson are acceptable provided they are fully equal to the suction diffuser specified.

## PART 3 - EXECUTION

3.01 INSTALLATION

A. The pumps shall be installed and serviced in accordance with the manufacturer's recommendations and as shown on the drawings.

B. A concrete base a minimum of four (4) inches higher than the surrounding floor shall be provided. Foundation bolts in pipe sleeves shall be set in the base to allow movement for final positioning of the bolts. The pump base shall be set dead level by means of properly spaced metal blocks or wedges. After pump is leveled, align pump and motor shaft and then pour grout between concrete base and pump base.

C. Pump base shall be isolated as shown on the drawings.

D. Coupling guards shall be installed per ANSI and OSHA standards.

E. Pumps mounted in areas other than slab on grade shall be mounted on inertia bases with vibration isolators.

END OF SECTION

# SECTION 15760

# HOT WATER UNIT HEATERS

## PART 1 - GENERAL

1.01 GENERAL

The Bidding and Contract requirements, Division 1 - General Requirements, Section 15010 - General Provisions, and Section 15050 - Basic Materials and Methods, shall apply to this section.

1.02 SCOPE

Provide and install hot water unit heater as shown on the drawings and as specified herein.

1.03 QUALITY ASSURANCE

A. The hot water unit heater shall have published ratings by an acceptable manufacturer.

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 HOT WATER UNIT HEATERS

The hot water unit heaters shall be of the type, capacity and voltage shown on the drawings. The unit heaters shall be manufactured by AIRTHERM. Unit heaters fully equal to the specified manufacturer and manufactured by TRANE, STERLING, RITTLING or TED REED THERMAL are acceptable.

A. Casing - Shall be constructed of heavy gauge furniture steel. It shall be phosphatized and completely dip painted with heavy-duty baked enamel. Cast brass supply and return pipe tap connections shall be bolted to corners of the back.

B. Coil - The coil shall be constructed on a single serpentine tube and shall be constructed of copper with at least .031" thick walls. Aluminum fins at least .015" thick shall be mechanically attached to the coil by expansion. All connections and U-bends shall be electrically induction-brazed to the tube. The coil shall be tested

for 100 psi.

C. Fan and Motor - Shall be selected for quiet operation. The fan shall be factory balanced and the motor shall have permanent lubricated bearings and inherent protection.

D. The unit shall have louvers or diffusers as shown on the drawings.

E. The unit heater shall be provided with low voltage (24v) controls by the manufacturer to interface with Division 15900 ATC system. It shall have a strap on hot water aquastat located on the hot water return to prevent the fan from running when hot water is not present.

## PART 3 - EXECUTION

3.01 INSTALLATION

The hot water heater shall be installed in accordance with the manufacturer's recommendations and as shown on the drawings. The unit shall be mounted for maximum headroom.

END OF SECTION

# SECTION 15840

# DUCTWORK AND DUCT ACCESSORIES

## PART 1 - GENERAL

1.01 GENERAL

The Bidding and Contract Requirements, Division 1 - 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 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

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.

A. 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.

B. 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.

C. All Variable Air Volume (VAV) supply air duct systems and 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) |

F. 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.

## 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.

D. All duct dimensions shown on the drawings are inside clear dimensions. The duct sizes of ducts with duct liner shall be increased accordingly.

3.05 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.

3.06 CLEANING/STORAGE

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.

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.

END OF SECTION

# SECTION 15905

# VARIABLE FREQUENCY DRIVE

## PART 1 - GENERAL

1.01 GENERAL

A. The Bidding and Contract Requirements and Division I - General Requirements for the Construction of this project shall apply to this division and all sections herein.

1.02 SCOPE

A. This specification defines the minimum requirements for a Variable Frequency Drive (VFD) for pump speed control.

1.03 QUALITY ASSURANCE

A. The VFD shall have a U/L listing and shall comply with UL508.

1.04 SUBMITTALS

A. Provide shop drawings on this equipment as described in Section 15010 - 1.04.

## PART 2 - PRODUCTS

2.01 VARIABLE FREQUENCY DRIVE

The variable frequency drive shall be of the size, capacity, and voltage shown on the drawings. The variable frequency drive shall be manufactured by MAGNETEK. Variable frequency drives fully equal to the specified drive and manufactured by DANFOSS, SAFTRONICS, ABB and TOSHIBA are acceptable.

2.02 GENERAL REQUIREMENTS

A. The VFD shall convert incoming fixed frequency three phase AC power into a variable frequency and voltage for controlling the speed of three phase AC motors. The motor current shall closely approximate a sine wave. Motor voltage shall be varied with frequency to maintain desired motor magnetization current suitable for centrifugal pump and/or fan control.

B. The VFD shall use 32-bit microprocessor based digital control technology and ASIC's (Application Specific Integrated Circuits) to regulate motor operation.

C. An advanced sine wave approximation and voltage vector control shall be used to allow operation at rated motor shaft output at nominal speed with no de-rating.

D. Means shall be provided for local Hand operation and for the local or remote selection of Hand or Auto operation.

E. There shall be a back lighted three line LCD alphanumeric display capable of displaying fault conditions, and suitable selectors to allow the display of operating conditions, set up of parameters and VFD configuration.

F. Equipment supplied must conform to recognized international standards and be manufactured to ISO 9001.

G. The manufacturer shall demonstrate a continuous period of manufacture and development for at least 10 years.

H. The manufacturer shall have integral add-on systems available for the addition of an AC line disconnect, bypass switchgear, and other devices as specified.

I. Manufacturer will provide contactors and controls as necessary for a complete system.

J. The Division 15900 contractor is responsible for selecting and providing the differential pressure transducer. The drive manufacturer shall coordinate with the division 15900 contractor to ensure the drive will accept the control signal as specified in 15900 2.02.

2.03 PACKAGE REQUIREMENTS

A. VFD enclosure shall be NEMA 1 for indoor applications and NEMA 3R for outdoor applications unless otherwise noted.

B. The enclosure shall be sized to allow the drive to operate at full rated current continuously with no additional cooling in ambient temperatures from -10° C to +40° C (+14° F to +104°F).

C. The VFD shall be rated to operate at a humidity of 95% RH to IEC 68-2.3 standard.

D. The VFD shall comply with the following vibration standards:

IEC 68-2-6, Vibration (sinusoidal) 1970
IEC 68-2-34, Random vibration wide band general requirement
IEC 68-2-35, Random vibration wide band reproducibility high
IEC 68-2-36, Random vibration wide band reproducibility med

E. The VFD shall comply with the following EMC (Electromagnetic compatibility) standards:

Emission - EN55011/CISPR 11 (w/RFI filter option)
Immunity - IEC 801-2 Electrostatic discharge
Immunity - IEC 801-3 Radiated electromagnetic field

F. Power line noise shall be limited to a voltage distortion factor and line notch depth as defined by IEEE Standard 519-1992. Harmonic distortion shall not exceed 5% for general systems or 10% for dedicated power feed systems as measured at a point of common coupling (as defined at the point of utility metering). VFD manufacturer shall be responsible for acquiring all information necessary to determine harmonic content of the system and to certify compliance.

2.04 INPUT POWER

A. VFD's rated nominal 460 volts AC shall meet all specifications when operating from 440 to 500 Volts +/-10%, three phase, 47 to 63 Hz power.

B. VFD's rated nominal 230 volts AC shall meet all specifications when operating from 200 to 230 Volts +/-10%, three phase, 47 to 63 Hz power.

C. An input isolation transformer shall not be required.

D. The VFD shall be capable of being powered from an AC distribution system having a symmetrical short circuit current rating of 100,000 amps RMS when the manufacturer's recommended fuses are used.

E. The VFD shall incorporate filters in the EDC link section sized so as to limit the AC line current 5th harmonic to approximately 35%. External AC line reactors are not permitted.

F. Displacement power factor shall be 90% or greater from no load to full load.

G. Full load efficiency shall be greater that 96% at 100% load and greater than 92% at 20% load.

H. The VFD input shall comply with the following AC line disturbance standards:

VDE 0160, Section 5.3.1.1.3, Under voltage
VDE 0160, Section 5.3.1.1.3, Over voltage
VDE 0160, Section 5.3.1.1.3, Phase loss

I. The VFD shall be insensitive to input phase rotation. Changing input phase rotation during shut down must have no effect on the VFD operation and shall not require reconnection of incoming power or motor wiring.

J. Inrush current shall be limited to a value that will not cause nuisance blowing of the incoming power line fuses when drive manufacturer recommended fuses are used.

K. The VFD's AC line input shall comply to the following EMC (Electromagnetic compatibility) standards:

Emission - EN55011, class A group 1 or class B group 1 as applicable (with optional RFI filter)
Emission - VDE 0875, part 3, curve N or G as applicable (with optional RFI filter)
Immunity - IEC 801-4 Burst
Immunity - IEC 801-5 Surge
Immunity - ANS/NEMA ICS 2-230 showering arc test
Immunity - VDE -0160 Section 7.3.1.1 AC line transient. Vpeak=2.3 x AC line, 1.3 ms half value time.

2.05 OUTPUT POWER

A. The output shall be variable frequency variable voltage capable or operating NEMA A, B, C, or D 230 volts AC or 460 volts AC (as applicable) 60 Hz three phase induction motors and shall be capable of being field reprogrammed to operate other standard three phase induction motors (IEC34/VDE030).

B. The VFD shall have the capacity to deliver full motor output voltage 10% greater than the supply voltage continuously.

C. The VFD will be supplied with output coils as standard to limit output voltage rate of rise to typical 500 volts per microsecond (1-60 hp) and 2000 volts per microsecond (75 hp+). The addition of external coils is not permitted.

D. The output switches shall operate at a nominal frequency of 4.5 kHz and will be field changeable from 2 to 14 kHz (1-60 hp units). The VFD shall be capable of varying switching frequency with the output frequency to maintain a high efficiency.

E. The VFD shall be self-protected while running or at rest against:

Switching motors on the drive output.
Output line-to-line short circuits.
Output line to ground short circuits.

F. The VFD shall be capable of driving a motor up to 1,000 feet away without the addition of output reactors.

G. The VFD shall be capable of operating without a motor connected for servicing.

H. The VFD shall be capable of starting in a constant torque mode to provide high starting torque with automatic switching to a variable torque mode.

I. The VFD shall be capable of operating a motor sized one standard size larger than the drive rating. The drive is not required to operate this larger motor beyond the drive rating.

J. The VFD design shall include a motor preheat circuit to prevent condensation forming in the motor during shutdown periods.

K. The VFD shall have electronic thermal overload protection to prevent damage to the variable frequency drive.

L. Electronic Thermal Overload protection shall be available with or without motor temperature feedback. This protection shall include the effects of the speed of the motor and the length of time of operation at a given speed and current in the calculation of the motor protection. The overload protection will be U/L recognized as a Class 20 overload device.

2.06 PERFORMANCE

A. Advanced PWM control shall be used to generate sine wave current output. Predictive control techniques shall be used to calculate pulse widths and spaces. Alternatively, systems utilizing a full wave diode bridge input with a PWM sine-coded output wave form will be considered. Such systems shall incorporate an input diode bridge that provides complete immunity against voltage dips, line noise, and harmonics. Additionally, output transistors shall be of the IGBT type (Insulated Gate Bipolar Transistor) to facilitate noiseless motor operation.

B. VFD's shall not "cog" at frequencies above 1.5 Hz. There shall be no sudden frequency shifts and associated acoustical noise shifts as the output frequency is varied between 1.5 and 60 Hz. Minimum switching frequency shall be as follows:

12 kHz for drives rated from 1 to 75 hp at 460 volts AC and from 1 to 40 hp at 230 volts AC.

C. The VFD shall be capable of automatic energy optimization. The volts per hertz ratio shall be automatically optimized to match the loads requirements.

D. The speed regulation of the VFD shall be +/-.5% of rated speed, with a 10 - 90% load variation from 6 - 60 Hz.

E. There shall be programmable start and slip compensation so that the variable frequency drives can optimize motor performance.

F. The VFD shall have built in DC injection braking programmable from 0 - 15 seconds with programmable DC injection voltage.

G. The drive output shall have a selectable frequency range from 0 -120 Hz and 0 - 500 Hz.

H. The VFD will have adjustable ramp times from 0.1 to 3, 600 seconds.

I. The VFD shall be capable of a flying start function. It shall be able to start into a rotating load (forward or reverse) without tripping.

J. The VFD shall have four programmable critical bypass frequencies to skip over resonant frequency ranges during acceleration/deceleration. The width of the bypass frequencies shall be adjustable.

K. The VFD shall be programmable for extended power loss ride through capability utilizing the stored energy of the rotating load.

L. There shall be provided as standard a closed loop PID controller which can be programmed to be supplied by a standard analog signal (0 - 5 V, 0 -10 V, 0 - 20 mA, 4 - 20 mA) or a maximum pulse signal of 100 Hz, 1 kHz, 10 kHz. The PID controller shall have a programmable low pass filter, programmable feed-forward function, and programmable and configuration functions of the drive. Where noted or required for pneumatic speed control, system shall be controlled by a 3-15 psi signal.

2.07 DISPLAYS AND PROGRAMMING

A. Data shall be displayed on a backlighted three-line LCD alphanumeric keypad mounted on the front of the VFD. The keypad shall be able to perform all programming and configuration functions of the drive.

B. The keypad shall display the VFD's status and programming in plain text. The language shall be English.

C. The programming keypad shall be remotely mountable to a distance of up to 3 meters.

D. The keypad shall include a red "FAULT" lamp and a green "POWER ON" lamp.

E. The keypad shall provide a HOA (Hand-Off-Auto) function and Hand mode speed up/down push buttons. Auto/Hand change over must be performed with a single keystroke.

F. The VFD shall be programmable to display any one of the following items during operation:

Reference signal (%)
Frequency of the output (Hz)
Feedback (programmable unit)
Motor current (Amps)
Motor torque (%)
Power (kW)
Power (HP)
Energy (kWh)
Output Voltage (Volts)
DC Bus Voltage (Volts)
Motor temperature (% until trip)
Drive temperature (% until trip)

G. The keypad display shall continuously display the VFD operating status and fault conditions in plain text.

H. There shall be provided a lock switch inside the VFD to prevent unwanted programming. The lock must not prevent operation of the Hand/Off/Auto modes.

I. The VFD shall include an RS485 serial communication port. The port shall permit monitoring, programming, and control of the VFD. The VFD manufacturer shall provide a DOS based VFD programming program upon request.

2.08 PROGRAMMED CONTROL INPUTS/OUTPUTS

A. Potential free terminals shall be provided for contact closure control inputs. A nominal +24 v DC supply shall be provided to operate these inputs or an external voltage between + 10 and + 37 v DC may be applied to operate the control.

B. The control inputs shall be operable with any mechanical or solid state switching device rated for a closed circuit current of 25 ma DC, and having an open circuit leakage of 100 uA or less at 24 VDC.

C. Control inputs shall be isolated from the AC line and power components sufficiently to withstand a test voltage of 2500 volts RMS for one minute. The control inputs shall be tested to the following standard:

VDE 0106/0160 (PELV), Galvanic isolation

D. The VFD control inputs shall comply with the following EMC (Electromagnetic compatibility) standards:

Immunity - IEC 801-4 Burst
Immunity - IEC 801-5 Surge
Immunity - SEN 361503 Line-conducted interference

E. Logic terminals shall be programmable. A minimum of eight shall be programmable for the following functions:

Hand mode/Auto mode
Auto mode enable
Start (Two wire non-latching control)
Reverse
Start (Three wire latching control)
Start reverse (Three wire non-latching control)
Stop (Ramping)
Stop (Alternate deceleration rate)
Stop (Coast to stop)
Stop (DC brake to stop)
Jog
Reset

Preset speed select (20 preset speeds)
Parameter set select (4 parameter sets)
Speed increment/decrement
Pulse train follower/feedback input]
Motor thermistor input

F. Terminals shall be provided for analog control of motor speed. Two terminals shall be programmable for the following functions:

Voltage input; 0-10 VDC, 2-10 VDC, 0-5 VDC, and 1-5 VDC signal (or inverted)

Current input; 0-20 mA and 4-20 mA signal, 226 ohm (or inverted)

G. A 4-20 mA signal loss detection function shall switch the VFD to the last speed, full speed, jog speed, or zero speed following a signal loss.

H. The VFD shall have two relay outputs (1 form A, 1 form C, UL rated 240 volts AC 2 amps) programmable to provide the following indications:

Ready
Alarm (Fault)
Warning
Current limit
Motor overload
Running on reference
Running
Out of frequency range
Out of current range

I. The VFD shall have two analog outputs (rated 0-20 mA or 4-20 mA, 470 ohm max.) programmable to provide the following analog or digital signals:

Frequency
Current
Torque
Reference
Ready
Alarm/Fault
Warning
Current limit
Motor overload
Running on reference
Running
Out of frequency range
Out of current range

J. Where noted VFD shall be capable of interfacing with Profibus RS485 serial communications networks.

K. Where noted VFD shall be capable of interfacing with Modicon Modbus Plus RS485 serial communication networks.

2.09 ADJUSTMENTS

A. The VFD shall default to a quick setup mode. The quick setup mode will limit the possible adjustments to the following:

Minimum frequency 0-120/500 Hz
Maximum frequency 0-120/500 Hz
Acceleration rate (0.1-3,600 seconds)
Deceleration rate (0.1-3,600 seconds)
Motor voltage
Motor frequency
Language
Reset to factory settings

B. The VFD shall have an extended setup mode. The extended mode will provide the following additional programmable adjustments:

Start frequency
Four acceleration and deceleration ramps (0.1-3,600 seconds)
Four bypass frequencies and adjustable bandwidth
Preset speeds (Twenty speeds)
Accel/decel ramp profile
Current limit
Start compensation
Start voltage
Slip compensation
Magnetization current
V/Hz ratio
Carrier switching frequency
Auto restart times (0-10 restarts)
PID parameters
D Differential time
FF Feed forward
LP Low pass filter
Feedback scale factor
Warning current High/Low
Warning frequency High/Low
Motor parameters: Horsepower, Voltage, Frequency
Custom display: Engineering unit, Scale factor
DC brake time
DC brake voltage
DC brake cut in frequency
Power loss ride through mode
Flying start mode

2.10 DIAGNOSTICS

A. The VFD shall have on board diagnostics, which will display faults and status messages. A log recording fault codes, time and value will be stored for past 8 faults. VFD operational data for the last fault shall be stored every 120 ms or immediately upon a trip condition for later analysis.

2.11 SERVICE AND WARRANTY

A. The VFD shall have a manufacturer's warranty period of one year.

B. The VFD manufacturer shall maintain a network of factory trained, stocking authorized service centers.

2.12 ACCESSORIES

A. The VFD manufacturer shall provide an integrated UL/UL listed NEMA 1 Adaptable Packaged Unit (APU) housing the following devices:

AC line disconnect, lockable, door interlocked
AC line fuses
VFD bypass circuit (3 contactor w/AC line isolating contactor)
Thermal overload relay, class 20 Control transformers, fused contactors.

B. The Adaptable Packaged Unit (APU) shall be capable of housing the following devices:

Start push button
Stop push button
Reset push button
VFD-Line selector switch
Speed meter
Current meter
Fault lamp
Bypass mode lamp
3-15 PSI input
Auto bypass circuit

The VFD shall have provisions to accommodate other control devices as specified.

**PART 3 - EXECUTION**

3.01 INSTALLATION

A. The variable frequency drives shall be installed and serviced in accordance with the manufacturer's recommendations and as shown on the drawings.

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 SECTION 01340. 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 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.

1.08 TEMPORARY FACILITIES

A. Temporary facilities shall be as specified under SECTION 01510 TEMPORARY UTILITIES. Requirements therein are hereby made a part of this Section as if fully specified herein.

B. Contractor shall coordinate with the construction phasing of the building in order for this contractor to provide power and systems cabling and devices for the temporary relocation of the existing administrative offices, media center and other essential school operational areas as directed by the Owner.

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 SECTION 01740 WARRANTIES AND BONDS.

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 it's 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

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 1/2 inch. No more than six (6) No. 12 AWG conductors shall be pulled in 1/2 inch conduit. For conductors larger than No. 12 AWG or quantities of No. 12 greater than six (6) conductors, 3/4 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 heavywall (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 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.

## 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 1½ 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 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.

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 1½ 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 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. Cover plates for switches 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.

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.

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 1½ 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 |
| 4. | Emergency | - White |
| 5. | Fire Alarm | - Red |

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 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 trip ratings and frame sizes.

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 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,

H. Where a circuit breaker is the disconnecting means for fire alarm equipment, a listed breaker locking device shall be installed.

I. 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.

J. Circuit breakers shall be manufactured by the same manufacturer as the panelboard and factory installed.

2.03 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 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. 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.

END OF SECTION