

PROJECT MANUAL

# BELVEDERE ELEMENTARY SCHOOL CLASSROOM RENOVATION PROJECT

6540 Columbia Pike  
Falls Church, Virginia 22041

SPECIFICATION VOL. 1 OF 1  
BID SET – JUNE 04, 2024



Quinn Evans  
2101 L Street, NW, Suite 950  
Washington, DC 20037

FAIRFAX COUNTY PUBLIC SCHOOLS

OFFICE OF FACILITIES MANAGEMENT  
5025 SIDEBURN ROAD  
FAIRFAX, VA 22032  
703-764-2457

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**SECTION 00020****INVITATION TO BID****PART 1 - GENERAL**

- 1.01 **Notice of IFB:** Notice is hereby given that the Fairfax County School Board ("Owner") will receive bids for the **Classroom Renovation Project at Belvedere Elementary School, before, 10:00 a.m. on Tuesday, June 4, 2024.**
- 1.02 Each bidder shall bear and be responsible for all costs, fees and expenses associated with its preparation and submission of a bid in response to this IFB. In no event shall any bidder be reimbursed by the Owner for any such costs, fees or expenses. Bid prices shall be inclusive of all labor, supplies, materials, equipment, permits, and sales or use taxes required to complete the Work in its entirety in strict accordance with the Contract Documents.
- 1.03 The procedure for withdrawal of bids and bid award public notification is set forth in the Instructions to Bidders.
- 1.04 Bids will be considered on a lump sum basis for the entire work described in the Contract Documents.
- 1.05 The Owner will not discriminate against a bidder solicitation or awarding of contracts because of race, religion, color, sex, national origin, age, disability, or any other basis prohibited by state law relating to discrimination in employment. Minority contractors and small business enterprises are invited and encouraged to submit bids in response to this solicitation. Each bidder shall indicate on its Bid Form whether or not it is a Small Business Firm or a Minority Business Firm, as such terms are defined in the instructions to Bidders. All responsive and responsible bidders will receive equal consideration for award.
- 1.06 Drawings and Specifications may be downloaded from <https://www.fcps.edu/get-involved/doing-business-fcps/facilities-management-current-solicitations> or examined at the Owner's Office of Facilities Management location on an appointment basis. Electronic contract document set may be obtained from the Architect of Record: Ballou Justice Upton Architects, 804-270-0909. One (1) set of electronic bidding documents will be furnished to each bidder.
- 1.07 The Contractor shall perform Substantial and Final Completion of Work on or before the respective Substantial and Final Completion dates established in Section 01010, Summary of Work. It is the intent of the Owner to assess liquidated damages in the amounts shown in Section 01010 in the event that these dates are not met.
- 1.08 Contract documents including Drawings and Specifications will be placed on the file at the following locations: (list revised 11/23)

NAME	ADDRESS	PHONE	FAX
<b>DODGE Data</b>	Dodge Data and Analytics 2860 S State Hwy 161, Suite #501 Grand Prairie, TX 75052-7361 <a href="mailto:support@construction.com">support@construction.com</a> <a href="http://www.construction.com">www.construction.com</a>	800-393-6343	800-625-3488
<b>Construct Connect</b>	30 Technology Parkway South Suite 100 Norcross, GA 30092 <a href="mailto:content@constructconnect.com">content@constructconnect.com</a>	800-364-2059 Ext. 8232	866-570-8187
<b>Valley Construction News</b>	426 West Campbell Avenue, SW Roanoke, VA 24016 <a href="mailto:emilyvcn@yahoo.com">emilyvcn@yahoo.com</a>	540-344-8127	540-344-0292
<b>The Blue Book</b>	800 E. Main Street Jefferson Valley, NY 10535 ATTN: Alex Gugliada <a href="mailto:agugliada@mail.thebluebook.com">agugliada@mail.thebluebook.com</a>	800-431-2584, Ext. 3327	914-243-4396
<b>Builders and Construction Exchange, Inc.</b>	1118 Azalea Garden Road Norfolk, VA 23502 <a href="mailto:plans@bceva.com">plans@bceva.com</a>	757-858-0680	757-858-0681
<b>Construction Bid Source, LLC</b>	528 Weather Ridge Lane Cary, NC 27513 Attn: Liz Stryker or Pearl Regis <a href="mailto:projects@constructionbidsource.com">projects@constructionbidsource.com</a>	1-888-786-9450	209-772-3573

1.13 Unless cancelled or rejected, a responsive bid from the lowest responsible bidder shall be accepted as submitted, except that if the bid from the lowest responsible bidder exceeds available funds, the School Board may negotiate with the apparent low bidder to obtain a contract price within available funds.

The conditions and procedures for such negotiation are set forth in the current version of School Board Policy 8240, the text of which is available for review at [www.fcps.edu](http://www.fcps.edu), search for “Policies, Regulations and Notices”, click this link, then select “Find a Policy”.

In summary, negotiation may be undertaken on behalf of the School Board where, and to the extent such, is deemed to be in the best interests of the School Board. Office of Facilities Management staff, along with the project’s design professionals and the apparent low bidder, will develop appropriate scope modifications that do not impair the proposed function of the project. These modifications will be priced by the apparent low bidder and reviewed by the Office of Facilities Management and the project’s design professionals, which may recommend an award on that basis if such is deemed to be in the best interests of the School Board and the price is within available funds.

THE COUNTY SCHOOL BOARD OF FAIRFAX COUNTY, VIRGINIA

Karl Frisch  
Chair

Dr. Michelle Reid  
Superintendent of Schools

Janice M. Szymanski  
Chief of Facilities Services  
& Capital Programs

Justin R. Moss  
Executive Director, Office of Facilities Management

END OF SECTION



## SECTION 00100

### INSTRUCTIONS TO BIDDERS

#### 1. QUALIFICATION OF BIDDER

- A. Each bidder shall be required to be licensed pursuant to Title 54.1, Chapter 11 of the Virginia Code, as amended, before such bidder's bid may be submitted to the Owner and be eligible for consideration hereunder. Each bidder shall place its Virginia Contractor License Number on the outside of the envelope containing its proposal and in the space provided therefore on the signature page of the Bid Form.
- B. The bidder shall be qualified by experience, financing, organization, scheduling and coordination ability, and shall have the necessary labor and equipment to perform the work called for in the Contract Documents. The bidder shall have experience with work of similar type and size to that called for in the Contract Documents and such experience shall be based upon projects that have been completed within the last five years.

#### 2. LICENSE AND REGISTRATION REQUIREMENTS

- A. 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 Fairfax County Department of Tax Administration, telephone number: (703) 222-8234.
- B. Any foreign corporation transacting business in Virginia shall obtain a Certificate of Authority, as required by Section 13.1-757 of the Code of Virginia, from the Virginia State Corporation Commission, Post Office Box 1197, Richmond, Virginia 23218. The Commission may be reached at (804) 371-9733. The consequences of failing to secure a Certificate of Authority are set forth in § 13.1-758 of the Virginia Code, as amended.
- C. A current State Corporation Commission Corporate Identification number. *Effective July 1, 2010, a company is required to provide FCPS a state authorization number to transact business in the state of Virginia. To obtain a State Corporation Commission Corporate Identification number, contact the state commission at 804-371-9733 or 1-800-552-7945, or <https://www.scc.virginia.gov/index.aspx>, email: [sccinfo@scc.virginia.gov](mailto:sccinfo@scc.virginia.gov) or The State Corporation Commission, Post Office Box 1197, Richmond, Virginia 23209.*

#### 3. QUESTIONS AND COMMUNICATIONS; ISSUANCE OF ADDENDA

- A. 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.

- B. Any question or request for an interpretation must be in writing and submitted: (i) by mail or hand delivery addressed to Architect and Owner as indicated on the cover page to this solicitation; or (ii) by email to the Architect of Record: Ballou Justice Upton Architects, [dley@bjuarchitects.com](mailto:dley@bjuarchitects.com) or email to the Senior Buyer at; [acmylechrain@fcps.edu](mailto:acmylechrain@fcps.edu) (Angela Mylechraine). In order to be eligible for consideration, a question or request for interpretation must be received on or before the deadline. Deadline will be established in the Pre-Bid Conference referenced in section 00020 ("Invitation to Bid"). 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. It shall be the responsibility of each bidder to ensure that all addenda are acquired. Any issued addenda in connection with this project will be posted under 'Current Solicitations'. The bidder may also call the Architect of Record: Ballou Justice Upton Architects, 804-270-0909 and Senior Buyer at 703-764-2457 prior to bid submission in order to determine whether any addenda have been issued in connection with this solicitation." Notwithstanding any provision to the contrary, the failure of any bidder to receive any such addenda or interpretations shall neither constitute grounds for withdrawal of a bid nor relieve such bidder from any obligation under his Bid as submitted. "Points of Interests" will be attached to Addendum 1, which will replace Pre-Bid meetings/addenda. All addenda so issued shall become part of the Contract Documents.
- C. The bidders for this Project are notified that the site for performance of the Work is "unclassified" and that, as such, complete, accurate and/or reliable information regarding surface and subsurface conditions likely to be encountered during performance of the Work is not available. Each bidder shall be provided full and complete access to the site of the Work (but only upon prearrangement with the Office of Facilities Management as to all aspects of the site visit) in order to conduct, at its expense, such tests and investigations of the site as it deems appropriate under the circumstances (and of which it has provided ten (10) days advance written notice to Owner) in order to evaluate and satisfy itself as to the surface and subsurface conditions likely to be encountered during performance of the Work.

Bidders which do not comply with the foregoing prearrangement and notice provisions shall not be permitted to visit the site or to conduct tests and investigations of the site.

It is the intent of these Contract Documents that the successful bidder for this Project shall bear full and complete responsibility for all surface and subsurface conditions, whether known or unknown, reasonably foreseeable or not, that shall be encountered during the performance of the Work and that, as such, each bidder shall include in its bid price for the Work an amount that it deems

sufficient, in its sole and absolute discretion, to protect such bidder from the increased costs of performance that it may incur as a result of its assumption of responsibility for all such surface and subsurface conditions. Notwithstanding any provision in the Contract Documents to the contrary, the successful bidder shall in no event be entitled to additional compensation, time or other relief from its obligations under the Contract Documents as a direct or indirect result of surface or subsurface conditions encountered during performance of the Work. Pursuant to the Contract Documents, the successful bidder shall waive any and all claims against the Owner and the Architect that such bidder has, or may have in the future, arising out of or in connection with surface and subsurface conditions encountered during performance of the Work. In the event that the Owner or the Architect (or any of its or their representatives) provide the bidders with access to or copies of any reports, data or other materials or information pertaining to the surface or subsurface conditions at the site of the Project, each bidder shall: (a) acknowledge that such reports, data or other materials or information were supplied without representation or warranty as to the accuracy or completeness thereof; and (b) certify that it did not rely upon any such information in tabulating its bid price for the Work.

#### 4. BID SECURITY

- A. Each bid shall be accompanied by a bid bond in an amount equal to five percent (5%) of the total amount of the principal's bid on the form prescribed herein (Section 00301). The original bid bond shall be submitted to the attention of the Senior Buyer at Office of Facilities Management, 5025 Sideburn Road, Fairfax, Virginia 22032. The bid bond shall be issued by a surety company licensed to conduct business as a surety in the Commonwealth of Virginia and otherwise satisfying any further requirements with respect to sureties set forth in the General Conditions. In lieu of a bid bond, a bidder may submit a certified check, cashier's check or cash escrow in the face amount required for the bond. Such bid security shall be given as a guarantee that the bidder will enter into a contract and provide the required contract security and insurance if awarded the work.
- B. The bid security of the unsuccessful bidders will be returned on or before the date that is five (5) days after the execution of the contract or, if no such contract shall have been executed, on or before the date that is 60 days after the date of opening of the bids. The bid security of the successful bidder will be returned only after such bidder shall have executed the agreement and furnished the contract security and evidence of insurance required hereunder.
- C. If the bidder to whom the Contract is awarded refuses or neglects to execute the agreement or fails to furnish the required contract security and evidence of insurance within ten (10) days after receipt of the notice, the amount of such bidder's bid security shall be forfeited to the Owner; provided, however, that no such forfeiture shall exceed the lesser of: (i) the difference between the bid for which the bond was written and the next low bid; and (ii) the face amount of the bid bond. If the bidder to whom the contract is awarded refuses or neglects to execute the agreement or fails to furnish the required contract security and

evidence of insurance, then the award of the contract may be annulled and the Owner may: (i) award a contract hereunder to the next best bidder and such bidder shall fulfill every requirement set forth in these documents as if it were the original party to whom the award was made; or (ii) reject all of the bids submitted hereunder, as its interest may require. Except as provided herein with regard to withdrawal of bids, no plea of mistake in the bid shall be available to the bidder for the recovery of its bid security or as a defense to any action based upon such bidder's failure or refusal to execute a contract and to furnish the required contract security and evidence of insurance.

## 5. CONTRACT SECURITY

- A. The Required Documentation and the Owner/Contractor Agreement will be sent to the successful bidder on the following Monday after bid opening. The Owner/Contractor Agreement shall be signed by an authorized officer of your company. Within seven (7) business days from the date of the Required Documentation, the successful bidder shall execute and deliver to the Owner four (4) copies of the Owner/Contractor Agreement. In Addition, the successful bidder shall furnish the following:
- 1) Two (2) original copies of the performance bond in an amount equal to 100 percent of the contract sum conditioned upon the faithful performance of the contract in strict conformity with the plans, specifications, and conditions of the contract.
  - 2) Two (2) original copies of the payment bond in an amount equal to 100 percent of the contract sum conditioned upon the prompt and faithful payment of all persons and entities who have and fulfill contracts which are directly with the contractor for performing labor or furnishing materials in the prosecution of the work provided for in the contract.
  - 3) One (1) or more certificates of insurance evidencing the types and amounts of insurance coverage required to be maintained by the Contractor under the Contract Documents.
- B. The Notice To Proceed (NTP) and the counter signed Owner/Contractor Agreement will be sent to the successful bidder on the following Monday of FCPS's School Board approval. The successful bidder will be authorized and directed to proceed with the Work after seven (7) business days of the FCPS's School Board approval.
- C. Each of the following Subcontractors shall submit Performance and Payment Bonds in the amount of one hundred percent (100 percent) of its subcontract amount. Bonds shall (i) be substantially in the form herein provided (Sections 00302 and 00303), (ii) name the Contractor as obligee, and (iii) be issued by a surety company licensed to conduct business in Virginia. Cost of said Bonds shall be included in the Contract Sum:

- 1) Electrical
- 2) Plumbing / HVAC
- 3) Sprinkler

D. Any performance or payment bond required hereunder shall be in the form included in these Contract Documents and shall be executed by a surety company that is legally authorized to transact business as a surety in the Commonwealth of Virginia and that otherwise satisfies any requirements with respect to sureties set forth in the General Conditions. In lieu of a payment and/or performance bond, the successful bidder may furnish a certified check or cash escrow in the face amount(s) required for such bond(s).

## 6. BIDS

A. In order to be entitled to consideration hereunder, bids shall be made in accordance with the following instructions.

- 1) Before submitting a bid, bidders shall visit the site of the work, fully inform themselves as to all existing conditions and limitations, and shall include in the bid a sum to cover the cost of all items included in the Contract Documents.
- 2) Bids shall be made in duplicate upon the Bid Form, a copy of which is bound herein. Bids shall be completed, including each and every item; bids shall be stated both in writing and in figures. The signatures of all persons shall be in longhand. The completed Bid form shall be without erasures or alterations.
- 3) No Bid shall contain any recapitulation of the work to be performed, and no alternate bid will be considered unless called for. No exceptions, exclusions or qualifications, unless expressly authorized, shall be permitted on the Bid Form. No oral, telegraphic or telephonic bids, or modifications, either to the Bid Form or the Bid Envelope, shall be considered.
- 4) Bids shall be time-stamped and deposited in the bid box at, the Office of Facilities Management, 5025 Sideburn Road, Room 62, 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 bidder and bidder's Virginia Contractor License Number.
- 5) Bids shall be firm and irrevocable for a period of 60 days following the date of opening of the bids.

## 7. OPENING OF BIDS

Bids will be opened and read aloud at the time and place set forth in the Invitation to Bid. Bidders, their representatives, and other interested persons may be present at the

opening of the bids. In the event that only one Bid Form is received by the Owner in response to the Invitation to Bid, the Owner may, in its discretion, decline to open such bid and return the unopened envelope to the bidder.

#### 8. **LATE BIDS**

Any Bids or unsolicited materials relating to a Bid that are received by the Owner after the date and time specified for the submission of bids will not be eligible for consideration by the Owner. Bids received after the bid submission deadline will be returned to the Bidder unopened, providing that sufficient bid identification information is shown on the outside of the bid envelope.

#### 9. **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 in the bid, 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 material made directly in the compilation 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.

If a bid contains both clerical and judgment mistakes, a bidder may withdraw his bid from consideration if the price bid would have been substantially lower than the other bids due solely to the clerical mistake, that was an unintentional arithmetic error or an unintentional omission of a quantity of work, labor, or material made directly in the compilation of a bid that shall 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.

- B. The following is the procedure for withdrawal of a bid and is stated in the advertisement for bids:
- 1) A bidder, who seeks to withdraw his bid in accordance with this provision, shall give notice in writing of his claim of right to withdraw his bid within two business days after the conclusion of the bid opening procedure and shall submit original work papers with such notice to:

Justin R. Moss, Executive Director  
Office of Facilities Management  
Facilities Services and Capital Programs  
Fairfax County Public Schools  
5025 Sideburn Road  
Fairfax, VA 22032  
Telephone Number 703-764-2405; Fax 703-239-0462  
Email: [jrmoss@fcps.edu](mailto:jrmoss@fcps.edu)

The mistake shall be proved only from the original work papers, documents, and materials delivered as required herein. The work papers, documents, and materials submitted by the bidder shall, at the bidder's request, be considered trade secrets or proprietary information subject to the conditions of subsection F of Section 2.2-4342 of the Code of Virginia.

- C. 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%).
- D. If a bid is withdrawn, the lowest remaining bid shall be deemed to be the low bid. No bidder who is permitted to withdraw a bid shall, 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.
- E. The Office of Facilities Management (OFM), acting for the School Board, shall notify the bidder in writing within five (5) business days of its decision regarding the bidder's request to withdraw its bid. If OFM denies the withdrawal of a bid, it shall state in such notice the reasons for its decision and award the contract to such bidder at the bid price, provided such bidder is a responsible and responsive bidder. At the same time that the notice is provided, OFM shall return all work papers and copies thereof that have been submitted by the bidder.

#### **10. 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.

#### **11. AWARD OF CONTRACT**

- A. The Contract will be awarded, if at all, under the terms and conditions of the Contract Documents to the lowest responsive and responsible bidder, as determined by the Owner, with due consideration given to the ability of the bidder to cooperate with separate contractors for the Project and to coordinate, schedule and complete the Work within the prescribed time period. The Owner reserves the right to award the Contract that would be in the best interests of the Owner.
- B. Public notice of the award of contract or the announcement of the decision to award a contract will be set forth on the website of Fairfax County Public Schools [www.fcps.edu](http://www.fcps.edu), search for "Bid Results", select "Office of Facilities Management", scroll to Bid Results. While school division staff may communicate procurement results to bidders or offerors, each bidder or offeror has the responsibility to monitor the FCPS website for its own purposes.

- C. The Owner reserves the right to require submission of references in sufficient time to make inquiries regarding the responsibility of the bidder before making the award, and the right to require a recent financial statement from the bidder if the Owner deems it necessary. The Owner also emphasizes its intention not to award any contract to a bidder whose past performance shows his firm to be generally late in performance of construction contracts. The ability of the low bidder to provide the required bonds will not in and of itself establish the responsibility of the bidder.
- D. The Owner reserves the right to defer award of any Contract for a period of 60 days after the due date for the bids. Bid prices shall be binding for 60 days following the due date for proposals, unless period for award of bids hereunder is extended by mutual consent of all parties, in which case bid prices shall be binding for such longer period as shall have been agreed upon.
- E. Under circumstances where no add alternates are included on the Bid Form, the low bidder shall be determined by the Owner based upon a comparison of the base bid amounts set forth on such Bid Forms. In the event that one or more add alternates are included on the Bid Form, the low bidder shall be determined by the Owner based upon the aggregate amount of: (i) the base bid, and (ii) any add alternates selected by the Owner. Add alternates shall be selected by the Owner based upon its authorized construction budget and the Owner's needs and requirements at the time of the bid opening. The Owner reserves the right, in its sole discretion, to select or reject any or all of the add alternates (or to select any combination of add alternates) included in the Bid Form. The Owner shall determine the low bidder for the base bid and any selected add alternates by means of a "blind" bid review process which shall operate generally as follows:
- 1) At the bid opening, a designated staff member from the Owner's Office of Facilities Management shall complete two bid tabulation sheets, the first of which shall identify each bidder by name, and the second of which shall omit the names of the bidders and shall refer to each bidder by a generic term such as "Contractor A" and "Contractor B." The Director of the Owner's Office of Facilities Management or his designee (the "Director") shall not attend the bid opening.
  - 2) Following the bid opening, school system staff shall submit only the second, anonymous bid tabulation sheet to the Director for his or her review and consideration. The Director shall determine the low bidder based on the aggregate amount of the base bid and any selected add alternates set forth on the second anonymous bid tabulation sheet, and shall circle and initial his or her choices on such form.
  - 3) Once the Director's selections have been made, the two tabulation sheets shall be compared, and the identity of the low bidder for the base bid and any selected add alternates shall be established.



- F. Any quantities set forth on the Bid Form represent estimates only and are included solely for the purpose of evaluating and comparing the bids received.
- G. 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.
- H. 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 and who has been prequalified, if required.
- I. The Office of Facilities Management reserves the right to require from the bidder:
  - 1) Submission of references within two (2) business days after the opening of the bids;
  - 2) A list of projects completed by bidder within the last two (2) years which are similar in size and scope to the work described in this solicitation; and/or
  - 3) Financial statements indicating current financial status, prepared in accordance with generally accepted accounting principles, by a duly licensed CPA.
- J. The successful low bidder, upon notice of award of contract, shall submit a completed "Responsible Land Disturber Certification" through FCPS, to Plan and Document Control, Office of Land Development Services (LDS), Fairfax County DPWES.

## 12. 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 the Chief of Facilities Services and Capital Programs, or designee, for Facilities Services and Capital Programs 8115 Gatehouse Road, Suite 3500, Falls Church, VA 22042, 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 Chief of Facilities Services and Capital Programs, or designee, for the Department of Facilities Services and Capital Programs shall issue a decision in writing within ten (10) days of 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 of receipt of the written decision by instituting legal action as provided in the Code of Virginia.

Nothing in this section shall be construed to permit a bidder to challenge the validity of the terms and conditions of the Invitation to Bid.

- B. If, prior to the award, it is determined that the decision to award is arbitrary and capricious, then the sole relief shall be a finding to that effect.

If, after an award, it is determined that an award of a contract was arbitrary or capricious, then the sole relief shall be as hereinafter provided.

Where the award has been made but performance has not yet begun, the performance may be enjoined.

Where the award has been made and performance has begun, The Chief of Facilities Services and Capital Programs, or designee, for the Department of Facilities Services and Capital Programs may declare the Contract void upon a finding that the action is in the best interest of the school division.

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 such 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 a 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 Chief of Facilities Services and Capital Programs, or designee, for the Department of Facilities Services and Capital Programs makes a written determination that proceeding without delay is necessary to protect the public interest or that the bid will expire.

### **13. SUBSTITUTIONS; PRE-APPROVED SUPPLIERS**

- A. Unless otherwise provided in the bidding 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.
- B. 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.

**14. SMALL AND MINORITY 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.

**15. CONFLICT OF INTEREST**

The provisions of the State and Local Government Conflict of Interests Act (Va. Code § § 2.2-3100 *et seq.*) and Article 6 of the Virginia Public Procurement Act entitled "Ethics in Public Contracting" (Va. Code Ann. § § 2.2-4367 *et seq.*) are incorporated herein by reference, and all Bidding Documents shall be deemed to incorporate appropriate reference to these provisions. The Contractor shall incorporate the above conflict-of-interest clause in each subcontract.

**16. GOVERNING LAW**

- A. The Contract Documents shall be governed by and construed in accordance with the laws of the Commonwealth of Virginia, without reference to conflict of laws principles. In the event that there is a conflict between any provision set forth in the Contract Documents and the Code of Virginia, and specifically Section 2.2-4300 *et seq.* (the "Virginia Public Procurement Act"), the Code of Virginia shall control. The Contractor is cognizant of the provisions of the Comprehensive Conflict of Interest Act (Va. Code Ann. Section 2.2-3100 through 2.2-3127) and Article 6 of the Virginia Public Procurement Act entitled "Ethics in Public Contracting" (Va. Code Ann. Section 2.2-4367 through 2.2-4377).
- B. Legal Provisions Deemed Included: Each and every provision of any law required by law to be inserted in this Contract shall be deemed to be inserted herein, and the Contract shall be read and enforced as though it were included herein and if, through mistake or otherwise, any such provision is not inserted or is not correctly inserted, then upon application of either party the Contract shall forthwith be physically amended to make such insertion. The Owner does not discriminate against faith-based organizations.

**17. 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 work contemplated hereby. The successful bidder shall be required to obtain, at its expense, all permits, licenses and other authorizations necessary for the prosecution of the Work, except that the Owner shall obtain, at its expense, the General Building Permit and any easement agreement necessary and indispensable to the completion of the Project. The successful bidder shall be responsible for giving all notices and complying with all laws, ordinances, rules, regulations and directives of any public authority bearing on the performance of the work.

**18. CONSTRUCTION SAFETY**

- A. The Contractor shall comply with the construction safety standards promulgated by the U.S. Department of Labor and by the Virginia Department of Labor and Industry.

END OF SECTION

**SECTION 00300**

**BID FORM**

Name of Bidder: \_\_\_\_\_

Bidder's Mailing  
Address for Notices: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Bidder's Principal  
Office Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Telephone No.: \_\_\_\_\_  
Fax No.: \_\_\_\_\_  
Email Address: \_\_\_\_\_

Bidder's Designated Contact Person: \_\_\_\_\_

TO: FAIRFAX COUNTY SCHOOL BOARD (the "Owner")  
FAIRFAX COUNTY PUBLIC SCHOOLS  
OFFICE OF THE CHIEF OF FACILITIES SERVICES AND CAPITAL PROGRAMS  
OFFICE OF FACILITIES MANAGEMENT  
5025 Sideburn Road, Room 62  
Fairfax, VA 22032

RE: **Belvedere Elementary School Classroom Renovation Project, 6540 Columbia Pike,  
Falls Church, VA 22041.**

Ladies and Gentlemen:

The undersigned Bidder, having examined the Drawings, Specifications and remaining Contract Documents for the above-referenced Project and having visited the site and examined all conditions affecting the Work, hereby proposes and agrees to furnish all labor, supplies, materials, and equipment and to perform all actions necessary to complete the entire Work in strict accordance with the Contract Documents for the following bid amount (to be set forth in words and in figures in the spaces set forth below):

**Base Bid Amount:**

\_\_\_\_\_ Dollars and \_\_\_\_\_ Cents; \$ \_\_\_\_\_

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. The undersigned Bidder hereby acknowledges that time is of the essence to the Contract and agrees to commence the Work on the date set forth as the date for commencement of the Work in the Notice to Proceed or, if no such date is specified, then immediately after receipt of the Notice to Proceed. The undersigned covenants and agrees to fully complete the Work prior to the expiration of the Contract Period, as such term is defined in the Contract Documents. The undersigned hereby declares that the Contract Period is sufficient to assure timely and satisfactory completion of the Work. The undersigned Bidder acknowledges that, in the event that the Work is not completed within the timeframes established in the Contract Documents, then he will be assessed liquidated damages in the amount set forth in Section 01010, Summary of Work, for each day that the time consumed in completing the Work exceeds the time provided therefor in the Contract Documents.
- B. The undersigned Bidder hereby certifies that the Bid Amount includes: (a) all labor, supplies, materials, equipment, and permits required to complete the Work in its entirety in strict accordance with the Contract Documents; (b) all costs associated with the successful bidder's responsibilities for coordination and cooperation with the Owner and any Separate Contractors at the site of this Project; (c) all costs associated with the successful bidder's responsibilities with regard to surface and subsurface conditions that may be encountered during performance of the Work; (d) all applicable sales and use taxes; and (e) allowances, if any, contemplated by the Contract Documents.
- C. By signing this Bid, the undersigned Bidder hereby certifies that: (i) neither the 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; and (ii), unless expressly disclosed in an attachment to this Bid on the Bidder's letterhead stationery, neither the 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 Bidder hereby represents and warrants to the Owner that the Bidder: (a) has reviewed and thoroughly understands the scope, terms and conditions set forth in this solicitation; (b) has made due inquiry of the School Board as to the existence of any addenda issued in connection with this solicitation; (c) is satisfied that it has received any and all such addenda and the Bidder has taken the contents thereof into consideration when preparing and submitting this Bid; and (d) accepts full and complete responsibility for the receipt of any and all such addenda and waives any claim of mistake or error in its Proposal based upon its failure, in fact, to have received any one or more addenda.
- E. The undersigned Bidder further hereby represents and warrants to the Owner that the Bidder: (a) has been provided the opportunity to conduct, at its expense, such tests and investigations of the site as it deems appropriate under the circumstances in order to evaluate and satisfy itself as to the surface and subsurface conditions likely to be encountered during performance of the Work; (b) if successful hereunder, shall bear full and complete responsibility for all surface and subsurface conditions, whether known or unknown, reasonably

foreseeable or not, that shall be encountered during performance of the Work; and (c) has included in its bid price an amount that it deems sufficient, in its sole and absolute discretion, to protect such bidder from the additional costs of performance that it may incur as a result of its assumption of responsibility for all surface and subsurface conditions encountered during performance of the Work. The Bidder hereby acknowledges that any reports, data, or other materials or information supplied by or on behalf of the Owner and/or the Architect with regard to surface and/or subsurface conditions at the site of the Project were given without representation or warranty as to the accuracy or completeness thereof and that the bidder did not rely upon any such information in tabulating its bid price for the Work.

- F. The undersigned Bidder covenants and agrees that in the event this Bid is one of the three lowest, as determined by Owner, Bidder will deliver to the Owner, within 48 hours after the bid opening, a written list of subcontractors (including names, address, and telephone number) for the following portions of the Work:

Electrical	Plumbing
Mechanical	Automatic Temperature Controls
Communication and Special Systems	Casework
Masonry	Sprinkler

**2. “Preapproved” or “approved” Manufacturers, Subcontractors and/or Suppliers.**

- A. For purposes of this solicitation and any contract which may result herefrom, the Owner’s designation of any one or more manufacturers, subcontractors and/or suppliers as “preapproved” or “approved” shall signify only that such manufacturers, subcontractors and suppliers previously have submitted work samples to the Owner which satisfied the Owner’s requirements for a specified portion of the Work. The Owner’s designation of any one or more manufacturers, subcontractors and/or suppliers as “preapproved” or “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 or capacity (in terms of financial wherewithal, personnel and equipment availability, managerial ability or otherwise) of performing any portion of the Work in accordance with the requirements of the Contract Documents. 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.
- B. The Contractor hereby acknowledges and agrees that, as between the Owner and the Contractor, the Contractor shall bear full and complete responsibility for the performance of its subcontractors, manufacturers and suppliers, regardless of whether any such subcontractor, manufacturer or supplier was designated as “preapproved” or “approved” by the Owner. The Owner’s designation of any one or more manufacturers, subcontractors and/or suppliers as “preapproved” 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 or capacity (in terms of financial wherewithal, personnel and equipment availability, managerial ability or otherwise) of performing any portion of the Work

in accordance with the requirements of the Contract Documents. The Contractor is responsible for conducting such independent investigation into the qualifications, experience and abilities of its selected manufacturers, subcontractors and suppliers, as it deems appropriate under the circumstances.

**3. Miscellaneous Provisions.**

- A. In the event that changes in the Work, not covered in the Contract Documents and involving added cost, are directed to be performed on a cost-plus fee basis, such fee shall be calculated in accordance with Section No. 01153, paragraph 1.06.
- B. The Owner reserves the right to defer award of Contract for a period of 60 days after the date for submission of bids, or for such longer period as shall be agreed upon by the parties in writing.
- C. The Owner reserves the right to accept or reject any proposed subcontractor, supplier, or materials/product proposed as equal to that specified herein.
- D. Minority or small business firms information:

Please check the following information relevant to your firm: (See Instructions to Bidders 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 responsive and responsible bids hereunder will receive equal consideration for award.

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

- A. Each bid submitted for a contract for construction, alteration, and/or repairs, shall include a list of all the following actions:
  - 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 public jurisdiction; 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; or (b) the Virginia Occupational Safety and Health Administration; or (c) the occupational safety and health plan from any other public jurisdiction.
  - 3) Termination of a contract between the Bidder and any public entity by its purchasing agent or his designee for safety violations.
- B. If the Bidder has not received or been the subject of any such violations referenced in paragraph A in the three (3) years prior to the bid submission, then the Bidder shall so indicate by certification of Safety Violations. The Bidder will also indicate 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, if the Bidder or contractor satisfactorily passes an eligibility evaluation, as determined by Owner.
  - 2) Notwithstanding the language of paragraph C, above, 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, if the Bidder or contractor satisfactorily passes an eligibility evaluation, as determined by Owner.
  - 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, if the Bidder or contractor satisfactorily passes an eligibility evaluation, as determined by Owner.
- 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 (including all information required) must be received by Owner no later than twenty-one (21) days before bids are due, unless otherwise stated in the Advertisement for Bid. The information required to be submitted by the Bidder for evaluation is stated in the County Safety Resolution and is available from the Owner's Office of Facilities Management. The determination of eligibility rendered by the Director of the office of Facilities Management or his designee shall be final.

- 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 by the Virginia Department of Labor and Industry.
- F. No contractor awarded a School Board 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.

By signing this Bid, the undersigned Bidder confirms that it has not received or been the subject of safety violations in the three (3) years prior to the date of this bid submission, and is in compliance with the requirements above.

The undersigned Bidder hereby acknowledges and agrees that the Owner has the right to reject any or all bids and to waive any informality in a bid. Except as expressly set forth in the Instructions to Bidders, this Bid, once submitted, may not be withdrawn for a period of 60 days from the date fixed for opening of the Bids.

Accompanying this Bid, at the election of the undersigned Bidder, is: (i) a certified check, (ii) a cash escrow, or (iii) a bid bond in an amount equal 5% of the total amount of the Principals's Bid.

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

Safety Violation(s): \_\_\_\_\_  
 \_\_\_\_\_

List of public jurisdictions (states and District of Columbia) in which Bidder performed work in the 3 years prior to bid submission:  
 \_\_\_\_\_  
 \_\_\_\_\_

(Legal Name of Bidder)

By: \_\_\_\_\_  
 (Signature of Bidder's Authorized Representative)

Printed Name: \_\_\_\_\_  
 Title: \_\_\_\_\_  
 Date: \_\_\_\_\_

Bidder's Virginia Contractor's License Number: \_\_\_\_\_

Bidder's Virginia State Corporation Commission ID Number (SCC ID#): \_\_\_\_\_

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

State in which Bidder's Principal Office is Located: \_\_\_\_\_

END OF SECTION

**SECTION 00301**

**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.

[SIGNATURES ON FOLLOWING PAGE]

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

\_\_\_\_\_(SEAL)  
**Principal** (Bidder)  
By: \_\_\_\_\_  
Name: \_\_\_\_\_  
Title: \_\_\_\_\_  
Address: \_\_\_\_\_  
\_\_\_\_\_

State of \_\_\_\_\_

County/City of \_\_\_\_\_

The foregoing bond was acknowledged before me this \_\_\_\_\_, 20\_\_\_\_, by \_\_\_\_\_, whose title is \_\_\_\_\_, on behalf of \_\_\_\_\_, the Principal

\_\_\_\_\_  
Notary Public

Title or Rank \_\_\_\_\_  
Serial Number, if any \_\_\_\_\_

\_\_\_\_\_(SEAL)  
**Surety**  
By: \_\_\_\_\_  
Attorney-in-Fact (attach copy of Power of Attorney)  
Name: \_\_\_\_\_  
Title: \_\_\_\_\_  
Address: \_\_\_\_\_  
\_\_\_\_\_

State of \_\_\_\_\_  
County/City of: \_\_\_\_\_

The foregoing bond was acknowledged before me this \_\_\_\_\_, 20\_\_\_\_, by \_\_\_\_\_ whose title is Attorney-in-Fact, on behalf of \_\_\_\_\_, Surety.

\_\_\_\_\_  
Notary Public

Title or Rank \_\_\_\_\_  
Serial Number, if any \_\_\_\_\_

END OF SECTION

**SECTION 00302**

**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, we have hereunto set our signatures and seals this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_, all pursuant to due authorization.

\_\_\_\_\_(SEAL)  
**Principal** (Contractor)  
By: \_\_\_\_\_  
Name: \_\_\_\_\_  
Title: \_\_\_\_\_  
Address: \_\_\_\_\_  
\_\_\_\_\_

State of \_\_\_\_\_  
County/City of \_\_\_\_\_

The foregoing bond was acknowledged before me this \_\_\_\_\_, 20\_\_\_\_, by \_\_\_\_\_, whose title is \_\_\_\_\_, on behalf of \_\_\_\_\_, the Principal

\_\_\_\_\_  
Notary Public

Title or Rank \_\_\_\_\_  
Serial Number, if any \_\_\_\_\_

\_\_\_\_\_(SEAL)  
**Surety**  
By: \_\_\_\_\_  
Attorney-in-Fact (attach copy of Power of Attorney)  
Name: \_\_\_\_\_  
Title: \_\_\_\_\_  
Address: \_\_\_\_\_  
\_\_\_\_\_

State of \_\_\_\_\_  
County/City of: \_\_\_\_\_

The foregoing bond was acknowledged before me this \_\_\_\_\_, 20\_\_\_\_, by \_\_\_\_\_ whose title is Attorney-in-Fact, on behalf of \_\_\_\_\_, Surety.

\_\_\_\_\_  
Notary Public

Title or Rank \_\_\_\_\_  
Serial Number, if any \_\_\_\_\_

END OF SECTION

**SECTION 00303**

**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.

[SIGNATURES ON FOLLOWING PAGE]

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

\_\_\_\_\_(SEAL)  
**Principal** (Contractor)  
By: \_\_\_\_\_  
Name: \_\_\_\_\_  
Title: \_\_\_\_\_  
Address: \_\_\_\_\_  
\_\_\_\_\_

State of \_\_\_\_\_  
County/City of \_\_\_\_\_

The foregoing bond was acknowledged before me this \_\_\_\_\_, 20\_\_\_\_, by \_\_\_\_\_, whose title is \_\_\_\_\_, on behalf of \_\_\_\_\_, the Principal

\_\_\_\_\_  
Notary Public

Title or Rank \_\_\_\_\_  
Serial Number, if any \_\_\_\_\_

\_\_\_\_\_(SEAL)  
**Surety**  
By: \_\_\_\_\_  
Attorney-in-Fact (attach copy of Power of Attorney)  
Name: \_\_\_\_\_  
Title: \_\_\_\_\_  
Address: \_\_\_\_\_  
\_\_\_\_\_

State of \_\_\_\_\_  
County/City of: \_\_\_\_\_

The foregoing bond was acknowledged before me this \_\_\_\_\_, 20\_\_\_\_, by \_\_\_\_\_ whose title is Attorney-in-Fact, on behalf of \_\_\_\_\_, Surety.

\_\_\_\_\_  
Notary Public

Title or Rank \_\_\_\_\_  
Serial Number, if any \_\_\_\_\_

END OF SECTION

**SECTION 00700**

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## SECTION 00700

### GENERAL CONDITIONS

#### PART 1 - DEFINITIONS

- 1.01 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.
- 1.02 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.
- 1.03 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.
- 1.04 Contract or Contract Documents. The terms "Contract" and "Contract Documents" shall be used interchangeably herein and shall consist of the following:
- A. The signed Agreement;
  - B. The General Conditions of the Contract, which appear herein;
  - C. The Drawings and Specifications;
  - D. The Supplementary Conditions;
  - E. Any Addenda issued prior to execution of the Agreement;
  - F. The Notice of Award issued by the Owner to the Contractor;
  - G. The Notice to Proceed issued by the Owner to the Contractor;
  - H. 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;
  - I. The Contractor's Payment and Performance Bonds;
  - J. The Bidding Documents, which shall include the Contractor's completed Bid Proposal Form and the Instructions to Bidders; and
  - K. 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.

- 1.05 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.
- 1.06 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.
- 1.07 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.
- 1.08 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.
- 1.09 Date of Final Completion. The date certified by the 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 Section 01010, Summary of Work.
- 1.10 Date of Substantial Completion. The date certified by the 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 Section 01010, Summary of Work.
- 1.11 Day. The term "day" shall mean "calendar day."
- 1.12 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).
- 1.13 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.
- 1.14 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.
- 1.15 Laws and/or Regulations. Any and all 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.

- 1.16 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, Sideburn Support Center, 5025 Sideburn Road, Fairfax, Virginia 22032, fax number (703)-239-0462.
- 1.17 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.
- 1.18 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.
- 1.19 Owner. The School Board of Fairfax County, Virginia, its authorized representatives and employees.
- 1.20 Prevailing Wage Rate. The rate, amount, or level of wages, salaries, benefits and other remuneration prevailing for the corresponding classes of mechanics, laborers, or workers employed for the same work in the same trade or occupation in the locality in which the Project is located, as determined by the Commissioner of Labor and Industry.
- 1.21 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.
- 1.22 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.
- 1.23 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.
- 1.24 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.

- 1.25 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.
- 1.26 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.
- 1.27 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.
- 1.28 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.
- 1.29 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 or plural, and the use of any gender shall be applicable to all genders.

## **PART 2 - EXECUTION AND INTENT OF THE CONTRACT**

- 2.01 Execution of Contract Documents. Four (4) copies of the Contract Documents shall be signed by both the Owner and the Contractor.
- 2.02 Familiarity with Site. The Contractor's execution of the Agreement shall constitute a representation that the Contractor has visited the Site, become familiar with local conditions under which the Work is to be performed, and correlated personal observations with the requirements of the Contract Documents.
- 2.03 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 of any conflict, error or ambiguity in or among the various Contract Documents, such documents shall be accorded the following order of precedence:



Change Orders  
Notice to Proceed  
Notice of Award  
Addenda  
Supplementary Conditions  
General Conditions  
Agreement  
Instructions to Bidders  
Drawings and Specifications  
Payment and Performance Bonds  
Bid Form

Except as otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

- A. the provisions of any standard, specification, manual, or code of any technical society, organization or association (whether or not specifically incorporated by reference in the Contract Documents); or
- B. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

2.04 Division of Work. The subdivision of the Drawings and Specifications into divisions, sections and articles is for the purpose of ease of reference only and shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade. The Contractor shall be responsible for segregating the Work among the various trades, if necessary or desirable in its discretion.

- A. The Specifications shall serve to amplify the requirements of materials and methods. The mention in any section of the Specifications of any article or operation requires that the Contractor shall provide all such items indicated on, or reasonably inferred from, the Drawings, furnishing for such purpose all labor, materials and equipment required in connection therewith. Omission of any article or operation does not relieve the Contractor of the responsibility for completion of the Work intended by the Drawings and Specifications to be included in the Contract.

2.05 Contract Interpretations. The Owner or the Contractor may request contract interpretations in writing from the Architect. Such requests for interpretations must be submitted sufficiently in advance of the date upon which the interpretation is actually required by the Owner or the Contractor to allow the Architect to issue the interpretation so as not to delay the progress of the Work. Written interpretations so requested shall be issued by the Architect in a manner commensurate with the timely execution of the Work, shall be consistent with the intent of the Contract Documents, and shall be in accordance with established progress schedules.

**2.06 Copies and Ownership of Drawings, Specifications and Other Documents.**

- A. The Contractor will be furnished **[one (1)]** electronic set of Drawings, Specifications and other documents prepared by the Architect (the "Architect's Documents") free of charge. Additional sets may be purchased by the Contractor at the cost of reproduction.
- B. Neither the Contractor nor any Subcontractor or supplier or other person or organization performing or furnishing any of the Work:
  - 1. shall have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the Architect's seal; or
  - 2. shall reuse any of such Drawings, Specifications, other documents, or copies on extensions of the Project or any other project without written consent of the Owner and the Architect.

**PART 3 - ARCHITECT**

- 3.01 **Contract Administration.** The Architect shall provide administration of the Contract in accordance with the Contract Documents and the Agreement between the Owner and the Architect.
- 3.02 **Owner's Representative.** The Architect shall serve as the Owner's representative during construction, until final payment is due, and with the Owner's concurrence, from time to time during the Correction Period described in Paragraph 12.05(B). The Architect shall advise and cooperate with the Owner and shall act on the Owner's behalf in accordance with the Contract Documents. The Owner shall issue instructions to the Contractor or, at its option, elect to have the Architect issue instructions to the Contractor.
- 3.03 **Observation of Work.** The Architect shall have access to the Work and shall visit the Site periodically in order to determine the progress of the Work and to assess the quality of the completed Work. Based upon its on-site evaluations, the Architect will advise the Owner of the progress of the Work and will endeavor to guard the Owner against defects and deficiencies in the Work. The Architect shall not have control over or charge of and shall not be responsible for construction methods, techniques, procedures, sequences or safety measures employed in connection with the Work. The Architect shall not be responsible for the failure of the Contractor, Subcontractors, or Sub-subcontractors to perform the Work in accordance with the Contract Documents.
- 3.04 **Payment Certifications.** Based upon the Architect's observations and evaluations of the Contractor's Applications for Payment, the Architect shall review and certify the amounts due the Contractor. The Architect may, in its discretion, revise the applications for payment to show the actual value of Work completed in accordance with the Architect's observations of the Work. The Contractor agrees to be bound by the Architect's revisions to the applications for payment.

- 3.05 Interpretation of Contract Documents. The Architect shall interpret the Contract Documents in accordance with Paragraph 2.05, and shall serve as the impartial judge of the performance of the Work.
- 3.06 Rejection of Work. The Architect and/or the Owner shall have the authority to reject Work that is defective or that otherwise does not conform to the requirements of the Contract Documents. The Architect and/or the Owner shall have the authority to order special inspections or tests, regardless of whether or not the Work has been fabricated, installed or completed. No responsibility or duty of the Architect and/or the Owner to the Contractor, Subcontractors, or Sub-subcontractors shall be created by this authority or by good faith decisions rendered in the exercise of this authority.
- 3.07 Preparation of Change Orders; Review of Submittals. The Architect shall prepare Change Orders, shall perform inspections to determine the Dates of Substantial and Final Completion, shall review all required documents submitted by the Contractor, and shall issue Certificates of Substantial Completion and Final Payment in accordance with the provisions of Paragraphs 12.04 and 12.05.
- 3.08 No Contractual Relationship. No contractual relationship shall exist or be deemed to exist between the Architect and the Contractor.
- 3.09 Ownership of Drawings and Specifications. Original Drawings and Specifications are the property of the Architect. Notwithstanding such fact, however, the Project is the property of the Owner, and the Architect may not use the Drawings and Specifications for any purpose not relating to the Project without the Owner's consent. The Owner shall be furnished with such reproductions of Drawings and Specifications as the Owner may reasonably require. Upon completion of the Work or any earlier termination of the Agreement pursuant to Part 17, the Architect will revise the Drawings to reflect changes made during construction and the Architect will promptly furnish the Owner with one complete set of reproducible record prints. All such reproductions shall be the property of the Owner who may use them without the Architect's permission for other projects, for additions to this Project, and/or for completion of this Project by others.

#### **PART 4 - THE OWNER**

- 4.01 Owner Representative. The Owner shall provide one or more representatives to observe the Work; provided, however, that the presence of the Owner's representatives shall in no way constitute an approval of means, methods or materials which do not conform to the requirements of the Contract Documents.
- 4.02 Rejection of Work. The Owner shall have the right to reject Work in accordance with Paragraph 3.06.
- 4.03 Completion and Correction of Work. The Owner shall have the right to complete or correct the Work in accordance with Paragraphs 4.05 and 12.05(D).
- 4.04 Review of Payment Applications. The Owner shall have the right to review, revise, and approve the Architect's certifications concerning payment.

- 4.05 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 17.06 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 17.06 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.
- 4.06 No Discrimination Against Faith-Based Organizations. The Owner does not discriminate against faith-based organizations on the basis of the organization's religious character, or impose conditions that (i) restrict the religious character of the faith-based organizations, except as provided by law, or (ii) impair, diminish or discourage the exercise of religious freedom by the recipients of such goods, services or disbursements.

## **PART 5 - CONTRACTOR**

- 5.01 General Duties and Obligations.
- A. Contractor Responsibilities. The Contractor shall perform all the Work and, except as otherwise expressly provided herein, shall furnish, at its own cost and expense, all labor, materials, equipment, and other facilities as may be necessary and proper for performing and completing the Work. The Contractor shall be responsible for the entire Work until completed and finally accepted by the Owner.

- B. Quality Workmanship. Unless otherwise provided herein, the Work shall be performed in accordance with the best modern practice and with materials and workmanship of highest quality, all as determined by and entirely to the satisfaction of the Owner and the Architect.
- C. Supervision and Construction Procedures. The Contractor shall supervise and direct the Work and coordinate the Work with that of Separate Contractors, if any, using its best skill and attention. Unless otherwise expressly provided, the Contractor shall be solely responsible for and shall have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract. Unless otherwise expressly provided, the means and methods of construction shall be such as the Contractor may choose; provided, however, that the Contractor shall employ adequate and safe procedures, methods, structures and equipment. Neither the Architect's approval nor its failure to exercise its right of approval shall relieve the Contractor of its obligation to accomplish the result intended by the Contract, nor shall the Architect's approval or failure to approve create a cause of action for damages. Notwithstanding the rights and remedies available to the Owner and the Architect hereunder, including without limitation, their respective rights to monitor the progress of the Work and to accept or retract acceptance of Subcontractors, the Contractor expressly acknowledges and agrees that it is in charge of and in control of the Work.
- D. Contractor's Review of Documents. The Contractor shall study and review the Contract Documents and shall compare them with each other and with any information made available by the Owner. If the Contractor finds a conflict, error, ambiguity or discrepancy in or among the Contract Documents, the Contractor shall immediately call it to the attention of the Owner and the Architect in writing before proceeding with the Work affected thereby. The Owner promptly shall resolve the matter in writing. Work performed by the Contractor after issuance of the Notice to Proceed and prior to written resolution thereof by the Owner shall be performed at the Contractor's sole risk.
- E. Contractor's Verification. The Contractor shall be responsible for verifying all dimensions, quantities and details set forth in the Contract Documents and shall notify the Owner and the Architect in writing of all errors, omissions, conflicts and discrepancies. The Contractor acknowledges and agrees that all equipment, materials, finishes, and other such listings are provided for the convenience of the Architect and the Contractor and are not guaranteed to be complete. The Contractor hereby assumes all responsibility for the making of estimates of the size, kind, quantity, and quality of materials, supplies and equipment included in Work.
- F. Differing Site Conditions. It is the intent of these Contract Documents that the Contractor shall bear full and complete responsibility for all surface and subsurface conditions, whether known or unknown, reasonably foreseeable or not, that shall be encountered during the performance of the Work. Notwithstanding any provision in the Contract Documents to the contrary, the

Contractor shall in no event be entitled to additional compensation, time or other relief from its obligations under the Contract Documents as a direct or indirect result of any surface or subsurface conditions encountered during performance of the Work. Consequently, the Contractor hereby waives any and all claims against the Owner and/or the Architect (and any of their members, officers, employees and authorized representatives) that the Contractor has, or may have in the future, arising out of or in connection with. (i) any surface and subsurface conditions encountered during performance of the Work; and (ii) any inaccurate or incomplete reports, data or other materials or information given to the Contractor by or on behalf of the Owner or the Architect that pertains to the surface or subsurface conditions at the Site of the Project. The Contractor covenants and agrees that it shall not make any claim for additional compensation from the Owner as a result of any such subsurface conditions.

- G. Notice to Owner and Architect. The Contractor shall submit to the Owner and the Architect in writing all items required to be brought to the Owner's and/or Architect's attention or to be submitted for approval. These items must be submitted sufficiently in advance of the date upon which the information or approval is actually required by the Contractor to allow the Owner and Architect to take appropriate actions so as not to delay the Work. The Contractor shall not have any right to an extension of time due to delays caused by its failure to submit any item in a timely fashion.

#### 5.02 Character and Competency.

- A. Certain Representations, Warranties and Covenants. The Contractor represents that it is a duly organized and licensed entity which employs qualified and experienced personnel who specialize in performing the type of construction services required hereunder. The Contractor agrees to provide a sufficient number of personnel who are suitably qualified and experienced and who are in all respects acceptable to the Owner to perform the Work in an efficient and timely manner. The Contractor represents that it is capable in all respects (including the possession of sufficient financial resources to provide fully for the payment of employees) of performing the Work and agrees to provide construction services of high quality. The Contractor agrees to diligently and conscientiously devote its resources to the performance of the Work. The Owner, upon written Notice to the Contractor, and in the Owner's sole discretion, shall have the right to direct the Contractor to remove an employee permanently from the Site for any reason.
- B. Direct Contact Certification. 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 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.

- C. Prohibited Activities; Removal from Site. 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 Director of the Owner's Office of Facilities Management.
- D. Contractor's Use of Premises. See Section 01010, Summary of Work, for detailed requirements regarding Contractor's use of premises.

#### 5.03 Permits, Fees and Notices.

- A. Compliance with Laws and Regulations; Required Permits. The Contractor shall comply with all Laws and Regulations and shall obtain, at its expense, all permits, licenses and other authorizations necessary for the prosecution of the Work, except that the Owner shall obtain, at its expense, the General Building Permit and/or any easement agreement necessary and indispensable to the completion of the Project.
- B. Conflict with Laws and Regulations. The Contractor shall be responsible for giving all Notices and complying with all Laws and Regulations. In the event that the Contractor determines that the Contract Documents, or any of them, do not conform in any respect with any Law or Regulation, he shall promptly inform the Architect of such fact in writing. Any required change shall be adjusted by Work Order and incorporated into a subsequent Change Order. If the Contractor performs any Work knowing it to be in conflict with any Law or Regulation without prior notification to the Architect and Owner, the Contractor shall accept all responsibility and bear all costs relating thereto.
- C. VDOT Permits. When applicable, the Contractor shall be responsible for acquiring any Virginia Department of Transportation ("VDOT") permits required for the Project. The Contractor shall be responsible for all application fees, bonding costs and inspection fees associated with such permits. When applicable, the Owner shall pay the Civil Engineer of Record for any costs incurred for additional engineering services required by VDOT in order to obtain these permits.

- 5.04 Responsibility for Those Performing the Work. The Contractor shall be responsible and accountable to the Owner for the acts and omissions of its employees in connection with the performance of the Work and for any Subcontractors or other persons or entities performing any of the Work under a contract with the Contractor or a contract with a Subcontractor.
- 5.05 Drawings and Specifications at the Site. The Contractor shall maintain one copy of all Drawings, Specifications, Addenda, approved Shop Drawings, Change Orders and other Modifications at the Site of the Project. All of the documents are to be kept in good order and marked to record all changes made during construction. The documents shall be made available to the Owner and Architect during performance of the Work. Upon completion of the Work, the Drawings, together with all changes and revisions made during construction of the Project, shall be delivered to the Architect.
- 5.06 Construction Schedule.
- A. Preparation of Construction Schedule. The Contractor, promptly after receipt of the Notice of Award, shall prepare and submit to the Owner and the Architect, for their review and approval, the Construction Schedule. The Construction Schedule, as approved, shall. (i) provide for the expeditious and diligent performance of the Work within the Contract Period; and (ii) be revised as necessary, in the opinion of the Owner, to accommodate and to reflect the progress of the Project as a whole.
  - B. Submittal Schedule. The Contractor shall prepare and keep current, for the Architect's approval, a schedule of submittals (the "Submittal Schedule") which is coordinated with the Construction Schedule and allows the Architect reasonable time to review all submittals.
  - C. Compliance with Schedules. The Contractor shall conform at all times to the most recent Construction Schedule and Submittal Schedule.
  - D. Additional Scheduling Requirements. Additional scheduling requirements are contained in Section 01310 of the General Requirements.
  - E. No Reliance on Silence of Owner or Architect. The Owner's or Architect's silence as to a submitted Construction Schedule that fails to meet or satisfy, in any respect, any milestone dates or other time limitations set forth in the Contract Documents shall not relieve the Contractor of its obligation to meet those time limits, nor shall it render the Owner or Architect liable to any Separate Contractor who suffers damages, increased costs or delays as a result thereof. Similarly, the Owner's or Architect's silence with regard to a Construction Schedule submitted by the Contractor that shows performance in advance of such time limits or milestones shall not create any rights in favor of the Contractor, a Separate Contractor or any other person or entity for performance in advance of such time limits or milestones.
- 5.07 Shop Drawings.



- A. Submission of Shop Drawings. The Contractor shall prepare and submit to the Architect Shop Drawings and similar submittals required by the Contract Documents with reasonable promptness and in accordance with the Submittal Schedule so as not to cause a delay in the Work or in the activities of the Owner or of Separate Contractors. Submittals presented by the Contractor that are not required by the Contract Documents may be returned without action.
  - B. Review Process. The Contractor shall not perform any portion of the Work requiring submittal and review of Shop Drawings or similar submittals until the respective submittal has been approved by the Architect. Such Work shall be performed in strict accordance with the approved submittals.
  - C. Verification and Coordination. By approving and submitting Shop Drawings and similar submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto and has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.
  - D. Deviation from Contract Documents. The Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's approval of Shop Drawings or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and the Architect has given written approval to the specific deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings or similar submittals by the Architect's approval thereof.
  - E. Attention to Revisions. The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings or similar submittals, to revisions other than those requested by the Architect on previous submittals.
  - F. Informational Submittals. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents.
  - G. Additional Shop Drawing Requirements. Additional requirements are contained in Section 01340 of the General Requirements.
- 5.08 Inspections of Work in Place. The Contractor shall be responsible for inspection of portions of Work already performed hereunder to determine that such portions are in proper condition to receive subsequent Work.
- 5.09 Required Tests and Inspections. The Contractor shall give the Owner and the Architect sufficient prior Notice of the date and time of required tests and inspections. Unless otherwise provided in the Contract Documents, the Contractor shall be responsible for all costs associated with such tests or inspections.

5.10 Use of Site. The Contractor shall confine the Work to areas permitted by the Contract Documents and any applicable laws, ordinances or permits and shall not unreasonably encumber the Project with any materials or equipment.

5.11 Indemnification.

A. The Contractor hereby assumes all liability for and agrees to indemnify and hold harmless the Owner and the Architect and its or their respective 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.

B. In the event that a claim is brought against an Indemnified Party by (a) the Contractor or an employee of the Contractor; (b) any Subcontractor or supplier or any employee thereof; (c) any person or entity engaged by or through the Contractor or any Subcontractor or supplier to furnish or perform any portion of the Work; or (d) any person or entity for whom the Contractor or any Subcontractor or supplier may be vicariously liable, then the indemnification obligations set forth in Section 5.11(A) shall not be limited in any respect by any limitation on the type or amount of damages, compensation, benefits or other remuneration payable by or for the Contractor or any Subcontractor, supplier or other such person or entity under any laws, rules, regulations or plans of any nature governing workers' compensation, disability benefits or other employee benefits.

C. Claims on Behalf of Subcontractors. No claim of any nature shall be made against an Indemnified Party by or on behalf of a Subcontractor unless the Contractor first shall have. (i) evaluated such claim thoroughly and determined it to be meritorious; (ii) issued a written Notice to the Subcontractor finding the Subcontractor's claim to be meritorious and setting forth any additional compensation or additional days to be paid or granted to the Subcontractor on account of such claim; and (iii) paid the Subcontractor in full for such claim. In presenting such a claim, the Contractor shall provide the Owner and the Architect

with a copy of the written Notice to the Subcontractor and with evidence of payment in full of the Subcontractor's claim. No such claim shall exceed the amount actually paid to the Subcontractor by the Contractor.

The Contractor covenants and agrees not to bring a claim against an Indemnified Party for indemnity based upon a Subcontractor's claim except as specifically permitted in this subsection.

- D. Liability Unaffected. Nothing contained herein shall in any manner create any liability against the Owner on account of any claim for labor, services, or materials, or of Subcontractors, and nothing herein contained shall affect the liability of the Contractor or its Sureties to the Owner or to any workmen or materialmen upon bonds given in connection with this Contract. The Contractor hereby acknowledges and agrees that, as between the Owner and the Contractor, the Contractor shall bear full and complete responsibility for the performance of its Subcontractors, manufacturers and suppliers, regardless of whether any such Subcontractor, manufacturer or supplier was designated as "preapproved" by the Owner.
- 5.12 Conflict of Interest. The provisions of the State and Local Government Conflict of Interests Act (Va. Code Ann. " 2.2-3100, *et seq.*) and Article IV of the Virginia Public Procurement Act entitled "Ethics in Public Contracting" (Va. Code Ann. " 2.2-4367, *et seq.*) as the same may be amended from time to time, are incorporated herein by reference. The Contractor shall incorporate the foregoing conflict of interests clause in each subcontract entered into in connection with the Work.
- 5.13 Non-discrimination. The Contractor hereby covenants and agrees as follows:
- A. The Contractor will not discriminate against any employee or applicant for employment because of race, religion, color, sex or national origin, except where religion, sex or national origin is a bona fide occupational qualification reasonably necessary to the normal operation of the Contractor. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.
- B. The Contractor, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, will state that such contractor is an equal opportunity employer.
- C. Notices, advertisements and solicitations placed in accordance with federal laws, rules or regulations shall be deemed sufficient for the purpose of satisfying the requirements of this Paragraph 5.13.

The Contractor will include the provisions of the foregoing Paragraph 5.13 (A), (B) and (C) in every subcontract or purchase order of over \$10,000, in order that the provisions contained herein will be binding upon each Subcontractor or vendor in connection with the Work.

- 5.14 Subcontractor Bonds. The Contractor hereby covenants and agrees to require such bonds of any subcontractors as may be specified in the Instructions to Bidders.
- 5.15 Safety and Health Program. The Contractor shall establish and maintain a program to protect the safety and health of all persons (employees, visitors, public) at the Site. Such program shall designate a qualified individual as responsible for implementation of the program, and establish procedures for coordinating safety and health activities with Separate Contractors at the Site. The program shall comply with all Laws and Regulations, including but not limited to the Virginia Occupational and Health Standards for the Construction Industry, 29 CFR Part 1926.20 and 1926.21, and the American National Standards Institute, A10.38-2000 and A10.33-1998 (R2004).
- 5.16 Prevailing Wage Requirements: The Contractor covenants and agrees that the remuneration to any individual performing services as a mechanic, laborer, or worker for the Work will be paid at a rate not less than the Prevailing Wage Rate. The Contractor further covenants and agrees to comply, and cause each Subcontractor to comply, with the following requirements applicable to the Work performed under this Contract:
- A. Upon award of the Contract, the Contractor will certify, under oath, to the Commissioner of Labor and Industry, the pay scale for each craft or trade to be employed on, or to provide labor for, the Project or the Work by the Contractor and any Subcontractors. The Contractor's certification will, for each such craft or trade, specify the total hourly amount to be paid to employees, including wages and applicable fringe benefits, provide an itemization of the amount paid in wages and each applicable benefit, and list the names and addresses of any third-party fund, plan or program to which benefit payments will be made on behalf of employees. Within five (5) days after submitting its certification to the Commissioner of Labor and Industry, the Contractor will provide a copy of the certification to the Owner.
  - B. The Contractor and each Subcontractor will keep, maintain, and preserve: (i) records relating to the wages paid to, and hours worked by, each individual performing the work of any mechanic, laborer, or worker; and (ii) a schedule of the occupation or work classification at which each individual performing the work of any mechanic, laborer, or worker on the Project is employed during each workday and week. The Contractor and each Subcontractor will: (a) preserve such records for a minimum of six (6) years from contract expiration or termination; (b) make such records available to the Department of Labor and Industry or the Owner within 10 days of a request; and (c) certify that such records reflect the actual hours worked and the amount paid to its workers for the time period covered by the request.
  - C. The Contractor and each Subcontractor will post the Prevailing Wage Rates for each craft or trade involved in the Project and the Work, including the effective date of any changes thereto, in a prominent and easily accessible place at the Site or at any such places as are used by the Contractor or Subcontractors to pay wages to their workers. Such posting must be made in English and in such other languages as may be specified by the Owner in order to provide meaningful

access to the information in the posting to workers with limited English proficiency. Within ten (10) days of such posting, the Contractor and each Subcontractor shall certify to the Commissioner of Labor and Industry its compliance with the posting obligation set forth herein.

- D. The Contractor and each Subcontractor will comply with all requirements and obligations applicable to contractors and/or subcontractors pursuant to Section 2-3-2 of the Prevailing Wage Ordinance adopted by the Fairfax County Board of Supervisors on January 25, 2022, as the same may be amended from time to time. The Prevailing Wage Ordinance may be viewed at [https://library.municode.com/va/fairfax\\_county/ordinances/code\\_of\\_ordinances?nodeld=1149114](https://library.municode.com/va/fairfax_county/ordinances/code_of_ordinances?nodeld=1149114)

5.17 Drug-Free Workplace Requirement. During the performance of the Work, 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. For purposes hereof, a "drug-free workplace" shall mean the Site.

## **PART 6 - SUBCONTRACTORS**

6.01 Absence of Contractual Relationship. Nothing contained in the Contract Documents shall operate to, or otherwise have the effect of, creating a contractual relationship between the Owner or the Architect, on the one hand, and any Subcontractor or Sub-subcontractor on the other.

6.02 Award of Subcontracts and Other Contracts for Portions of the Work.

- A. List of Subcontractors. Unless otherwise specified in the Contract Documents, within ten (10) days after receipt of the Notice of Award of the Contract, the Contractor must submit a written statement to the Architect and the Owner setting forth the name, address, and telephone number of each proposed Subcontractor and Sub-subcontractor and the portion of the Work and/or materials which each such Subcontractor or Sub-subcontractor is proposed to perform or provide, as the case may be. The Contractor also must furnish any other information (including but not limited to an OSHA Form 300) to establish to the satisfaction of the Owner and the Architect that the proposed Subcontractor has the necessary facilities, skill, integrity, safety records, past experience and financial resources to perform the Work in strict accordance with the terms and

conditions of the Contract Documents. The Architect shall advise the Owner of its opinion with regard to each proposed Subcontractor and Sub-subcontractor.

- B. Review by Owner. If the Owner finds, in its sole and absolute discretion, that a proposed Subcontractor or Sub-subcontractor is not qualified, then the Contractor will be notified promptly of such decision in writing. If no such Notice is provided within 20 days after the Contractor's submission of a written statement, then the Owner shall be deemed to have accepted the Subcontractor. If it is determined a Subcontractor or Sub-Subcontractor is not qualified, then the Contractor must utilize another Subcontractor or Sub-Subcontractor at no additional cost to the Owner. The Owner may retract its acceptance of any Subcontractor in the event such Subcontractor evidences an unwillingness or inability to perform its portion of the Work in strict accordance with the requirements of the Contract Documents. Notice of such retraction will be given in writing to the Contractor. Upon receipt of notification of such rejection or retraction, the Contractor shall submit a new Subcontractor for the Owner's review. Any increase or decrease in the Contract Sum resulting from the required substitution shall be adjusted by appropriate Change Order; provided, however, that. (i) no increase in the Contract Sum will be allowed for substitutions unless the Contractor has submitted a list of proposed Subcontractors in accordance with the provisions hereof; and (ii) no such increase shall exceed the amount set forth with respect to such Work, plus 10%.
  - C. Rejection of Subcontractor. The Contractor shall not enter into a contract for performance of any portion of the Work with any Subcontractor who has been rejected by the Owner and/or the Architect.
  - D. Subcontracts. Upon request, the Contractor promptly shall file with the Owner a complete copy of any one or more of its subcontracts. The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the Work to bind Subcontractors to the Contractor in accordance with the terms of these Contract Documents insofar as applicable to the Work of Subcontractors, and to give the Contractor the same power to terminate any subcontract that the Owner may exercise to terminate the Contractor under the provisions of these Contract Documents.
  - E. Responsibility for Subcontractors. The Owner's review or acceptance of Subcontractors as described herein shall not relieve the Contractor of any of its responsibilities, obligations and liabilities hereunder. The Contractor shall be solely responsible to the Owner for the acts, defaults, or omissions of its Subcontractors and of its Subcontractors' officers, authorized representatives and employees.
- 6.03 Subcontractor and Sub-subcontractor Agreements. Work performed by Subcontractors and Sub-subcontractors shall be set forth in a signed, written agreement between the parties. Each such agreement shall:

- A. be consistent in all respects with these Contract Documents and shall neither. (i) contain a provision which negates, conflicts with or otherwise compromises the requirements of the Contract Documents; or (ii) contain a provision which limits or otherwise adversely affects the rights of the Owner and the Architect as such rights are defined in the Contract Documents;
- B. require timely processing of applications for payment and of claims for additional costs, damages, or time, in order that the Contractor may in turn promptly process such applications or claims in conformance with the Contract Documents;
- C. waive the rights of either party against the other in regard to claims for fire or other peril covered by the property insurance described in Paragraph 14.02. Such waiver shall not exclude either party from rightful access to the proceeds of such insurance; and
- D. make specific reference to this Paragraph 6.03 of the General Conditions as a mutually binding provision.

#### 6.04 Payments to Subcontractors.

- A. The Contractor will be liable for the entire amount owed to any Subcontractor with which it contracts, provided that the Contractor will not be liable for amounts otherwise reducible due to the Subcontractor's noncompliance with the terms of its contract. However, in the event that the Contractor withholds all or a part of the amount promised to the Subcontractor under the Contract, the Contractor must notify the Subcontractor, in writing, of its intention to withhold all or a part of the Subcontractor's payment with the reason for nonpayment. Payment by the Owner to the Contractor will not be a condition precedent to payment to any lower-tier Subcontractor. Any provision in the Contract Documents contrary to this paragraph will be unenforceable.
- B. Within seven (7) days after receipt of payment from the Owner, the Contractor shall:
  - 1. Pay each Subcontractor for the proportionate share of the total payment received by the Contractor attributable to Work performed by such Subcontractor; or
  - 2. Notify the Owner and the Subcontractor in writing of the intention to withhold all or part of the amounts due a Subcontractor pursuant to Paragraph 6.04(B)(1) above, and state the reason in reasonable detail for such withholding.
- C. In the event the Contractor fails to submit a timely Application for Payment, and that failure is due exclusively to the actions of the Contractor, the Subcontractor shall have the right to be paid by the Contractor upon demand the amounts due as described in Paragraph 6.04(B)(1).

- D. The Contractor shall pay interest on amounts owed to the Subcontractor which remain unpaid seven (7) days after the Contractor's receipt of payment from the Owner; provided, however, that amounts owed the Subcontractor which have been withheld properly pursuant to Paragraph 6.04(B)(2) shall not accrue interest. Interest on amounts due the Subcontractor and unpaid shall accrue at the rate of .5 percent per month; provided, however, that the Contractor's obligation to pay interest hereunder shall in no event be construed to be or otherwise become an obligation of the Owner. Claims for reimbursement by the Owner for interest charges owed by the Contractor to any Subcontractor shall not be allowed.
- E. Insurance proceeds received by the Contractor under the insurance policies described in Part 14 shall be equitably distributed to the affected Subcontractors in accordance with their respective interests in the underlying claim.
- F. Information concerning percentages of completion of Work performed by a Subcontractor as shown in Application for Payment may be made available to that Subcontractor upon mutual agreement with the Architect and the Owner.
- G. The Contractor shall include in each subcontract a requirement that each Subcontractor shall be bound by and subject to the provisions of Paragraph 6.04(B) through 6.04(E) above in regard to payments made by such Subcontractor to its Sub-subcontractors.

## **PART 7 - SEPARATE CONTRACTS**

- 7.01 **Owner's Right to Award Separate Contracts.** The Owner reserves the right to award one or more separate contracts in connection with other portions of the Project or other construction or operations at the Site. The Contractor hereby acknowledges that for all or some of the Contract Period such Separate Contractors may be present at the Site. The Contractor hereby assumes the risk of delays and disruptions caused by the presence of Separate Contractors at the Site and hereby covenants and agrees that it shall not make a claim against the Owner for additional compensation as a result of the activities of such Separate Contractors, unless such activities give rise to an "unreasonable delay" as set forth in Part 11 hereof.
- 7.02 **Covenant to Coordinate and Cooperate.** As part of the Work and at no additional cost to the Owner, the Contractor covenants and agrees at all times during its performance of the Work to coordinate such performance with the activities and operations of any Separate Contractors. The Contractor shall use its good faith best efforts to cooperate, coordinate and consult with the Owner and all Separate Contractors in the performance of the Work. The Contractor shall connect and coordinate the Contractor's construction and related operations with the construction and related operations of any Separate Contractors to the extent necessary to achieve the timely and satisfactory completion of the Work and in such a manner as to avoid delaying, interfering with, or otherwise placing undue burden upon the activities of any Separate Contractor. The Contractor shall afford the Owner and each Separate Contractor reasonable opportunity for



introduction and storage of their materials and equipment and reasonable access to the Site for performance of their respective activities.

- 7.03 No Interference with Separate Contractors. The Contractor shall not take any action, or omit to take any action, that will delay, interfere with, or otherwise unduly burden the activities of a Separate Contractor or that will obstruct reasonable access by any Separate Contractor to the site of such Separate Contractor's activities and operations.
- 7.04 Scheduling with Separate Contractors. Upon request by the Owner, the Contractor shall meet with the Owner and any Separate Contractors at times designated by the Owner in order to review the Construction Schedule and the schedules of the Separate Contractors and to coordinate and conform those schedules. The Contractor promptly shall make any revisions to the Construction Schedule that are required, in the Owner's sole discretion, to serve the interests of the Project as a whole. The Construction Schedule, as revised, shall then constitute the schedule to be used by the Contractor until subsequently revised.
- 7.05 Report of Discrepancies. Whenever the Contractor's Work depends for proper execution or results upon construction or operations by a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect in writing any apparent discrepancies or defects in such construction or operations performed by a Separate Contractor that would render it unsuitable for such proper execution and results. Failure of the Contractor to report such apparent discrepancies and/or defects shall constitute an acknowledgment that the Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

## **PART 8 - MISCELLANEOUS PROVISIONS**

- 8.01 Governing Law. The Contract Documents shall be governed by and construed in accordance with the laws of the Commonwealth of Virginia, without reference to conflict of laws principles.
- 8.02 Successors, Assigns and Legal Representatives. Except as provided in Part 6 hereof with respect to Subcontractors, this Agreement 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. The Owner's consent to a particular subcontract or assignment shall in no event constitute a waiver of the Owner's right to consent to any further or additional subcontracts or assignments.
- 8.03 Entire Agreement. The Contract Documents constitute the entire agreement among the parties pertaining to the Work and supersedes all prior and contemporaneous agreements and understandings of the parties in connection therewith. The Contract Documents may not be modified or amended orally or by course of conduct. Any

modification or amendment shall be set forth in a written Change Order executed by the Owner and the Contractor.

8.04 Royalties and Patents. The Contract Sum includes all royalties and costs arising from patents, trademarks, and copyrights in any way involved in the Work. Whenever the Contractor is required or desires to use any design, device, material or process covered by letters of patent or copyright, the Contractor shall indemnify and save harmless the Owner and Architect, their officers, agents and employees from any and all claims for infringement by reason of the use of any such patented design, device, tool, material, equipment, or process to be performed under the Contract, and shall indemnify the Owner and the Architect, their officers, agents, authorized representatives, and employees for any costs, expenses and damages which may be incurred by reason of any such infringement at any time during the prosecution and after the completion of the Work. Notwithstanding the foregoing, the Contractor shall not be liable hereunder to the extent that any infringement arises by virtue of a design or implementation supplied to the Contractor by the Owner or the Architect.

8.05 Contractual Claims.

- A. If the Contractor wishes to make a contractual claim, whether for extra compensation, damages or any other relief, he shall provide Notice to the Owner and to the Architect in accordance with the provisions of Paragraph 8.09 hereof. The Contractor's failure to comply strictly with the requirements of Paragraph 8.09 shall result in waiver of the claim
- B. Resolution of any outstanding claims, counterclaims, disputes and other matters in question arising out of or relating to the Contract Documents to the extent not resolved by the parties hereto, shall be decided by a court of competent jurisdiction in the Commonwealth of Virginia; provided, however, that nothing contained herein shall be construed to invalidate the finality of the Owner's decisions. The Owner and the Contractor hereby waive any right they may have to a jury trial in connection with the resolution of any such claim, counterclaim, dispute or other matter arising out of or in connection with the Contract Documents. In any such court proceeding, the Owner shall have the right to bifurcate or otherwise reserve the court's determination regarding issues of: (i) the Owner's entitlement to recovery from the Contractor of the Owner's attorney's fees and costs; and (ii) the quantum of any such recovery, until after a decision or other disposition by the court in the underlying matter.

8.06 Tests and Inspections.

- A. The Contractor shall give the Owner and Architect sufficient prior Notice of the date and time of required tests or inspections. The Contractor shall be responsible for all costs associated with such tests or inspections, unless otherwise specifically excluded from the scope of Work defined in the Contract Documents.

- B. If, during the course of the Work, the Architect or Owner decides it is reasonable and necessary to perform supplemental inspections or testing not required by law or Contract Documents, then the Contractor will be instructed in writing to arrange for such testing. It shall be the responsibility of the Contractor to give timely Notice of such inspections or testing to the Owner and Architect. If the supplemental testing or inspections reveal defective or non-complying Work, then the Contractor shall be responsible for all costs associated with the performance of the tests or inspections, any additional costs required to rectify the defective or non-complying Work, and any costs for additional architectural services related thereto. If the Work is found to be in compliance with the requirements of the Contract Documents, then the Contractor shall be entitled to an equitable adjustment in for the reasonable associated costs of the testing or inspections.
- C. The Contractor shall be responsible for securing all certificates or records of additional tests or inspections, and distributing them to the Owner and Architect in a timely manner.
- D. Performance of required or supplemental inspections and testing by persons or organizations other than the Contractor, Subcontractors, or Sub-subcontractors, shall not compromise performance of the Work in compliance with the Contract Documents.

#### 8.07 Conflict with Provisions of Laws or Regulations.

- A. In the event that there is a conflict between a provision of these Contract Documents and that of any Law or Regulation, such conflicting Law or Regulation shall control.
- B. All legal provisions required by law to be included in the Contract Documents shall be deemed to be a part hereof, whether actually set forth or not herein.

8.08 No Claims Against Individuals. No claim whatsoever shall be made by the Contractor against any officer, Member, authorized representative or employee of the Owner or the Architect for, or on account of, anything done or omitted to be done in connection with this Contract, and the Contractor shall be strictly liable for all costs, attorneys fees and expenses incurred by any individual or entity who is sued in violation of this Paragraph.

#### 8.09 Disputes.

- A. Notice of Claim. If the Contractor wishes to dispute that any Work required, necessitated, or ordered by the Architect or the Owner, or otherwise to claim any action required or ordered by the Architect or the Owner to be taken or not taken violates the terms and provisions of this Contract, then he shall proceed with such Work and/or comply with such requirement or order without delay and shall, within five days after the earlier of (a) commencing such Work or (b) receiving Notice of such requirement or order, notify the Owner and the Architect, in writing, of his claim with respect thereto and request a final determination thereof. In order to invoke the procedures of this Paragraph, the Contractor's request

must. (i) refer specifically to this Paragraph by number; (ii) in the case of the Owner, be hand-delivered both to the office of the Director, Office of Facilities Management and to the Project Manager at the Site; (iii) contain a full explanation of the basis of the Contractor's position, and the rationale for Contractor's request, including actual photocopies of all materials or documents (other than Contract Documents) referred to in the Contractor's request; (iv) detail the quantum of any relief requested by the Contractor and provide verified substantiation of all such amounts; (v) describe in detail any other relief requested; (vi) describe in detail all efforts the Contractor has made to mitigate any alleged loss or otherwise avoid the claim; and (vii) be signed by an officer of Contractor under oath. No request for a Change Order, request for change proposal, or other requested modification shall be sufficient, on its own or collectively to satisfy or to defer the commencement of the Notice requirements set forth herein.

- B. Claim Review Process. The Owner shall issue a written determination with regard to any such claim on or before the date that is 14 days after the date of its receipt of the Contractor's written request; provided, however, that in the event that the Owner determines, based upon the size or complexity of the claim at issue, that additional time is required for the issuance of a response, the Owner shall issue written Notice of such finding to the Contractor within 14 days following the date of its receipt of the Contractor's written request and shall issue a written determination with regard to such claim on or before the date that is 60 days after the later of (i) the date of the Owner's receipt of the Contractor's written request or (ii) the Contractor's submission of all supplemental information where such has been requested by the Owner. The Contractor's failure to submit promptly any supplemental information requested by the Owner shall result in the waiver of the claim. In order to reserve its right to claim compensation for such Work, or damages resulting from such compliance, the Contractor shall, within five days after receiving Notice of the Owner's determination and direction, notify the Owner and the Architect, in writing, that the Work is being performed, or that the determination and direction is being complied with, under protest. Failure of the Contractor to so notify the Owner and the Architect as provided herein shall constitute a waiver and release of the Contractor's right to claim compensation for any Work performed under protest or damages resulting from such compliance. Should Owner fail to issue a written determination within the time periods specified herein, such failure shall be deemed to be a denial of the claim entitling the Contractor to institute legal action with respect to the claim without further administrative review by Owner. In no event shall Contractor be permitted to make a total cost claim or the like against Owner, nor any other claim which fails to conform strictly to the above standards or to Virginia law; any such claims shall be deemed to be null and void.
- C. Undisputed Amounts; Claims for Extension of Time. All monies owed and not in dispute will be made available to the Contractor in accordance with the Contract Documents. Any request for an extension of time in connection with disputed Work shall be governed by Part 11 hereof.

- 8.10 Benefit of Agreement. The Contract Documents shall be enforceable and binding upon, and shall inure to the benefit of, the parties hereto, their respective successors and permitted assigns. Nothing contained herein, express or implied, is intended to or shall confer upon any other person any rights, benefits or remedies of any nature whatsoever under or by reason of this Agreement.
- 8.11 No Estoppel. Neither the Owner, nor any officer, Member, employee, or authorized representative thereof, will be bound, precluded, or estopped by any action, determination, decision, acceptance, return, certificate, or payment made or given under or in connection with this Contract by any officer, employee, Member or authorized representative of the Owner or of the Architect, at any time either before or after final completion and acceptance of the Work or any payment therefor. The Owner may, at any time and from time to time. (a) show the true and correct classification, amount, quality, or character of the Work performed, or that any determination, decision, acceptance, return certificate or payment is incorrect or was improperly made in any respect, or that the Work or any part thereof does not in fact conform to the requirements of the Contract Documents; (b) demand and recover from the Contractor any overpayment made to him or such damages as the Owner may sustain by reason of the Contractor's failure to comply with the requirements of the Contract Documents; or (c) both of the foregoing clauses (a) and (b).
- 8.12 No Waiver of Rights. No act or omission on the part of the Owner (including but not limited to those matters set forth in A through D below) shall be deemed to constitute a waiver of any right, duty, obligation or other provision set forth in these Contract Documents:
- A. inspections conducted by the Owner, the Architect, or any of their respective employees, officers, Members or authorized representatives;
  - B. orders for the payment of money;
  - C. payments for, or acceptance of, all or any part of the Work;
  - D. extensions of time or changes to the Contract Documents, Specifications or Drawings.

In order to be effective, any waiver by the Owner must be in writing and must expressly use the term "waiver," or a variation thereof. In no event shall any waiver of any breach of this Contract be held as a waiver of any subsequent breach of this Contract. The terms of this Contract shall be in addition to, and not a limitation on, any and all rights and remedies which the Owner has or may have at law or in equity. The Owner will have the right to enjoin the Contractor against any breach of the terms of this Contract without any showing that such relief is necessary to avoid irreparable injury or that there is no adequate remedy at law.

## **PART 9 - CHANGES IN THE WORK**

### 9.01 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.

#### 9.02 Extra Work.

- A. **Order for Extra Work.** The Owner may, in its sole and absolute discretion, at any time by issuance of a Work Order or Change Order and without notice to the Sureties require the performance of such Extra Work as it deems necessary or desirable. 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 Architect, and the Extra Work so ordered must be performed by the Contractor. The Contractor hereby covenants and agrees to perform such Extra Work on the terms and conditions set forth in the applicable Work Order or Change Order, as the case may be, and hereby waives any claim, suit or cause of action of any nature based, in whole or in part, upon the allegation that any Extra Work ordered hereunder and/or any Work omitted pursuant to Paragraph 9.03 hereof, individually or in the aggregate, constitute a cardinal change to, or other material deviation from, the Contract Documents and/or the Work contemplated thereby. Any attempt by the Contractor to alter or modify a Change Order or to reserve a claim thereunder shall be void and of no legal effect. Each Change Order, when executed, shall constitute full and final compensation for all matters directly or indirectly related to or arising from the changes to the Work ordered thereby (the "Changed Work"), including, but

not limited to, all Overhead and all other direct and indirect costs associated with the Changed Work and any and all adjustments (of whatever nature) to the Contract Sum or to the Contract Period attributable to the Changed Work.

- B. Compensation for Extra Work. The amount of compensation to be paid to the Contractor for any Extra Work set forth in a Work Order or a Change Order shall be determined as follows:
1. By such applicable unit prices, if any, as are 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; or
  3. If no such unit prices are set forth in the Contract and if the parties cannot agree upon a lump sum or other unit prices, then by the actual and reasonable costs as determined by the Architect in accordance with Section 01153 of the General Requirements.
- C. Full and Final Compensation. Regardless of the manner in which the adjustment to the Contract Sum on account of Extra Work is determined, such adjustment shall be deemed to include all amounts, whether direct, indirect or consequential, resulting from the performance of the Extra Work, including but not limited to all Overhead. The adjustment to the Contract Sum, if any, shall constitute the final, full and mutual accord and satisfaction for all costs related to such change.
- D. Notice and Records of Extra Work. At least one day prior to the performance of Extra Work hereunder, the Contractor shall provide Notice to the Owner and Architect setting forth: (1) his intention to perform Extra Work; (2) the nature of the Extra Work and the precise location, time of commencement, duration, and basis therefor; and (3) Subcontractors involved therein. Unless such Notice of Extra Work is provided in the manner prescribed herein, such Extra Work shall not be compensated. Records of Extra Work performed hereunder, if any, shall be submitted by the Contractor to the Owner at the end of each day on which such Extra Work shall have been performed. Duplicate copies of accepted records shall be made and signed by both the Contractor or its representative and the Owner's representative, and one copy shall be retained by each.
- E. Payment Requests. Payment requests for approved and duly authorized Extra Work shall be submitted by the Contractor upon a certified statement supported by receipted bills. Such statements shall be submitted for payment by the Owner in the month in which such Extra Work was performed and in accordance with Paragraph 12.03 hereof.
- F. Time Extension for Extra Work. The Contractor shall be entitled to an extension of time for Extra Work duly authorized by the Architect only for the number of days required, in the opinion of the Architect, to complete such Extra Work, and then only if the Contractor has strictly complied with all the requirements of the Contract Documents.

## 9.03 Omitted Work.

- A. Omission of Work by Owner. The Owner may at any time by a written order and without notice to any Surety require the omission of such Work as the Owner may find necessary or desirable in its sole and absolute discretion.
- B. Order for Omission of Work. Order An order for omission of Work shall be valid only if signed by the Owner and the Architect and the Work so ordered must be omitted by the Contractor. The amount of any credit due the Owner as a result of any such omission of Work shall be determined in accordance with Paragraph 9.02(B)(1), (2) and (3) above.

## 9.04 Suspension of Work.

- A. Suspension of Work by Owner. The Owner may suspend the Work by written order in order to. (i) coordinate the activities and operations of the Contractor with that of any Separate Contractors; (ii) expedite completion of the Project, even though completion of the Work may be delayed thereby; or (iii) serve the best interests of the Owner or of the Project as a whole. No single suspension by the Owner shall exceed 10 days.
- B. Order for Suspension of Work. An order for suspension of the Work (or any portion thereof) shall be signed by the Owner and the Architect, shall identify the Work that is to be suspended by the Contractor, and shall set forth the effective dates of such suspension. Such order (and the effective dates of the suspension) may be updated by the Owner from time to time during the course of the suspension.
- C. Compensation for Suspension. In the event of a suspension of the Work (or any portion thereof) hereunder, the Contractor shall accept as full compensation for such suspension. (i) the actual costs incurred by the Contractor on this Project for demobilization and remobilization, as documented to the satisfaction of the Owner and the Architect; and (b) an extension of time for completion of the Work for such number of days as the Owner and the Architect shall determine that the suspension shall have actually and adversely impacted the Critical Path for the Work.

- 9.05 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 9.05, 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.

## **PART 10 - CHANGE ORDER AND WORK ORDER PROCEDURES**

### 10.01 Definitions.

- A. Change Order. Refer to the definition in Paragraph 1.02.
- B. Work Order. Refer to the definition in Paragraph 1.28.
- C. Overhead. Refer to the definition in Paragraph 1.18.

10.02 Change Orders. See Section 01153 of the General Requirements.

## **PART 11 - TIME**

### 11.01 Time of Start and Completion; Liquidated Damages.

- A. Commencement and Performance of Work; Time of the Essence. The Contractor shall commence the Work within ten (10) days after the date stated as the date to proceed in the Notice to Proceed. Time being of the essence with respect to this Contract, the Contractor shall prosecute the Work diligently, using such means and methods of construction as will secure its full completion in accordance with the requirements of the Contract Documents, and will complete the Work within the Contract Period. By executing the Agreement, the Contractor confirms that the Contract Period constitutes a reasonable period for performing the Work. The Contractor shall proceed expeditiously with adequate forces, scheduling and resources to complete the Work within the Contract Period. The actual Dates of Substantial and Final Completion will be established by the Architect after inspections have been conducted in accordance with Paragraphs 12.04 and 12.05 hereof.
- B. Liquidated Damages. The Owner and the Contractor hereby acknowledge and agree that time is of the essence with respect to this Contract and that in the event the Contractor fails to complete the Work within the Contract Period, the Owner will incur actual and considerable monetary damage, the actual amounts of which are uncertain and not readily ascertainable. The stipulated amount per day set forth in the Summary of Work (Section 01010) is reasonably in proportion to the probable loss to the Owner and that amount per day is hereby agreed upon as the liquidated damages for each day that the time consumed in completing the Work exceeds the time allowed. This stipulated amount shall in no event be considered to be a penalty or otherwise than as the liquidated and adjusted damages to the Owner because of the delay, and the Contractor and its Surety hereby agree that the stated sum per day for each such day of delay shall be deducted and retained out of the monies which may become due hereunder and if not so deductible, the Contractor and its Surety shall be liable therefor.

## 11.02 Extension of Time.

- A. Extension of Time. The parties to this Contract wish to provide a framework for resolving issues in connection with any delays that may occur on this Project. No extension beyond the date of completion fixed by the terms of the Contract will be effective unless granted in writing and signed by the Owner's representative.
- B. Contractor's Notice of Delay. Notice of delay must be given in writing to the Director of the Owner's Office of Design and Construction, with copies to the Architect and to the Owner's on-Site project manager within 5 days after the commencement of the delay and in strict accordance with the General Conditions. Each such Notice shall. (i) be submitted in written, narrative form on the Contractor's letterhead; (ii) be identified as a "Notice of Delay;" (iii) shall describe, in reasonable detail, the nature of the delay encountered; (iv) shall have appended to it a copy of this Paragraph 11.02; and (v) shall set forth the date of the commencement of the delay. An update to the Construction Schedule shall in no event be deemed to be sufficient, on its own and unless submitted as part of an application for extension of time as provided herein, to satisfy the Notice of requirements set forth in this Paragraph 11.02. In case of a continuing cause of delay, only one Notice shall be required.
- C. Contractor's Application for Extension of Time. The Contractor's application for any extension of time shall be in writing and addressed to the Director of the Owner's Office of Design and Construction, with copies to the Architect and to the Owner's on-site project manager, not more than 20 days after the commencement of the delay. Any such application for extension of time shall. (i) be on the Contractor's letterhead; (ii) describe in reasonable detail the reasons for and causes of the delay; (iii) demonstrate in a clear and convincing fashion the extent to which, if any, the delay impacts the Critical Path for the Project; (iv) contain a justification for each additional day which is requested; (v) be identified as an "Application for Extension of Time; and (vi) have appended to it a copy of this Paragraph 11.02(A), together with copies of any documents referenced therein. If the delay should continue for longer than 20 days, the Contractor must submit the substantiation and support for such delay no less frequently than in 20 day increments. Any application for extension of time which does not conform in every respect to the requirements of this Paragraph 11.02(A) shall be deemed to have been waived.
- D. Basis for Extension of Time. If such an application is made, the Contractor shall be entitled to an extension of time for delay in completion of the Work if obstructed or delayed in the commencement, prosecution or completion of any part of the Work on the Critical Path 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.

- E. Measurement of Delay. The Contractor shall, however, be entitled to an extension of time for such causes only for the number of days of delay which the Architect may determine to be due solely and exclusively to such causes and only to the extent that such occurrences actually and adversely impact the Critical Path for the Work, and then only if the Contractor shall have strictly complied with all of the requirements of these Contract Documents.
- F. Delay for Abnormal Weather Conditions. The Contract Period will be adjusted to account for unusually severe and abnormal weather conditions that prevent or inhibit the Contractor's performance of the Work and lengthen the Critical Path indicated on the Construction Schedule (such unusually severe and abnormal weather conditions referred to herein as "Inclement Weather"). The occurrence of Inclement Weather shall be established by reference to climatological data compiled by the U.S. Department of Commerce National Oceanic and Atmospheric Administration for Washington-Dulles International Airport or Washington National Airport, whichever is closest to the Site of the Project.
- G. Procedure for Protesting Denial of Extension of Time. In the event that the Contractor is denied an extension of time hereunder, he may contest such decision by notifying the Architect, the Director of the Owner's Office of Design and Construction and the Project Manager in writing within four days after the issuance of such denial, stating in detail its reasons for disagreement and submitting all information necessary for a final determination by the Owner pursuant to Paragraph 8.09 hereof. The Contractor shall provide the Architect and the Owner with all substantive information that supports the Contractor's claim for an extension of time. The Contractor must address all elements of the denial of such time extension. No claim for an extension of time under this provision will be valid unless submitted as stated herein.
- H. Supplier and Subcontractor Delays. Except as expressly set forth in Section 11.02(J), delays caused by the failure of the Contractor's materialmen, manufacturers, and dealers to furnish approved shop drawings, materials, fixtures, equipment, appliances, or other supplies on time or the failure of Subcontractors to perform their Work in conformity with the approved Construction Schedule shall not constitute a basis for an extension of time.
- I. Remedy for Delay. Except as expressly set forth in Section 11.02(J) hereof, no claim for payment, compensation or adjustment of any kind (other than the extensions of time provided for herein) shall be made or asserted against the Owner by the Contractor for costs or damages caused by hindrances or delays from any cause, whether such hindrances or delays be avoidable or unavoidable, and the Contractor shall make no claim for damages by reason of any such hindrances or delays, and will accept in full satisfaction of such hindrances or delays an extension of time to complete performance of the Work as specified.
- J. Owner-Caused Delay. Notwithstanding the provisions of Section 11.02(I), nothing contained herein is intended to, or shall have the effect of, waiving, releasing or extinguishing any rights of the Contractor to recover costs or

damages for an unreasonable delay in performing this Contract, either on its behalf or on behalf of a Subcontractor, if and to the extent that such delay is caused by acts or omissions of the Owner, its agents or employees, and due to causes within their control. In order to seek costs or damages in connection with any such unreasonable delay, the Contractor must comply fully with each of the requirements set forth in Section 11.02(B) hereof, and shall identify each Notice of delay and application for extension of time submitted thereunder, respectively, as a "Notice of Delay and Additional Costs" and as an "Application for Extension of Time and Additional Costs." Each Notice of Delay and Additional Costs shall contain, in addition to the requirements set forth in Section 11.02(B). (i) a description of the nature of the monetary loss or damage associated with the unreasonable delay; (ii) an explanation as to why the delay is deemed to be "unreasonable;" (iii) a clear demonstration of how such unreasonable delay was caused solely and exclusively by acts or omissions of the Owner, its agents and employees, and due to causes within their control; and (iv) a detailed description of all efforts the Contractor has made to mitigate any alleged loss or otherwise avoid the claim. In addition to the requirements set forth in Section 11.02(B), each Application for Extension of Time and Additional Costs shall demonstrate in a clear and convincing fashion. (i) that the delay was "unreasonable;" and (ii) the extent, if any, to which the delay was caused by acts or omissions of the Owner, its agents or employees, and due to causes within their control. In the event it is determined that the Contractor (either on its behalf or on behalf of a Subcontractor) is entitled to costs or damages on account of such an Owner-caused unreasonable delay, the amount thereof shall be determined as set forth in Section 11.02(K).

- K. Contractor's Liquidated Damages. The parties recognize the difficulty in calculating damages incurred by the Contractor resulting from unreasonable delays caused by acts or omissions of the Owner, its agents and/or employees, and due to causes within their control. As such, the parties hereby agree that the amount set forth in the Summary of Work (Section 01010) shall be the liquidated damages for each and every day that the Contractor and/or any Subcontractor(s) incurs compensable costs or damages for unreasonable delays in performing this Contract and that this figure represents a reasonably accurate forecast of the daily aggregate, anticipated actual damages in the event of an unreasonable delay. The parties hereby acknowledge and agree that the liquidated damages provided for hereunder represent full and final compensation for all losses, costs and damages incurred in the aggregate by the Contractor and its Subcontractors (if any) in connection with an unreasonable delay and that neither the Contractor nor any Subcontractor will in any event submit a claim or seek further or additional compensation in excess of the stated amount. The Contractor shall include in each of its subcontract agreements for the Project a liquidated damages provision similar to that set forth herein.
- L. Reimbursement of Owner's Costs and Expenses. In the event that the Contractor makes a claim against the Owner for costs or damages due to unreasonable delays caused by the Owner, its agents and/or employees and such claim is determined to be false or to have no basis in law or otherwise is

resolved in favor of the Owner, in whole or in part, then the Contractor shall be liable to the Owner for a percentage of all the costs the Owner incurs in investigating, analyzing, negotiating, and litigating the claim. The percentage for which the Contractor shall be liable shall be equal to the percentage of the Contractor's total delay claim that is determined through litigation or administrative procedures to be false or to have no basis in law or otherwise resolved in favor of the Owner.

- M. **Phased Construction.** Where portions of the Work have been phased in order to accommodate Owner's use of existing premises, and the beginning date and ending date for the performance of the phased Work have been stipulated, and the beginning date must be changed to accommodate unforeseen circumstances, then the ending date shall accordingly be adjusted so that the amount of time allotted for the phased Work shall not change.

## **PART 12 - PAYMENTS AND COMPLETION**

### 12.01 Prices.

- A. **Contract Sum.** 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 ordered under Paragraph 9.02 hereof, less credit for any Work omitted pursuant to Paragraph 9.03 hereof.
- B. **Unit Prices; Estimated Quantities.** The amount awarded as a unit price for any unit price Contract item shall represent payment in full for all the material, equipment and labor necessary to complete, in conformity with the Contract Documents, each unit or item of Work shown, specified, or required with respect to such unit price Contract Item. With respect to unit price items, the number of units actually required to complete the Work under the Contract may be less or more than stated in the bid. The Contractor agrees that no claim will be made for any damages or for loss of profits or overhead because of a difference between the quantities of the various classes of Work assumed and stated in the bid as a basis for comparing bids and the quantities of Work actually performed.
- C. **No Other Payments Due.** No payment other than the amount awarded will be made for any class of work included in a lump sum Contract item or a unit price Contract item, unless specific provision is made therefor in the Contract Documents.

12.02 **Submission of Schedule of Values.** See Section 01370 of the General Requirements. The Schedule of Values, once accepted by the Architect, may be used for checking the Contractor's applications for partial payments hereunder but shall not be binding upon the Owner or the Architect for any purpose whatsoever.

## 12.03 Partial Payments.

- A. Applications for Partial Payment. 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 during the preceding month and may apply for partial payment. The Architect may, in his discretion, revise the estimate to show the actual value of Work completed in accordance with the Architect's observation of the Work. The Contractor agrees to be bound by the Architect's revisions to its applications for partial payment. Whenever the monthly estimate, after approval by the Architect, shows that the value of the Work completed during the period covered by the payment request exceeds \$1,000.00, the Architect will issue a Certificate of Payment for such Work. Such Certificate will authorize payment by the Owner in an amount equal to the value of the Work completed less any sums retained or deducted by the Owner under the terms of the Contract Documents, and less retainage of 5 percent of payments claimed. Within 45 days after receipt of each Certificate of Payment, the Owner shall pay the Contractor in accordance with the applicable Certificate and the Contract Documents. Unless withheld in accordance with Paragraph 12.03(B) hereof, amounts not paid when due shall accrue interest at a rate of .5% per month. The Owner may, in its sole and absolute discretion, reduce the amount of retainage withheld, in the latter stages of the Project. For additional requirements, see Section 01152 for other Requirements.
- B. Withholding Payment. The Owner may withhold payment to the Contractor hereunder to such extent as may be necessary in the opinion of the Architect to protect the Owner due to loss because of:
1. defective Work not remedied;
  2. third party claims (including Separate Contractor Claims) filed or reasonable evidence indicating probable filing of such claims;
  3. failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
  4. reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
  5. damage to the Owner or another person or entity (including a Separate Contractor);
  6. reasonable evidence that the Work will not be completed within the Contract Period;
  7. persistent failure to carry out the Work in accordance with, or to otherwise observe the requirements of, the Contract Documents; or

8. liability, damage, or loss due to injury to persons or damages to the Work or property of Separate Contractors, or the subcontractors of others, caused by the act or neglect of the Contractor or any of its Subcontractors or Sub-subcontractors.
- C. Owner's Application of Withheld Amounts. The Owner shall have the right, as an authorized representative for the Contractor and without the Surety's consent, to apply any such amounts so withheld in such manner as the Owner may deem proper to satisfy such claims or to secure such protection. The application of these amounts shall be deemed payments for the account of the Contractor and shall reduce the Owner's obligation to the Contractor accordingly.
- D. Payment for Materials and Equipment. Unless otherwise provided herein, no partial payment will be made for any materials or equipment supplied hereunder before they are. (i) incorporated in the Work in a permanent manner as required by the Contract Documents, (ii) properly stored at the Site of the Project or (iii) properly stored in a bonded warehouse to the satisfaction of the Owner.
- E. Equipment and Materials Stored On Site. The cost of equipment and materials delivered and stored at the Site of the Project and tested for adequacy may be included in the Contractor's application for partial payment; provided, however, that the Contractor shall furnish written evidence satisfactory to the Owner that the Contractor is the owner of such materials or equipment at the time of payment therefor by the Owner and that such equipment is being stored and maintained in accordance with the Contract Documents and the manufacturer's recommendations. The amount to be paid by the Owner for such equipment and nonperishables will be 90 percent of the documented invoice cost to the Contractor as supported by receipted bills, which shall be furnished to Owner at the time the request for payment is made. Such payment shall not relieve the Contractor of full responsibility for completion of the Work and for protection of materials and equipment until incorporated in the Work in a permanent manner as required by the Contract Documents.
- F. Payment Affidavits. Before any payment will be made under this Contract, the Contractor and every Subcontractor, if required, shall deliver to the Architect a written, verified statement, in satisfactory form, showing in detail all amounts then due and unpaid by the Contractor to all laborers, workers, and mechanics, employed under the Contract for the performance of the Work at the Site of the Project, for daily or weekly wages, or to other persons for materials, equipment, or for supplies delivered at the Site of the Project during the period covered by the payment request.
- G. No Improper Payments. Upon the request of the Architect, as a prerequisite for payment pursuant to the terms of this Contract, the Contractor shall give the Owner a statement that no employee of the Owner has received or has been promised, directly or indirectly, any financial benefit, by way of a fee, commission, finder's fee or in any other manner, or any other remuneration arising from or directly or indirectly related to this Contract. All parties agree that

the Owner shall have the right, in its sole and absolute discretion, to withhold payment to the extent of any such fee or commission. The Contractor shall not be entitled to interest and shall not have any claim on account of any payments being withheld under this Paragraph 12.03 G.

#### 12.04 Substantial Completion.

- A. Notice of Substantial Completion; Inspection by Architect. When the Contractor considers that the Work, or in the case of phased construction, such portion thereof which the Owner agrees in writing to accept separately, is substantially complete, the Contractor shall provide the Owner and the Architect written notification of such fact. The Contractor shall conduct a "pre-punch" inspection, and shall submit a written and dated "pre-punch" list prior to requesting the formal Punch List Inspection by the Owner and the Architect. (The Contractor shall have the Job Superintendent and a representative from each of the major sub-contractors present at the Punch List Inspection) Upon receipt of the Contractor's "pre-punch" list and concurrence of the Owner's Field Inspector, the Architect and the Owner shall conduct the Punch List Inspection and shall prepare a comprehensive list of items to be completed and/or corrected. The Contractor shall proceed promptly to complete and correct items on the list. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. Subsequently, the Architect and the Owner will make an inspection to determine whether the Work, or such designated portion thereof, is substantially complete. If the Architect's inspection discloses any item, whether or not included on the list, which is not in accordance with the requirements of the Contract Documents, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. The Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.
1. Phased construction. Where the Work shall be performed in phases, Owner acceptance of each phase shall not occur until all of the following activities have taken place:
    - a. The Contractor shall perform a "pre-punch" inspection, shall notify the Owner upon completion of the inspection, and shall supply the Owner with a written and dated copy of its "pre-punch" list, which shall compile all deficiencies in the work observed by the Contractor.
    - b. The Owner and Architect shall review the "pre-punch" list, and shall determine whether or not a "punch list" inspection shall take place.
    - c. Upon such determination, the Owner, the Architect and the Contractor (including the Job Superintendent and a representative from each of the major sub-contractors) shall conduct the "punch



list” inspection and shall compile a list of deficiencies for correction by the Contractor. The Contractor shall correct the deficiencies contained in the “punch list” in the time period indicated in Paragraph 12.04(B).

- d. The Contractor shall not proceed to the next construction phase until all items on the “punch list” have been corrected, and the Owner has agreed in writing to allow the Contractor to proceed to the next phase.

B. Punch List:

1. The Contractor shall have a maximum of sixty (60) days after the date of issuance of any punch list to complete all of the Work items contained thereon. Where the Project consists of discrete construction phases, the Contractor shall have a maximum of fourteen (14) days after the date of each punch list for each phase to complete the Work contained on the list. If the Work is not completed within the designated period, the sum of \$50.00 per day per punch list item will be deducted from the Contract Sum until the Date of Final Completion.
2. In the event that the Contractor refuses or fails to complete any one or more punch list items within the time period specified herein, then the Owner shall have the right (but not the obligation) to complete any such Punch List item with its own forces or with such other contractors as it deems advisable and to charge the account of the Contractor and its Surety therefore. This right of completion shall be in addition to, and not in lieu of, any remedy provided by another section of these Contract Documents. In the event the Owner exercises its right hereunder to complete all items on a Punch List, the \$50.00 daily amount shall not thereafter continue to be assessed for that Punch List item, although nothing contained herein shall be construed to eliminate or reduce the daily amount then accrued.

- C. Certification By Architect. When the Work, or any Owner-designated portion thereof, is substantially complete, the Architect shall prepare and issue a Certificate of Substantial Completion (substantially in the form of AIA Document 6704) which shall establish the date of Substantial Completion, the responsibilities of the Owner and the Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate of Substantial Completion. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work, or such designated portion thereof, unless otherwise provided in the Certificate of Substantial Completion. The Certificate of Substantial Completion shall be submitted to the Owner and to the Contractor for their written acceptance of responsibilities assigned to each of them therein.

- D. Payment by Owner. Upon Substantial Completion of the Work, or such Owner-designated portion thereof, and upon application by the Contractor and issuance of a Certificate of Substantial Completion by the Architect, the Owner shall make payment, less retainage, for such Work or such portion thereof as provided in the Contract Documents.

#### 12.05 Final Inspection.

- A. Notice of Final Completion; Inspection by Architect. 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 Architect will conduct a final inspection of the Work. When the Architect determines that the Work has been satisfactorily completed and the Contract Documents fully performed, he shall promptly prepare and issue a Final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of its observations and inspections, the Work has been completed in accordance with the Contract Documents and that the amount stated in the Final Certificate of Payment, less the Correction Retainage (as defined below), is due and payable.
- B. Payment by Owner; Correction Retainage. The Owner shall, within 45 days after receipt of the Final Certificate of Payment, pay the Contractor the amount stated therein, less a percentage of the Contract Sum based upon the following schedule:

Cost of Contract (\$5,000 minimum)	Retained %
Up to and including \$ 50,000	1.00%
Above \$50,000 to \$750,000 inclusive	0.75%
Above \$750,000 to \$1,250,000 inclusive	0.60%
Above \$1,250,000 to \$2,000,000 inclusive	0.50%
Above \$2,000,000 to \$3,000,000 inclusive	0.425%
Above \$3,000,000	0.4%

Such retained sum (the "Correction Retainage") shall be held by the Owner for a period of one year from the Date of Substantial Completion (the "Correction Period") as collateral security for the prompt and complete correction and/or performance by the Contractor of any and all Work determined by the Owner, in its sole and absolute discretion, to be defective, incomplete or to have been improperly performed. The Owner shall pay to the Contractor the Correction Retainage, less any amounts expended in accordance with Paragraph 12.05(D), within thirty days after the expiration of the Correction Period.

- C. Correction of Work by Contractor. In the event the Work, or any portion thereof, is determined during the Correction Period to be defective, incomplete or to have been improperly performed, the Contractor shall, within three days after written Notice from the Owner, commence to remove all defective and deteriorated Work and materials and replace it with Work and materials that conform in all respects with the requirements of the Contract Documents and to complete all incomplete

work in accordance with the Contract Documents within 14 days or such longer period as shall be requested by the Contractor and agreed-upon by the Owner.

- D. Contractor's Failure to Correct Work. In the event the Contractor fails to commence the removal, replacement, completion or correction of such Work within three days after the date of written Notice from the Owner and to complete such Work within the time period established in Paragraph 12.05(C), then the Owner will cause such work to be performed by other contractors and will deduct the cost of such Work from the Correction Retainage. In the event that the Correction Retainage is insufficient to cover such costs, then the Owner shall charge the Contractor and its Surety for the amount of the deficiency and the Contractor and/or the Surety shall pay such amount to the Owner in full on or before the date that is thirty days after the expiration of the Correction Period.

12.06 Final Payment Request. Neither final payment nor any retainage shall become due until the Contractor submits the following items to the Architect. (i) an affidavit that payrolls, bills for materials and equipment, and all other indebtedness in connection with the Work for which the Owner might be responsible have been paid or otherwise satisfied; (ii) a certificate evidencing that insurance required by the Contract Documents to remain in force following final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written Notice has been provided to the Owner; (iii) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents; (iv) consent of the Surety to final payment; and (v) if required by the Owner, other data establishing the payment or satisfaction of obligations (such receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract) and such guaranties and indemnities all in such form and detail as may be required by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner, in its sole and absolute discretion, sufficient to indemnify the Owner against any claim or lien. If any such claim remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such claim, including all costs associated therewith, including reasonable attorneys' fees.

12.07 Effect of Final Payment. The Contractor's acceptance of final payment constitutes a waiver of all claims against the Owner in connection with the Project, except for the Contractor's claim to the Correction Retainage, if any, when due. No payment, final or otherwise, shall operate to release the Contractor, or its Surety, from any obligations under the Contract.

### **PART 13 - PROTECTION OF PERSONS AND PROPERTY**

13.01 Safety Program. The Contractor shall be responsible for instituting, maintaining and supervising prudent safety procedures, as well as for complying with all safety laws, regulations, ordinances and other directives of jurisdictional authorities in order to prevent injury, damage or loss to:

- A. All employees involved in performance of the Work;

- B. All students, teachers, administrative personnel, and employees, and other persons in proximity to, or otherwise affected by the Work;
  - C. The Work, materials and equipment to be incorporated therein, whether in storage on or off the Site;
  - D. Property at the Site or in proximity to the Work and which is designated to be maintain by the Contractor;
  - E. Property that is located on-site or in proximity to the Work and is designated to be altered, renovated or relocated by the Contractor.
- 13.02 Use of Explosives. The use of explosives shall be allowed only. (i) when necessary for the performance of the Work; (ii) when prior Notice is given to, and when the approval is received from, the Owner; and (iii) when conducted by qualified personnel in accordance with applicable safety laws and regulations.
- 13.03 Protection of Work. During performance of the Work and until final acceptance thereof, the Contractor shall be under an absolute obligation to protect the finished and unfinished Work against any damage, loss, or injury. The Contractor shall take proper precautions to protect the finished Work from loss or damage, pending completion and final acceptance of all Work included in the Contract. Such precautions shall not relieve the Contractor from any and all liability and responsibility for loss or damage to the Work occurring before final acceptance by the Owner. Such loss or damage shall be at the risk of and borne by the Contractor, whether arising from acts or omissions of the Contractor or others and whether or not covered by the Contractor's builder's risk insurance. In the event of any such loss or damage, the Contractor shall repair, replace, and make good the Work without extension of time. Therefore, the Contractor shall take special precautions throughout all its operations to guard against fire and shall reduce the amount of inflammable materials stored at the Site to the minimum amount consistent with the proper handling and storing of such materials.
- 13.04 Safety Representative. The Contractor shall select one or more on-site personnel whose duty shall be accident prevention. One such person shall be the Contractor's superintendent, unless otherwise designated by the Contractor in writing to the Owner and the Architect.
- 13.05 Structural Overload. The Contractor shall not structurally overload or permit any part of the Work to be overloaded so as to endanger its safety or the safety of others.

## **PART 14 - INSURANCE**

### 14.01 Contractor's Statutory and Legal Liability Insurance.

- A. 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 persons or organizations who may cause liability to be incurred by the Contractor or any Subcontractor in connection with the Work. Such coverage shall include the following:

1. Claims arising under workers' compensation, disability benefit, or other related benefits programs.
  2. Claims resulting from bodily injury, occupational illness or death of any employee performing the Work.
  3. Claims resulting from bodily injury, illness, disease, or death of any person in contact with the Work but who is not engaged as an employee.
  4. Claims arising under personal injury liability coverage for injury to any employee, which are directly or indirectly attributable to its 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 of such damage or destruction.
- B. During the Contract Period, the Contractor shall, at its own expense, purchase and maintain the following insurance in the minimum limits specified with companies properly licensed to do business in the Commonwealth of Virginia, rated not less than A-/VII by A.M. Best Company and satisfactory to Owner. The Contractor shall maintain and provide proof of General Liability and Umbrella Excess Liability insurance for at least one (1) year following completion of the project. The Owner, "The Fairfax County School Board, its members, officers, authorized representatives and employees", shall be designated on each policy as "The Fairfax County School Board" as an additional named insured except for workers' compensation where the correct certificate of insurance coverage shall be furnished.
1. Workers' Compensation including Occupational Disease and Employer's Liability Insurance.
    - a. Statutory. Amounts and coverage as required by District of Columbia, Maryland, and Virginia Workers' Compensation Law, including provision for voluntary D. C. benefits as required in labor union agreements, and including the "All States" endorsement.
    - b. 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

2. Commercial General Liability Insurance. Contractor shall provide coverage written on ISO occurrence form CG 00 01 10 01 (or a substitute form providing equivalent coverage) to include the following:
  - a. Contractual liability as required by the indemnification provision of Paragraph 5.11.
  - b. Personal injury liability, including offenses related to employment.
  - c. Coverage of explosion, collapse, or underground hazards.
  - d. Broad form property damage liability, including completed operations coverage.
  - e. Additional insured endorsement shall include coverage for Owner with respect to liability arising out of the completed operations of Contractor.
  - f. Additional Insured coverage shall apply as primary insurance and shall be non-contributory with respect to any other insurance or self-insurance programs afforded to Owner.
  - g. Status of the Owner as an insured shall not restrict coverage with respect to the escape of pollutants at or from a site owned or occupied by the Owner.
  - h. There shall be no endorsement or modification limiting the scope of coverage for liability arising from pollution.
  - i. Limits of Commercial General Liability Insurance.
    - (1) \$1,000,000 bodily injury and property damage per occurrence;
    - (2) \$1,000,000 personal injury and advertising injury per person;
    - (3) \$2,000,000 products/completed operations aggregate; and
    - (4) \$1,000,000 aggregate products and completed operations; and
    - (5) \$2,000,000 general aggregate, per project.

- ii. Business Auto Liability Insurance. (Includes owned, non-owned and hired vehicles.)
  - (1) Contractual liability coverage shall be included with respect to all auto rentals or lease agreements.
  - (2) Limits of \$1,000,000 combined bodily injury and property damage per accident.
- iii. Umbrella Excess Liability Insurance. Unless a different dollar limit is prescribed for this division of the Work in Section 01010, the lesser of \$5,000,000 or that amount which, when added to requirements of Paragraphs 14.01(B)(1), 14.01(B)(2), 14.01(B)(3) and 14.01(B)(4), total \$5,000,000. (For example, a \$4,000,000 umbrella in excess of the \$1,000,000 limits under the sections listed above shall meet the limits requirements of this paragraph). Coverage terms and conditions under the Umbrella Excess Liability Insurance policy shall be at least as broad as underlying coverages.
- i. The limits of liability of the insurance described in Paragraph 14.01(B) may be superseded if the limits prescribed by law are greater.
- j. 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.

#### 14.02 Property Insurance.

- A. The Contractor shall purchase and maintain property insurance upon the entire Work at the Site to the full insurance value thereof. This insurance shall include the interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Work, and shall insure against all risks of loss. Such insurance shall include, but not be limited to, coverage for the following:
  - 1. Loss by explosion of boilers during testing (any exclusion applicable to such loss shall be waived).
  - 2. Partial or complete occupancy by the Owner (any exclusion applicable to occupancy shall be removed).
  - 3. Loss without coinsurance penalty (coinsurance or similar "insurance to value" requirements shall be eliminated).

4. Coverage of property in transit and unscheduled locations sufficient in limits to adequately cover maximum anticipated values at risk.
5. Coverage of Contractor's labor, overhead and profit.

A copy of this policy of insurance shall be available upon written request by the Owner.

#### 14.03 Notice of Insurance.

- A. Proof of insurance, satisfactory to Owner, for each type of coverage listed herein shall be provided within 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 so obtained and approved by the Contractor and found to be in accordance with the requirements set forth herein. The Contractor certifies by commencement of the Work that its insurance and that of Subcontractors is in effect and meets the requirements set forth herein.

#### 14.04 Notice of Cancellation.

- A. All of the aforesaid insurance policies must be endorsed to provide that the insurance company shall give 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 set forth herein.

#### 14.05 Copies of Insurance Policies.

- A. Before commencing the Work, the Contractor shall cause its insurance carrier to provide the Owner with a certified copy of each policy that he and each of its Subcontractors shall carry in accordance herewith, together with receipted bills evidencing proof of premium payment.

#### 14.06 No Waiver.

- A. Nothing contained herein shall have effect or shall be deemed to effect a waiver of the Owner's sovereign immunity under law.

### **PART 15 - CONTRACT SECURITY**

#### 15.01 Contract Security.

- A. The Contractor shall execute and deliver to the Owner Performance and Payment Bonds on the forms provided herein, each in an amount equal to the Contract Sum. The Performance and Payment Bonds shall be executed by a



solvent and responsible surety company licensed to conduct business in the Commonwealth of Virginia, named in the current list of "Surety Companies Acceptable on Federal Bonds" as published in the Federal Register by the Audit Staff Bureau of Accounts, U.S. Treasury Department, and acceptable to the Owner. These bonds shall be issued and countersigned by a local authorized representative of such surety company who is a resident of the Commonwealth of Virginia, regularly commissioned and licensed in the Commonwealth and producing satisfactory evidence of the authority of the person or persons executing the bonds to execute them on behalf of the Surety. The Performance and Payment Bonds shall serve as security for the faithful performance of this Contract, and for the payment of all persons performing labor and furnishing materials and services in connection with this Contract. The premiums on the Performance and Payment Bonds shall be paid by the Contractor and shall be included in the Contract Sum.

- B. If at any time the Owner shall become dissatisfied with any Surety or Sureties upon the Performance and Payment Bonds, or if for any other reason such bond shall cease to be adequate security for the Contractor, the Contractor shall within five days after notification of such fact, substitute acceptable bonds in such form and sum and signed by such other sureties as may be satisfactory to the Owner. The premiums on such Bonds shall be paid by the Contractor and shall be included in the Contract Sum. No further partial payments shall be deemed due nor shall be made until the new sureties have qualified.
- C. The Contract Documents may require one or more of the Subcontractors to furnish payment and/or performance bonds.

## **PART 16 - UNCOVERING AND CORRECTION OF WORK**

### 16.01 Uncovering of Work.

- A. If a portion of the Work is covered contrary to the Architect's request or to the requirements contained in the Contract Documents, the Contractor shall, at its own expense and upon the written request of the Architect or Owner, uncover and replace such Work without an adjustment to the Contract Period.
- B. If a portion of the Work has been covered which the Architect has not specifically requested to observe prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be charged to the Owner. If such Work is not in accordance with the Contract Documents, the costs of uncovering and replacing such Work shall be deducted from amounts then or thereafter due the Contractor and, if such amounts are insufficient to cover such costs, then the Contractor shall pay any such deficiency promptly following written demand by the Owner.

### 16.02 Correction of Work.

- A. The Contractor shall promptly correct any Work which is defective or otherwise 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, including additional testing and inspections and compensation for the Architect's services and expenses made necessary thereby.
- B. The Contractor's obligation to correct defective or non-complying Work shall continue for a period of one (1) year 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. The Contractor shall correct the Work in accordance with Paragraph 16.02(A) promptly following receipt of a written request by the Owner.
- C. Nothing contained herein shall affect the Owner's right to correct nonconforming Work pursuant to Paragraph 12.05(D) hereof.

#### 16.03 Acceptance of Defective or Nonconforming Work.

The Owner reserves the right to accept any defective or noncomplying Work; provided, however, that in such event the Contract Sum shall be reduced by an appropriate and equitable amount to account for such defect or noncompliance. Such adjustment shall be effected whether or not final payment has been made pursuant to Paragraph 12.05 hereof.

### **PART 17 - CONTRACTOR'S DEFAULT & TERMINATION**

#### 17.01 Owner's Right and Notice.

- A. The parties agree that:
  - 1. if the Contractor fails to begin the Work when required to do so; or
  - 2. if, at any time during the progress of the Work, the Contractor is not prosecuting the Work with reasonable speed and diligence, or is delaying the Work unreasonably or unnecessarily; or
  - 3. if the force of workmen or the quality or quantity of material furnished is not sufficient to insure completion of the Work within the Contract Period and in strict accordance with the Contract Documents; or
  - 4. if the Contractor fails to make prompt payments to suppliers or to Subcontractors for Work performed in connection with the Contract; or
  - 5. if the Contractor fails to cooperate in good faith with the Owner and/or any Separate Contractor, or in any manner of substance fails to observe the provisions of this Contract; or

6. if any of the Work, machinery, or equipment is defective and is not replaced as herein provided;

then the Architect shall certify such fact or condition to the Owner and 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. In the event the Owner elects to declare the Contractor in default, the Owner shall notify the Contractor and its Sureties by written Notice describing the nature of the default and providing the Contractor a right to cure such default within three 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 correct or complete the Work, as set forth in Paragraph 17.03 hereof.

17.02 Contractor's Duty upon Default. Upon Notice from the Owner that he is in default hereunder, the Contractor shall discontinue all further operations in connection with the Work, or such specified part thereof, and shall immediately vacate the Site, or such specified part thereof, leaving untouched all plant, materials, equipment, tools, supplies and job site records, and shall cooperate fully with the Owner by providing the Owner with any keys or access devices used to gain entry to the Site.

17.03 Completion of Work after Default.

- A. If the Contractor defaults or neglects to perform the Work in accordance with the Contract Documents and fails within a three (3) day period after receipt of written Notice from the Owner to commence and continue correction of such default or neglect, the Owner may, without prejudice to the other rights the Owner may have, correct such defaults or deficiencies by such means and in such manner, by contract with or without public letting, or otherwise as it may deem advisable, utilizing for such purpose without additional cost to the Owner such of the Contractor's plant, materials, equipment, tools and supplies remaining on the Site, and also such Subcontractors as it may deem advisable and may take any or all of the following actions:
  1. delete part or parts of the Work from the Contract and contract to have it performed by others;
  2. supplement the Contractor's work force;
  3. withhold payments due the Contractor and use such payments to satisfy any claims for monies owed by the Contractor in connection with the Project, in accordance with Paragraph 12.03(B);
  4. replace or repair any defective Work, machinery or equipment;
  5. terminate the Contractor.

- B. The Contractor and his Sureties shall bear all costs associated with completing or correcting the Work, including without limitation, the cost of reletting, the amount of any liquidated damages, and any and all costs incurred in connection with the actions listed in this Paragraph 17.03. 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 its Surety shall pay to the Owner the amount of any deficiency.

17.04 Partial Default. In the event the Owner declares the Contractor in default in accordance with the provisions of Paragraph 17.01 hereof with respect to a portion of the Work, the Contractor shall discontinue such portion of the Work declared in default, shall continue performing the remainder of the Work in strict conformity with the terms of the Contract and shall not hinder or interfere with any other contractor or persons whom the Owner may engage to complete the Work for which the Contractor was declared in default. The costs of such completion shall be paid by the Contractor and its Sureties as provided in Paragraph 17.03(B).

17.05 Owner's Right to Terminate for Cause. The parties agree that:

- A. if legal proceedings have been instituted by others than the Owner in such manner as to interfere with the progress of the Work and to potentially subject the Owner to the peril of litigation or outside claims; or
- B. if the Contractor is adjudicated bankrupt or makes an assignment for the benefit of creditors; or
- C. if in any proceeding instituted by or against the Contractor, an order is made or entered granting an extension of the time of payment, composition, adjustment, modification, settlement or satisfaction of its debts or liabilities; or
- D. if a receiver or trustee is appointed for the Contractor or the Contractor's property; or
- E. if the Contract or any part hereof is sublet without the prior written consent of the Owner; or
- F. if the Contract or any rights, monies, or claims hereunder are assigned in whole or in part by the Contractor, otherwise than as herein specified; or
- G. if the Work to be done under this Contract is abandoned; or
- H. if the Contractor fails to cure any default declared pursuant to Paragraph 17.01 within the time period specified therefor;

then such fact or condition shall be certified by the Architect to the Owner and thereupon, without prejudice to any other rights or remedies the Owner may have, the

Owner shall have the right to terminate the Contract immediately upon written Notice to the Contractor.

If, after issuance of a Notice of termination of the Contract under the provisions of this Paragraph 17.05, it is determined for any reason that the Contractor was not in default under the provisions of Paragraph 17.05(A) through 17.05(H), or that cause for such termination otherwise did not exist under the provisions of Paragraph 17.05(A) through 17.05(H), 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 17.06 hereof; provided, however, that the Contractor in such event shall be deemed to have received seven days prior written Notice of termination. Any compensation thereupon owing to the Contractor under Paragraph 17.06 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.

- 17.06 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 days prior written Notice of termination to the Contractor. In such event, 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 10%; or (2) the pro rata percentage of completion based upon the Schedule of Values (as described in Paragraph 12.02) plus the actual cost of any labor, equipment or materials ordered in good faith which could not be canceled, less the salvage value thereof. Each subcontract shall contain a similar termination provision for the benefit of the Contractor and the Owner. The Contractor shall not be entitled to receive anticipated profits on unperformed portions of the Work or consequential damages. The Owner and its authorized representatives shall have the right in accordance with the provisions of Paragraph 9.05 to verify any amounts claimed by the Contractor to be due under this Paragraph.

## **PART 18 - MISCELLANEOUS SPECIAL CONDITIONS**

### 18.01 Laying Out Work.

- A. The Contractor shall, upon entering the Site of the Project for the purpose of commencing the Work, locate all general reference points and take all such action as is necessary to prevent their destruction; lay out the Work, except where otherwise required by Contract Documents, and be responsible for all lines, elevations, measurements of buildings, grading, paving, utilities and other Work executed by him under the Contract. The Contractor shall exercise proper and reasonable care in verifying figures shown on the Drawings before laying out the Work and will be held responsible for any error resulting from its failure to exercise such care.
- B. The Contractor shall establish permanent bench marks referenced to finish floor lines. Contractor shall employ a licensed surveyor who shall, after masonry

corners have been set, certify over its seal to the Owner that the building is located properly in relation to property lines and in accordance with Drawings.

18.02 Inspection and Approval of Site Improvements.

- A. On-site and off-site improvements shall conform to the County of Fairfax Design and Construction Standards.
- B. The Contractor shall notify the Owner's field representative three days prior to the beginning of all street or storm sewer work.
- C. All work shall be staked out by a certified surveyor and cut sheets shall be submitted to the Department of Public Works with a copy to the Owner's Field Representative.
- D. The Contractor shall perform the Work in such a manner as to prevent the washing of any soil, silt or debris onto adjacent properties and he shall be held responsible for any damage resulting from its failure to prevent the washing of such materials upon adjacent properties for a period of one year after final acceptance of the completed Work.

18.03 Partial Use or Occupancy. The Contractor shall permit the Owner to use and occupy any completed or partially completed portion or unit of the Project prior to final acceptance by the Owner.

The Owner's use and occupancy shall not constitute final acceptance of the Work and shall in no event relieve the Contractor of its obligation to maintain the insurance coverage described in Part 14 hereof.

18.04 Release of Bonds. The Surety providing the bonds in connection with the Project shall obtain a written release from the Owner prior to the expiration date of the bonds.

18.05 No Asbestos. No materials or equipment containing asbestos shall be utilized in the construction of the Project.

END OF SECTION

## SECTION 01010(C)

### SUMMARY OF WORK (RENOVATIONS)

#### PART 1 - GENERAL

1.01 RELATED DOCUMENTS: Drawings and general provisions of contract including General Conditions and other Division One through Division Sixteen Specifications Sections, apply to this section, with special attention to the following:

- A. Applicable Standards: Section 01091
- B. Temporary Utilities: Section 01510
- C. Construction Aids: Section 01520
- D. Barriers: Section 01530
- E. Temporary Controls: Section 01560
- F. Cleaning: Section 01710
- G. Selective Demolition: Section 02070

1.02 SCOPE OF WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of this Project is defined by the Contract Documents and includes, but is not limited to, the following:
  - a. Demolition of existing interior finishes and mechanical, electrical systems.
  - b. Installation of new wall partitions, doors and frames and dividing a single classroom into two separate classroom spaces. Interior finishes and furnishings as indicated.
  - c. New mechanical and electrical systems for both spaces.
- B. Normal operations shall be maintained during the course of the school year.

1.03 CONTRACT METHOD

- A. Construction of the Work under a single lump sum contract.

1.04 CONTRACTOR USE OF PREMISES

- A. Limit use of premises for Work and for construction operations.

1.05 CONTRACTOR'S DUTIES

- A. Except as specifically noted, provide and pay for:
  - 1. Labor, materials, and equipment.

2. Tools, construction equipment, and machinery.
  3. Water, heat, and utilities including electrical power required for construction.
  4. Other facilities and services necessary for proper execution and completion of work.
- B. Temporary Power and Lighting: Provide in accordance with Section 01510
- C. Pay legally required sales, consumer and use taxes.

1.06 COORDINATION

- A. Perform survey of existing site and building prior to commencing demolition work or other work affecting existing facilities.
- B. Coordinate performance of work with school principal and staff in order to minimize disruption of normal activities during school hours. Operations requiring access to the existing facility that would cause such disruption will be scheduled for evening hours, summer recess or school holidays. See phasing, paragraph 2.02.
- C. Coordinate the work for the various sections of Specifications to ensure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items installed later.
- D. Verify that the characteristics of elements of interrelated operating equipment are compatible; coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- E. Coordinate space requirements and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes,



ducts, and conduits, as closely as practicable; make runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

- F. In finished areas conceal pipes, ducts, and wiring in the construction. Coordinate locations of fixtures and outlets with finish elements.

#### 1.07 FIELD ENGINEERING

- A. Provide field engineering service; establish grades, lines, and levels, by use of recognized engineering survey practices.
- B. Control datum for survey is that established by Owner-provided survey. Locate and protect control and reference points.

#### 1.08 REFERENCE STANDARDS

- A. For Products specified by association or trade standards, comply with requirements of the standards, except when more rigid requirements are specified or required by applicable codes.
- B. The date of the standard is that which was in effect as of the Bid date, unless a specific date is indicated.
- C. Obtain copies of standards when required by Contract Documents. Maintain copy at job site during progress of the specific work. Refer to Section 01091, Applicable Standards.

### PART 2 - SCHEDULE OF COMPLETION

#### 2.01 CONSTRUCTION TIME

- A. The Work shall be substantially complete and certified by the Architect on or before 08/09/2024. The work shall be finally complete on or before 08/16/2024.

2.02 WORK SEQUENCE

- A. Construct work in accordance with Project Schedule established under Section 01310; coordinate the schedule and operations with the Owner's Representative. There shall be no shutdown of electricity, water, sanitary/storm sewers, or heat during the life of the project unless approved in writing by the Owner. The Contractor is responsible for providing temporary air conditioning or heating for those areas which are scheduled to be occupied for school use and the Contractor has demolished the existing air conditioning or heating system. Maintain minimum corridor temperature at 68°F during heating season.

Portion of Work	Date of Commencement of Work	Date of Substantial Completion
	06/12/2024	08/09/2024

- B. Commencement of each phase of work in existing classrooms shall not occur until sufficient materials and equipment are available for the particular phase, and sufficient numbers of workmen are available to execute the work in the time period indicated.
- C. Work Shifts: Where required by construction schedule and in order to ensure completion of work phases during the time periods indicated, the contractor shall operate two (2) separate, full time, work shifts per day, employing trades, skills and specialties including, but not limited to, the following:
  - 1. General labor
  - 2. Cleaning staff
  - 3. Special systems technicians
  - 4. Electrical
  - 5. Sprinkler
  - 6. Plumbing

7. HVAC
  8. The contractor may modify this list to include other trades, skills and specialties as necessary to comply with the construction phasing schedule.
- D. Where night shifts are in operation, the Contractor shall be allowed four (4) ten-hour night shifts per week, Monday through Thursday, during the school year. Friday nights and Saturday nights shall be available for school use during the school year.

### **PART 3 - USE OF PREMISES**

#### **3.01 CONTRACTOR'S USE OF PREMISES**

- A. Contractor shall coordinate use of premises under direction of Owner's Representative.
1. The Contractor shall maintain a drug free workplace for all his employees and subcontractors. The possession and/or use of drugs and alcohol are strictly forbidden on school property, and shall constitute grounds for immediate removal from the project site (Refer to Section 00700, General Conditions, 5.02C and 5.16).
  2. Smoking, use of improper language and fraternization by contractor's employees with students and staff are prohibited and shall constitute grounds for immediate removal from the project site (Refer to Section 00700, General Conditions, 5.02C).
- B. Contractor shall assume full responsibility for protection and safekeeping of Products under this Contract stored on the site.
- C. Contractor shall move any stored Products, under Contractor's control, which interfere with operations of the Owner.
- D. Contractor shall, at his option, obtain and pay for the use of additional storage or work areas needed for operations.
- E. Contractor shall limit his use of the existing building for work and for storage to allow for:
1. Owner Occupancy
  2. Public Use
- F. Contractor shall provide temporary toilet facilities for use by his employees and other workers associated with the project. Contractor shall provide and maintain enough toilets to comply with OSHA and ANSI standards: 20 or less workers

require 1 toilet, 20 or more require 1 toilet and 1 urinal per 40 workers, 200 or more require 1 toilet and 1 urinal per 50 workers. Toilets that are not maintained in a usable, sanitary condition shall not be considered "provided" or "available". The use of existing facilities is not permitted. Temporary toilets shall be located out of sight of the school building entrances and windows and away from staff and student travel paths. When site conditions do not allow for such placement, contractor shall provide and maintain a temporary privacy screen or other visual obstruction to prevent exposure of construction workers to staff or students. Privacy screen or other visual obstruction shall not impede the temporary toilet service vehicles from cleaning and maintenance operations, and shall not cause other inherent safety issues (e.g., uncapped rebar used as posts). Location of temporary toilets should be such that water runoff from cleaning operations do not contaminate student and staff travel paths. Final location to be approved by Owner.

- G. In order to work overtime, a minimum of five (5) workers, excluding foreman and superintendent, must be available and willing to work. No overtime shall be allowed if this minimum crew size cannot be guaranteed.

### 3.02 WORK IN, OR ADJACENT TO, EXISTING OR OCCUPIED AREAS

#### A. Integrity of Existing Facility

1. Conduct operations to maintain the existing building in a secure, weather tight condition.
2. Repair damage to existing structures, equipment and furnishings resulting from the Contractor's operations within the building and on the site.
3. Where corridor ceilings have been removed and sprinkler mains have been installed to serve renovated space or new additions, sprinkler heads shall be temporarily installed and activated in the upright position and shall remain in the upright position until the ceiling concealment inspection has occurred, and the finished ceilings in those corridors can be completed.

#### B. Safety and Integrity of Occupied Areas

1. Where corridors shall be maintained for occupant use, no construction materials shall be stored or stockpiled. No Construction materials shall be stored in a manner that restricts means of egress which are required be remain open for use by building occupants.
  - a. A minimum clear corridor width of 72" shall be maintained in all active corridors.
2. All existing emergency exit lights and fire alarms shall remain operational in occupied areas.

3. Means of egress for occupied areas shall be maintained with hard surfaced, non-slip walkways, ramps or other platforms. Use temporary handrails, barricades or canopies in accordance with Construction Phasing Plan requirements and requirements of Section 01520.
4. No work such as welding, soldering, or cutting, which is considered hazardous to the building occupants, shall take place in occupied areas during school operating hours.
5. Contractor shall take all necessary safety precautions to clearly delineate the construction areas with temporary barricades, dust partitions, and temporary construction fences as appropriate (See Section 01520, Construction Aids and Section 01530, Barriers).
6. Temporary partitions shall be dustproof partitions extending from floor to underside of deck. Doors through these partitions shall be lockable and self-closing.
7. Use temporary fencing to isolate on-site staging areas, storage yards and construction access ways. All temporary storage areas and construction trailers shall be enclosed with 6' high construction fences. Refer to 2.03, Temporary Enclosures, Section 01520.
8. No pneumatic, gas powered or other noise producing equipment, or other equipment powered by flammable fuels shall be allowed in occupied or renovation areas before or during normal school hours. Use of this equipment shall be permitted after normal school hours and weekends only. Comply with OSHA 1926.850.
  - a. Temporary heat shall be supplied by electric heaters only.
9. No hoisting shall be allowed over the school building during normal school hours or other times when the building is occupied for school related activities or other events.
10. Fire extinguishers are required in all construction areas. Comply with OSHA 1923.150.
11. Do not perform any work, including demolition, during normal school hours (or during times when school related activities or other events are being conducted) that could cause the fire alarm to be inadvertently activated. Do not perform any work during these times that could negatively impact operational sprinkler systems.
12. Roofing tanker trucks shall not be placed near windows and/or fresh air intakes of occupied areas. No roofing shall take place above occupied areas.

13. Where VAT (vinyl asbestos tile) and/or other asbestos containing materials (ACM) require removal prior to installation of new VCT flooring or where other work disturbs ACM, such removal shall be done under separate contract by Fairfax County Public Schools, except as noted in Section 02070 (See Section 02070, Selective Demolition).
14. All painting performed by spray application shall be done only when the building is unoccupied.
15. Do not locate masonry saws near any window or door opening or near a fresh air intake. Locate saws in fenced construction areas only.
16. Use of school supplies or school equipment by the Contractor is prohibited.
17. Where existing windows and/or doors are removed, and new replacement windows and/or doors are not available, the Contractor shall provide secure plywood coverings over the openings. No wall openings of any kind, no matter how small, shall be left uncovered after completion of a work shift.
18. No loud construction activities shall be allowed during school hours. Workers shall not operate radios, CD players, or "boom boxes" in the school building.

C. Scheduling and Operations

1. Schedule deliveries to avoid conflicts with morning student arrivals and afternoon student departures. Coordinate with the school to determine actual starting and ending times and approximate time periods for arrival and departure. No deliveries shall be allowed during these periods.
2. No work shall be allowed in corridors in occupied areas during school operating hours. Work such as cutting, demolition and patching, use of ladders and scaffolding, and presence of construction materials in these corridors between the hours of 6:00 AM and at least 30 minutes after scheduled release of students shall not be allowed.
3. Elementary Schools: No work shall be allowed in a corridor in an occupied area which is adjacent to, and provides access to, SACC (School-Aged Child Care) Rooms between the hours of 7:15 AM and 6:15 PM.
4. For each work phase, the Contractor shall remove and temporarily store all loose equipment (desks, chairs, bookcases furniture, etc.) and boxes within the rooms being renovated in an approved, designated location on the site. The school will be responsible for boxing and tagging all items prior to removal and storage. At the completion of the work phase, the Contractor shall move the stored items to their final location as directed

by the Owner's Field Representative. The Contractor can expect the following inventory as typical equipment for removal, storage and relocation, which includes but is not limited to:

a. Classrooms: Approximately 30 desks, 30 chairs, 1 teacher wardrobe unit, teacher desk and chair, 2 or more file cabinets and 2 or more bookcases.

5. Do not start demolition of occupied space until the materials required for renovation are on the project site. The list of materials includes: floor finishes and base, millwork (pencil sharpener blocks, map rack blocking, etc), paint, doors and hardware, windows and venetian blinds, ceilings, power and lighting, HVAC equipment and controls, clocks, sound system, fire alarm system, security system, intercommunications system, telecommunications system, and sprinkler system.
6. Do not install doors unless all hardware and vision panel glass for the doors is on the project site.
7. Contractor shall postpone or reschedule work to a later shift and/or weekends and holidays whenever such work would disrupt or interfere with student testing, such as SAT (Scholastic Aptitude Test) or SOL (Standards of Learning) tests. Contractor shall coordinate with school staff or Liaison for actual dates and times of testing.

F. Cleaning

1. Dust and mop corridors every morning before teachers arrive. Dust and mop any areas made dirty by construction operations on a daily basis.
2. Contractor shall immediately remove construction equipment and debris and clean any work zone located in an occupied area, once the work is completed or halted for a significant period of time.
3. Contractor shall provide consistent and frequent (daily) vacuuming to minimize and control dust levels in work areas (See Section 01710, Cleaning).

E. Systems Maintenance

1. Where the sequence of work requires work to be continuously performed in existing corridor ceiling spaces in occupied areas, tie all light fixtures at each corner of fixture to existing joists above, tie all smoke detection devices as close to structure as possible, and secure all security, intercommunications, telecommunications, and other active wiring which is not housed in conduit.
2. Do not remove existing wiring such as CATV, intercommunications, telecommunications, etc until the new wiring is in place and operational.

3. Prior to installation, Contractor shall obtain approval from Owner's Field Representative to run temporary wiring.
4. Inspect and change filters in HVAC equipment frequently during construction and prior to occupancy by Owner. Owner will not occupy any renovated area unless the entire HVAC system (including exhaust systems and automatic temperature controls) is operational.
5. All PRVs shall be fully operational at all times. Do not demolish any existing PRVs until replacement units are on site and new wiring is installed and ready for connection.

3.03 OWNER OCCUPANCY

- A. The Contractor shall schedule his operations for completion of portions of the Work, for the Owner's occupancy upon Substantial Completion of the entire Work.
- B. The Contractor agrees to permit the Owner to use and occupy a portion or unit of the project prior to formal acceptance of the total project by the Owner, provided the Owner:
  1. Secures written consent of the Contractor (except in the event in the opinion of the Architect, the Contractor is chargeable with unwarranted delay in final cleanup of punch list items or other contract requirements, the Owner may occupy without Contractor's consent);
  2. Secures endorsement from the insurance carrier and consent of the surety to permit occupancy of the building or use of the project during the remaining period of construction.
- C. Owner will occupy the premises during the normal 10-month school year for the conduct of his normal operations. Cooperate with Owner's Representative in all construction operations to minimize conflict and to facilitate continued owner usage.

**PART 4 - PRECAUTIONS AND SAFETY**

4.01 SPECIAL REQUIREMENTS

- A. Fire Protection: Provide and maintain an adequate number of hand fire extinguishers at convenient and appropriate locations during construction. Avoid all accumulations of flammable debris by removing rubbish promptly. Take all other precautions necessary to prevent fire. Supervise closely the storage of paint materials and other combustible products.
  1. Existing fire alarm and detection system must remain operable at all times during construction.



- B. Accident Prevention and Safety: Comply will all applicable laws, ordinances, rules, regulations and orders of governing authorities having jurisdiction for the safety of persons and property to protect them from damage, injury or loss. Erect and maintain, as required by conditions and progress of the work, all necessary safeguards for safety and protection, including fences, railings, barricades, lighting, posting of danger signs and other warnings against hazards. Where prevention of construction accidents is not regulated by code or ordinances, comply with AGC's "Manual of Accident Prevention in Construction." Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Project. All scaffolds shall be built in accordance with all requirements of local, state and Federal laws and regulations.
  
- C. Crisis Preparedness – “Shelter in Place”
  - 1. FCPS has developed a “Shelter in Place” procedure to protect students, teachers, administrative staff and construction workers in the event that a dangerous chemical or biological agent is released into the environment during occupied hours.
  - 2. Upon notification by Public Safety Officials, all individuals on school grounds shall be directed to move indoors. All windows and doors shall be closed and locked. All heating, ventilating and air conditioning systems shall be shut down.
  - 3. “Shelter in Place” emergencies are generally of short duration (several minutes to one or two hours). All individuals shall remain inside until Public Safety Officials have deemed that the area is safe.
  - 4. It is the General Contractor’s responsibility to familiarize his employees and subcontractors with the school’s “Shelter in Place” plans and procedures. Note that once an emergency has been declared, no workers, subcontractors or suppliers who may be in transit to the job site shall be allowed into the area until the emergency is over.
  
- D. ID Badges: The Owner shall supply identification badges which shall be worn by all tradesmen working on this project. No employees of the Contractor, subcontractors or sub-contractors, material suppliers or other persons associated with the project shall enter the existing school building or school property without an approved identification badge. Failure to comply with this requirement will be cause for immediate and permanent removal of the employee(s) in question from this and any other school building. Contractor shall maintain an identification badge log and record each badge number and to whom it was given and when.
  - 1. Badge shall be a minimum 2" x 3 1/2".
  - 2. Visible at all times.

3. Bright color (orange, lime green, etc.)
- E. See paragraph 3.02, this Section, for additional specific precautions or restrictions related to safety.

END OF SECTION

## SECTION 01040

### SUPERVISION AND COORDINATION

#### 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 01153: Change Order Procedures.
- B. Section 01340: Shop Drawings, Product Data and Samples.
- C. Section 01410: Testing Laboratory Services.
- D. Section 01720: Project Record Information.

##### 1.03 DESCRIPTION OF WORK

- A. This contract will require the Contractor to utilize two shifts for part or all of the project. The Contractor shall employ and pay for the services of two full time, qualified Project Superintendents (one for each shift) for the duration of the construction work.
- B. Qualifications of Project Manager and Project Superintendents:
  - 1. Experienced in field work of the type required for this Project.
  - 2. Submit name and address to Architect/Engineer.

##### 1.04 PROJECT MANAGER'S RESPONSIBILITIES

- A. Implement Change Order procedures in accordance with Section 01153.
- B. Assist Project Superintendent(s) with schedules, material deliveries and subcontractor coordination and scheduling.
- C. Participate in Progress Meetings

##### 1.05 PROJECT SUPERINTENDENT RESPONSIBILITIES

- A. Coordinate the work of the Contractor and the Subcontractors for the work of all trades.
- B. Coordinate the schedules of the Contractor, the Subcontractors and materials and equipment suppliers.
- C. Verify timely deliveries of products for installation by the trades.
- D. Verify that labor and materials are adequate to maintain schedules.

- E. Conduct conferences and maintain communications with Subcontractors, suppliers, and other concerned parties as necessary to:
  - 1. Maintain coordination and schedules.
  - 2. Resolve matters in dispute.
- F. Participate in Project Meetings.
- G. Report progress of work. Submit daily report to Owner's Representative listing number and type of work force and work in progress.
- H. Recommend needed changes in Schedules.
- I. Assist in compiling and assembling Project Record Information.
- J. Observe required testing. Maintain a record of tests including:
  - 1. Testing agency and name of inspector.
  - 2. Subcontractor.
  - 3. Manufacturer's representative present.
  - 4. Date and time of testing.
  - 5. Type of product or equipment.
  - 6. Type of test, and results.
  - 7. Retesting required.
- K. Verify that Subcontractors maintain accurate record documents.
- L. Attend all punch list inspections.

#### 1.06 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

- A. Prior to submittal, review for compliance with Contract Documents. Contractor shall stamp submittals approving them for materials, fit and coordination, prior to submission to Architect.
- B. Check field dimensions and clearance dimensions.
- C. Check relation to available space.
- D. Review the effect of any changes on the work of other contracts or trades.
- E. Check compatibility with equipment and work of other trades.

END OF SECTION

## SECTION 01045

### CUTTING AND PATCHING

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

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

##### 1.02 DESCRIPTION

- A. Contractor shall be responsible for all cutting, fitting, and patching, including attendant excavation and backfill, required to complete the work and to:
  - 1. Make its several parts fit together properly.
  - 2. Uncover portions of the Work to provide for installation of ill-timed work.
  - 3. Remove and replace defective work.
  - 4. Remove and replace work not conforming to requirements of Contract Documents.
  - 5. Remove samples of installed work as specified for testing.
  - 6. Provide routine penetration of non-structural surfaces for installation of piping and electrical conduit.
- B. Related Requirements in other parts of the project manual:
  - 1. Basic responsibilities of other parties: General Conditions Section 00700.

##### 1.03 RELATED WORK

- 1. Summary of Work: Section 01010.
- 2. Construction Aids: Section 01520
- 3. Barriers: Section 01530
- 4. Selective Demolition: Section 02070
- 5. Earthwork: Section 02200
- 6. Temporary Shoring: Section 02250

##### 1.04 SUBMITTALS

- A. Submit a written existing building survey to Architect and the Owner's Representative prior to any work being started.
- B. Submit a written request to Architect and the Owner's Representative well in advance of executing any cutting or alteration which affects:
  - 1. The work of the Owner or any separate contractor.
  - 2. The structural value or integrity of any element of the Project.
  - 3. The integrity or effectiveness of weather-exposed or moisture resistant elements or systems.
  - 4. The efficient, operational life, maintenance or safety of operational elements.
  - 5. The visual qualities of the sight-exposed elements.
- C. Submit a written notice to Architect and the Owner's Representative designating the date and the time the work will be uncovered.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

- A. Comply with specifications and standards for each specific product involved.

## **PART 3 - EXECUTION**

### **3.01 INSPECTION**

- A. General Contractor shall conduct an existing building survey with the Owners representative prior to any construction operations. A written report shall be made of existing project conditions, including elements subject to damage or to movement during cutting of patching.
- B. After uncovering work inspect the conditions affecting installation of products, or performance of the work.
- C. Report unsatisfactory or questionable conditions to the Architect and the Owner's Representative in writing; do not proceed with the work until the Architect and the Owner's Representative have provided further instructions.
- D. Verify that areas to be demolished are unoccupied and discontinued in use.
- E. Verify that all utilities within the area to be demolished have been cut off and capped.

- F. Do not commence work until conditions are acceptable to Architect and Owner's Representative.

### 3.02 PREPARATION

- A. Provide adequate temporary support as necessary to assure the structural value or integrity of the affected portion of the work.
- B. Provide devices and methods as necessary to protect other portions of the Project from damage.
- C. Provide protection from the elements for that portion of the Project which may be exposed by cutting and patching work, and maintain excavations free from water.
- D. Remove items scheduled to be salvaged for Owner, and place in designated storage area.

### 3.03 PERFORMANCE

- A. Execute cutting and demolition by methods that will prevent damage to other work, and will provide proper surfaces to receive installation of repairs.
- B. Execute excavating and backfilling by methods which will prevent settlement or damage to other work.
- C. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes.
- D. Restore work that has been cut or removed; install new products to provide completed work in accordance with requirements of Contract Documents.
- E. Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through walls, floors, roofs and other surfaces.
- F. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:
  - 1. For continuous surfaces, refinish to nearest intersection.
  - 2. For an assembly, refinish the entire unit.
- G. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools; do not use power-driven impact tools during school hours.
- H. Do not use power-driven impact tools in or near occupied areas during school hours (see Section 01010, Summary of Work).

END OF SECTION

## SECTION 01091

### APPLICABLE STANDARDS

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General Conditions and other Division 1 through Division 16 Specification Sections, apply to this Section.

##### 1.02 RELATED WORK

- A. Specific naming of codes or standards occurs in other sections of these specifications.

##### 1.03 DESCRIPTION

- A. Throughout the Contract Documents, reference is made to codes and standards which establish qualities and types of workmanship and materials, and which establish methods for testing and reporting on the pertinent characteristics.
- B. Where materials or workmanship are specified in the Contract Documents to meet or exceed the specifically named code or standard, it is the Contractor's responsibility to provide materials and workmanship which meet or exceed the specifically named code or standard.
  - 1. It is the Contractor's responsibility, when so required by the Contract Documents or by written request from the Architect, to provide all required proof that the materials or workmanship, or both, meet or exceed the requirements of the specifically named code or standard. Such proof shall be in the form requested in writing by the Architect, and generally will be required to be copies of a certified report of tests conducted by a testing agency approved for that purpose by the Architect.
- C. The most current adopted edition of the individual standards or test procedures, published by the associations establishing applicable standards, and referenced throughout the Contract Documents, shall apply. Exception: The edition of the VUSBC governing the Contract Documents shall be that edition which was in force for purposes of permit review and issuance by Fairfax County Department of Public Works and Environmental Services (DPWES).

##### 1.04 QUALITY ASSURANCE

- A. Familiarity with pertinent codes and standards: In procuring all items used in this Work, it is the Contractor's responsibility to verify the detailed requirements of the specifically named codes and standards and to verify that the items procured for use in this Work meet or exceed the specified requirements.
- B. Rejection of non-complying items: The Architect reserves the right to reject items incorporated into the Work which fail to meet the specified minimum requirements. The Architect further reserves the right, and without prejudice to other recourse the Architect may take, to accept non-complying items subject to



an adjustment in the Contract Amount as approved by the Architect and the Owner.

#### 1.05 APPLICABLE INDUSTRY AND CODE REFERENCE STANDARDS

A. Applicable standards listed in the Specifications include, but are not necessarily limited to, standards promulgated by the following agencies and organizations:

1. AAMA - American Architectural Manufacturers Association, 1827 Walden Office Square, Suite 550, Schaumburg, IL 60173-4268. 1-847-303-5664.
2. AASHTO - American Association of State Highway and Transportation Officials, 444 N. Capitol St., N.W., Suite 249, Washington, D.C. 20001. 1-202-624-5800.
3. ACI - American Concrete Institute, 38800 Country Club Drive, Farmington Hills, MI 48333-9094. 1-248-848-3700.
4. AGA - American Gas Association, 400 N. Capitol Street., N.W., Washington, D. C. 20001. 1-800-841-8430.
5. AISC - American Institute of Steel Construction, Inc., One East Wacker Drive, Suite 3100, Chicago, IL 60601-2001. 1-312—670-2400.
6. ICC/ANSI A117.1-2003 - American National Standards Institute, Inc. 25 West 43rd Street, Fourth Floor, New York, NY 10036. 1-212-642-4900.
7. ASTM - American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959. 1-610-832-9585.
8. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., (ASHRAE), 1791 Tullie Cir., N.E., Atlanta, GA 30329. 1-800-5-ASHRAE.
9. AWI - Architectural Woodwork Institute, 1952 Isaac Newton Square W., Reston, VA 20190. 1-703-733-0600.
10. AWS - American Welding Society, Inc., 550 N.W., Lejuene Road, Miami, FL 33126. 1-800-433-9353.
11. BIA - Brick Industry Association, 11490 Commerce Park Drive, #300, Reston, VA 22091-1525. 1-703-620-0010.
12. BHMA – Builder’s Hardware Manufacturers Association, 355 Lexington Ave., 17<sup>th</sup> Floor, New York, NY 10017. 1-212-297-2122.
13. CRI – Carpet and Rug Institute, 310 Holiday Ave., P.O. Box 2048, Dalton, GA 30722. 1-800-882-8846.

14. CRSI - Concrete Reinforcing Steel Institute, 933 North Plum Grove Road, Schaumburg, IL 60173-4758. 1-847-517-1200.
15. CS - Commercial Standard of NIST, U.S. Department of Commerce, Government Printing Office, Washington, D.C. 20402.
16. DHI – Door and Hardware Institute, 14150, Newbrook Dr., Suite 200, Chantilly, VA 20151-2223. 1-703-222-2410.
17. Glass Association of North America, 2945 S.W. Wanamaker Dr., Suite A, Topeka, KS 66614. 1-785-271-0208.
18. International Building Code, International Code Council, Inc., in cooperation with Building Officials and Code Administrators International, Inc., 4051 West Flossmoor Road, Country Club Hills, IL 60478-5795, 1-800-214-4321 (as incorporated into the Virginia USBC).
19. MFMA – Maple Flooring Manufacturers Association, 60 Revere Dr., Suite 500, Northbrook, IL 60062. 1-847-480-9138.
20. NAAMM - The National Association of Architectural Metal Manufacturers, 8 South Michigan Avenue, Suite 100, Chicago, IL 60603. 1-312-332-0405.
21. NCMA - National Concrete Masonry Association, 2302 Horse Pen Road, P.O. Box 781, Herndon, VA 20171-3499. 1-703-713-1900.
22. NEC - National Electrical Code (See NFPA).
23. NEMA - National Electrical Manufacturers Association, 660 White Plains Rd., Suite 600, Tarrytown, NY 10591. 1-914-524-8650.
24. NFPA - National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269. 1-800-344-3555.
25. NIST - National Institute of Standards and Technology, Office of Standards Service, 100 Bureau Dr., Gaithersburg, MD 20899. 1-301-975-2758.
26. NRCA - National Roofing Contractors Association, 10255 West Higgins Road, Suite 600, Rosemont, IL 60018-5607. 1-847-299-9070.
27. NSF - National Sanitation Foundation, 3475 Plymouth Road, Ann Arbor, MI 48105.
28. NTMA – National Terrazzo and Mosaic Association, 110 E. Market St., Suite 200A, Leesburg, VA 20176. 1-800-323-9736.
29. OSHA - Occupational Safety and Health Administration, US Dept. of Labor/OSHA, 200 Constitution Avenue, N.W., Washington, D.C. 20210. 1-202-693-1999.

30. PCA - Portland Cement Association, 5420 Old Orchard Road, Skokie, IL 60077-1083. 1-847-966-6200.
31. SMACNA - Sheet Metal and Air-Conditioning Contractors Association International, 4201 Lafayette Center Dr., Chantilly, VA 20151. 1-703-803-2980.
32. SDI - Steel Deck Institute, P.O. Box 25, Fox River Grove, IL 60021-0025. 1-847-458-4647.
33. SDI - Steel Door Institute, 30200 Detroit Road, Cleveland, OH 44145-1967. 1-440-899-0010.
34. SJI - Steel Joist Institute, 3127 10th Avenue, North, Myrtle Beach, South Carolina 29577-6760. 1-843-626-1995.
35. SSPC - Steel Structures Painting Council, 40 24<sup>th</sup> Street, 6<sup>th</sup> Floor, Pittsburgh, Pennsylvania 15222-4656. 1-412-281-2331.
36. TCA - Tile Council of America, Inc., 100 Clemson Research Boulevard, Anderson, SC 29625. 1-864-646-TILE.
37. UL - Underwriters Laboratories, Inc., 333 Pfingsten Road, Northbrook, Illinois 60062-2096. 1-877-854-3577.
38. VDOT - Virginia Department of Transportation, P.O. Box 256, 2400 Pine Forest Drive, Colonial Heights, Virginia 23834.
39. Federal Specs and Federal Standards - General Services Administration, Specification Section, Room 6654, 7th & D Streets S.W., Washington, D.C. 20407.
40. VUSBC - Virginia Uniform Statewide Building Code.
41. 2010 ADA Standards for Accessible Design. Department of Justice 800-514-0301
42. Fairfax County Special Inspections Program: Special Inspections: Implementation in Fairfax County – Current Edition (SIFC- Current Edition), as administered by the Fairfax County Critical Structures Section, Department of Public Works and Environmental Services.
43. Fairfax County “Public Facilities Manual” (PFM).
44. Commonwealth of Virginia, “Erosion and Sediment Control Handbook.”
45. VA CHPS-Virginia Collaborative for High Performance Schools, 2443 Fair Oaks Blvd. #259, Sacramento, CA 95825.

1.06 JOB SITE ACCESS

- A. The Contractor shall provide one (1) copy of all reference standards at the job site for review by the Architect and Owner's Representative.

END OF SECTION

## SECTION 01092

### APPLICABLE FCPS STANDARDS

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General Conditions and Division 1 through Division 16 Specification Sections, apply to this Section.

##### 1.02 RELATED WORK (including, but not limited to, the following)

- A. Section 08710: Finish Hardware
- B. Section 10100: Markerboards, and Tack boards
- C. Section 10800: Toilet Accessories
- D. Section 12302: Wood Casework
- E. Section 12304: Plastic Laminate Faced Casework and Fixtures
- F. Section 12360: Library Casework
- G. Section 15450/15451: Plumbing Fixtures and Trim
- H. Section 15900: Automatic Temperature Controls
- I. Division 16 Specification Sections
- J. 2010 ADA Standards for Accessible Design Department of Justice
- K. ICC/ANSI A117.1 –2009

##### 1.03 DESCRIPTION

- A. This section establishes the standard required mounting heights for the types of equipment and accessories normally associated with the scope of school construction. Contractor shall coordinate the standards listed herein with the Construction Drawings and other specifications sections of the construction documents to determine applicability of the standards to equipment and accessories specified for the work, and the suitability of mounting height dimensions to the building occupants, where more than one dimension is listed for a particular item or accessory.

##### 1.04 QUALITY ASSURANCE

- A. The Contractor shall be responsible for ensuring that the trades associated with the installation of the equipment and accessories referenced herein are familiar with these standards as they relate to the work of each trade.

##### 1.05 EQUIPMENT MOUNTING HEIGHTS

- A. Fairfax County Public Schools standard for equipment installation heights:

##### 1. **COUNTERTOPS:** (measured from finish floor to top or sink rim surface if provided)

- a. Grades PS, K, 1, 2, 3 = 24"
- b. Grades 4, 5, 6 = 27"

##### 2. **FIRE EXTINGUISHERS:** (Measured from floor to top of cabinet <4" deep)

- a. All Grades and Adults = 56"
3. **PENCIL SHARPENER BLOCKS:** (Measured from floor to top of 8" x 8" wood block)
- a. Grades PS,K,1,2,3 = 32"  
 b. Grades 4,5,6 = 38"  
 c. Grades 7,8,9,10,11,12 = 42"
4. **CORRIDOR TACK STRIPS:**
- a. (2) strips - 6'-8" A.F.F. and 4'-8" A.F.F.  
 b. Stop strips 36" from door/window frames  
 c. Maximum strip length 20'. Provide 5' break between strips.
5. **MARKERBOARDS & TACKBOARDS:** (Measured from floor to bottom of writing or tackable surface)
- a. Grades PS,K,1,2,3 = 32"  
 b. Grades 4,5,6 and other instructional spaces = 32"  
 c. Grades 7,8,9,10,11,12, and Adults = 36"
6. **DOOR HARDWARE:** (Measured from floor to centerline of hardware)
- a. Grades PS,K,1,2,3,4,5,6
- 1) Push Plates = 42"  
 2) Pull Handles = 42"  
 3) Levers = 36"  
 4) Panic Exit = 36" centerline of push bar  
 5) Deadlocks = 48" maximum
7. **CCMS SENSORS:** (Measured from floor to centerline of box)
- a. All Occupied Spaces = 5'-6" A.F.F.
8. **THERMOSTATS:** (Measured from floor to top of box)
- a. All Occupied spaces = 4'-0 A.F.F.
9. **CONV. RECEPTACLES:** (Measured from floor to bottom of box)
- a. General Areas = 1'-4" A.F.F.  
 b. Special Areas = As required/check with Owner
10. **CLOCK OUTLETS:**
- a. General Areas = 6" from ceiling to top of box  
 b. Special Areas = As required/check with Owner
11. **LIGHT SWITCHES:** (Measured from floor to top of box)

- a. All Areas = 4'-0" A.F.F.
12. **FIRE ALARM PULL SWITCHES:** (Measured from floor to top of box)
- a. All Areas = 4'-0" A.F.F.
13. **FIRE ALARM BELLS/HORNS:** (Measured from floor to top of box)
- a. All Areas = 6'-8" A.F.F.  
(or 6" below ceiling, whichever is lower)
14. **INTERCOM SPEAKERS:**
- a. General Areas = Flush with ceiling  
b. Special Areas = As required/check with Owner
15. **T. V. OUTLETS:** (Measured from floor to bottom of box)
- a. General Areas = 1'-4" A.F.F.  
b. TV/VCR Fixed = 1'-0" Below ceiling  
c. TV/VCR on Cart = 5'-0" A.F.F.  
d. Special Areas = As required/check with Owner
16. **TELECOMMUNICATIONS:**  
(Measured from floor to bottom of box) = 1'-4" A.F.F.
17. **SOUND SYSTEM CALL SWITCHES:**  
(Measured from floor to top of box) = 4'-0" A.F.F.
18. **SMOKE/HEAT DETECTOR:**
- a. General Areas = Ceiling  
b. Special Areas = As required/check with Owner
19. **WIRELESS ACCESS POINT:**
- a. Locate unit 1'-0" below ceiling. For ceiling heights 11'-0" A.F.F. or higher, mount unit at 10'-0" A.F.F.

END OF SECTION

## SECTION 01152

### APPLICATIONS FOR PAYMENT

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

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

##### 1.02 DESCRIPTION

- A. Submit Applications for Payment to Architect in accordance with the schedule established by Conditions of the Contract and Agreement Between Owner and Contractor.

##### 1.03 RELATED WORK

- A. Lump Sum Price: Agreement Between Owner and Contractor.
- B. Progress Payments, Retainages, and Final Payment. General Conditions, Section 00700.
- C. Construction Progress Schedules: Section 01310.
- D. Schedule of Values: Section 01370.
- E. Contract Close-out: Section 01700.

##### 1.04 FORMS

- A. Application for each progress payment shall be prepared using the standard Fairfax County Public Schools Forms (copy enclosed), which include the following:
  - 1. Requisition Form
  - 2. Stored Material Log
  - 3. Change Order Log
  - 4. Certification Form



## 1.05 PREPARATION OF APPLICATION FOR EACH PROGRESS PAYMENT

- A. Fill in required information, complete list of all component items of Work, fill in columns for all line items included in the Schedule of Values. Round all values off to the nearest dollar.
- B. Requisition Form: Describe each line item and list scheduled value, previous completed value, value of work for the current application, total value to date, and balance of uncompleted work. Calculate percentage of completion. Provide a total for all line items for each column.
- C. Stored Material Log: Describe all stored materials, listing previous value, received value for the application period, and installed value for the application period. List the total of these values (current value) for each item. Provide a total for all columns, less 10% retainage.
  1. The Contractor may bill for materials stored off the site with the following provisions:
    - a. Provide a copy of manufacturers invoice indicating nature of materials and amount of invoice.
    - b. Indicate location of materials stored.
    - c. Materials shall be marked to indicate that they are the property of Fairfax County Public Schools, and to indicate their destination.
    - d. Provide proof of sufficient insurance coverage to cover the value of the materials stored. The policy or certificate of insurance shall be in the name of Fairfax County Public Schools and must be submitted prior to the submission of the requisition. The Owner reserves the right to inspect the materials stored off the site prior to processing the requisition.
- D. Change Order Log: Identify and describe all Change Orders, Change Proposals and prepared Modification Requests. List total value, previous value, value for application period, total value to date, and balance of uncompleted work. Provide a total for all columns, less 5% retainage.
- E. Complete all items in item 1, "Analysis of Work Performed" on the certification form.
- F. Execute certification form with the signature of a duly authorized officer of the Contractor on all copies of the completed form.
- G. Submit 5 copies of the application for payment.

## 1.06 PROGRESS PAYMENTS

- A. The Owner will make a Progress Payment to the Contractor on the basis of a duly certified and approved estimate of the work performed during the preceding calendar month under this Contract, but to insure the proper performance of this contract, the Owner will retain five percent (5%) of the value of change orders and ten percent (10%) of the portion of the Contract Sum properly allocable to materials and equipment suitably stored at or off the site until final completion and acceptance of all work included in the Contract.

#### 1.07 PREPARATION OF APPLICATION FOR FINAL PAYMENT

- A. Fill in Application Form as specified for progress payments.
- B. Use continuation sheet for presenting the final statement of accounting as specified in Section 01700: Contract Close-out.

#### 1.08 SUBMITTAL PROCEDURE

- A. Submit Applications for Payment on a monthly basis or as stipulated in the Owner Contractor agreement.
- B. Submit for review and obtain certification signature of the School Board Inspector on all completed copies of the application. The Contractor shall provide supplementary information to facilitate review of application if requested.
- C. Upon review and certification by the School Board Inspector, submit all copies to the Architect. Upon review and certification by the architect, all copies shall be forwarded to the School Board representative.
- D. Upon review and certification by the School Board representative, the application shall be forwarded for payment.
- E. Upon rejection by any certifying party, the Contractor shall make corrections or adjustments required by the rejection, and shall be required to obtain certification of the corrected application by all parties.

END OF SECTION

CONTRACTOR LETTERHEAD

FAIRFAX COUNTY PUBLIC SCHOOLS REQUISITION

PROJECT:
DATE:
REQUISITION #

1. ANALYSIS OF WORK PERFORMED

Table with 4 columns: Item (A-H), Description, Percentage, and Value. Items include Total Cost of Work Performed to Date, Less Amount Retained, Net Amount Earned on Contract to Date, Materials Stored, Add or Deduct Change Orders, Total Amount Earned on Contract to Date, Less Previous Payments, and Balance Due This Payment.

2. CERTIFICATION OF CONTRACTOR

ACCORDING TO THE BEST OF MY KNOWLEDGE AND BELIEF, I CERTIFY THAT ALL ITEMS AND AMOUNTS SHOWN ON THE FACE OF THIS REQUISITION FOR PAYMENT ARE CORRECT; THAT ALL WORK HAS BEEN PERFORMED AND/OR MATERIAL SUPPLIED IN FULL ACCORDANCE WITH THE REQUIREMENTS OF THE REFERENCED CONTRACT, AND/OR DULY AUTHORIZED DEVIATIONS, SUBSTITUTIONS, ALTERATIONS, AND/OR ADDITIONS; THAT THE FOREGOING IS A TRUE AND CORRECT STATEMENT OF THE CONTRACT ACCOUNT UP TO AND INCLUDING THE LAST DAY OF THE PERIOD COVERED BY THIS REQUISITION; THAT NO PART OF THE "BALANCE DUE THIS PAYMENT" HAS BEEN RECEIVED AND THAT I WILL MAKE TIMELY PAYMENT FROM THESE PROCEEDS TO MY SUBCONTRACTORS AND/OR SUPPLIERS IN ACCORDANCE WITH MY CONTRACTUAL ARRANGEMENTS WITH THEM.

BY \_\_\_\_\_ CONTRACTOR \_\_\_\_\_ SIGNATURE OF AUTHORIZED REPRESENTATIVE
\_\_\_\_\_ 19 \_\_\_\_\_ TITLE \_\_\_\_\_

3. CERTIFICATION OF SCHOOL BOARD INSPECTOR

I CERTIFY THAT I HAVE CHECKED AND VERIFIED THE ABOVE AND FOREGOING REQUISITION FOR PAYMENT DURING MY REGULAR INSPECTION.

\_\_\_\_\_ SCHOOL BOARD INSPECTOR \_\_\_\_\_ DATE

4. CERTIFICATION OF ARCHITECT

I CERTIFY THAT I HAVE CHECKED AND VERIFIED THE ABOVE AND FOREGOING REQUISITION FOR PAYMENT; THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF IT IS A TRUE AND CORRECT STATEMENT OF WORK PERFORMED AND/OR MATERIAL SUPPLIED BY THE CONTRACTOR; THAT ALL WORK AND/OR MATERIAL INCLUDED IN THIS REQUISITION HAS BEEN INSPECTED BY ME AND/OR BY DULY AUTHORIZED REPRESENTATIVE OR ASSISTANTS AND THAT IT HAS BEEN PERFORMED AND/OR SUPPLIED IN FULL ACCORDANCE WITH REQUIREMENTS OF THE REFERENCED CONTRACT; AND THAT PAYMENT CLAIMED BY THE CONTRACTOR IS CORRECTLY COMPUTED ON THE BASIS OF WORK PERFORMED AND/OR MATERIAL SUPPLIED TO DATE.

SIGNED \_\_\_\_\_ ARCHITECT \_\_\_\_\_ DATE

5. PRE-PAYMENT CERTIFICATION BY FAIRFAX COUNTY SCHOOL BOARD

I CERTIFY THAT I HAVE CHECKED AND VERIFIED THIS REQUISITION AND THAT, TO THE BEST OF MY KNOWLEDGE AND BELIEF, IT IS A TRUE AND CORRECT STATEMENT OF WORK PERFORMED AND/OR MATERIAL SUPPLIED BY THE CONTRACTOR; THAT ALL WORK INCLUDED IN THIS ESTIMATE HAS BEEN INSPECTED AND THAT IT HAS BEEN PERFORMED AND OR SUPPLIED IN FULL ACCORDANCE WITH REQUIREMENTS OF THE CONTRACT.

FAIRFAX COUNTY SCHOOL BOARD

SIGNED \_\_\_\_\_ DATE

**FAIRFAX COUNTY PUBLIC SCHOOLS  
REQUISITION FORM**

**PROJECT:**  
**DATE:**  
**REQUISITION #:**

ITEM #	DESCRIPTION	SCHEDULED VALUE	PREVIOUS VALUE	VALUE THIS REPORT	TOTAL VALUE TO DATE	BALANCE TO COMPLETE	% COMPLETE
<b>TOTALS:</b>							





## SECTION 01153

### CHANGE ORDER PROCEDURES

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General Conditions and other Division 1 Specifications Section, apply to this Section.

##### 1.02 RELATED WORK

- A. Section 01152: Applications for Payment.
- B. Section 01370: Schedule of Values.

##### 1.03 WORK DESCRIPTION

- A. Promptly implement Change Order procedures:
  - 1. Provide full written data required to evaluate changes.
  - 2. Maintain detailed records for work done on a time-and-material/force account basis.
  - 3. Provide full documentation to Architect/Engineer on request.
- B. Contractor and Owner will designate in writing the person who is authorized to execute Change Orders.

##### 1.04 DEFINITIONS

- A. Change Order: See Section 00700, General Conditions.
- B. Proposed Modification: See Section 00700, General Conditions.

##### 1.05 PRELIMINARY PROCEDURES

- A. Owner or Architect/Engineer 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 Proposal Form.
    - b. Those mutually agreed upon between Owner and Contractor.
- B. Contractor may initiate changes by submitting a written notice to Architect/Engineer, 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 change in Contract Sum or Contract Time, as appropriate.
  6. 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.

#### 1.06 DOCUMENTATION OF PROPOSALS AND CLAIMS

- A. Support each quotation for a lump-sum proposal, and for each unit price which has not previously been established, with sufficient substantiating data to allow Owner and Architect/Engineer to evaluate the quotation.
1. Proposal 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 proposals in accordance with the following criteria:
1. The Contractor's proposal 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 proposals 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 proposal 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 proposal 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 proposal 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 RS Means 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 RSMeans database. 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 1.06B3 and 1.06B4. 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 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, acceleration, changes in sequence, delays, overtime, 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 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 proposal, 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 Field 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.
- D. Document requests for substitutions of Products as specified in Section 01600.

#### 1.07 PREPARATION OF CHANGE ORDERS

- A. Architect/Owner will prepare each Change Order. Three 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, enter the pertinent changes in Record Documents.

#### 1.08 CHANGE ORDER CONTENTS

- A. Contents of Change Orders will be based on, either:
  - 1. Architect/Engineer's proposed Modification and Contractor's responsive Proposal as mutually agreed between Owner and Contractor.
  - 2. Contractor's Proposal for a change as recommended by Architect/Engineer and as mutually agreed between Owner and Contractor.
- B. Owner and Architect/Engineer 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.

END OF SECTION

**SECTION 01200**  
**PROJECT MEETINGS**

**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. Summary of Work: Section 01010.
- B. Construction Progress Schedules: Section 01310.
- C. Shop Drawings, Product Data and Samples: Section 01340.
- D. Project Record Information: Section 01720.
- E. Operating and Maintenance Data: Section 01730.

1.03 DESCRIPTION OF WORK

- A. Architect/Owner will schedule and administer pre-construction meetings, periodic progress meetings and specially called meetings throughout the progress of the Work. Architect/Owner will:
  - 1. Preside at meetings.
  - 2. Record the minutes, including all significant proceedings and decisions.
  - 3. Distribute copies of minutes after each meeting to the Contractor, Owner's Office, and Owner's Representative.
- B. Representatives of Contractor, Subcontractors and suppliers attending the meeting shall be qualified and authorized to act on behalf of the entity each represents.
- C. Architect will attend meetings to ascertain that Work is being expedited consistent with Contract Documents and the construction schedules. Consulting Engineers will attend meetings when so directed by the Architect.

1.04 PRE-CONSTRUCTION MEETING

- A. Schedule immediately after date of Notice to Proceed.
- B. Location: A central site, convenient for all parties, as designated by the Owner.
- C. Attendance:

1. Owner's Representative.
  2. Architect/Engineers.
  3. Contractor's Superintendent.
  4. Major Subcontractors.
  5. Major Suppliers.
  6. Others as appropriate as determined by the Architect and Contractor.
- D. Suggested Agenda (including, but not limited to the following):
1. Distribution and discussion of:
    - a. List of major subcontractors and suppliers.
    - b. Projected Construction Schedules.
  2. Critical work sequencing:
    - a. Major equipment deliveries and priorities.
  3. Project Coordination.
    - a. Designation of responsible personnel.
  4. Procedures and processing of:
    - a. Field decisions.
    - b. Submittals.
    - c. Change Orders.
    - d. Applications for Payment.
  5. Adequacy of distribution of Contract Documents.
  6. Procedures for maintaining Record Information.
  7. Use of premises:
    - a. Office, work, and storage areas.
    - b. Owner's requirements.

8. Construction facilities, controls and construction aids.
9. Temporary utilities.
10. Safety and first aid procedures.
11. Security procedures.

#### 1.05 PROGRESS MEETINGS

- A. Schedule progress meetings every second week unless it is determined by Architect and Owner that additional meetings are necessary.
- B. Hold specially called meetings as required by progress of the work.
- C. Location of the meetings: The Project field office of the Contractor.
- D. Attendance:
  1. Architect and his professional consultants as needed.
  2. Subcontractors as appropriate. (Major and Active)
  3. Suppliers as appropriate. (Major and Active)
  4. Owner's Representatives
- E. Agenda of each progress meeting.
  1. Review and approval of minutes of previous meeting
  2. Safety Concerns
  3. School Coordination Issues
  4. Submittals
  5. Delivery Schedules
  6. Utility Coordination
  7. Field observations, problems, conflicts
  8. Outstanding RFI's, PM's, CO's
  9. Outstanding Punch Lists
  10. Uncorrected Deficiencies
  11. Status of DPWES, Fire Marshal, Health Inspections

12. Third Party Inspections and Certifications
13. Abatement Issues
14. Any other problems which might impact the schedule
15. Corrective measures and procedures to regain projected schedule
16. Previous two-week look-ahead review
17. Two-week look-ahead
18. Maintenance of quality standards and controls
19. Site Cleanliness
20. Security Issues
21. Project Closeout related items
22. Other pertinent business

END OF SECTION

## SECTION 01310

### CONSTRUCTION PROGRESS SCHEDULES

- 1.1 GENERAL. This section specifies requirements and procedures in preparing computerized schedules and reports for planning, coordinating, executing, and monitoring the progress of the Work. Work shall be scheduled using the Critical Path Method (CPM) type of network analysis. Scheduling software shall be Primavera Project Planner (P3, or most recent version for Microsoft Windows) or Microsoft Project Pro 2003 (such software to be referred to herein as the "Specified Software").

The Contractor shall employ a trained and experienced construction scheduling person knowledgeable in construction work sequencing, productivity, scheduling, and application of the Specified Software system. This person shall work together with the Contractor's management team and with the Architect and the Owner to deliver acceptable products outlined in this section.

- 1.2 SCHEDULING RESPONSIBILITIES.

1.2.1. Critical Path Method. The Construction Schedule shall be developed by means of a critical path method of scheduling and shall be used to monitor job progress. The Contractor shall be responsible for providing all information concerning the sequencing, logic and duration of all activities as well as providing the initial critical path method ("CPM") logic network diagram (in electronic and paper form) and tabular report data. Once the initial logic network diagram is accepted by the Architect and the Owner, the Contractor shall be responsible for providing monthly update information on logic, percentage completion, actual start and finish dates, and duration changes as requested by the Owner.

1.2.2. Large-Scale Plots; Posting of Schedule and Schedule Updates. The Contractor shall provide a large scale plot of the initial schedule and of any subsequent updated schedules. The schedules shall be posted in the progress meeting trailer and in the FCPS Representative's trailer at the Project Site.

1.2.3. Schedule Accuracy. The initial Construction Schedule and all update information shall be provided by the Contractor. This information shall constitute a representation of the best efforts of the Contractor and his subcontractors with regard to the manner in which they intend to accomplish the Work within the Contract Period. Similarly, all progress information to be provided by and through the Contractor shall constitute an accurate representation of his or his subcontractor's or supplier's actual performance. The Construction Schedule shall at all times remain an accurate reflection of the Contractor's actual or projected sequencing of Work. Once accepted by the Owner, adherence to the established Construction Schedule shall be obligatory upon the Contractor and his subcontractors for performance of the Work. The Owner shall have the right to require the Contractor to revise the Construction Schedule if in his judgment the schedule does not accurately reflect the actual prosecution of the Work, or the Contractor is in violation of any provisions of this section. The Contractor shall revise the Construction Schedule to meet the above criteria as often as is necessary during the performance of the Work without additional cost to the Owner.



### 1.3 SUBMITTALS.

- 1.3.1. Qualifications. The Contractor shall submit a statement of qualifications to perform computerized CPM scheduling. The submittal shall verify that either the Contractor has in-house capability qualified to use CPM technique and the Specified Software or that the Contractor has arranged for the services of a CPM consultant so qualified. In either event the statement shall identify the individual(s) who will perform the CPM scheduling. Capability shall be verified by description of construction projects on which the individual has successfully utilized computerized CPM scheduling and shall include at least two projects of similar nature, scope, and value, neither of which shall be less than one-half the Contract Sum for the Project. The statement shall also identify the contact persons for the referenced projects with current telephone and address information. Unless otherwise agreed in writing by the Owner, the Contractor shall assign the individual who will perform the scheduling to a full-time, onsite position.
- 1.3.2. 90-Day CPM Network Diagram. Within 14 days after issuance of the Notice to Proceed, the Contractor shall submit to the Architect six (6) prints of his proposed CPM network diagram (also in electronic form) and tabular reports for the first 90 days of the Work. This initial logic diagram shall be drawn as described herein and submitted on sheets 36 inches by 48 inches and shall include both procurement and construction activities. The schedule will be the subject of a schedule review meeting with the Contractor, the Architect, and the Owner within 14 days after its submission. The Contractor shall revise and resubmit the 90-day schedule until it is acceptable to the Owner.
- 1.3.3. Complete CPM Network Diagram. Within 60 days after issuance of the Notice to Proceed, the Contractor shall submit to the Architect six (6) sets of his proposed CPM logic diagram (also in electronic form) and tabular reports for the entire Contract duration and shall include both procurement and construction activities. The tabular reports shall include the following:
- a. Report of activities sorted by activity number. Activity numbers, where practical, shall correlate to the area numbers designated on the drawings.
  - b. Report of activities sorted by early start date and late start date.
  - c. Report of activities sorted by total float, as such term is defined below.
  - d. Report of activities sorted by responsibility code. Responsibility codes shall be established for the Contractor, Architect, Owner, Subcontractors, Suppliers, etc. These codes shall be identified in the network diagram.
  - e. A successor-predecessor report which shall identify the successor and predecessor activities for each activity and ties between schedule activities.
  - f. Report of resource loading.
  - g. Report of cost loading.
  - h. Cash flow curves, cumulative and per month sorted by early start dates.

- i. Activity codes, values, and coding dictionary.

The logic diagram shall be drawn as described herein and will be the subject of a schedule review meeting with the Contractor, the Architect, and the Owner within two weeks after its submission. If a review of the submitted CPM schedule indicates a work plan which will not result in completion of the Work within the Contract Period, it shall be the Contractor's responsibility to revise the CPM schedule as required by the Owner and resubmit it until it is acceptable.

The Contractor's failure to submit an acceptable CPM schedule may, without limitation and in the Owner's sole discretion, constitute cause for the withholding of any partial payment otherwise due under the Contract Documents. The accepted schedule will be designated the "original Construction Schedule".

Acceptance of the Contractor's proposed CPM schedule by the Owner will in no event constitute its representation that the Work can be completed as indicated on such schedule.

- 1.3.4. Submittal Schedule. In addition to the above scheduling requirements, the Contractor shall submit a complete separate and independent schedule and detailed listing of anticipated submittals during the Contract Period. The submittal schedule shall be submitted within 30 days after Notice to Proceed. The submittal schedule shall then be accepted or revised as required by the Owner within 10 working days after receipt, and the Contractor shall incorporate the dates and review durations into his complete CPM schedule.

The Contractor shall coordinate his submittals with those of his Subcontractors and suppliers. The anticipated submission due date for each submittal shall be indicated along with the date on which its return is required. For planning purposes, the Architect will return shop drawings within 10 working days after receipt. Whenever the review of a particular submittal is on the critical path, such submittal shall be clearly marked in red with the words "Critical Path" by the Contractor at the time of submission.

The Submittal Schedule, including a detailed listing of submittals, shall be revised and resubmitted each month for use as a tracking log.

- 1.3.5. Look Ahead Reports. The Contractor shall also submit two-week look ahead reports.

#### 1.4 NETWORK REQUIREMENTS.

- 1.4.1. Network Diagrams. The network diagram shall show the order and interdependence of activities and the sequence in which the Work is to be accomplished as planned by the Contractor. The purpose of the network analysis diagram is to show how the start of a given activity is dependent on the completion of preceding activities and how its completion restricts the start of succeeding activities. A time scaled precedence format shall be followed. The detailed network diagram shall be time scaled showing a continuous flow from left to right.

- 1.4.2. Schedule Activities Groupings. The schedule activities shall be organized into two major groups: procurement and construction.

Procurement activities shall include, but not be limited to, the following:

- a. Major submittal items.
- b. Review and acceptance of major submittal items.
- c. Fabrication and delivery of major submittal items.

Fabrication and delivery of the major submittal items shall be tied logically to the correct construction activity in the overall Construction Schedule.

Construction activities shall be physical work activities that describe how the job will be constructed.

- 1.4.3. Breakdown of Activities and Coding Structure. The Contractor shall breakdown the Work into activities with durations of no greater than 15 working days each, except for nonconstruction activities such as procurement of materials, delivery of equipment, and other activities which may require longer durations. To the extent feasible, activities related to a specific physical area of the Project shall be grouped on the network for ease of understanding and simplification. The selection and number of activities and coding of activities shall be subject to the review and acceptance by the Architect and Owner.

The coding shall follow the designation conventions of the facilities outlined on the drawings and in the specifications and shall include identification of Subcontractors, suppliers/vendors and fabricators, and other parties reporting to the Contractor.

Each activity on the network shall have indicated for it the following:

- a. A single duration, no longer than 15 working days which represents the single best estimate of the expected elapsed time considering the scope of work involved in the activity. Durations shall be expressed in days. Normal holidays and weather delays shall be included. One critical path shall be shown for the schedule.
- b. A unique activity identification (I.D.) number shall be assigned to each activity. The I.D. number may contain up to 10 alpha-numeric characters.
- c. A brief description of the activity shall be included. If this description is not definitive, a separate listing of each activity and a descriptive narrative may be required.
- d. Each activity (except for procurement activities) shall be cost loaded as specified herein to indicate the total estimated costs of the activity. No activity shall exceed \$50,000 except for an equipment item or other item approved by the Owner. Material costs shall be assigned to delivery activities.
- e. Each activity shall be manhour loaded with the estimated manhours to be expended on each activity.

1.4.4. Incomplete Schedules. Notwithstanding the network review by the Architect and/or the Owner, the failure to include on a network any element of the Work required for the performance of this Contract shall not excuse the Contractor from completing all Work required within the Contract Period.

1.4.5. Early Finish Schedules. A CPM schedule which shows a completion of any milestone or completion dates prior to the contractual completion date for that milestone or completion date may be accepted, but in no event shall be acceptable as a basis for a claim for delay against the Owner and Architect and any of their authorized representatives if the early completion date is not met by the Contractor.

## 1.5 COST LOADING.

1.5.1. Schedule of Values. Each activity on the Construction Schedule shall be allocated a dollar value in accordance with the provisions of this section. Each activity's assigned cost shall consist of labor, equipment, and materials costs, and a *pro rata* contribution to overhead and profit. The aggregate amount of all activity costs shall equal the Contract Sum. In submitting cost data, the Contractor certifies that it is not unbalanced and that the value assigned to each activity represents the Contractor's estimate of the actual costs of performing that activity.

The accepted schedule of values shall be deemed to represent a fair, reasonable, and equitable dollar cost allocation for each activity on the Contractor's construction schedule.

1.5.2. Documentation. If, in the opinion of the Architect and the Owner, the cost data do not meet the requirements for a balanced bid breakdown, the Contractor shall present documentation to the Architect substantiating any cost allocation on the cost data. Cost allocations shall be considered unbalanced if any activity on the construction schedule has been assigned, in the opinion of the Owner, a disproportionate allocation of direct costs, overhead, or profit.

## 1.6 PROGRESS OF THE WORK.

1.6.1. Start of Work. The Work shall be started in accordance with Article 11 of the General Conditions and the Notice to Proceed. The Work shall be executed with such progress as may be required to prevent delay to separate contractors or to the completion of the Project as a whole. The Work shall be executed at such times and in or on such parts of the site and with such forces, material, and equipment, as to assure completion of the Work within the Contract Period.

1.6.2. Delays to Critical Path. Whenever it becomes apparent that delays to the critical path have occurred (other than an unreasonable delay caused by the Owner) and that, as a result, the Work will not be completed within the Contract Period, the Contractor, at the direction of the Owner, shall take one or more of the following actions at no additional cost to the Owner:

- a. Increase construction and other manpower in such quantities and crafts as will substantially eliminate the backlog of Work.

- b. Increase the number of working hours per shift, shifts per day, or working days per week; the amount of construction equipment; the forms for concrete work; etc., or any combination of the foregoing to substantially eliminate the backlog of Work.
- c. Reschedule activities to achieve maximum practical concurrence of accomplishment of activities, and comply with the revised schedule.
- d. The Contractor shall submit to the Owner for review a written statement of the steps he intends to take to remove or arrest the delay to the schedule. The Contractor shall promptly provide such level of effort to bring the Work back on schedule. Should schedule delays persist, the Contractor's Surety may be asked to attend schedule update meetings.
- e. Failure of the Contractor to comply with the requirements herein shall subject him, without limitation and at the Owner's sole discretion, to withholding, in whole or in part, of payments otherwise due the Contractor for Work performed under the Contract. Any withholding of monies is not a penalty for noncompliance, but is an assurance for the Owner that funds will be available to implement these requirements should the Contractor fail to do so, since failure of the Contractor to comply with these requirements shall mean that the Contractor failed to prosecute the Work with such diligence as to ensure its completion within the Contract Period.

## 1.7 SCHEDULE DATES.

- 1.7.1. Changed Work. If the Contractor claims acceleration charges in a cost proposal, the Contractor shall document a sub-network in the schedule depicting the changed Work and its effect on other activities. This sub-network shall be tied to the main network with appropriate logic so that a true analysis of the critical path can be made in order to prove acceleration costs.
- 1.7.2. Extensions of Time. The Contract Period will be adjusted only for causes specified in the Contract Documents. In the event that the Contractor requests an extension of any Contract Period, he shall furnish such justification and supporting evidence as the Owner or Architect may deem necessary, and as provided for in the General Conditions for a determination as to whether the Contractor is entitled to an extension of time under the provisions of this Contract. The Owner will, after receipt of such justification and supporting evidence, make a determination in the manner specified in the General Conditions and will advise the Contractor in writing thereof. If the Owner finds that the Contractor is entitled to an extension of the Contract Period under the provisions of the Contract Documents, then the Owner's determination as to the total number of days of extension shall be based upon the current accepted and updated Construction Schedule and on all data relevant to the extension. Such data shall be included in an update of the Construction Schedule. The Contractor acknowledges and agrees that actual delays in activities which, according to the Construction Schedule do not affect any contract completion date shown by the critical path in the network, do not have any effect on the Contract completion dates, and therefore, will not entitle the Contractor to an extension of time or to any change in the Contract Period.

All information known to the Contractor at the time concerning the nature and extent of the delay shall be submitted in writing in accordance with the General Conditions. Within the time frame stated in the General Conditions but before the date of final payment under this Contract, all information as required above concerning the delay must be submitted to the Architect and to the Owner. No time extension will be granted for requests which are not submitted with the specified time limits.

1.7.3. Schedule Adjustment by Owner. From time to time it may be necessary for the Contract Schedule and completion time to be adjusted by the Owner to reflect the effects of job conditions, acts or omissions of other contractors not directly associated with the Contract, weather, technical difficulties, strikes, unavoidable delays on the part of the Owner or his representatives, and other unforeseeable conditions which may require schedule adjustments and/or extensions of the Contract Period. Under such conditions the Contractor shall reschedule the Work to reflect the changed conditions, and the Contractor shall revise his schedule accordingly. Time extensions affecting the Contract Period shall be granted by the Owner in writing. No additional compensation shall be made to the Contractor for such schedule changes. The Owner has the right to accelerate performance of the Work. The Contractor will be entitled additional compensation in the event that the Owner requires completion of the Project prior to the expiration of the Contract Period; provided that such acceleration is not required as a result of the fault or neglect of the Contractor.

1.7.4. Schedule Meetings. The Contractor shall participate in such periodic scheduling meetings, and shall furnish such periodic schedule updates, as may be required by the Owner in order to meet the needs of the Project, as such are determined by the Owner.

## 1.8 FLOAT.

1.8.1. Definition of Float. As employed in the Contract Documents, the terms “float” and “float time” shall be used interchangeably to mean 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 activities set forth on the Construction Schedule.

1.8.2. Ownership of Float. The Owner shall have and retain exclusive ownership of the float.

1.8.3. Float Time. The Contractor shall not be entitled to any adjustment to the Contract Period, the Construction Schedule, or the Contract Sum, or to any additional payment of any sort by reason of the loss of use of any float time. The Owner may initiate changes to the Work that absorb float time without obligation to adjust or extend the overall completion date or any intermediate completion dates set forth in the CPM network. Owner-initiated changes that affect the critical path on the CPM network shall be the sole grounds for extending (or shortening) the Contract Period. Contractor-initiated changes that encroach on the float time identified in the CPM network may be accomplished with the Owner’s prior approval. Such changes, however, shall give way to Owner-initiated changes competing for the same float time. Delays in the critical path that are not associated with proper requests for time extensions in accordance

with Part 11 of the General Conditions shall be deemed to be the responsibility of the Contractor.

END OF SECTION

## SECTION 01340

### SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract, including General Conditions and other Division 1 through Division 16 Specifications apply to this Section, with special attention to the following:
1. Construction Progress Schedules: Section 01310.
  2. Respective Sections of the Specifications requiring submittals: Consult Division 15 and 16 for any additional requirements.
  3. The Fairfax County Special Inspections Manual/"Special Inspections: Implementation in Fairfax County" (Edition in force at time of project permit). Review and approval of fabrication and erection submittals as required by the Special Inspections Program.
  4. Fairfax County Public Schools Agreement between Owner and Architect, Paragraph 1(D).5.j: The Architect shall make available to the Contractor compact disks containing the floor plan backgrounds, reflected ceiling plans and building sections. These electronic files shall be used for preparing submittals which require equipment locations and systems layouts.

##### 1.02 DESCRIPTION OF WORK

- A. Submit shop drawings, product data and samples required by Contract Documents.

##### 1.03 SHOP SUBMITTALS

- A. Identify details by reference to sheet and detail numbers shown on Contract Drawings.
- B. Sheet size minimum: 8 1/2" x 11"; maximum: 30" x 42". All sheets in one submittal shall be of uniform size.
- C. Drawings: Submit one (1) set of electronic documents; one (1) electronic set shall be returned to the Contractor for reproduction and distribution. Contractor shall provide one (1) paper set of approved prints to the Owner. For submittals requiring special inspection review, provide additional sets as required by the special inspection manual.
- D. For submittals other than drawings, such as written specifications, maintenance instructions, calculations and catalog data which are capable of xerographic duplicating, provide one electronic copy. One (1) copy shall be returned to the



Contractor for duplication and distribution. Contractor shall provide one (1) printed copy to the Owner.

#### 1.04 PRODUCT DATA:

- A. Manufacturer's standard schematic drawings.
  - 1. Delete information not applicable to project.
  - 2. Provide additional information applicable to project.
- B. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data:
  - 1. Mark each copy to identify pertinent materials, products or models.
  - 2. Indicate dimensions and clearances required.
  - 3. Indicate performance characteristics and capacities.
  - 4. Indicate wiring diagrams and controls.

#### 1.05 SAMPLES

- A. Office samples shall be of sufficient size and quantity to clearly illustrate:
  - 1. Functional characteristics of product or material with integrally related parts and attachments devices.
  - 2. Full range of color samples.
- B. Field samples and mock-ups.
  - 1. Erect at project site at location acceptable to Architect.
  - 2. Construct each sample or mock-up complete.
- C. Provide a minimum of three (3) samples unless specified otherwise. Two (2) samples shall be retained by the Owner.

#### 1.06 SUBMITTALS REQUIRING JURISDICTIONAL APPROVAL

- A. Certain categories of submittals are required to be reviewed and approved by appropriate jurisdictional authority prior to incorporating into the Work. Make such submittals first to the Architect for review, then submit to the approving authority.
- B. Structural Submittals; to each drawing affix the seal and signature of a Professional Engineer licensed in the State of Virginia, including, without limitation:

1. Foundation piles and caissons, reinforced concrete framing systems, structural steel components and framing, steel roof trusses and girders, open-web steel joists, steel deck systems, steel stair railing and guardrail systems, steel ladders, cold-formed metal framing.

#### 1.07 SUBMITTALS FOR CHPS APPROVAL

1. Provide documentation from the manufacturer that the products meet or exceed the requirements of CHPS.

#### 1.08 CONTRACTOR RESPONSIBILITIES

- A. Review shop drawings, product data and samples prior to submission for conformance to contract requirements. Return non-conforming submittals to originator.

1. Contractor shall stamp each submittal with a stamp bearing the following information:

Approved for Construction  
Approved as Noted  
Submittal Deviates from Contract Requirements

Contractor

Date: \_\_\_\_\_

Review by: \_\_\_\_\_

Return by: \_\_\_\_\_

Spec. Section: \_\_\_\_\_

Submittal No.: \_\_\_\_\_

Indicate action taken of each submittal by checking appropriate box. If information on stamp is incomplete, submittal will be returned with no action taken.

- B. Verify:
  1. Floor Plan layouts provided by Architect on electronic media.
  2. Field measurements
  3. Field construction criteria
  4. Catalog numbers and similar data.
- C. Coordinate each submittal with requirements of work and of Contract Documents.
- D. Contractor's responsibility for errors and omissions in submittals is not relieved by Architect's review of submittals.

- E. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved by Architect's review of submittals, unless Architect gives written acceptance of specific deviations.
- F. At time of submission, note deviations in submittals from requirements of Contract Documents.
- G. Begin no work which requires submittals unless such submittals have been returned with Architect's stamp and initials or signatures indicating review.
- H. Distribute copies of submittals to parties concerned.

#### 1.09 SUBMISSION REQUIREMENTS

- A. Schedule submissions for receipt by the architect from the date of Notice to Proceed (NTP) as follows:
  - 1. Finish materials and packaged or prefabricated equipment: Maximum of 45 calendar days from NTP.
  - 2. Designed systems (such as, but not limited to, casework, control systems, fire protection special systems window and curtain wall systems): Maximum of 90 calendar days from NTP.
  - 3. Liquidated damages: Liquidated damages shall be assessed for each consecutive calendar day beyond the maximum time periods indicated above. Refer to Section 01010, summary of work.
- B. Shop Drawings: Submit the required number of prints of each Drawing, including fabrication, erection, layout, and setting drawings until final acceptance is obtained.
- C. Product Data: Submit copies of manufacturer's descriptive data for materials, equipment and fixtures, including catalog sheets, showing dimensions, performance characteristics and capacities; wiring diagrams and controls; schedules; and other pertinent information as required. Indicate compliance with applicable referenced quality standards.
- D. Samples: Submit samples specified in product specification sections.
  - 1. Provide full range for color, texture or pattern selection.
  - 2. Samples shall be marked, tagged, or otherwise identified with name of Contractor, name of project, purpose for which samples are submitted, and date, and be accompanied by letter of transmittal containing similar information, together with specification paragraph number for identification of each item.
- E. Submittals shall include:

1. Date and revision dates.
2. Project title and number \_\_\_\_\_.
3. The names of:
  - a. Architect
  - b. Contractor
  - c. Subcontractor
  - d. Supplier
  - e. Manufacturer
  - f. Separate detailer when pertinent.
4. Identification of product or material.
5. Relation to adjacent materials.
6. Field dimensions, clearly identified as such.
7. Specification section number.
8. Applicable standards, such as ASTM number or Federal Specification.
9. Space for Architect's stamp. (3" x 5" min.)
10. Identification of deviations from Contract Documents.

#### 1.10 RESUBMISSION REQUIREMENTS

##### A. Shop Drawings

1. Revise drawings in accordance with review comments and resubmit as specified for initial submittal.
2. Indicate changes that have been made. Indicate resubmittal status by adding "R" after the original submittal number.

##### B. Project Data and Samples: Submit new data and samples as specified for initial submittal.

#### 1.11 ARCHITECT'S DUTIES

##### A. Review for:

1. Design concept of project.
2. Information given in Contract Documents.
3. Review consultants' shop drawings for coordination with Contract Documents.

- B. Review of separate item does not constitute review of an assembly in which item functions.
- C. Affix stamp and initials or signature certifying to review of submittal.
- D. Return submittals to Contractor for reproduction and distribution.

END OF SECTION

## SECTION 01370

### SCHEDULE OF VALUES

#### 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 this Section, with special attention to the following:
  - 1. Allowances: Section 01020
  - 2. Application for Payment: Section 01152

##### 1.02 DESCRIPTION OF WORK

- A. Submit to the Architect a Schedule of Values allocated to the various portions for the Work within ten days after award of Contract.
- B. Upon request of the Architect, support the values with data substantiating their correctness.
- C. The Schedule of Values, unless objected to by the Architect, shall be used only as the basis for the Contractor's Applications for Payment.

##### 1.03 FORM AND CONTENT OF SCHEDULE OF VALUES

- A. The form for the Schedule of Values shall be the Fairfax County School Board's "Schedule of Amounts for Contract Payments" and will be obtained from the School Board's Office of Design and Construction. The form shall be completed in detail including quantities and unit costs.
- B. Identify Schedule with:
  - 1. Complete title of Project and location.
  - 2. Name of Architect and Architect's Commission Number.
  - 3. Name and address of Contractor.
  - 4. Date of Submission.
- C. Organize the Content of Schedule into columns with headings as follows:
  - 1. Item No. (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).
- D. Column numbers above are identical to Requisition for Payment column numbers.
- E. Information in Schedule of Values shall be incorporated into proper and identical lines and columns of all Requisitions for Payment, and shall serve as a basis for computing Progress Payments during construction.
- F. All line items shall be separated into all sub-values of major products and all information for all sub-values shall be as outlined above.
- G. Each item shall include a directly proportional amount of the Contractor's overhead and profit.
- H. The sum of all values listed in the Schedule shall equal the total Contract Sum.

#### 1.04 SUBMITTALS

- A. Submit six (6) copies for review by the Architect and Owner immediately after the Notice to Proceed. The Architect and Owner shall review and approve, or require modifications of the submittal. If modifications are required, make corrections and resubmit.

END OF SECTION

**SECTION 01400**  
**QUALITY CONTROL**

**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. Additional Requirements of all parties to the Contract: General Conditions, Section 00700.
- B. Summary of Work: Section 01010.
- C. Supervision and Coordination: Section 01040.
- D. Construction Progress Schedules: Section 01310.
- E. Shop Drawings, Product Data and Samples: Section 01340.
- F. Testing Laboratory Services: Section 01410.
- G. Materials and Equipment: Section 01600.

1.03 REFERENCE STANDARD

- A. ASTM E329-77 (1983) Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as used in construction.

1.04 QUALITY CONTROL

- A. The Owner, with the cooperation of the Contractor, shall maintain an adequate inspection system and perform such inspections and tests as will assure that the work performed under the Contract conforms to the Contract Documents and shall maintain and make available to the Architect adequate records of such inspections and tests.

1.05 DEFINITIONS

- A. Factory Tests: Tests made on various products and component parts prior to shipment to the job site, including but not limited to such items as transformer, boilers, air conditioning equipment, electrical equipment, and precast concrete.
- B. Field Tests: Tests or analysis made at, or in the vicinity of the job site in connection with the actual construction.



- C. Product: A type or category of manufactured goods, constructions and installations, or their associated services.
- D. Testing Laboratory: An individual or firm whose function includes testing, analyzing or inspecting "products."
- E. Certified Test Reports: Reports are reports of tests signed by a qualified professional attesting that tests were performed in accordance with the test method specified, that the test results reported are accurate, and that items tested either meet or fail to meet the stated minimum requirements. These test reports include those performed by Factory Mutual, Underwriters Laboratories, Inc., and others.
- F. Certified Inspection Reports: Those signed by approved inspectors attesting at the items inspected meet the specification requirements other than any exception included in the report.
- G. Manufacturer's Certificate of Conformance or Compliance: A certificate signed by an authorized manufacturer's official attesting that the material or equipment delivered meets the specifications requirements.

#### 1.06 SUBMITTALS

- A. Submittals shall be prepared in accordance with the General Requirements and submitted to the Owner for approval. Each submittal shall be accompanied with a cover letter signed by the Lab. Each item proposed to be incorporated into the Contract shall be clearly marked and identified in the submittals, and shall be cross-referenced to the Contract Drawings and Specifications so as to identify clearly the use for which it is intended.
- B. Submit the number required by the Contractor plus four (4) copies for the Architect.
- C. Certified Test Reports: Before delivery of materials and equipment, certified copies of the reports of all tests listed in the technical sections shall be submitted and approved. The testing shall have been performed in a laboratory meeting the requirements specified herein. Unless otherwise specified the tests shall have been performed within three years of submittal of the reports for approval. Test reports shall be accompanied by the certificate from the manufacturer certifying that the material and equipment proposed to be supplied is of the same type, quality, manufacturer, and make as that tested.
- D. Manufacturer's Certificates of Conformance or Compliance: Manufacturer's certification furnished by the Contractor on items of materials and equipment incorporated into the work will be accepted only when this method will assure full compliance with the provisions of the Contract, as determined by the Architect. Pre-printed certifications will not be acceptable. All certifications shall be in the original. The original of all manufacturer's certifications shall name the

appropriate item of equipment or material, specification, standard, or other document specified as controlling the quality of that item and shall have attached thereto certified copies of test data upon which the certifications are based. All certificates shall be signed by the manufacturer's official authorized to sign certificates of conformance or compliance.

- E. Laboratory Reports: Reports shall cite the contract requirements, the test or analysis procedures used, the actual test results, and include a statement that the item tested or analyzed conforms or fails to conform to the specification requirements. All test reports shall be signed by a representative of the testing laboratory authorized to sign certified test reports.

#### 1.07 QUALITY CONTROL REQUIREMENTS

- A. The Testing Laboratory shall inspect and test all work under the contract and maintain records of the inspections and tests. Approvals, except those required for field installations, field applications, and field tests, shall be obtained before delivery of materials and equipment to the project site.
- B. Factory Tests: Unless otherwise specified, the Contractor will arrange for factory tests when they are required under the Contract.
- C. Factory Inspection: Unless otherwise specified, the Contractor will arrange for factory inspection when required under the Contract.
- D. Field Inspections and Tests by the Owner: The Owner will provide and pay for all equipment, instruments, qualified personnel, and facilities necessary to inspect all work and perform all tests required by the Contract.
- E. Approval of Testing Laboratories: All laboratory work under this Contract shall be performed by a laboratory approved by the Owner. The basis of approval includes the following:
  - 1. Testing laboratories performing work not in connection with concrete, steel or bituminous materials shall comply with Sections 3 and 4 of ASTM E329.
- F. Repeated Tests and Inspections: The Owner will repeat tests and inspections after each correction made to non-conforming materials and workmanship until tests and inspections indicate that the materials, equipment, and workmanship conform to the Contract requirements. The retesting and reinspection shall be performed by the testing lab. The Contractor shall pay for any retesting and reinspection.

END OF SECTION

## SECTION 01410

### TESTING LABORATORY SERVICES

#### 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. Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities: Conditions of the Contract
- B. Certification of Products: The respective sections of Specifications.
- C. Testing, adjusting and balancing of equipment: The respective sections of Specifications.
- D. Laboratory tests required and standards for testing: Each Specification Section listed.

##### 1.03 DESCRIPTION OF WORK

- A. Owner will employ and pay for the services of an Independent Testing Laboratory to perform specified services and testing.
- B. Employment of the laboratory shall in no way relieve the Contractor's obligations to perform the Work of the Contract.

##### 1.04 SUBMITTALS

- A. Submit a copy of report of inspection of facilities made by Materials Reference Laboratory of National Institute of Standards and Technology (NIST) during the most recent tour of inspection, with memorandum of remedies of any deficiencies reported by the inspection.

##### 1.05 QUALIFICATION OF LABORATORY

- A. Authorized to operate in the Commonwealth of Virginia.

##### 1.06 TESTING EQUIPMENT

- A. Calibrated at reasonable intervals by devices of accuracy traceable to either:
  - 1. National Institute of Standards and Technology (NIST).
  - 2. Accepted values of natural physical constants.

## 1.07 LABORATORY DUTIES

- A. Cooperate with Architect and Contractor; provide qualified personnel after due notice.
- B. Perform specified inspections, sampling and testing of materials and methods of construction.
- C. Comply with specified standards.
- D. Ascertain compliance of materials with requirements of Contract Documents.
- E. Promptly notify Architect/Owner and Contractor of observed irregularities or deficiencies of work products.
- F. Promptly submit written report of each test and inspection; one copy each to Architect, Owner, Contractor and one copy to Record Documents File. Each report shall include:
  - 1. Date issued.
  - 2. Project title and number.
  - 3. Testing laboratory name, address and telephone number.
  - 4. Name and signature of laboratory inspector.
  - 5. Date and time of sampling or inspection.
  - 6. Record of temperature and weather conditions.
  - 7. Date of test.
  - 8. Identification of product and specification section.
  - 9. Location of sample or test in the Project.
  - 10. Type of inspection or test.
  - 11. Results of tests and compliance with Contract Documents.
  - 12. Interpretation of test results, when requested by Architect/Engineer.
  - 13. Employment of personnel making test samples.
  - 14. Perform additional tests as required by Architect/Engineer or the Owner.

## 1.08 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

- A. Laboratory is not authorized to:
  - 1. Release, revoke, alter or expand requirements of the Contract Documents.
  - 2. Approve or accept any portion of the Work.
  - 3. Perform any duties of the Contractor.

#### 1.09 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with laboratory personnel, provide access to Work, to Manufacturer's operations.
- B. Secure and deliver to the laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.
- C. Furnish copies of Products test reports as required.
- D. Furnish incidental labor and facilities.
- E. To provide access to Work to be tested.
- F. To obtain and handle samples at the Project site or at the source of the product to be tested.
- G. To facilitate inspections and tests.
- H. For storage and curing of test samples, provide a suitable storage box at the site.
- I. Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.
- J. When tests or inspections cannot be performed after such notice, reimburse Owner for laboratory personnel and travel expenses incurred due to Contractor's negligence.
- K. Make arrangements with laboratory and pay for additional samples and tests required for Contractor's convenience, including concrete design mixes.
- L. Pay for the services of the Independent Testing Laboratory to perform additional inspections, sampling and testing required when initial tests indicate that work does not comply with Contract Documents.

END OF SECTION

## SECTION 01505

### CONSTRUCTION WASTE MANAGEMENT

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract, including General Conditions and Division One Specification Sections, apply to the Work of this Section with special attention to the following:
  - 1. Section 01010, Summary of Work
  - 2. Section 01200, Project Meetings
  - 3. Section 01400, Quality Control
  - 4. Section 01560, Temporary Controls
  - 5. Section 01700, Contract Close Out

##### 1.02 RELATED WORK

- A. Section 02070, Selective Demolition – Recycling of Materials Resulting from selective demolition in Existing Building.

##### 1.03 REFERENCES

- A. Environmental Protection Agency, “Waste Wise” Program ([www.epa.gov/wastewise/](http://www.epa.gov/wastewise/))
- B. Institute of Scrap Recycling Industries, Inc., Washington, D.C. ([www.isri.org](http://www.isri.org))
- C. Triangle J Council of Governments, Research Triangle Park, NC, “Waste Spec” ([www.tjcog.dst.nc.us](http://www.tjcog.dst.nc.us))
  - 1. Appendix A: Preparing Estimates on Recycling
  - 2. Appendix D: Sample Waste Management Plan

##### 1.04 SUMMARY OF WORK

- A. The Contractor shall minimize the amount of non-hazardous construction waste disposal into landfills, and shall salvage as much non-hazardous construction waste as possible for shipment to recycling collection centers.
  - 1. Revenues or cost savings resulting from recovery of recycled construction waste materials shall accrue to the Contractor.
- B. Provide labor for material handling, provide storage enclosures and containers, signage, transportation and other resources required in order to implement the construction waste management operations described in this section. The Contractor shall maintain a clearly designated on-site collection area for the

temporary stock piling of construction waste designated to be recycled, separated from other non-recyclable materials that shall be disposed of legally.

1. Provide clearly identified enclosures, bins or labeled containers for each type of recyclable waste material to be temporarily stockpiled in the collection area. Include signage listing acceptable or unacceptable materials for each enclosure, bin or container.
2. Locate collection area convenient to work areas, but not in a location that will impede free flow of construction traffic, inhibit performance of construction activities or adversely affect school daily operations. Locate collection area to minimize interference with roads, streets, walkways, and other facilities adjacent to the project site.
3. Provide adequate vehicle access and working clearance for pick up of waste materials for delivery to recycling processing centers.

#### 1.05 QUALITY ASSURANCE

- A. The Contractor shall designate a full time, on-site representative to oversee compliance of subcontractors, and other personnel associated with the project, with the construction waste requirements of this Section.
- B. Within 30 days of the date of the Notice to Proceed, review construction waste management procedures with Owner's Representative. Include the following:
  1. A proposed list of construction waste materials to be recycled to meet a diversion percentage goal of a minimum of 50% of construction and demolition materials to be recycled.
  2. A proposed on site location for waste material collection area.
  3. A list of local or regional recycling processing centers and the type of materials that each center will accept. The list shall include name, address and telephone number of each center.
  4. A description of methods that shall be used for separating and storing construction waste materials, including types of containers and container labeling.

### PART 2 - PRODUCTS

#### 2.01 RECYCLABLE MATERIALS

- A. Construction waste materials designated for recycling include, but are not limited to, the following:
  1. General waste:

- a. Paper and beverage containers used by on-site construction staff and workers
2. Uncontaminated packaging and shipping materials:
  - a. Corrugated cardboard
  - b. Metal banding/strapping
  - c. Wood pallets
  - d. Packing shims
  - e. Paper wrappings
  - f. Wood crates
  - g. Polystyrene packing material
3. Construction metals:
  - a. Light gauge framing members (cutoffs)
  - b. Metal floor and roof decking (deck cutouts, etc.)
  - c. Plumbing/Mechanical piping
    - 1) Schedule 40 black steel
    - 2) Copper
    - 3) Ductile iron
    - 4) Cast iron
  - d. Electrical conduit
  - e. Concrete reinforcing steel
  - f. Sheet metal (ductwork, metal flashings)
  - g. Suspension wire
  - h. Miscellaneous structural framing steel (angles, channels, etc.)
4. Clean unfinished wood:
  - a. Dimensional lumber
  - b. Wood trim
  - c. Wood athletic and stage flooring
  - d. Wood sheet materials such as plywood
5. Clean, unfinished gypsum board
6. Other construction waste materials identified by Contractor that are capable of being recycled

### PART 3 - EXECUTION



### 3.01 IMPLEMENTATION AND PERFORMANCE

- A. The Contractor shall conduct a preconstruction meeting to familiarize subcontractors, fabricators, suppliers, and other personnel associated with the project, with the approved job site waste management procedures and requirements for recyclable materials. The contractor shall provide each meeting participant with a written copy of the procedures. Include discussion of the following:
1. Waste management procedures for each individual trade.
  2. Procedures for separation, handling and stockpiling of construction waste materials.
  3. Procedures for periodic waste collection and transport to recycling processing centers.
- B. The Contractor shall provide updates of ongoing waste management practices as a recurring agenda item during regular job progress meetings. Discussion shall include the following:
1. Types of construction waste materials currently being stockpiled on site.
  2. Verification that correct procedures for separation, handling, stockpiling and transporting are being followed.
  3. Verification that periodic and frequent collection and transport of materials to recycling collection centers is being maintained.

### 3.02 COLLECTION AREA

- A. On site collection area shall be established on site plan prior to bidding. Alternate sites may be established until the location has been approved by the Owner's Representative.

### 3.03 CONSTRUCTION WASTE MATERIAL HANDLING

- A. Place, grade and shape material stockpiles to shed surface water. Cover stockpiles where needed to avoid wind blown debris and dust. For stockpiled materials subject to deterioration from weather exposure, store above ground and provide cover.
- B. Waste management documentation:
- a. Compile weight tickets for all wastes removed from the site including recycled and salvaged materials to document diversion percentages achieved.

- b. Recycling summary: Recycle and waste data will be collected into a summary document for construction documentation.
- C. Periodically inspect enclosures, bins and containers for contamination and misplaced waste materials. Clean enclosures, bins and containers, and remove contaminated or inappropriate materials.
- D. Control the amount of temporarily stockpiled, recyclable waste materials by arranging frequent, periodic removal of materials to off-site collection centers, in order to avoid over-accumulation in the collection area. Remove and transport materials in a manner that will prevent spillage.
- E. Organize and store recycled waste materials in tight, dense bundles. Comply with special requirements of collection centers.
- F. Wood materials: Sort and stock dimensional materials according to size, type and length.
  - 1. Where possible, arrange for return of wood pallets to material or equipment suppliers and manufacturers. Otherwise, break down pallets into component pieces and sort by size and length.
  - 2. Crates: Break down into component pieces and sort by size and length.
- G. Structural Steel: Sort and stack structural steel members according to size, type of member, and length.
- H. Gypsum Board: Stack large, uncontaminated pieces on wood pallets and store under cover.
- I. Piping and conduit: Reduce tubular items to straight lengths and stockpile by type and size.
- J. Sheet metal and metal strapping: Flatten and fold to fit into containers.
- K. Cardboard packaging and boxes: Break down into flat sheets. Bundle and store above ground and under cover.
- L. Polystyrene packing material: Separate and bag.

### 3.04 FINAL CLEAN UP

- A. At project closeout, ensure that all recyclable construction waste materials have been removed and delivered to collection centers. Remove all enclosures and containers from the Project Site.
- B. Re-grade and re-establish all areas disturbed by recycling activities in accordance with the requirements of Division 2, Site Work, and the County approved Civil Drawings.

END OF SECTION

**SECTION 01510**  
**TEMPORARY UTILITIES**

**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, with special attention to the following:

- 1. Summary of Work: Section 01010.

1.02 DESCRIPTION OF WORK

- A. Furnish, install and maintain temporary utilities required for construction. Remove temporary utilities upon completion of work.

1.03 REQUIREMENTS OF REGULATORY AGENCIES

- A. Comply with National Electric Code.
- B. Comply with Federal, State and Local Codes and Regulations and with utility company requirements.

**PART 2 - PRODUCTS**

2.01 MATERIALS

- A. Materials may be new or used, but shall be adequate in capacity for the required usage, shall not create unsafe conditions, and shall not violate requirements of applicable codes and standards.

2.02 TEMPORARY ELECTRICITY AND LIGHTING (NEW WORK)

- A. Contractor shall provide electricity for construction use, by arranging with Virginia Power for temporary construction service, providing generators, or by any other methods or combinations there of deemed appropriate by the Contractor. All costs for service and for power used, shall be paid by the general contractor.
- B. Install circuit and branch wiring, with area distribution boxes located so that power and lighting is available throughout the construction by the use of construction type power cords.
- C. Provide adequate artificial lighting for all areas of work when natural light is not adequate for work, and for areas accessible to the public.

- D. After Owner occupies building and assumes payment of power charges, the Contractor shall be charged for electric power on a prorated basis for areas not yet turned over to Owner.

#### 2.03 TEMPORARY ELECTRICITY AND LIGHTING (ADDITIONS and ALTERATIONS)

- A. Make connections to existing service facilities in compliance with governing code, laws, and regulations.
- B. Owner will be responsible for paying power charges.
- C. Install circuit and branch wiring, with area distribution boxes located so that power and lighting is available throughout the construction by the use of construction type power cords. Use of propane heaters is only permitted at new additions and may not be used in renovation areas.
- D. Provide adequate artificial lighting for all areas of work when natural light is not adequate for work, and for areas accessible to the public.

#### 2.04 TEMPORARY HEAT AND VENTILATION

- A. Provide temporary heat and ventilation as needed to maintain adequate environmental conditions to facilitate progress of the Work, to meet specified minimum conditions for the installation of materials and to protect materials and finishes from damage due to temperature or humidity.
- B. Provide adequate forced ventilation of enclosed areas where curing of installed materials occurs, in order to disperse humidity and noxious odors and to prevent hazardous accumulations of dust, fumes, vapors or gases.
- C. Portable heaters shall be standard UL approved units complete with controls. Use of propane heaters is only permitted at new additions and may not be used in renovation areas.
- D. Pay all costs of installation, maintenance, operation and removal and for fuel consumed.
- E. No extension of time shall be allowed due to Contractor's failure to provide temporary heat.

#### 2.05 TEMPORARY TELEPHONE SERVICE

- A. Arrange with local telephone service company, provide direct line telephone service at the construction site for the use of personnel and employees.
  - 1. Pay all costs for installation, maintenance and removal, and service charges for local calls. Toll charges shall be paid by the party who placed the call.

#### 2.06 TEMPORARY WATER

- A. Provide temporary water required for construction process (new work);  
Or, make connections to existing facilities, provide water for construction purposes (additions & renewal work).
- B. Owner will pay costs of water used.

#### 2.07 TEMPORARY SANITARY FACILITIES

- A. Provide sanitary facilities in compliance with laws and regulations. See section 01010, Contractor Use of Premises.
- B. Service, clean and maintain facilities and enclosures.
- C. Provide one separate sanitary facility for the sole use of the Owners Representative, throughout the construction period.
- D. Use of school facilities by contractor's personnel is prohibited.

### **PART 3 - EXECUTION**

#### 3.01 GENERAL

- A. Comply with applicable requirements in Division 15 - Mechanical, and in Division 16 - Electrical.
- B. Maintain and operate systems to assure continuous service.
- C. Modify and extend systems as work progress requires.

#### 3.02 REMOVAL

- A. Completely remove temporary materials and equipment when their use is no longer required.
- B. Clean and repair damage caused by temporary installations or use of temporary facilities.
- C. Restore existing facilities used for temporary service to specified or original condition, fully operational.

END OF SECTION

**SECTION 01520**  
**CONSTRUCTION AIDS**

**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, with special attention to the following:
  - 1. Section 01010 "Summary of Work" (Safety precautions)
  - 2. Section 01530 "Barriers".

1.02 DESCRIPTION OF WORK

- A. Furnish, install and maintain required construction aids; remove upon completion of work.

1.03 REQUIREMENTS OF REGULATORY AGENCIES

- A. Comply with Federal, State and local codes and regulations.

**PART 2 - PRODUCTS**

2.01 MATERIALS

- A. Materials may be new or used, suitable for the intended purpose, but shall not violate requirements of applicable codes and standards.

2.02 CONSTRUCTION AIDS

- A. Provide construction aids and equipment as required by personnel and to facilitate the execution of the work; including scaffolds, staging, ladders, stairs, ramps, runways, platforms, railings, hoists, cranes, chutes and other such facilities and equipment.
- B. Refer to respective sections for particular requirements for each trade.
- C. Maintain all facilities and equipment in a first-class condition.

2.03 TEMPORARY ENCLOSURES

- A. Provide temporary enclosures to separate work areas from the areas of existing building occupied by Owner; to prevent penetration of dust, fumes, or moisture into occupied areas, to prevent damage to existing equipment, to protect Owner's occupants and operations from construction work, and to prevent entry of

unauthorized persons. Doors in the construction barrier between the additions / renovated areas shall be self-closing.

- B. Provide temporary exterior and interior doors and frames with self-closing hardware and padlocks. Springs utilized as closers shall not be permitted. Doors shall be solid core wood or hollow metal, and weather stripped. Provide temporary walk-off mats at each passable entrance between occupied and construction areas in order to minimize dust migration. Mats shall be carpet with non-skid backing. Mats shall be rotated and professionally cleaned on a regular basis, in a manner sufficient to maintain visual cleanliness and mitigate airborne dust in occupied spaces. Mats should be dissimilar to the school's own floor mats, in order to minimize confusion for custodial staff.
- C. Where work is phased, enclosures shall be removable as necessary for work being done in each phase. Other enclosures shall be removable as necessary for performance of work and handling of material.
- D. Enclosures shall be 3 5/8", 20 gauge minimum metal stud frames with 5/8" gypsum wallboard to meet two-hour rated construction. Frames shall extend from floor to underside of metal deck and shall completely seal off all necessary areas. On exterior enclosures, substitute 1/2" CDX plywood. Tape or otherwise seal panel joints in gypsum board and plywood. Where exterior enclosures form temporary means of egress, provide 1/2" gypsum sheathing. Insulate exterior enclosures with batt type insulation complying with the requirement of Section 07210, 2.01A.
  - 1. For temporary enclosures or exitways adjacent to work that is occurring overhead, provide structural roof construction that is adequate to protect building occupants using the enclosures or exitways.
  - 2. Secure sole plates of temporary enclosures to existing floors with construction adhesive.
- E. Exterior enclosures: Provide 6 feet high temporary chain link construction fencing to enclose construction work areas, material storage areas, and access ways. Fences shall be added or modified to enclose active work and storage areas as the project progresses. All chain link mesh panels shall be secured with clamps, wire ties shall not be permitted. Mesh shall be knuckled at the top and bottom, securely fastened to panel frames and shall be monitored for protruding wires. Barbed wire shall not be permitted.

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

- A. Consult with Architect, review site conditions and factors which affect construction procedures and construction aids, including adjacent properties and public facilities which may be affected by the execution of the Work.

## 3.02 GENERAL

- A. Relocate construction aids as required by progress of construction, by storage or work requirements, and to accommodate legitimate requirements of Owner and other contractors employed at the site.

## 3.03 REMOVAL

- A. Completely remove temporary materials, equipment and services:
  - 1. When construction needs can be met by use of permanent construction.
  - 2. At completion of the Project.
- B. Clean, and repair damage caused by installation or by use of temporary facilities.
- C. Grade areas of the site affected by temporary installations to required elevations and slopes, and clean the area.
- D. Restore existing and permanent facilities used for temporary purposes to specified or to original condition.

END OF SECTION



## **SECTION 01530**

### **BARRIERS**

#### **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 with special attention to the following:
  - 1. Summary of Work: Section 01010.
  - 2. Construction Aids, Enclosures: Section 01520.

##### **1.02 DESCRIPTION OF WORK**

- A. Furnish, install and maintain suitable barriers to prevent public entry, and to protect the Work, existing facilities, trees and plants from construction operations; remove when no longer needed or at completion of Work.
- B. Maintenance of Means of Egress
  - 1. The Contractor shall keep open and maintain all existing and temporary fire exits in the existing school during the course of construction.
  - 2. Provide alternate fire exits if necessary including barriers and signs as may be required by local fire official.
  - 3. Contractor shall coordinate and arrange with local fire officials to implement a plan for temporary exiting of existing school building should alternate fire exits be required.

##### **1.03 REQUIREMENTS OF REGULATORY AGENCIES**

- A. Comply with Federal, State, and local codes and regulations.

#### **PART 2 - PRODUCTS**

##### **2.01 BARRIERS**

- A. Materials shall be determined at Contractor's option, of type, size and quantity as appropriate to serve the required purpose.

**PART 3 - EXECUTION****3.01 TREE AND SHRUB PROTECTION**

- A. The Contractor shall preserve and protect all existing trees and shrubs on or adjacent to the site which have not been designated for removal or relocation. The Contractor shall be responsible for all unauthorized cutting or damaging of trees and shrubs, including damage due to careless operation of equipment materials stockpiles shall not be permitted within branch spread. All trees susceptible to possible damage by equipment shall be boxed with boards and wire to protect the trunk. Barricades shall be erected to prevent operation of heavy equipment within the drip lines of trees to remain.
- B. Interfering branches shall be removed without injury to the trunks. Care shall be taken by the Contractor in felling trees authorized for removal to avoid any unnecessary damage to trees and shrubs that are to remain in place. Any branches of trees broken during such operations shall be trimmed in accordance with recommended practice. The Contractor shall replace or restore at his own expense all trees and shrubs not protected as required herein that may be destroyed or damaged by construction operations.

**3.02 REMOVAL**

- A. Completely remove barricades, including foundations, when construction has progressed to the point that they are no longer needed and when approved by the Architect.
- B. Clean and repair damage caused by installation. Fill and grade the areas of the site to required elevations and slopes and clean the area.

END OF SECTION

## SECTION 01560

### TEMPORARY CONTROLS

#### 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, with special attention to the following:
  - 1. Construction Aids: Section 01520.
  - 2. Barriers: Section 01530.
  - 3. Cleaning: Section 01710.

##### 1.02 RELATED WORK

- A. Related requirements specified in Division 2: Site Work.

##### 1.03 DESCRIPTION OF WORK

- A. Contractor shall provide and pay for all controls required by Fairfax County Regulations for noise, dust, water, pest and rodent, debris, pollution, traffic and erosion whether indicated in the Contract Documents or not.
- B. All site controls and features shall be constructed and maintained in accordance with the latest edition of the Fairfax County Public Facilities Manual.

##### 1.04 OTHER REGULATIONS

- A. All regulations of the Fairfax County Department of Public Works and Environmental Services.

##### 1.05 OPEN BURNING

- A. Not Permitted

##### 1.06 EROSION CONTROL

- A. The Contractor shall perform the work in such a manner as to prevent the washing of any soil, silt, or debris onto adjacent properties, and shall be held responsible for any damage incurred for a period of one year after date of acceptance of the completed work. This includes construction of berms, siltation pond, collars on structures, etc., or any other device that might aid as a deterrent to erosion.
- B. The Contractor shall construct a siltation trap in natural ground at the base of all perimeter fill slopes. The siltation trap shall be 2 feet deep, 2 feet wide at the bottom with 2:1 side slopes. All excavated material shall be placed on the

downhill side of the construction to act as a berm. Minimum one-foot top berms shall be maintained at all times during the construction of perimeter fills.

- C. The Contractor agrees to hold the School Board or any of its agents harmless from any and all liability or damage that may arise out of a violation of the Siltation Ordinance and agrees to indemnify them against any loss.
- D. If at any time during the construction of this property silt goes offsite and if, when this occurs, the site plan and specifications for siltation and erosion control as approved by Fairfax County are not being complied with, then the Contractor shall pay to the Owner the sum of \$5,000 as liquidated damages.
- E. This provision for liquidated damages shall be a continuing one and for each and every occurrence there shall be paid to the Owner the sum of \$5,000 as liquidated damages.

#### 1.07 INSPECTION AND APPROVAL

- A. The County School Board of Fairfax County, Virginia, shall provide an inspector to represent it in the inspections of the work. The presence of this inspector shall in no way be construed by the Contractor as approval of methods or materials that do not conform to the requirements of this Contract.

#### 1.08 TRAFFIC CONTROL

- A. The Contractor shall maintain, at his expense, all boundary, adjacent and/or access roads, regardless of status, classification, or ownership, which he or his subcontractor uses, under permit or otherwise during the course of construction of this project. Maintenance shall be performed as needed to keep the road passable at all times, so as to guarantee that other users of the road can travel thereon with a minimum of inconvenience and interruption of normal routine.
- B. Contractor shall, at his expense, provide and maintain all traffic control devices, signals, barriers, flares, lights, flagmen, etc. required by law when his operations conflict with the movement of traffic, both vehicular and pedestrian, on dedicated streets and highways.

#### 1.09 PERMITS AND FEES

- A. Contractor shall obtain and pay for all permits and fees required for the performance of this Work.

END OF SECTION

## SECTION 01600

### MATERIAL AND EQUIPMENT

#### 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, with special attention to the following:
  - 1. Section 01340: Shop Drawings, Product Data and Samples: Submittal of manufacturers' certificates.
  - 2. Section 01700: Contract Closeout.

##### 1.02 WORKMANSHIP

- A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.
- B. Perform work by persons qualified to produce workmanship of specified quality.
- C. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

##### 1.03 MANUFACTURER'S INSTRUCTIONS

- A. When work is specified to comply with manufacturers' instructions, submit copies as specified in Section 01340, distribute copies to persons involved, and maintain one set in field office.
- B. Perform work in accordance with details of instructions and specified requirements. Should a conflict exist between Specifications and instructions, consult with Architect.

##### 1.04 DELIVERY AND HANDLING

- A. Transport Products by methods to avoid Product damage; deliver in undamaged condition in manufacturer's unopened containers or packaging, dry.
- B. Provide equipment and personnel to handle Products by methods to prevent soiling or damage.
- C. Promptly inspect shipments to ensure that Products comply with requirements, quantities are correct, and Products are undamaged.

##### 1.05 STORAGE AND PROTECTION

- A. Store Products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive Products with weather-tight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions.
- B. For exterior storage of fabricated Products, place on sloped supports above ground. Cover Products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.
- C. Store loose, granular materials on solid surfaces in a well-drained area; prevent mixing or contact with foreign matter.
- D. Arrange storage to provide access for inspection. Periodically inspect to assure that Products are undamaged, and are maintained under required conditions.
- E. After installation, provide coverings to protect Products from damage from traffic and construction operations, remove when no longer needed.

## **PART 2 - PRODUCTS**

- 2.01 Products include materials, equipment, and systems.
- 2.02 Comply with Specifications and referenced standards as minimum requirements.
- 2.03 Components required to be supplied in quantity within a Specification section shall be the same, and interchangeable.
- 2.04 No asbestos materials are permitted to be used in the construction of this project.

## **PART 3 - EXECUTION**

(Not used)

END OF SECTION

## SECTION 01630

### SUBSTITUTIONS AND PRODUCT OPTIONS

#### 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 CONTRACTOR'S OPTIONS

- A. For products specified only by referenced performance standards, select a product and manufacturer meeting all the required standards. After award of contract, evidence of conformance shall be submitted in accordance with Section 01340, Shop Drawings, Product Data and Samples.
- B. For products specified by naming a list of several products and manufacturers, select any product and manufacturer named on the list. Contractor may propose a directly comparable substitution to the specified items in accordance with the requirements of this section.
- C. Products specified by naming one product and manufacturer shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. Contractor may propose a directly comparable substitution to the specified item in accordance with the requirements of this Section.
- D. For products specified by naming one product and manufacturer followed by the phrase "No Substitution", there shall be no option. The contractor shall not be allowed to propose a substitution to the specified item.

##### 1.03 SUBSTITUTIONS

- A. Ten (10) days prior to receipt of bids, Architect will consider formal requests from Contractor for substitution of products; requests received less than 10 days prior to bid due date shall not be considered.
- B. Submit 4 copies of request for substitution. Include:
  - 1. Complete data substantiating compliance of proposed substitution with Contract Documents.
  - 2. For Products:
    - a. Product identification, manufacturer's name and address.

- b. Manufacturer's literature indicating product description, performance and test data, reference standards and range of manufacturers colors if item requires color selection.
  - c. Samples.
  - d. Name and address of similar projects on which product was used, dates of installation, responsible contacts, and telephone numbers.
3. Detailed description of proposed construction methods with drawing illustrating methods.
  4. Itemized comparison of proposed substitution with product(s) or method(s) specified.
  5. Data relating to changes in construction schedule.
  6. Relation to separate contracts (if applicable).
- C. Request for substitution represents that:
1. Contractor has personally investigated proposed product or method, and determined that it is equal or superior in all respects to that specified.
  2. Contractor will provide the same guarantee for substitution as for product or method specified.
  3. Contractor will coordinate installation of accepted substitution into work, making such changes as may be required for work to be complete.
  4. Contractor waives all claims for additional costs related to substitution that may arise subsequent to approval.
- D. Substitutions shall not be considered if:
1. Subsequent to award of contract, such items are indicated or implied on shop drawings or project data submittals, without formal substitution request submitted as specified in this Section.
  2. Acceptance will require substantial revision of Contract Documents.
  3. Acceptance will require additional contract time and will adversely affect construction schedule.
- E. Substitutions will be considered after the deadline only under the following conditions:
1. The specified product is no longer manufactured.



2. The specified product is not available due to a strike or catastrophic occurrence.

**PART 2 - PRODUCTS**

2.01 NOT APPLICABLE

**PART 3 - EXECUTION**

3.01 NOT APPLICABLE

END OF SECTION

## SECTION 01660

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

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

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

##### 1.02 RELATED WORK

- A. Division 15 Specifications: Section 15010, General Provisions.
- B. Division 15 Specifications: Section 15900, Automatic Temperature Controls.

##### 1.03 WORK DESCRIPTION

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

- B. Testing, Adjusting and Balancing

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

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

2. The balancing agency shall submit for review to the Fairfax County Public Schools Project Manager an acceptable procedure for performing the testing, adjusting, and balancing work within thirty (30) days after the agreement between the Fairfax County Public Schools and the Contractor has been signed. This procedure shall be forwarded to the Contractor for coordination of his installations within sixty (60) days after the agreement between the Fairfax County Public Schools and Contractor has been signed. A pre-conference testing, adjusting, and balancing meeting

including, but not limited to representatives of the Fairfax County Public Schools Project Manager, the Fairfax County On-Site Field Representative, the Contractor, the Sub-Contractors and the Architect/Engineer shall be conducted to review the procedure plan and schedule within ninety (90) days after the agreement between the Fairfax County Public Schools and Contractor has been signed.

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

C. Commissioning

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

a. Division 15000 (General)

- 1) In each purchase order or subcontract written, include requirements for submittal data, commissioning documentation, O&M data and training.
- 2) Attend commissioning scoping meeting and other meetings necessary to facilitate the commissioning process.
- 3) Provide the CA with normal cut sheets and shop drawing submittals of commissioned equipment.
- 4) Provide additional requested documentation, prior to normal O&M manual submittals, to the CA for development of start-up and functional testing procedures.
  - a) This is to include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any owner-contracted tests, fan and pump curves, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation, start-up and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the CA.
  - b) This contractor shall submit to the CA any additional requested documentation deemed necessary by the CA.

- 5) Provide a copy of the O&M manuals and submittals of commissioned equipment, through normal channels, to the CA for review and approval.
  - 6) Assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
  - 7) Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the prefunctional checklists from the CA for all commissioned equipment. Submit to CA for review and approval prior to start-up.
  - 8) During startup and initial checkout process, execute the mechanical-related portions of the prefunctional checklists for all commissioned equipment.
  - 9) Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CA.
  - 10) Address current A/E punchlist items before functional testing. Air and water TAB shall be completed with discrepancies and concerns remedied before functional testing of the respective air to water related items.
  - 11) Provide skilled technicians to perform functional performance testing under the direction of the CA. Assist the CA in interpreting the monitoring data, as necessary.
  - 12) Correct deficiencies (differences between specified and observed performance) as interpreted by the CA, CM and A/E and retest the equipment.
- b. Division 15000 (Automatic Temperature Controls)
- 1) Provide the following approved submittals to the Commissioning Authority;
    - a) Hardware and software submittals.
    - b) Control panel construction shop drawings.
    - c) Narrative description of each control sequence for each piece of equipment controlled
    - d) Diagrams showing all control points, sensor locations, point names, actuators, controllers and,

- where necessary, points of access, superimposed on diagrams of the physical equipment.
- e) Logic diagrams showing the logic flow of the system.
  - f) A list of all control points, including analog inputs, analog outputs, digital inputs, and digital outputs. Include the values of all parameters for each system point. Provide a separate list for each standalone control unit.
  - g) A complete control language program listing including all software routines employed in operating the control system. Also provide a program write-up, organized in the same manner as the control software. This narrative shall describe the logic flow of the software and the functions of each routine and sub-routine. It should also explain individual math or logic operations that are not clear from reading the software listing.
  - h) Hardware operation and maintenance manuals.
  - i) Application software and project applications code manuals.
- 2) Verify proper installation and performance of controls / BAS hardware and software provided by others.
  - 3) Integrate installation and programming schedule with construction and commissioning schedules.
  - 4) Provide a control system technician and a control system programmer for use during system verification and functional performance testing.
  - 5) Additional trend logs may be required to facilitate the commissioning process.
  - 6) Manipulate control systems to facilitate verification and performance testing.
  - 7) Participate in the "Opposite Season" functional performance testing.

## **PART 2 - PRODUCTS**

2.01 NOT APPLICABLE

## **PART 3 - EXECUTION**

3.01 NOT APPLICABLE

END OF SECTION

**SECTION 01700**  
**CONTRACT CLOSEOUT**

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General Conditions and other Division 1 Specification Sections, apply to the Work of this Section, with special attention to the following:
  - 1. Section 01010 - Summary of Work.
  - 2. Section 01720 - Project Record Information
  - 3. Section 01730 - Operating and Maintenance Data

1.02 CLOSEOUT PROCEDURES

- A. Comply with procedures stated in General Conditions of the Contract for issuance of Certificate of Substantial Completion.
- B. Owner will occupy designated portion of Project for the purpose of installation of equipment, conduct of business, under provision stated in Certificate of Substantial Completion.
- C. When Contractor considers Work has reached final completion, submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect's inspection.
- D. In addition to submittals required by conditions of Contract, provide submittals required by governing authorities, and submit final statement of accounting giving total adjusted Contract Sum, previous payments, and sum remaining due.
- E. Owner's Representative will issue final change order reflecting approved adjustments to Contract Sum not previously made by Change Order.
- F. Ceiling Concealment Inspection.
  - 1. General: Prior to installation of ceiling panels, an inspection shall be conducted to ascertain the quality and degree of completion of all work above the finished ceiling and to record any discrepancies in the Contract Documents. The inspection shall be conducted by the Owner's Representative and the Contractor and recorded on forms provided by the Owner's Representative.
  - 2. Ceiling Suspension System: Grilles, registers, diffusers, light fixtures, and cut panels around fixtures may be installed prior to the inspection,

however, ceiling panels shall not be laid in place until after the inspection and all discrepancies have been corrected.

- G. Wall Close-in Inspection: Prior to wall close-in, an inspection shall be conducted to ascertain the quality and degree of completion of all work concealed within walls and record any discrepancies in the Contract Documents. The inspection shall be conducted by the Owner's Representative, Architect, and the Contractor and recorded by the Contractor on forms provided by the Owner's Representative.
- H. Copies of the Inspection Reports: Reports shall be prepared by the Contractor with copies to the Owner's Representative, Architect, and the Consulting Engineers. The inspection report shall be annotated as each discrepancy is corrected and any discrepancy remaining at the time of the Final Inspection shall be included on the punch list.
- I. Substantial Completion: See Section 00700, General Conditions, paragraph 12.04.
- J. Final Inspection: See Section 00700, General Conditions, paragraph 12.05.

### 1.03 SYSTEMS DEMONSTRATION

- A. Prior to final inspection, demonstrate operation of each system to Owner's Representative.
- B. Instruct Owner's designated operating and maintenance personnel in operation, adjustment, and maintenance of materials, products, equipment and systems, using the operation and maintenance data as the basis of instruction.

END OF SECTION

## **SECTION 01710**

### **CLEANING**

#### **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, with special attention to the following:

- 1. Summary of Work: Section 01010.

##### **1.02 RELATED WORK**

- A. Each Specification Section: Cleaning for specific equipment, products, or elements of the work.

##### **1.03 WORK DESCRIPTION**

- A. Execute cleaning, during the course of the Work, and at completion of the Work, as required by General Conditions, and as described in Part 3 of this Section.
- B. Nothing in this Section or elsewhere in the Contract Documents shall be construed as relieving the Subcontractors of their individual responsibility to perform periodic clean up of their portion of the Work. Subcontractors shall cooperate with the Contractor to assist in both periodic and final clean up. The Contractor shall enforce this requirement and shall notify each subcontractor of his responsibility for any damage caused by his operations during such cleanups.
- C. If the Contractor fails to clean up, the Owner may do so and the cost thereof shall be deducted from the Contract Sum.

##### **1.04 DISPOSAL REQUIREMENTS**

- A. Conduct cleaning and disposal operations to comply with codes, ordinances, regulations, and anti-pollution laws.

#### **PART 2 - PRODUCTS**

##### **2.01 MATERIALS**

- A. Use only those cleaning materials that will not create hazards to health or property and which will not damage surfaces.
- B. Use only those cleaning materials and methods recommended by manufacturer of the surface.



- C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

### **PART 3 - EXECUTION**

#### **3.01 CLEANING DURING CONSTRUCTION**

- A. Execute daily cleaning to keep the Work, the site and adjacent properties free from accumulations of waste materials, rubbish and windblown debris, resulting from construction operations.
- B. Provide on-site containers for the collection of waste materials, debris and rubbish. Remove containers from the site at project completion.
- C. Remove waste materials, debris and rubbish from the site as necessary and dispose of at legal disposal areas away from the site.
- D. Where work is performed adjacent to occupied areas, contractor shall utilize HEPA vacuums to minimize and control dust levels. Use of other types of vacuums shall not be acceptable.
- E. During the course of construction the building and premises shall present a neat, orderly and workmanlike appearance.

#### **3.02 DUST CONTROL**

- A. Clean interior spaces prior to the start of finish painting and continue cleaning on an as-need basis until painting is finished.
- B. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly coated surfaces.

#### **3.03 FINAL CLEANING**

- A. Employ skilled workmen for final cleaning.
- B. Besides the general broom cleaning and refuse removal, the Contractor shall do the following special cleaning for all trades before the final completion and acceptance of the work.
  - 1. Remove putty stains, soil and paint from all glass and wash and polish same.
  - 2. Clean and polish all finishing hardware.
  - 3. Remove all spots, soil and paint from all ceramic tile work, glazing and mirrors.

4. Clean all plumbing fixtures, accessories and equipment, including all mechanical equipment.
  5. Clean all tile, terrazzo, wood, and other finished floors.
  6. Clean and vacuum all carpet.
  7. Clean premises of all debris and dirt.
  8. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels and other foreign materials from sight-exposed interior and exterior surfaces.
  9. Polish glossy surfaces to a clear shine.
  10. Clean window frames, entrance frames, hollow metal work and all ornamental iron work.
- C. Ventilating Systems:
1. Clean permanent filters and replace disposable filters if units were operated during construction.
  2. Clean ducts, blower, and coils if units were operated without filters during construction.
- D. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.
- E. Prior to final completion, or Owner occupancy, Contractor shall conduct an inspection of sight-exposed interior and exterior surfaces, and all work areas, to verify that the entire Work is clean.

END OF SECTION

## SECTION 01720

### PROJECT RECORD INFORMATION

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General Conditions and other Division 1 Specification Sections, apply to the Work of this Section, with special attention to the following:
  - 1. Section 01730, Operating and Maintenance Data, for pertinent data which shall be included in the Record and Information Booklet.

##### 1.02 DESCRIPTION OF WORK

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

##### 1.03 SUBMITTALS

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

##### 1.04 QUALITY ASSURANCE

- A. Accuracy of Record
  - 1. Make legible entries on each pertinent sheet of drawings, specifications, or other documents as necessary, in order to properly document the entry.
- B. Accuracy shall be such that the Architect may reasonably rely upon the information for preparation of Record Documents, and that the information may be reasonably relied upon for future reference and research by the Owner.
- C. Entries shall be recorded in a timely fashion upon performance or notification of a change or deviation.

**1.05 HANDLING OF RECORD INFORMATION**

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

**PART 2 - PRODUCTS****2.01 PROJECT RECORDS**

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

**PART 3 - EXECUTION****3.01 MAINTENANCE OF JOB SET**

- A. Make entries using colored pencil. Add description notes to clarify entry, such as item description, location and reason for the change. "Cloud" or otherwise highlight entries. Use different colors where different entries overlap.
- B. All entries shall be dated.
- C. Provide record data for in-place arrangements of circuitry, conduit, piping, ductwork, and other systems that are indicated by schematic layouts or diagrams in the Contract Documents. The Owner or Architect may, at his discretion, allow the Contractor to omit record data for items where the elaboration of the layout or diagrams conveys no additional useful information.

**3.02 SUBMITTAL TO THE ARCHITECT**

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

END OF SECTION

## SECTION 01730

### OPERATING AND MAINTENANCE DATA

#### 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, with special attention to the following:
  - 1. Shop Drawings, Product Data and Samples: Section 01340.
  - 2. Testing, Adjusting and Balancing of Systems: Section 01660
  - 3. Contract Close-out: Section 01700.
  - 4. Project Record Information: Section 01720
  - 5. Warranties and Bonds: Section 01740.
  - 6. Applicable Divisions 2 through 16 Specifications

##### 1.02 DESCRIPTION OF WORK

- A. Compile product data and related information appropriate for Owner's record, maintenance and operation of products, equipment, materials and systems furnished under the Contract.
- B. Prepare record, operating and maintenance data as specified in this Section and as referenced in other pertinent sections of Specifications.
- C. All information shall be organized into a Record and Information Booklet.

##### 1.03 SUBMITTAL PROCEDURES

- A. Prepare three (3) complete copies of the Record and Information Booklet and deliver to the Architect. Provide one (1) additional copy each of the following (including warranties): Special Systems, Communication Systems, House and Stage Lighting Controls and Stage Lighting Systems, Automatic Temperature Controls, and Food Service Equipment.
- B. The Architect shall review the booklets for compliance to the requirements specified in this section. If found to be non-complying, the booklets shall be returned to the Contractor for corrections.
- C. The Architect shall indicate approval of the booklets by review stamp on each copy and shall forward the booklets to the Owner. The Owner shall not accept the booklets unless they have been reviewed and stamped as approved.

**PART 2 - PRODUCTS**

## 2.01 FORM OF SUBMITTALS

- A. Prepare data in the form of an instructional manual for use by Owner's personnel.
- B. Format:
  - 1. Size: 8 1/2" x 11".
  - 2. Paper: 20 pound, minimum, white, for typed pages.
  - 3. Text: Manufacturer's printed data, or neatly typewritten. All catalog, data, maintenance and cleaning instructions shall be on manufacturer's letterhead, or have other identification indicating the manufacturer as source of information.
- C. Drawings:
  - 1. Provide reinforced, punched, binder tab, bind in with text.
  - 2. Fold larger Drawings to the size of the text pages.
- D. Provide flyleaf for each separate product, or each piece of operating equipment.
  - 1. Provide typed description of product and major component parts of equipment.
  - 2. Provide indexed tabs.
- E. Cover: Identify each volume with typed or printed title "RECORD AND INFORMATION BOOKLET", and the name of the project.
- F. Identify on each volume a list of general subject matter covered in the manual.
- G. No partial submittals shall be accepted. Contractor shall not deliver Record and Information Booklets to the Architect until all the required documents have been obtained by the Contractor and organized in accordance with the requirements of this Section. Incomplete submissions shall be returned to the Contractor, and all expenses required for resubmission shall be the responsibility of the Contractor.

## 2.02 BINDERS

- A. Commercial quality three-ring binders with durable and cleanable plastic covers.
- B. Maximum ring size: 3 inches

- C. When multiple binders are used, correlate the data into related, consistent groupings. Mark binders in sequence.

### 2.03 CONTENT OF BOOKLET

- A. Neatly typewritten table of contents for each volume, arranged in a systematic order by specifications divisions.
- B. Indicate contractor, name of responsible principal, address, and telephone number.
- C. List each product material, piece of equipment, and system required to be included, indexed to the content of the volume. Include serial and/or model numbers of equipment where appropriate, in order to specifically identify such items.
- D. List with each product material, piece of equipment and system as appropriate, the name, address and telephone number of the following with the area of responsibility clearly identified for each:
  - 1. Manufacturer.
  - 2. Representative.
  - 3. Subcontractor or installer.
  - 4. Maintenance Contractor as appropriate.
- E. Indicate local source of supply for parts and replacement.
- F. Identify each product by product name and other identifying symbols as set forth in Contract Documents.
- G. Include operating, cleaning and maintenance information.
- H. Include copies of each warranty, bond, and service contract issued.
- I. Information Sheet: Provide information sheet on manufacturer's letterhead indicating the following:
  - 1. Proper procedures in the event of equipment or systems failure.
  - 2. Conditions that may affect the validity of warranties or bonds.

### 2.04 PRODUCT DATA

- A. Include only those sheets, which are pertinent to the specific product.
- B. Annotate each sheet to:

1. Clearly identify the specific product or part installed.
2. Clearly identify the data applicable to the installation.
3. Delete references to inapplicable information.

## 2.05 DRAWINGS

- A. Supplement product data with Drawings as necessary to clearly illustrate:
  1. Relations of component parts of equipment and systems.
  2. Control and flow diagrams.
- B. Coordinate drawings with information in "as-built" drawings, shop submittals or other project record information to assure correct illustration of completed installation.
- C. Do not use project record information as operating and maintenance drawings.
- D. Organize in a consistent format under separate headings for different procedures.
- E. Provide a logical sequence of instructions for each procedure.
- F. Items included in each Booklet: The Booklet shall contain a complete description of all products materials, equipment and systems as outlined in Part 3.

## PART 3 - EXECUTION

### 3.01 PRODUCT, MATERIALS, EQUIPMENT AND SYSTEMS DESCRIPTIONS

- A. Division 1 - General Requirements
  1. Warranties and Bonds: Provide a copy of each warranty, bond and service contract issued. Execute warranties and bonds in accordance with provisions of Section 01740.
- B. Division 4 - Masonry
  1. Brick: Identify each type of brick selected, including size and color.
  2. Concrete Masonry Units: Identify each type of unit used; include fire resistance ratings where applicable.



## C. Division 8 - Doors and Windows

1. Metal and Wood Doors: Identify each type of door including labeled doors; indicate core, veneer and face sheet construction.
2. Hardware: Furnish as-built schedule with closeout documents, including keying control schedule, manufacturers' installation, adjustment and maintenance information. Include supplier's final inspection report. Provide product descriptions of major door hardware equipment, including but not limited to, hinges, closers, exit devices, locksets, and latch sets.
3. Glass: Identify each type, design or pattern.

## D. Division 9 - Finishes

1. Finish Schedule: Schedule shall identify each room or space by name and number, with a list of each type of finish to include: floors, base, wainscot, wall coatings, ceilings and all other applicable finishes. Where more than one color pattern or design is used for each type of finish, identify on the schedule.
2. Ceramic Tile:
  - a. Identify each type; include manufacturers catalog number, name of each color and design or pattern.
  - b. Provide manufacturers recommended maintenance and cleaning instructions.
3. Acoustical Tile Ceilings: Identify type of grid and each type of panel.
4. Resilient Tile and Base:
  - a. Identify each type, provide manufacturer's catalog number and name of each color or pattern.
  - b. Provide manufacturer's recommended maintenance and cleaning instructions.
7. Paint and Coatings: Identify each type of paint and coating by schedule.

## E. Division 12 - Furnishings

1. Casework, tops and accessories: Provide manufacturer's recommended maintenance procedures for care and cleaning of finished surfaces.

## F. Division 15 - Mechanical

1. Heating and air conditioning systems: Include the following:
  - a. Manufacturer's catalog data, parts list and wiring diagram for each item of equipment, along with preventative maintenance instructions.
  - b. Manufacturer's catalog data, "equipment cuts", parts list and diagrams for each type of temperature controls. Include "as built" diagrams incorporating all control system components. Include system description manuals as specified in Section 15900.
  - c. Maintenance and lubrication instructions for each item of equipment.
2. Ventilating and Exhaust Fans:
  - a. Identify each type, model number, size and capacity.
  - b. Provide service manual, parts list, and catalog data for each type of fan.

## G. Division 16 - Electrical

1. Power, Lighting and Special Systems: Include the following:
  - a. Manufacturer's catalog data and parts list for each item of service entrance equipment and each item of electrical sub-distribution equipment, along with preventative maintenance instructions.
  - b. Manufacturer's catalog data, "equipment cuts" and parts list for all lighting fixtures; indicate installed locations.
  - c. Manufacturer's catalog data, "equipment cuts", parts list, and "as built" wiring diagrams for all components of all special systems: fire alarm system, sound and intercommunication system, master clock and program system, cable TV and broadband system, and security system.
  - d. Training manuals, where described in the individual sections, are separate from the requirements listed above.

END OF SECTION

## SECTION 01740

### WARRANTIES AND BONDS

#### 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, with special attention to the following:
  - 1. Bid Proposal Bonds: Instructions to Bidders.
  - 2. Performance Bond and Labor and Material Payment Bond: Sections 00302 and 00303.
  - 3. General Warranty of Construction: General Conditions, Section 00700 (16.02).
  - 4. Contract Close-out: Section 01700.
  - 5. Operating and Maintenance Data: Section 01730.

##### 1.02 DESCRIPTION OF WORK

- A. Compile specified Warranties and Bonds.
- B. Co-execute submittals when so specified.
- C. Review submittals to verify compliance with Contract Documents.
- D. Assemble and format, include in Record and Information Booklets and submit to Architect for review and transmittal to Owner.

##### 1.03 SUBMITTAL REQUIREMENTS

- A. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers and subcontractors.
- B. Number of original signed copies required: See Section 01730, submittal procedures.
- C. Product or work item: List each firm or manufacturer, with name of Principal or representative, address and telephone number.
  - 1. Product Identification: Provide serial and/or model numbers for specific identification of equipment.

- D. Indicate date of beginning of warranty, bond or service and maintenance contract.
- E. Specify duration of warranty, bond, or service maintenance contract.
- F. Provide information for Owner's personnel:
  - 1. Proper procedure in case of failure.
  - 2. Instances which might affect the validity of warranty or bond.
- G. Contractor, name of responsible principal, address, and telephone number.

#### 1.04 FORM OF SUBMITTALS

- A. Format:
  - 1. Size 8 1/2" x 11", punch sheets for 3 ring binder.
  - 2. Fold larger sheets to fit into binders.
  - 3. Incorporate into Record and Information Booklets in accordance with format described in Section 01730.

#### 1.05 EFFECTIVE DATE AND DURATION OF WARRANTIES AND BONDS

- A. The Contractor shall provide and maintain warranties on all completed work performed under this Contract for a period of one (1) year, unless noted otherwise in the individual specification section. The start of the Warranty Period for all completed work shall commence on the date of legal occupancy by the Owner for each separate phase.
- B. All materials, products, equipment, etc. provided under this contract shall carry the manufacturer's standard warranties. Where standard equipment through the manufacturer exceed the periods listed in these specifications, the manufacturer's warranty shall take precedence. **No additional cost extended warranties or service agreements are required under this contract.**

#### 1.06 SUBMITTALS REQUIRED

- A. Submit warranties, bonds, and service and maintenance contracts as specified in the respective sections of Specifications, and as specified by this Section.

END OF SECTION

## 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.

##### 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. 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.

##### 1.05 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.

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

#### 2.02 MORTAR MIX

- A. Provide minimum 1800 psi mortar.

#### 2.03 MORTAR ADMIXTURES

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

### **PART 3 - EXECUTION**

#### 3.01 MIXING MORTAR

- A. Thoroughly mix mortar ingredients, in quantities needed for immediate use.
- B. Do not use anti-freeze compounds to lower the freezing point of mortar.
- C. Mortar shall be used within two and one half hours of the initial mix-up at temperatures between 40 degrees F (10 degrees C) and 80 degrees F (26 degrees C) and within two hours of mixing at temperatures over 80 degrees F (26 degrees C). It shall not be used after it has begun to set.
- D. If necessary, retemper mortar within two hours of mixing to replace water lost by evaporation. Do not retemper mortar after two hours of mixing.

END OF SECTION

## SECTION 04200

### UNIT MASONRY

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

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

##### 1.02 RELATED WORK

- A. Section 04100: Mortar

##### 1.03 REFERENCES

- A. ASTM A82 - Cold-Drawn Steel Wire for Concrete Reinforcement.
- B. ASTM A615M - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
- C. ASTM C55 - Concrete Building Brick.
- D. ASTM C216 - Facing Brick.
- E. ASTM C90 - Hollow and Solid Load-Bearing Concrete Masonry Units.
- F. ASTM C129 - Non-Load-Bearing Concrete Masonry, Normal Weight Units.
- G. ASTM C426 - Shrinkage Testing of Concrete Masonry Units.
- H. ASTM C476 - Grout for Reinforced and Non-Reinforced Masonry.
- I. FF QQ-W-416 - Wire, Steel, Carbon, (Round, Bare and Coated).
- J. ASTM C140 - Sampling and Testing Concrete Masonry Units.
- K. ACI-530/ACI 530.1 - Building Code Requirements for Masonry Structures and Specifications for Masonry Structures.
- L. ASTM C331 – Standard Specification for Lightweight Aggregate for Concrete Masonry Units.
- M. ASTM A951 – Standard Specification for Masonry Joint Reinforcement.
- N. ACI 216.1-97/TMS 0216.1-97 – Standard Method for Determining Fire Resistance of Concrete and Masonry Construction Assemblies.

## 1.04 REQUIREMENTS OF REGULATORY AGENCIES

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

## 1.05 SUBMITTALS

- A. Product Data for each type of masonry unit, accessories and other manufactured products specified in this Section.
- B. Shop drawings for masonry reinforcing as indicated on Drawings, detailing fabrication, bending and placement of reinforcing bars.
- C. Grout mix design for grout used in reinforced and non-reinforced masonry.
- D. Samples:
  - 1. All accessories that shall be embedded in masonry.
- E. Material certificates signed by the manufacturers, attesting to compliance with referenced standards and requirements of this Section.
  - 1. Cement products required for masonry grout.
  - 2. Material and grade for reinforcing bars.
  - 3. Each type and size of joint reinforcement.
  - 4. Each type and size of anchors, ties, and other metal accessories.
  - 5. UL listings (or equivalencies) for masonry utilized in fire resistive assemblies, indicating hourly rating.

## 1.06 QUALITY ASSURANCE:

- A. Samples: Typical units of each type of masonry shall be submitted to the Architect before beginning sample panel.
- B. Test Reports: As a condition of approval, the masonry units listed here shall require the submittal of the following certified test reports:
  - 1. Hollow load-bearing units:
    - a. ASTM C90-93, for Type 1, moisture controlled units using 8" samples.
    - b. ASTM C-426-83 for average shrinkage not to exceed .030 using a minimum of three (3) 8" samples. The test report shall indicate shrinkage measurements for each duration period of drying.

Testing shall be performed for a minimum total time of 19 days, or until equilibrium is obtained, whichever is greater.

c. ASTM C140-75 indicating absorption characteristics.

2. Hollow non-load bearing units:

a. ASTM C129-85 for Type 1, moisture controlled units using 6" samples.

b. ASTM C426-83 for average shrinkage not to exceed .030 using a minimum of three (3) 6" samples. The test report shall indicate shrinkage measurements for each duration period of drying. Testing shall be performed for a minimum total time of 19 days, or until equilibrium is obtained whichever is greater.

c. ASTM C140-75 indicating absorption characteristics.

#### 1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

B. Store units above ground.

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

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

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

#### 1.08 COLD WEATHER PROTECTION

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

B. Conform to applicable requirements of ACI 530.1.

#### 1.09 HOT WEATHER PROTECTION

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

B. Conform to applicable requirements of ACI 530.1.

### PART 2 - PRODUCTS

## 2.01 FACE BRICK

- A. Face brick shall comply with ASTM C216, Type FBS, Grade SW. (Face brick shall match existing for addition and alteration projects.)
  - 1. Brick: Match Existing.
- B. All face brick used as an interior finish material shall be bullnose at all external corners.

## 2.02 CONCRETE MASONRY UNITS

- A. Single source responsibility: All masonry units shall be of one manufacturer.
- B. Hollow load-bearing units: ASTM C90-93, Grade N, Type 1 nominal face dimension of 8 x 16 inches.
- C. Building Brick: ASTM C55-85, Grade N, Type 1.
- D. Hollow non-load bearing units: ASTM C129-85, Type 1 and nominal face dimension of 8 x 16 inches.
- E. Solid load bearing units: ASTM C90-93.
- F. Approved Manufacturers:
  - 1. An approved manufacturer is one who has given evidence that the masonry units to be supplied have been tested in accordance with the ASTM specifications listed in this specification (see Quality Assurance). The manufacturer shall have on file with the Owner current certified test reports. Current test reports are defined as those reports performed and dated within twelve (12) months of the bid due date for this project.
  - 2. The manufacturer shall certify, as a condition of approval, that the masonry units supplied for the project shall be a minimum of 30 days old at time of shipment from manufacturer, and shall comply with 1.05 (A) above.
- G. Provide UL listed units as required for fire resistant ratings indicated, or provide units for masonry assemblies complying with ACI 216.1-97/TMS 0216.1-97 for the fire resistant rating required.
- H. Provide Bullnose units as indicated and at all external corners.

## 2.03 ANCHORS, TIES AND JOINT REINFORCEMENT

- A. Acceptable Manufacturers:

1. Hohmann and Barnard, Hauppauge, NY, 1-631-234-0600 (www.h-b.com)  
(Basis of Specification except as noted)
  2. AA Wire Products, LLC, Chicago, IL, 1-312-586-6700
  3. Wirebond, Charlotte, NC, 1-800-849-6722 (www.wirebond.com)
- B. Horizontal Joint Reinforcement
1. General: Factory welded, truss type wire units, pre-fabricated into straight, corner and tee units.
  2. Multi-wythe (cavity) wall: Truss type joint reinforcement with factory welded projecting eyes to accommodate thickness of cavity insulation and to accept adjustable masonry veneer ties. Hohmann and Barnard "Lox All" adjustable eye-wire, truss type #170.
  3. Composite Wall (no cavity): 3-wire truss type joint reinforcement; Hohmann and Barnard "Lox All" #130 "Truss-Tri Mesh".
  4. Single-wythe wall: 2-wire truss type joint reinforcement; Hohmann and Barnard "Lox All" #120 "Truss-Mesh".
  5. Longitudinal wire:
    - a. Style: Single one sided
    - b. Treatment: Deformed
    - c. Wire: ASTM A-82
    - d. Size: 9 gauge
  6. Transverse wires:
    - a. Wire: ASTM A-82
    - b. Size: 9 gauge
  7. Finish: Hot-dip galvanized, ASTM A153, class B-2 for both exterior and interior masonry walls.
- C. Restoration Anchors (for securing existing face brick to existing CMU backup): Hohmann and Barnard Torq-Lox 500, sized to fit masonry joint (facade hole diameter).
- D. Masonry Ties and Anchors



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

#### 2.04 CLEANING AGENTS

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

### PART 3 - EXECUTION

#### 3.01 QUALITY CONTROL

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

#### 3.02 INSPECTION

- A. Carefully examine Drawings. Check arrangement of courses and jointing with size of masonry openings and work built-in in connection with masonry. If discrepancies occur, notify Architect immediately.
- B. Inspect foundations to assure surfaces to support masonry work are as follows:
  1. To proper grades and elevations.
  2. Free of dirt and other deleterious materials.
  3. Surfaces not properly prepared have been satisfactorily corrected.

#### 3.03 CONSTRUCTION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces of columns, walls and arises do not exceed 1/4 inch in 10 feet, 3/8 inch in a story height not to exceed 20 feet, nor 1/2 inch in 40 feet or more. For external corners, expansion joints, control joints and other conspicuous lines, do not exceed 1/4 inch in any story or 20 feet maximum, nor 1/2 inch in 40 feet or more.
- B. Variation from Level: For lines of exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines, do not exceed 1/4 inch in any bay or 20 feet maximum, or 3/4 inch in 40 feet or more.
- C. Variation of Linear Building Line: Position indicated in plan and related portion of columns, walls, and partitions, do not exceed 1/2 inch in any bay or 20 feet maximum, nor 3/4 inch in 40 feet or more.

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

### 3.04 INSTALLATION

- A. Do not lay masonry when temperature is below 40 degrees F unless suitable means as approved by Architect and Owner's Representative are provided to heat materials. Protect work from cold and frost and insure that mortar will harden without freezing.
- B. Build walls and other masonry construction to full thickness indicated, except, build single-wythe walls to actual thickness of masonry units, using units of nominal thickness shown.
- C. Build all interior non-bearing masonry walls to full height of story, tight to underside of floor or roof deck. Voids between decking and top of wall shall be filled with fire safing insulation as specified in Section 07210.
- D. Build chases and recesses as indicated and as required. Provide not less than 8 inches of masonry between chase or recess and jamb of openings, and between adjacent chases and recesses. Build in chases, do not cut in.
- E. Cut masonry units with motor-driven saws designed to cut masonry with clean, sharp, unchipped edges. Cut units as required to provide pattern shown and to fit adjoining work neatly. Use full units without cutting wherever possible.
- F. Set units plumb, true to line with level courses accurately spaced within tolerance specified.
- G. Lay units in running bond.
- H. CMU shall be dry when laid.
- I. Adjust unit to final position while mortar is soft and plastic.
- J. Cut and fit masonry units, including that required to accommodate work of other sections, by masonry mechanics with masonry saws.
- K. Remove units disturbed after mortar has stiffened, clean joints and relay unit with fresh mortar.
- L. Grout masonry cells with reinforcing bars solid. Grout lift height and grout pour height shall not exceed 5 feet. Acceptable range for grout slump shall be between 8" and 11". Do not consolidate grout by rodding. Utilize cleanouts at base of masonry walls if necessary to verify that cells have been completely filled.

### 3.05 JOINING OF WORK

- A. Where fresh masonry joins partially or totally set masonry, clean exposed surface of set masonry and remove loose mortar and foreign material prior to laying fresh masonry.
- B. If necessary to stop off a horizontal run of masonry, rack back one-half block length in each course. Tothing shall not be permitted.
- C. Fill collar joints full.

### 3.06 CONTROL AND EXPANSION JOINTS

- A. Keep joint free of mortar, debris, or other foreign matter.
- B. Refer to drawings for maximum control joint spacing.
- C. Wall reinforcement shall be interrupted at control and expansion joints.
- D. Provide and install control joints at a maximum of 30 foot spacing and as shown on drawings. If control joints are not indicated on drawings, contractor to provide and install at a maximum of 30 foot spacing. Architect will choose locations for both interior and exterior masonry control joints to be installed by contractor.

### 3.07 PROTECTION OF WORK

- A. Provide temporary shoring and bracing for all exterior and interior bearing and exterior bearing walls subsequent to erection and prior to permanent connection to floor or roof systems, or abutting cross walls. Temporarily shore and brace any other walls exposed to lateral forces or other conditions, which would compromise stability prior to completion of building envelope.
- B. Protect face materials against staining.
- C. Remove misplaced grout or mortar immediately. As walls are constructed, use methods to avoid mortar droppings in cavities.
- D. Protect sills, ledges, offsets, and similar items from mortar drippings or other damage during construction.
- E. Cover top of walls, so as to prevent any penetration of water, with nonstaining waterproof coverings when work is not in progress.
- F. Coverings shall overhang at least 2 feet on each side of wall and be securely anchored.

### 3.08 BUILD-IN WORK

- A. Install bolts, anchors, nailing blocks, inserts, doorframes, vents, flashing, conduits, insulation and other built-in items as masonry work progresses.

- B. Grout solid with mortar spaces around built-in items.
- C. Provide 1/4 inch to 3/8 inch outside joint around exterior doors and other wall openings to receive sealant. Rake and tool smooth to uniform depth of 1/2 inch.

### 3.09 HORIZONTAL AND VERTICAL FACE JOINTS

- A. Uniform 3/8 inch thick unless otherwise required to obtain coursing indicated.
- B. Shove vertical joints tight.
- C. Tool joints in all exposed masonry surfaces, when thumbprint hard, with round jointer.
- D. Cut mortar joints in surfaces covered with finish material flush.
- E. Remove mortar protrusions extending into cells or cavities to be reinforced and filled.
- F. Fill horizontal joints between top of masonry partitions and underside of concrete slabs or metal deck with compressed mineral wool firesafing insulation (unfaced).

### 3.10 HOLLOW UNIT MORTAR BEDDING

- A. Lay with full mortar coverage on horizontal and vertical face shells.
- B. Bed webs in courses of piers, columns, and pilasters; in starting course; and where adjacent to cells or cavities to be reinforced or filled with grout.

### 3.11 SOLID UNIT MORTAR BEDDING

- A. Lay with full horizontal and vertical joints.

### 3.12 BONDING WITH PREFABRICATED JOINT REINFORCEMENT

- A. Bond facing and backing of adjacent wythes of masonry walls with prefabricated joint reinforcement.
- B. Provide one cross wire serving as tie for not more than each two square feet of wall face area.
- C. Vertical spacing of reinforcement shall not exceed 16 inches.
- D. Embed longitudinal wires in mortar. Lap reinforcement a minimum of 6" at ends. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" Sections.

### 3.14 LINTELS (Precast concrete lintels only)

- A. Provide precast masonry lintels where indicated and wherever openings of more than 1 foot 0 inch are shown without structural steel or other supporting lintels.

Cure precast lintels before handling and installation. Exposed surface finish texture to match lightweight masonry units. Masonry lintels shall bear minimum of 8 in. on each side of opening.

- B. Submit data on precast lintels to Architect for review/approval.

### 3.15 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.

### 3.17 CLEAN UP

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

END OF SECTION

## SECTION 07210

### BUILDING INSULATION

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

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

##### 1.02 RELATED WORK

- A. Section 09110: Non-Load Bearing Wall Framing Systems.

##### 1.03 QUALITY ASSURANCE

- A. Pre-installation Meeting: Prior to commencement of installation of exterior rigid insulation, review and document methods and procedures related to installation, including the following:
  1. Participants: Authorized representatives of the Contractor, [Construction Manager] [Owner], Architect, [Engineer], Applicator, Independent Inspector and Manufacturer.
  2. Review metal wall framing assemblies for potential interference and conflicts and coordinate layout and support provisions for interfacing work.
  3. Review insulated sheathing methods and procedures related to application, including manufacturer's installation guidelines Thermal and Air Barrier Wall System.
  4. Review construction schedule and confirm availability of products, applicator personnel, equipment and facilities.
  5. Confirm air barrier systems are compatible with cavity wall rigid insulation.
  6. Review field quality control procedures.

##### 1.04 REFERENCE STANDARDS

- A. ASTM E84 - Test for Surface Burning Characteristics of Building Materials.
- B. ASTM C-665 - Insulation Blankets, Thermal (Mineral Fiber, for Ambient Temperatures).
- C. ASTM C-578 - Rigid Polystyrene Insulation.
- D. ASTM E96/E96M-[05]: Test Method for Water Vapor Transmission of Materials.

- E. ASTM E331-[00]: Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
- F. NFPA 285 [2006]: Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components Using the Intermediate-Scale, Multistory Test Apparatus

#### 1.05 SUBMITTALS

- A. Manufacturer's Literature: Descriptive data, installation instructions and four physical samples [size: 12" square].
- B. Reports: Submit Test Reports, summarized by Manufacturer of material(s), verifying qualities of thermal and air barrier wall system components meet or exceed specified requirements.
  - 1. Include results of ASTM E2357 air barrier system testing and ASTM E331 water penetration tests.
  - 2. Submit Field Inspection and Test Reports in accordance with Field Quality Control requirements in accordance with Section 01400.
- C. Cradle-to-Cradle Certification for rigid, perimeter, and slab insulation

#### 1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in manufacturer's original unopened packaging.
- B. Identify contents, manufacturer, brand name, thermal values and applicable standards.
- C. Store materials in area protected from weather and moisture. Materials exposed to inclement weather will be rejected.
- D. Remove damaged material from site and replace same at no additional cost to the Owner.

#### 1.07 ENVIRONMENTAL REQUIREMENTS

- A. Do not install insulation when temperature is 40°F or below, during rain or wet weather or when surfaces are wet.

#### 1.08 WARRANTY

- A. Provide written warranty that the actual thermal resistance of the extruded polystyrene foam insulation will not vary by more than 10% from its published thermal resistance.

**PART 2 - PRODUCTS**

## 2.01 MINERAL FIBER (BATT-TYPE) BLANKET INSULATION

- A. Fully Concealed Applications (Enclosed metal stud or furring assemblies): Glass or other inorganic fiber and resinous binders formed into flexible blankets or semi-rigid sheets, complying with ASTM C-665; Type I, Class A; density of not less than 1.5 pounds per cubic foot; thermal conductivity of 0.27, of thickness indicated or as necessary to completely fill voids indicated on Drawings.
- B. Exposed or Semi-Exposed Applications (Ceiling/Plenum spaces): All batt insulation shall be "FR" type (fire resistant faced foil), ASTM C-665, type III, class A.
- C. Sound barrier assemblies above the folding partition track head to consist of 5/8" gyp board on both sides to extend from ceiling to underside of structure above. Provide batt insulation pack tight inside the wall to achieve STC wall rating of the same as the Folding Partiton (51 STC)

## 2.02 SOUND ATTENUATION BATTS

- A. Flexible blankets of glass or other inorganic fiber, unfaced, complying with ASTM C-665, Type I, and ASTM E-136. Sound attenuation batts in rated assemblies shall also comply with ASTM E-119.

## 2.03 FIRESAFING INSULATION

- A. Mineral Wool Batt: ASTM C-665, Type 1, unfaced; USG "Thermafiber" SAFB or comparable ([www.usg.com](http://www.usg.com)).
- B. Foam Seal: Silicone - Dow Corning 3-6548.

## 2.04 EXPANDING FOAM INSULATION

- A. Expanding polyurethane base foam prepackaged in metal aerosol containers.

## 2.05 MECHANICAL FASTNERS

- A. Acceptable Products for Steel Stud Wall Insulation:
  - 1. Rodenhouse Inc "Thermal-Grip Insulation Fasteners" with 2 inch diameter solid faced high-grade plastic washers
  - 2. Wind-lock Corporation "ci-Lock Steel Series Selection" with 1-3/4 inch diameter high-grade plastic washers
- B. As recommended by insulation manufacturer.
- C. Minimum length 1/2 inch longer than insulation thickness.



## 2.06 ADHESIVES

- A. As recommended by insulation manufacturer.

**PART 3 - EXECUTION**

## 3.02 INSTALLATION

- A. Extend insulation full thickness over entire surface to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation and mastic.
- B. Exercise care to prevent damage and soiling of faces on insulation units exposed to view. Align joints accurately, with adjoining surfaces set flush.
- C. Tape joints and ruptures in vapor barriers, using adhesive tape of type recommended by insulation manufacturers. Seal each continuous area of insulation to surrounding construction to ensure vapor-tight installation of the units.
- D. Completely pack voids between top of walls and flutes of roof decking with firesafing insulation.
- E. After installation, in-place insulation shall be inspected by the Architect and Owner's Representative, before installation of subsequent work which will conceal the insulation from view.

## 3.03 CLEAN-UP

- A. Remove insulation adhesive splatters and smears from exposed surfaces.
- B. Remove debris related to work of this Section from project site and dispose of legally.
- C. Leave work areas in clean condition.

END OF SECTION

## SECTION 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.

##### 1.02 RELATED WORK

- A. Section 08800 - Glazing: Sealants used in conjunction with glazing.

##### 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
- B. FS TT-S-.001657 Sealing Compound, Single Component, Butyl Rubber Based Solvent Release Type.
- C. ASTM C834 - Latex Sealing Compounds.
- D. ASTM C920 – Elastomeric Joint Sealant Compounds
- E. 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](http://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.
- D. Type 3: "AC-20FTR"; one part, modified acrylic latex acoustical sealant, complying with ASTM E90-16 and ASTM C834.

## 2.03 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: Interior acoustical 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 08100

### METAL DOORS AND FRAMES

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

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

- 1. Section 01092 - Mounting Heights

##### 1.02 RELATED WORK

- A. Section 08211 - Wood Doors (Particle Core)
- B. Section 08710 - Finish Hardware
- C. Section 08800 - Glazing (vision panels).
- D. Section 09900 - Painting

##### 1.03 DESCRIPTION OF WORK

- A. This Section includes provision and installation of exterior hollow metal doors, exterior and interior hollow metal door frames, and interior hollow metal window frames where indicated on the drawings.

##### 1.04 QUALITY ASSURANCE

- A. Hollow metal work: Manufactured in accordance with requirements of ANSI/SDI-100-91 "Recommended Specifications for Standard Steel Doors and Frames".
- B. Hollow metal door and frame supplier: Direct factory supplier who employs a certified door consultant (CDC) or other individual who can demonstrate equivalent knowledge and experience.
- C. Field Installation: Comply with SDI-105, "Recommended Erection Instructions for Steel Frames."
- D. Installation of doors and hardware shall be in accordance with ANSI/DHI A115.1G-199, "Installation Guide for Doors and Hardware".

##### 1.05 SHOP DRAWINGS AND PRODUCT DATA

- A. Submit shop drawings covering each type of frame, each type of door, frame anchorage details, and a door and frame schedule. Indicate coordination with

hardware requirements. Show cutouts and hardware reinforcement where required.

- B. Submit manufacturers product data technical specifications and installation instructions for each type of door.
- C. Include certifications required to show compliance with this Section.

#### 1.06 REQUIREMENTS OF REGULATORY AGENCIES

- A. Where fire-rated doors and frames are indicated, provide units tested and labeled as a rated assembly and labeled by Underwriter's Laboratories, Inc., Intertek Testing Services - Warnock Hersey or other authorized labeling agency.
- B. Non-sprinklered buildings: All labeled doors in rated enclosed stairways shall comply with the VUSBC for maximum temperature rise of 450°F after 30 minutes of standard fire test exposure. Such compliance shall be clearly stated on the door label.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, and handle hollow metal work in manner to prevent damage and deterioration.
  - 1. Provide packaging such as cardboard or other containers, separators, banding, spreaders, and paper wrappings to protect hollow metal items.
- B. Storage of Doors: Doors shall be stored in an upright position under cover. Place the units on at least 4" (101.6 mm) wood sills on floors in a manner that will prevent rust and damage. Do not use non-vented plastic or canvas shelters, which create humidity and promote rusting. If the corrugated wrapper on the door becomes wet, or moisture appears, remove the wrapper immediately. Provide at least a ¼" (6.35 mm) space between the doors to promote air circulation.
- C. Storage of Frames: Frames shall be stored under cover on 4" (101.6 mm) wood sills on floors in a manner that will prevent rust and damage. Do not use non-vented plastic or canvas shelters, which create humidity and promote rusting. Assembled frames shall be stored in a vertical position, with no more than five units in a single stack. Provide at least a ¼" (6.35 mm) space between frames to promote air circulation.
- D. Follow other special storage and handling requirements of manufacturer.
- E. Protect exposed finish surfaces of pre-finished items with masking tape.
- F. Inspect delivered doors and frames for damage. Minor damage may be repaired provided that the repairs are acceptable to the Owner's Representative and Architect. Hollow metal doors and frames damaged in transit, during storage and handling, or during the construction process shall be replaced at no cost to the Owner when such items cannot be restored by field repairs.

## 1.08 WARRANTY

- A. Provide a one (1) year warranty against defects in materials and workmanship.

**PART 2 - PRODUCTS**

## 2.01 DOOR FRAMES

- A. Fabricate frames with mitered corners, welded construction for interior and exterior applications. Knocked-down frames for field assembly shall be allowed only at retro-fitted applications as indicated on the drawings.
- B. Minimum gauges: 16 gauge cold rolled steel for interior frames; 14 gauge galvanized steel with A60 zinc coating for exterior frames.
- C. Break-form steel sheets:
  - 1. Provide profiles and shapes free of warp, buckles, fractures or other defects.
  - 2. Form stops integral with frames unless otherwise shown.
- D. Corners and connection shall be mitered and welded with exposed welds ground flush and smooth.
- E. Frame Reinforcement: Reinforce per SDI 107.
  - 1. Hinge reinforcement: Minimum 7 gauge.
  - 2. Strike reinforcement: Minimum 16 gauge.
  - 1. Closer reinforcement: Minimum 14 gauge.
  - 2. Provide welded-in-place guards for all hardware cutouts.
- F. Anchors:
  - 1. Provide one anchor at each jamb for each 2 feet 6 inches of door height or fraction thereof.
  - 2. Vary anchor types where required by conditions to provide positive fastening to, and compatible with adjacent construction:
    - a. Attachment to Masonry Construction:
      - (1) Galvanized
      - (2) Adjustable, flat, corrugated or perforated "T" shaped with leg not less than 2 inches wide by 10 inches long.
    - b. Attachment to Drywall Construction:



- (1) Manufacturers standard compression type for Drywall type frame.
  - (2) Steel or Wood Stud type to accommodate frame jamb depth and face dimension.
- c. Existing Masonry or Concrete
- (1) 3/8 inch countersunk flat head bolt and expansion shields.
  - (2) Locate 6 inches from top and bottom and maximum 24 inches on center.
  - (3) Weld pipe spacers or other type of spacers, per manufacturers standard design, in back of frame soffit.
3. Weld a 16-gauge minimum metal clip angle at bottom of each jamb member for anchoring to floor, with a minimum of 2 fasteners per clip.
  4. Provide "B-label" type adjustable strap anchors for labeled units.

### 2.03 PREPARATION FOR FINISH HARDWARE

#### A. Prepare frames to receive hardware:

1. Furnish hollow metal, manufacturer-approved hardware schedule, hardware templates and samples of physical hardware where necessary to ensure correct fitting and installation.
2. Preparation includes sinkages and cutouts for mortise and concealed hardware.
3. Prepare frames for security devices as required by Section 08710 and Division 16 Electrical Specifications. Provide cutouts and backboxes as part of the work of this section.

#### B. Provide reinforcements for both concealed and surface-applied hardware.

1. Drill and tap mortise reinforcements at factory, using templates.
2. Install reinforcements with concealed connections designed to develop full strength of reinforcements.

#### C. Provide dust boxes for the following:

1. Strike plate cutouts.

#### D. Prepare frames to receive inverted type door silencers; coordinate with approved hardware schedule.

### 2.04 FINISH

- #### A. Welded unit frames and doors shall be leveled and ground smooth; exterior frames and doors shall be galvanized.

- B. Apply mineral filler to eliminate weld scars and other blemishes.
- C. All doors, frames, and other components shall be cleaned, phosphatized and finished with one coat of baked-on rust inhibiting primer complying with ANSI A224.1.
  - 1. Door and frame units shall be finished in the field in accordance with Paint Schedule in Section 09900, Painting.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION OF FRAMES**

- A. Install frames and doors in accordance with the Steel Door Institute's recommended erection procedures (SDI 105). Install labeled doors and frames in accordance with NFPA 80.
- B. Exercise care in setting of frames to maintain scheduled dimensions, hold head level and maintain jambs plumb and square.
- C. Secure anchorages and connections to adjacent construction; grout all frames solid.
- D. Wherever possible, leave frame spreader bars intact until frames are set perfectly square and plumb, and anchors are securely attached.
- E. Where frames are installed in existing wall construction, secure with manufacturers recommended, "retrofit" anchorage devices, or as otherwise indicated on the drawings.
- F. Secure welded unit frames to structural steel framing concealed in hollow metal work, and make field splices.
- G. Allow for expansion movement.
- H. Fill exposed fasteners and other blemishes.
- I. Where non-galvanized frames come in contact with concrete or masonry, coat frame throat with one full coat of bituminous paint.

#### **3.02 DOOR INSTALLATION**

- A. Fit hollow metal doors accurately in frames, with clearances specified in SDI 105:
  - 1. 1/8 inch between door and frame at heel and jambs.
  - 2. 1/8 inch at meeting edges of door pairs.
  - 3. 3/4 inch above finish floor at sills without threshold.
  - 4. 1/4 inch at sills with threshold.
- B. Ensure that doors contact frame stops uniformly.

### 3.03 HARDWARE INSTALLATION

- A. Install hardware in accordance with Hardware Manufacturer's written instructions and Section 08710. Drill and tap for machine screws where required; do not use self-tapping screws.

### 3.04 PRIME COAT TOUCH-UP

- A. Immediately after erection, areas where primer coat has been damaged shall be sanded smooth and touched up with same primer as applied at shop.
- B. Remove rust and apply touch-up primer as specified above.
- C. Touch-up shall not be obvious and shall blend into paint finish.

### 3.05 ADJUSTMENT AND CLEANING

- A. Remove dirt, excess sealant, mortar, glazing compounds, or other foreign material from exposed door and frame surfaces.
- B. Adjust moving parts for smooth, unhindered operation.
- C. Fill minor dents, holes etc. with metal filler and sand smooth and flush with adjacent surfaces. Prime and paint to match adjacent surface.

### 3.06 PROTECTION

- A. Protect installed hollow metal work against damage or deterioration from other construction work or undue weathering. Correct any damages to hollow metal work prior to finish painting.

END OF SECTION

**SECTION 08211**  
**WOOD DOORS**  
**(PARTICLE CORE)**

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

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

1.02 RELATED WORK

- A. Section 01740: Warranties and Bonds
- B. Section 08100: Metal Doors and Frames
- C. Section 08710: Finish Hardware
- D. Section 08800: Glazing

1.03 REFERENCES

- A. NFPA 80-99: "Fire Doors and Fire Windows"
- B. NFPA 252-95: "Standard Methods of Fire Tests of Door Assemblies"
- C. Architectural Woodwork Institute (AWI)
- D. Window and Door Manufacturers Association (WDMA)
- E. Intertek Testing Services - Warnock Hersey (ITS-WH)
- F. ICC/ANSI A117-1-1998: "Accessible and Usable Buildings and Facilities"
- G. UL 10C-98: "Positive Pressure Fire Tests of Door Assemblies"

1.04 DESCRIPTION OF WORK

- A. Provide and install interior solid core doors, including fire doors, where shown and scheduled on the drawings.

1.05 QUALITY ASSURANCE

- A. General: Comply with AWI Quality Standards of the Architectural Woodwork Institute (AWI Section 1300, latest edition), and WDMA 1.S.1A latest edition.

- B. Fire Doors: Comply with NFPA 80 for labeled fire doors. Fire doors shall be tested in compliance with NFPA 252 or UL 10-C for positive pressure. A physical label shall be permanently affixed to the fire doors.
- C. Supplier shall be a qualified direct distributor for the door manufacturer.
- D. All doors furnished for this project shall be fabricated by a single manufacturer to ensure uniformity in appearance and construction.
- E. In order to verify compliance with Product Standards in Part 2, Owner reserves the right to randomly select, field cut, and inspect two (2) doors delivered to the Project Site. Failure of the tested doors in meeting Product Standards may, at the discretion of the Owner, require replacement of some or all doors at no cost to the Owner.

#### 1.06 SHOP DRAWINGS AND PRODUCT DATA

- A. Product Data: Submit door manufacturer's product data, specifications and installation instructions for each type of wood door.
  - 1. Include details of core and edge construction, trim for openings, and louvers and similar components.
  - 2. Include finishing specifications for doors to receive factory applied shop finish.
  - 3. Include certifications required to show compliance with specifications.
- B. Shop Drawings: Submit shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for factory sealing and other pertinent data.
- C. Samples: Submit samples indicating veneer and door construction, indicating exposed edges, stile and rail construction, and core composition. Include door finish samples.
- D. Submit manufacturer's warranty statement.

#### 1.07 REQUIREMENTS OF REGULATORY AGENCIES

- A. Where fire rated doors are indicated on the drawings, provide units tested and labeled by Underwriter's Laboratories Inc., Factory Mutual, ITS-Warnock Hersey or other such testing agencies which are demonstrated to be acceptable to the local code officials.
- B. Non-Sprinklered Buildings: All labeled doors in rated enclosed stairways shall comply with the VUSBC for maximum temperature rise of 450° F after 30 minutes of standard fire test exposure. Such compliance shall be clearly stated on the door label.

**1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver wood doors to site only after completion of "wet" trades and after building is dry, heated and ventilated.
- B. Deliver wood doors in manufacturer's original packaging, individually bagged, with manufacturer's identifying label intact. Inspect doors for damage after delivery.
- C. Store wood doors in a secure dry area, safe from extreme variations in temperature and humidity, with HVAC system in operation. Acceptable humidity range shall be no less than 25%, nor greater than 55%.
- D. Stack doors flat on lumber supported at ends and center. Protect top and bottom doors of stack from damage to door surface. Do not drag one door across another when stacking or unstacking.

**1.09 WARRANTY**

- A. Warranty: Submit signed, warranty executed on manufacturer's standard form. Provide for replacing (including cost of rehang and refinishing), at no cost to Owner, wood doors exhibiting defects in materials or workmanship, including warp and de-lamination, for lifetime of the installation of interior doors as follows:
  - 1. Telegraphing of stile and rail through face, causing surface variation in excess of 1/100 inch in any 3-inch space.
  - 2. Warp or twist of 1/4 inch or more in any plane of door face.

**PART 2 - PRODUCTS****2.01 DOOR TYPES**

- A. Flush faced type interior wood doors.

**2.02 DOORS**

- A. Flush Interior doors: PC-5 (AWI 1300-S-7), 1-3/4 inch thick, Type I (face assembly), Type II (core assembly), Class I with plain sliced, book matched, stain grade red oak face veneers; Custom Grade for face material and exposed edges.
  - 1. Core construction: Particleboard core complying with AHSI A208.1-LD-2, bonded to stiles and rails.
  - 2. Stiles: Minimum 1-3/8" (after trim) face thickness for vertical edges.
  - 3. Top and Bottom Rails: Minimum 1-3/8" (after trim and standard undercut) face thickness for horizontal edges.

4. All horizontal and vertical edges shall be solid wood, one piece or laminated without voids or show-through except that Structural Composite Lumber (SCL) shall be acceptable as an alternative to solid wood.
  5. Provide Bonded edge interface of stiles and rails to particleboard core per AWI 1300-S-5. Adhesive shall conform to Type I or Type II, ANSI/WDMA I.S.1-A Series. Abrasively plane and sand surfaces before veneering to avoid telegraphing of core parts through veneer face.
- B. Doors shall be pre-fit, beveled, and pre-machined at the factory.
- C. Factory Finish: Provide door manufacturer's factory finish, which shall meet or exceed AWI System TR-6, catalyzed polyurethane. Finish shall be clear (no stain). System shall consist of three coats of sealer, sanding, and two topcoats. Cure to produce finish complying with AWI Quality Standards, Section 1500.
1. Factory seal top and bottom rails of door.
- D. CHPS Requirement for Low Emitting Materials
1. Products shall meet the VOC content requirements in the applicable category of South Coast Air Quality Management District (SCAQMD) rule 1113. Architectural coatings current edition.
  2. Provide paints, coatings, adhesives and wood products that have low emission of VOC's as approved by CHPS.

### 2.03 LOUVERS AND VISION PANELS

- A. Provide factory pre-cut openings for installation of vision panels and metal louvers as indicated by door types shown on the drawings.
- B. Vision Panel Frames, Non-labeled doors: Manufacturers standard flush wood glass lite moldings, matching door face veneer. Set and putty nail attachment locations.
- C. Vision Panel Frames, Labeled Fire Doors: Metal vision frames shall be Air Louvers, Inc. or comparable beveled visionlite with glass retainer (model #VLF-EZ), listed by Underwriter's Laboratories, Inc. and shall carry U.L. label. All corners shall be mitered and flush welded. Counter-sunk flush mounting holes shall be prepunched and plated thru-bolt fasteners provided by the factory.

Vision frames shall be 18 gauge cold rolled steel, and shall be degreased and given a phosphate preparation prior to a baked silicon polyester powder coat finish.

### 2.04 FABRICATION

- A. Fabricate doors in accordance with requirements of AWI Quality Standards, Section 1300 and WDMA standards (I.S. 1-A).

- B. Provide doors with minimum 1/4 inch thick edge strips, of wood species to match face veneers.
- C. Bevel-strike edge of single acting doors 1/8 inch in 2 inches. Radius strike edge of double acting swing doors 2-1/8 inches.
- D. Pre-machine and prepare doors to receive hardware. Refer to Section 08710 for hardware requirements. Provide proper blocking to accommodate hardware. Comply with approved hardware schedule and hardware templates.
  - 1. Coordinate with Division 16 for preparation required to accommodate security devices and electromagnetic door holders.
- D. Where doors shall be installed in existing frames, fabricate doors to fit existing frames. Field verify all existing frames prior to door fabrication to ensure correct fit.

### **PART 3 - EXECUTION**

#### **3.01 INSPECTION**

- A. Inspect the locations where the doors shall be installed. Notify the Architect and Owner's Representative of any conditions that would adversely affect the installation or normal operation of the doors. Do not proceed until unsatisfactory conditions have been corrected.
  - 1. Verify that door frames are of type required for door and are installed as required for proper installation of doors.
  - 2. Inspect frames prior to door installation. Do not install doors in frames out of plumb or square that would otherwise hinder the proper operation of the doors.
- B. Field Testing: Owner may elect to field cut two (2) doors as described in 1.05 E.

#### **3.02 INSTALLATION**

- A. Fitting and Machining (for new doors in existing frames).
  - 1. Fit doors for width by planing; for height by sawing.
    - a. 1/2 inch from bottom.
    - b. 1/8 inch maximum from top.
    - c. Comply with NFPA 80 for fitting clearances of fire-rated doors.



2. Machine doors for hardware. A plus or minus 1/32-inch tolerance is allowable on hardware locations. A plus 1/32-inch, minus 1/64-inch tolerance is allowable for lock front cutouts
  3. Seal job site cut surfaces with two (2) coats of varnish before final hanging of doors.
- B. Installation of Doors:
1. Install in accordance with requirements of AWI Section 1300 and WDMA standards. All doors shall be allowed to acclimate to controlled building environment (temperature and humidity) before installation.
  2. Clearances:
    - a. Allow maximum of 1/8 inch at jamb and head.
    - b. Allow maximum of 1/8 inch at lock edges.
    - c. Allow maximum of 3/8 inch over threshold or saddle.
    - d. Allow maximum of 1/2 inch over decorative floor coverings (3/4 inch maximum for non-combustible floor).
  3. Install fire-rated doors in accordance with NFPA 80.
  4. Drill pilot holes for all fasteners for hinges, lock hardware, and other devices.
  5. Field finishing: For field modifications only. See Section 09900, Painting. Field finishing shall be performed on all six sides of doors prior to hardware installation.

### 3.03 ADJUSTMENT AND CLEANING

- A. Wood doors that are hingebound, not swinging freely or otherwise operating improperly shall be rehung; replace door(s) if deficiencies cannot be corrected by rehunging.
- B. Protect doors to minimize damage or deterioration prior to Owner acceptance. Temporarily cover doors with original wrapping until accepted.
- C. Refinish or replace doors damaged during construction.
- D. Remove all trash and debris associated with the work of this Section from the Project area and dispose of legally.

END OF SECTION

## SECTION 08710

### FINISH HARDWARE

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

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

##### 1.02 REFERENCE STANDARDS

- A. The Americans with Disabilities Act Accessibility Guidelines (ADAAG) and ICC/ANSI A117.1.
- B. BHMA – Builders Hardware Manufacturers Association
- C. DHI – Door and Hardware Institute
- D. NFPA – National Fire Protection Association
  - 1. NFPA 80: Fire Doors and Windows
  - 2. NFPA 101: Life Safety Code
  - 3. NFPA 252: Fire Tests of Door Assemblies
- E. UL – Underwriters Laboratories
  - 1. UL 10C: Positive Pressure Fire Tests of Door Assemblies
  - 2. UL 305: Panic Hardware
- F. ITS-WH – Intertek Testing Service - Warnock Hersey
- G. SDI – Steel Door Institute
- H. WDI – Wood Door Institute
- I. AWI – Architectural Woodwork Institute
- J. NAAM – National Association of Architectural Metal Manufacturers

##### 1.03 RELATED WORK

- A. Shop Drawings, Product Data and Samples: Section 01340
- C. Cleaning: Section 01710
- D. Metal Doors and Frames: Section 08100
- E. Wood Doors: Section 08211
- F. Interior Signage: Section 10440
- G. Fire Alarm System: Section 16710

##### 1.04 WORK DESCRIPTION

- A. The work of this section includes, but is not limited to, the following:
  - 1. All door hardware.
- B. Contractor shall provide all labor necessary to install hardware and accessories.

### 1.05 DESCRIPTION OF HARDWARE

- A. The required types of hardware include (but are not necessarily limited to) the following:
1. Butts and Hinges
  2. Lock Cylinders and Keys
  3. Door Closers
  4. Protective Plates
  5. Stripping and Seals

### 1.06 QUALITY ASSURANCE

- A. Qualifications of Manufacturers: Products used in the Work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect and Owner.
- B. Qualifications of Hardware Supplier: Direct factory contract supplier who employs a certified architectural hardware consultant (AHC), available at reasonable times during course work for project hardware consultation to Owner, Architect and Contractor and responsible for detailing, scheduling and ordering of finish hardware.
- C. Hardware: New, free from defects, blemishes and excessive play. Each kind of hardware shall be supplied from a single manufacturer.
- D. Departures from Approval Materials: Substitutions shall not be allowed except as provided in Section 01630. Include product data and comparison of proposed substitution and specified product. Furnish operating samples upon request.

### 1.07 SUBMITTALS

- A. Existing Buildings: Prior to submittal, carefully inspect existing condition to verify finish hardware required to complete work, including sizes quantities and suitability of specified materials. Conflicts between scheduled materials and actual conditions shall be documented in writing to the Architect and Owner's Representative.
- B. Submit copies of hardware schedule in accordance with Section 01340. Organize vertically formatted schedule into "Hardware Sets" with index of doors and headings, indicating complete designations of every item required for each door or opening. Include the following information:
1. Type, style, function, size, quantity and finish of hardware items. Use BHMA finish codes per ANSI A156.18.
  2. Name, part number and manufacturer of each item.
  3. Fastenings and other pertinent information.
  4. Location of hardware set coordinated with floor plans and door schedule.
  5. Explanation of abbreviations, symbols, and codes contained in schedule.
  6. Mounting locations for hardware.

7. Door and frame sizes, materials and degrees of swing.
8. List of manufacturers used and their nearest representative with address and phone number.
9. Catalog cuts.
10. Manufacturer's technical data templates and installation instructions with copy of transmittal indicating applicable data has been distributed to the installer.
11. Date of jobsite visit.
12. Key control schedule for all locksets.
13. Material samples.
14. Guarantees
15. Evidence of Coordination of hardware types with work of other trades.

#### 1.08 PRODUCT HANDLING AND STORAGE

- A. Packing and Marking: Individually package each unit of finish hardware, complete with proper fastenings and appurtenances, clearly marked on the outside to indicate the contents and specific locations in the Work.
- B. Protection: Provide secure lock-up for hardware delivered to the project, but not yet installed. Contractor shall exercise care in the handling and installation of hardware items that are not immediately replaceable, so that the completion of the work will not be delayed by hardware losses, both before and after installation.
  1. Permanent keys and cores: Provide secure delivery direct to Owner. (Keying Requirements, 2.03)
- C. Replacements: In the event of damage after delivery, the Contractor shall make all repairs and replacements necessary at no additional cost to the Owner.

#### 1.09 SEQUENCING AND COORDINATION

- A. Verify proper wall reinforcement. Coordinate floor mounted hardware with finish floor materials and floor substrates. Furnish manufacturer templates to door and frame fabricators.
- B. Provide door and opening frame submittals to hardware supplier to confirm that adequate provisions are made to ensure proper hardware installation.

#### 1.10 WARRANTIES

- A. Provide manufacturer's warranties as follows:
  1. Hinges: Life of installation
  2. All other Hardware: One (1) year

## 1.11 HARDWARE MOUNTING HEIGHTS

- A. Mounting heights of hardware from standing level (see Drawings) shall be as follows: (Measured from floor to centerline of hardware device)
1. Grades K through 6:
    - a. Push Plates: 42"
    - b. Pull Handles: 42"
    - c. Levers: 36"
    - d. Exit Devices: 36" to centerline of push bar
    - e. Deadlocks: 48" maximum

**PART 2 - PRODUCTS**

## 2.01 GENERAL

- A. References to specific products are used to establish minimum standards of utility and quality. Provide the specific products as indicated or pre-approved in accordance with Section 01630.
- B. Manufacturers: Hardware standards described in this Section shall be considered as standards of quality. Review and approval shall be based on conformity to operation, design, finish and quality of specified hardware. Furnish items for use on doors and frames that are compatible with the thickness, profile, swing and other requirements, which are critical to proper function. Numbers shall be taken from, but not necessarily limited to (except as noted), the catalogs of the following manufacturers.
1. Ball-Bearing Butt Hinges:
    - a. Hager
    - b. Bommer
    - c. Ives
  2. Continuous Hinges:
    - a. Markar
    - b. Roton/Hager
    - c. Ives
  3. Locksets/Latchsets: Schlage "ND Series" (no substitutions)
  4. Stops, Coordinators, Bumpers, & Silencers:
    - a. Ives
    - b. Trimco
    - c. Rockwood

5. Key System, Cylinders & Key blanks: Schlage (no substitutions)
6. Cylinder Guards: Schlage
7. Overhead Stops & Holders:
  - a. Glynn-Johnson
  - b. ABH
  - c. Sargent
- C. All finish hardware shall be furnished and packaged with all necessary screws, bolts, and other fasteners of suitable sizes and type to anchor the hardware in position for long life under hard use.
- D. Furnish fastenings where necessary using expansion shields, toggle bolts, sex bolts and other anchors approved by the Architect, compatible with the material to which the hardware is to be applied, and in conformance with the recommendations of the hardware manufacturer.
- E. All fastenings shall match the hardware material and finish.
- F. Finishes: Take special care to coordinate all of the various manufactured items furnished under this Section. Where practical, ensure uniform finish of all the various hardware components.
  1. Unless noted otherwise, all hardware shall have 630 satin stainless steel finish. If stainless steel finish is not available as a standard, then satin chrome Sparta -626 shall be acceptable.

## 2.02 MATERIALS

- A. Butt Hinges
  1. Provide hinge open widths of sufficient throw to permit maximum door swing. Where doors are required to swing 180 degrees, furnish hinges of sufficient throw to clear the trim.
  2. Furnish 5-knuckle, ball bearing half surface hinges with through bolts and back plates on mineral core labeled doors.
  3. Furnish 5-knuckle, ball bearing full mortise hinges with non-rising pins for non-labeled interior doors.
  4. Furnish non-removable pins at out-swinging exterior doors, non-rising pins at interior doors.
  5. Provide not less than 3 hinges per door leaf.
  6. Interior hinges shall be plated steel; exterior hinges shall be stainless steel with non-removable pins.

7. All hinges shall be standard weight, average frequency.
8. Products as follows:

	<u>Hager</u>	<u>Bommer</u>	<u>Ives</u>
Full Mortise	BB1279	BB5000	5BB1
	BB1168	BB5004	5BB1HW
	BB1191	BB5002	5BB1
	BB1199	BB5006	5BB1HW
Half Surface	BB1163	BB5304	5BB4HW

C. Locksets, latchsets and deadbolts: Extra Heavy Duty Cylindrical Locks and Latches: as scheduled. (Schlage ND Series)

1. Chassis: cylindrical design, corrosion-resistant, plated cold-rolled steel, through bolted.
2. Locking Spindle: stainless steel, interlocking design.
3. Latch Retractors: forged steel. Balance of inner parts: corrosion resistant plated steel, or stainless steel.
4. Lever Trim: accessible design, independent operation, spring-cage supported, minimum 2" clearance from lever mid-point to door face.
5. Strikes: 16 gage curved steel, bronze or brass with 1" deep box construction, lips of sufficient length to clear trim and protect clothing.
6. Provide Schlage auxiliary reinforcement kit (37-001) for reinforcement of lever sets in hollow metal doors.
7. Certifications:
  - a. ANSI A156.2, Series 4000, Grade 1.
  - b. UL listed for A label and lesser class single doors up to 4 ft. x 8 ft.

D. Overhead Closers:

1. High Frequency Surface Door Closers
  - a. Locations:
    1. All exterior doors
    2. All doors equipped with panic exit devices
    3. Corridor doors at PE/gym, cafeteria, locker rooms
    4. Group toilets
    5. Library (main access)
    6. Main reception office

7. Guidance reception office
  8. Other areas as specified
- b. Shall conform to ANSI A156.4, Grade 1, NFPA 80, NFPA 101 and UL10C
  - c. ISO 9000 certified. Units shall be stamped with date of manufacturer code.
  - d. Where parallel arm closers are specified, provide forged rigid heavy duty with large nut at elbow.
  - e. Factory representative to inspect all closers prior to final acceptance to ensure proper installation and adjustment. A written report shall be filed with the Architect and Owner after inspection.
  - f. Closers shall have metal cover with standard powder coat or painted finish.
  - g. All closers to be installed with steel through bolts and non-ferrous back plates. Back plates shall be rectangle in shape and of sufficient size to capture all four bolts in single plate, but not less than 1/2" clearance from edge of plate to edge of bolt hole. Thickness shall not be less than .038" (20ga.) thick.
  - h. Locate closers on interior side of exterior doors and on the non-public side of interior doors, unless otherwise specified.
  - i. Provide plates, brackets and special templates when needed for interface with particular header door and wall conditions and adjacent hardware.
  - j. Closers shall have a stable fluid withstanding temperature range of 120 degrees to 30 degrees hydraulic fluid.
  - k. Install closers and templating to provide maximum ADA opening force compliance.
  - l. Provide auxiliary stop or closer arm with integral spring stop on closer applications that open past 105-degrees without contacting an adjacent wall.
  - m. Closers shall be non-handed cast iron, 1.5" diameter bore with single piece forged piston, one body for all applications. Closers to be multi-size 1 thru 6.
  - n. Acceptable Products:

LCN  
4040XPM

Norton (xCWF)  
9500M

Sargent  
281MC-O



4040XPM-EDA	PR9500MxPR7701-5 Arm	281MC-P10
4040XPM-SCNS	UNI 9500M	281MC-CPS

Note: (H) suffix for hold-open feature

2.

G. Protection Plates:

1. Fasteners: Provide manufacturer’s standard exposed fasteners for door trim units (kick plates, edge trim, viewers, and similar units), either machine screws or self-tapping screws.
2. Fabricate edge trim of stainless steel, not more than 1/2” or less than 1/16” smaller in length than door dimension.
3. Fabricate protection plates (armor, kick or mop) not more than 1 1/2” less than door width on stop side and not more than 1/2” less than door width on pull side, x the height indicated. Where protection plates and half-surface hinge backplates conflict, reduce protection plate width by clearance required, plus 1/2”.
4. Metal Plates: Stainless steel, .050” (U.S. 18 ga.), beveled 3 edges (B3E).
5. Acceptable Products:
  - a. Ives 8400 Series
  - b. Trimco K0050 Series
  - c. Rockwood K1050 Series

H. Door Silencers (all doors): All hollow metal frames shall have gray resilient type silencers. Quantity: (3) for each single door and (6) for each pair of doors.

1. Products:
 

	<u>Ives</u>	<u>Trimco</u>	<u>Rockwood</u>
Metal Doors:	SR64	1229A	608
Wood Doors:	SR65	1229B	609

I. Doors Stops (all doors): shall be furnished to prevent damage to doors or hardware from striking adjacent walls or fixtures. Provide wall bumpers; except where not practical, furnish floor stops. Where conditions prohibit the use of either wall or floor type stops, furnish surface mounted overhead stops.

1. Acceptable Products:
 

<u>Ives</u>	<u>Trimco</u>
WS406CCV	1270WV
FS444	1201
FS495	

Q. Overhead Holders and Stops:

Furnish concealed overhead holder/stop complying with ANSI/BHMA A156.8 of the type, design and function as specified here within.

1. All holders shall be non-handed and furnished complete with proper fasteners.
2. All holder arms and channels shall be made of extruded bronze or stainless steel.
3. Shock absorber to be a shock absorbing coil steel spring with a rubber insert.
4. Furnish sex bolts on all wood doors.

Acceptable Products:

<u>Glynn-Johnson</u>	<u>ABH</u>
100 Series	1000 Series
450 Series	4000 Series

- U. Miscellaneous: All other items, not specifically described but required for a complete and proper installation of finish hardware, shall be as selected by the Contractor, but subject to the approval of the architect.

## 2.03 KEYING REQUIREMENTS

- A. Key System: Schlage "Everest 29 T Family" utility-patented restricted keyway, non-interchangeable core, except interchangeable core type operating cylinders for panic hardware, removable mullions, mortise locksets, overhead/coiling doors, padlocks, elevators. Utility patent protection to extend at least until 2029. Key blanks shall be available only from factory-direct sources; blanks provided by after-market key blank manufacturers shall not be allowed. Requirements are as follows:
1. Existing factory registered grand master key system.
  2. Non-interchangeable core construction keying: inserted type partial key. At each phase and at substantial completion, remove inserts in presence of Owner's Representative; demonstrate consequent non-operability of construction key. At substantial completion, give all removed inserts and all construction keys to Owner.
  3. Interchangeable core construction keying: Furnish temporary keyed-alike cylinders/cores. Remove at substantial completion and install permanent cylinders/cores in presence of Owner's Representative. Demonstrate that construction keys no longer operate.

4. Temporary cylinders/cores shall remain property of supplier.
  5. Furnish 10 construction keys.
  6. Stamp each change key with facility code; key set symbol and "DO NOT DUPLICATE". Bitting will not be stamped on change key.
  7. Furnish 2 construction control keys.
  8. Furnish 2 extractor tools 35-057.
  9. Furnish not less than 3 keys each lock or 2 keys each keyed alike group with a minimum of 6 keys per group.
  10. Furnish the following quantities of master keys:
    - a. Elementary Schools: 16 each
  11. Furnish to Owner a complete bitting list of all keys used on this project in Excel format.
  12. Recombinate entire project at no extra expense to Owner if construction keys or construction cylinder inserts are missing.
  13. Furnish to Owner 10 faculty restroom lock emergency keys for Elementary, Middle and High School Projects.
  14. Provide elevator cores at each level keyed to the school master.
  15. Provide cores for gym curtains and motorized projection screens switches, keyed to the school master.
- B. Key Cylinders: utility patented 6-pin solid brass construction.
- C. Locks and cylinders: keyed at factory of lock manufacturer where permanent records are maintained. Locks and cylinders shall be of the same manufacturer.
- D. All keys and bitting list sent shall be directly from lock manufacturer to Owner marked with project name, via registered mail to:

Director, Design and Construction, Fairfax County Public Schools  
Project:  
8115 Gatehouse Road, Suite 3500  
Falls Church, VA 22042-1203

### PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Coordinate hardware installation with work of other trades. Supply information related to the approved hardware schedule, including manufacturers' basic written installation instructions.
- B. Install hardware per manufacturer's written instructions and recommendations. Upon completion of the installation, and as a condition of its acceptance, visually inspect all finish hardware furnished under this Section and place in optimum working condition. Do not install surface-mounted items until finishes have been completed on substrate. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate for proper installation and operation.
  - 1. When hardware is to be attached to existing metal surface and insufficient reinforcement exists, use "RivNuts", "NutSerts" or similar anchoring device for screws.
- C. Drill pilot holes for fasteners in wood doors and/or frames.

### 3.02 ADJUSTING

- A. Adjust and check for proper operation and function. Replace units which cannot be adjusted to operate freely and smoothly.
  - 1. Hardware damaged by improper installation or adjustment methods shall be repaired or replaced at no extra cost to Owner.

### 3.03 DEMONSTRATION

- A. Demonstrate electrical, electronic and pneumatic hardware systems, including manufacturer's recommended adjustment and maintenance procedures.

### 3.04 PROTECTION AND CLEANING

- A. Cover installed hardware, protect from paint, cleaning agents, weathering, construction activities, etc. until accepted by Owner. Remove covering materials and clean hardware immediately prior to substantial completion.
- B. In addition to requirements of Section 01710, use all necessary care during installation of the work to prevent scratching, gouging, chipping, etc. of the surface of adjoining work.
- C. At completion of each segment of installation in a room or space, promptly remove all scraps, debris, and surplus materials related to the work of this Section from the work area and dispose of legally.
- D. Clean adjacent wall, frame and door surfaces soiled from installation/reinstallation process.

### 3.05 EXISTING HARDWARE

- A. Inspect, clean, and lubricate locksets and latchsets designated to remain.
- B. Inspect, tighten, and lubricate hinges to remain.
- C. Inspect all closers designated to remain for proper operation; adjust and tighten fasteners.

### 3.06 INSPECTION

- A. Inspection: Conduct in the presence of the hardware supplier and Owner's Representative.
- B. Follow-up inspection: Installer shall provide letter of agreement to Owner that, approximately 6 months after substantial completion, installer shall visit project with representatives of the manufacturers of the locking devices and door closers, and shall perform the following:
  - 1. Re-adjust hardware.
  - 2. Evaluate maintenance procedures and recommend changes or additions, and instruct Owner's personnel.
  - 3. Identify items that have deteriorated or failed.
  - 4. Submit written report identifying observed problems and potential future problems.

### 3.07 HARDWARE SCHEDULE

- A. Hardware sets are included on the drawings and are cross-referenced by set number to the Door/Opening Schedule.

END OF SECTION

## SECTION 08800

### GLAZING

#### 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. Warranties and Bonds: Section 01740.
- B. Metal Doors and Frames: Section 08100.
- C. Wood Doors: Section 08211.

##### 1.03 REFERENCE STANDARDS

- A. Safety Standard for Architectural Glazing Materials, CPSC, Title 16, Part 1201 of the Code of Federal Regulations.
- B. ANSI Z 97.1 (2004), American National Standard for Safety Glazing Materials Used in Buildings.
- C. Glazing Standards: Glass Association of North America (GANA) "Glazing Manual" and "Sealant Manual".

##### 1.04 SUBMITTALS

- A. Submit copies of manufacturer's specifications, technical data and installation instructions for each type of glass required. Include test data substantiating that glass complies with specified requirements, including UL product classifications for fire rated safety glazing.
- B. Submit samples of each type of glass specified.
- C. Submit samples of glazing sealants, tape, and setting blocks.

##### 1.05 DELIVERY AND STORAGE

- A. Deliver glass to site in suitable containers that will protect glass from weather and breakage.
- B. Standard Glass: Provide labels showing glass manufacturers' identity, type of glass, thickness and quality on each piece of glass. Label shall remain on glass until glass has been set and inspected. Certificates will be accepted in lieu of

labels for shop or job cut glass. See special requirements listed in 1.06 below for non-rated and fire rated safety glass.

- C. Glazing materials shall arrive at project site in manufacturer's original, unopened and labeled containers.

#### 1.06 QUALITY ASSURANCE

- A. Non-rated Safety glass: comply with ANSI Z97.1 and CPSC 16 CFR 1201, category I & II for door glass, and bear a permanent, factory applied identification label on each piece.
- B. Glazing: Comply with recommendations of the GANA "Glazing Manual" and "Sealant Manual" ([www.glasswebsite.com](http://www.glasswebsite.com)).

#### 1.07 WARRANTIES

- A. Provide a two (2) year written warranty on glazing installation.

### **PART 2 - PRODUCTS**

#### 2.01 GLASS

- A. Tempered Glass: ASTM C1048-85, Kind FT, Condition A, Type I, Class 1, 1/4 inch or 3/8 inch thick, clear, as indicated. Provide wherever tempered glass (T) is indicated or required. Glass shall have a permanent, factory applied identification mark.

#### 2.02 GLAZING SEALANTS/COMPOUND

- A. Provide black exposed glazing materials. Provide hardness of materials as recommended by manufacturer for the required application and condition of installation of each case. Provide only compounds proven to be fully compatible with surfaces contacted. For fire rated glass, provide flame resistant gasket material and glazing tape.
- B. Sealant: "50% joint movement capability, UV and weather resistant, primerless adhesion; tested under U. L. 723-79 "Test for Surface Burning Characteristics."
  1. Dow Corning 795, Dow Corning Corp., Midland, MI ([www.dowcorning.com](http://www.dowcorning.com)).
  2. "Silglaze II 2800", GE Sealants and adhesives, 1-866-ASK-GESA ([www.gesealants.com](http://www.gesealants.com)).
  3. "Spectrem 2", Tremco Inc., 1-800-321-7906 ([www.tremcosealants.com](http://www.tremcosealants.com)).

#### 2.03 MISCELLANEOUS GLAZING MATERIALS

- A. Setting Blocks: Neoprene (0-90 Durometer hardness) compatible with sealant used.

- B. Spacers: Neoprene (40-50 Durometer hardness) compatible with sealant used.
- C. Cleaners, primers and sealers: Type as recommended by sealant or gasket manufacturers.

## **PART 3 - EXECUTION**

### **3.01 STANDARDS AND PERFORMANCE**

- A. Watertight and airtight installation of each piece of glass is required. Each installation shall withstand normal temperature changes, wind loading, impact loading without failure.
- B. Protect glass from edge damage during handling and installation.
- C. Comply with the GANA "Glazing Manual" and "Sealant Manual", except as indicated or specified otherwise, and except as specifically recommended otherwise by manufacturers of glass and glazing materials.
- D. Inspect each piece of glass immediately before installation, and eliminate pieces that have observable edge damage or face imperfections.

### **3.02 PREPARATION**

- A. Clean glazing channel, or other framing members to receive glass, immediately before glazing. Remove coating not firmly bonded to substrate. Remove lacquer from metal surfaces wherever elastomeric sealants are used.
- B. Apply primer or sealer to joint surfaces wherever recommended by sealant manufacturer.

### **3.03 GLAZING**

- A. Install setting blocks of proper size at quarter points of sill rabbet. Set blocks in thin course of heel-bead compound.
- B. Do not attempt to cut, seam, nip or abrade tempered or heat-strengthened glass.
- C. Install pressurized tapes to protrude slightly out of channel to eliminate dirt and moisture pockets.
- D. Clean and trim excess glazing materials from the glass and stops or frames promptly after installation.
- E. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction and including natural causes, accidents and vandalism.

### **3.04 CLEANING**



- A. After installation is complete, remove all excess materials such as trash, debris, tools, primers and sealants, and dispose of legally.

END OF SECTION

## SECTION 09110

### NON-LOAD BEARING WALL FRAMING SYSTEMS

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

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

##### 1.02 REFERENCE STANDARDS

- A. ASTM A653 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
- B. ASTM A1003 - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
- C. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.
- D. "Gypsum Construction Handbook" as published by United States Gypsum Company or "SFIA's Technical Guide for Cold-Formed Steel Framing Products" or a comparable manual as published by other acceptable manufacturer.

##### 1.03 SUBMITTALS

- A. Materials Lists: Complete list of materials proposed to be furnished and installed, stating manufacturer's name and catalog number for each item.
- B. Product Data: For each product type.
- C. Manufacturer's Recommendations: Current recommended method of installation for each item. Recommendations shall be the basis for acceptance or rejection of actual installation methods used.

##### 1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protection: Use means necessary to protect metal products from rusting and damage before, during and after installation and to protect the installed work and materials of other sections.
- B. Replacement: In event of damage, immediately make repairs and replacements necessary.
- C. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI's "Code of Standard Practice".

## 1.05 REQUIREMENTS OF REGULATORY AGENCIES

- A. Where fire-resistance classification is specified for walls or partitions with steel stud framing, provide steel studs and accessories of the type, which have been tested and listed for construction indicated.

**PART 2 - PRODUCTS**

## 2.01 ACCEPTABLE MANUFACTURERS

- A. ClarkDietrich Building Systems (basis of specification), West Chester, OH ([www.clarkdietrich.com](http://www.clarkdietrich.com)).
- B. Directly comparable products of the following manufacturers:
  - 1. MBA Building Supplies, Inc. Frackville, PA 17931 ([www.mbastuds.com](http://www.mbastuds.com))
  - 2. [Southeastern](http://www.sestud.com) Stud & Components, Inc., Montgomery, AL ([www.sestud.com](http://www.sestud.com))
- C. Other manufacturers, pre-bid approved in accordance with Section 01630, shall be acceptable.

## 2.02 MATERIALS

- A. General: Items specified are products of ClarkDietrich Building Systems. All studs shall be fabricated from steel having 33KSI minimum yield strength or better.
- B. Protective Coating: Comply with ASTM C 645; roll-formed from hot-dipped galvanized steel; complying with ASTM A 1003/A 1003M and ASTM A 653/A 653M G40 (Z120) or having a coating that provides equivalent corrosion resistance. A40 galvanized products are not acceptable.
- C. Metal Studs: ClarkDietrich ProSTUD 20 (20 gauge) with 1-1/4" flange; thickness as indicated on Drawings; 16" o. c. unless denoted otherwise on Drawings.
- D. Ceiling and Floor Runner: ClarkDietrich ProTRAK to match studs with 1-1/4" flange.
- E. Furring Channels: ClarkDietrich metal furring channel, 25 gauge; 7/8" x 2-23/32".
- F. Metal Angle Runners: 24 gauge.
- G. Cold Rolled Channels: ClarkDietrich cold rolled channels, 16 gauge; 3/4" and/or 1-1/2" as required.
- H. All studs and accessories to be galvanized.

- I. Suspended Ceiling Grillage for Gypsum Board Ceilings:
  - 1. 8 gauge hanger wires at 48" o. c.
  - 2. 1-1/2" channels at 48" o. c.
  - 3. Metal furring channels at 16" o. c. anchored to 1-1/2" channels.
  - 4. Shall be in compliance with recommendations of USG's "Gypsum Construction Handbook."
- J. Backing Plate: Proprietary fire-resistance-treated blocking and bracing in width indicated.
  - 1. Product: Subject to compliance with requirements, provide ClarkDietrich Building Systems; Danback Fire-Treated Wood Backing Plate [D16F] [D24F], or a comparable product.
- K. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
  - 1. Product: Subject to compliance with design requirements provide ClarkDietrich Building Systems; [BlazeFrame DSL] [MaxTrak] [SLP-TRK] Slotted Deflection Track, or a comparable product.

## 2.03 FASTENERS

- A. Runner fasteners, power-driven type, to withstand 193 pounds single shear and 200 pounds bearing force when driven through structural head or base and without exceeding allowable design stress in runner, fastener or structural support.
- B. Screws: Pan self-drilling, self-tapping of size recommended by manufacturer for type of construction involved. See "Selector Guide for USG Screws" as printed in USG "Gypsum Construction Handbook."

## 2.04 AUXILARY MATERIALS

- A. Isolation Strips at exterior walls: Provide one of the following:
  - 1. Asphalt-Saturated Organic Felt; ASTM D 226, Type I (No. 15 asphalt felt) nonperforated.
  - 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8" (3.2 mm) thick, in width to suit steel stud size.

**PART 3 - EXECUTION**

## 3.01 INSPECTION

- A. Prior to work, carefully inspect installed work and verify work is complete to point where installation may commence.
- B. Verify that metal studs may be installed in accordance with original design and manufacturer's recommendations.
- C. In event of discrepancies, immediately notify Owner's Representative and Architect. Do not proceed with installation until discrepancies have been fully resolved.

## 3.02 PREPARATION

- A. Accurately lay out partitions and wall lines from dimensions given.

## 3.03 INSTALLATION

- A. Install metal studs and accessory items in accordance with manufacturer's instructions, anchoring member's securely in position.
- B. Align partitions and wall assemblies to a tolerance of 1/8 inch in 8 feet, maximum variation from plumb or level in exposed line or surface.
- C. Securely fasten floor and ceiling runners 24 inches o. c. with suitable fasteners or to suspended ceiling at 16 inches o. c.
- D. Installation, Standard Metal Studs: ASTM C 754.
  - 1. Position vertically in the runners, spaced 16 inches o. c.
  - 2. Anchor studs located adjacent to door frames, partition intersections and corners to runner flanges by positive screw engagement with panhead screws through each stud flange and runner flange.
  - 3. Splice, when necessary, by nesting two studs with a minimum lap of 8 inches and attaching flanges together with two screws in each flange.
  - 4. Locate studs not more than 2 inches from doorframe jambs, abutting partitions, partition corners and other construction.
  - 5. Securely anchor to jamb and head anchor clips of each doorframe by bolt or screw attachment.
  - 6. Over metal door frames install a cut-to-length section of runner with flanges slit and web bent to allow flanges to overlap adjacent vertical studs and securely screw-attach to adjacent studs.

7. Position a cut-to-length stud extending from doorframe header to ceiling runner at the vertical joint over the doorframe.
  8. When partitions abut an exterior wall, place an additional stud no greater than 6 in. from abutment.
  9. Extend and brace partitions to structure above ceiling as required and indicated on drawings.
  10. Install additional studs, blocking and/or headers to framing as necessary to provide for secure rigid attachment for doors, cabinets, fixtures and accessories.
  11. Reinforce partitions to support grab bars adequately for resisting 300 pounds shear. Install additional studs and/or blocking as necessary.
  12. Install continuous isolation strips at all exterior wall and metal framing junctures to fully isolate metal from contact with exterior wall construction.
- E. Isolation of Partitions from Structure: Where partitions abut ceiling or deck construction or vertical structural elements, provide slip or cushion-type joint between partition and structure as recommended by stud manufacturer to prevent the transfer of structural loads or movements to partitions.
- F. Extend partition framing full height to structural supports or framing above suspended ceilings, unless partitions are indicated to terminate at suspended ceilings.

END OF SECTION

## SECTION 09251

### ABUSE RESISTANT GYPSUM WALLBOARD

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

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

##### 1.02 SCOPE (Install Abuse Resistant Gypsum Wallboard at the following locations or as shown on the drawings)

- A. Classroom partitions

##### 1.03 RELATED WORK

- A. Section 09110 - Non-load Bearing Wall Framing Systems
- B. Refer to Section 09250 for gypsum sheathing and regular, fire-rated, exterior ceiling and moisture-resistant gypsum wallboards.

##### 1.04 REFERENCE STANDARDS

- A. U.S. Gypsum Company Guide SA929, "Abuse Resistant Systems."
- B. National Gypsum "Gypsum Wallboard Systems" Guide
- C. ASTM C36 - Gypsum Wallboard
- D. ASTM C475 - Joint Treatment Materials for Gypsum Wallboard Construction
- E. ASTM E119 - Fire Test of Building Construction Materials
- F. ASTM C473 - Humidified Deflection
- G. ASTM D1037 - Linear Variation
- H. ASTM E72 - Racking Resistance
- I. Gypsum Association Manual GA-214, "Recommended Specifications for Levels of Gypsum Board Finish"
- J. Gypsum Association Fire Resistance Design Manual, GA-600
- K. ICC ES Legacy Report, NER-684.

##### 1.05 CONSTRUCTION STANDARDS

- A. ASTM C840 – Standard Specification for Application and Finishing of Gypsum Wallboard
- B. Construction manual of approved gypsum manufacturer.

#### 1.06 SUBMITTALS

- A. Submit the following:
  - 1. Fire test reports where fire rated gypsum wallboard assemblies are indicated on the Drawings.
  - 2. Fire hazard classification.
  - 3. Certified Test Reports for testing performed in accordance with Reference Standards.
  - 4. Wallboard Manufacturer's product specifications and printed installation instructions for each type of installation required for the Project.
  - 5. Provide GREENGUARD Certification as a low emitting material that meets CHPS requirements.
  - 6. Provide Data for the weighted average recycled-content value both in postconsumer and secondary.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wallboard, trim, and accessories in Manufacturer's unopened bundles or packaging, clearly identified by Manufacturer's name, brand, type, and grade.
- B. Protect materials from weather, soiling, and damage in accordance with manufacturer's recommendations.
- C. Store materials in a dry, secure location protected from physical damage. Store all panels flat (not vertically).

### **PART 2 - PRODUCTS**

#### 2.01 ACCEPTABLE MANUFACTURERS

- A. United States Gypsum Company, Chicago, IL, 1-800-USG-4YOU (874-4968) ([www.usg.com](http://www.usg.com)).
- B. National Gypsum Company, Charlotte, NC, 1-800-NATIONAL ([www.nationalgypsum.com](http://www.nationalgypsum.com)).
- C. Other Manufacturers pre-bid approved in accordance with Section 01630, and complying with the requirements of this Section, shall be acceptable.



## 2.02 WALLBOARD

- A. Fiberock Aqua-Tough Interior Panel. Abuse-Resistant Gypsum Fiber Panels, 5/8" (15.9mm) thick. (Basis of Specification). Provide ASTM C36, Type "X" for fire rated assemblies, where shown on the Drawings.
- B. National Gypsum Gold Bond Hi-Abuse brand XP Gypsum Board, 5/8" (15.9 mm).
- C. Products Characteristics Gold Bond Hi-Abuse brand XP
  - 1. Type "X" gypsum core panel with white abrasion resistant paper on the finished side and liner paper on the concealed side. 0.20" "Lexan" shall be bonded to the back side. *(Note: this product is not recommended for use on the interior side of exterior walls).*
  - 2. Surface Abrasion (ASTM D4977): 0.015" at 50 cycles.
  - 3. Surface Indentation (ASTM D5420): 0.158".
  - 4. Hard Body Impact (Complete panel penetration by a 2 3/4" steel cylinder): 110 ft-lbs.
- D. Product Characteristics ("Abuse Resistant Sheetrock Moldtough AR "):
  - 1. Abuse Resistance Surface abrasion: Tested in accordance with ASTM C1629. Level 2.
  - 2. Surface indentation: Tested in accordance with ASTM C1629. Level 2.
  - 3. Soft-body impact test: Tested in accordance with ASTM C1629. Level 1.

## 2.03 ACCESSORIES

- A. Accessories listed in paragraphs B through E are products of U.S. Gypsum Co. Comparable products by National Gypsum and compatible with the "Hi-Impact" Fireshield panel shall be acceptable.
- B. Fasteners: Corrosion-resistant, ASTM C-840. Self-drilling, self-tapping, bugle head screws for use with power driver. Use type S, 1" long for single layer applications; 1-5/8" for two layer applications.
- C. Joint Tape: "Sheetrock Joint Tape", U. S. Gypsum Co., ASTM C475. Use of fiberglass tape is not acceptable.
- D. Joint Compound: "Sheetrock" Setting-Type ("Durabond") Joint Compound.
- E. Metal Trim (U. S. Gypsum Co.):
  - 1. Corner Bead: #103
  - 2. Control Joint: #093
  - 3. Casing Bead: #200A

**PART 3 - EXECUTION**

## 3.01 INSPECTION

- A. Prior to installing wallboard panels, carefully inspect metal framing for accurate spacing and alignment.
- B. Verify that spacing of metal framing does not exceed that shown on Drawings and recommended for the thickness of wallboard to be installed.
- C. Verify that depth of doorframes is compatible with the finished thickness of wall.
- D. Do not proceed with wallboard installation until deficiencies are corrected and framing surfaces are acceptable for installation as recommended by Manufacturer.

## 3.02 INSTALLATION

- A. Comply with ASTM C840 and Manufacturer's wallboard installation instructions.

## 3.03 METAL TRIM AND CORNER BEADS

- A. Carefully inspect Drawings and verify location of metal trim required.
- B. Install trim in accordance with Manufacturer's recommendations.

## 3.04 TAPING AND FINISHING

- A. Environmental conditions:
  - 1. Control heating and ventilating during finishing operations to ensure the maintenance of 55 degrees F. minimum temperature, with a maximum range of 55 to 70 degrees F.
  - 2. Fill joint recesses and metal trim.
  - 3. Center the reinforcing tape on joint and press into fresh compound, wiping down with sufficient pressure to remove excess compound, but leaving sufficient compound under the tape for proper bond.
  - 4. Feather edges and leave surface free from blisters and type wrinkles.
  - 5. Apply compound to fastener recesses, leaving it flush with adjacent surfaces.
  - 6. Fold reinforcing tape along centerline and apply to interior angles, following the same procedure as for joints.

- B. Second Coat:
  - 1. Light sand dry compound with fine sandpaper to remove irregularities.
  - 2. Apply a second coat of compound to joints, feathering approximately three inches beyond edges of tape.
  - 3. Apply second coat to fastener recesses; allow to dry.
- C. Third coat:
  - 1. Lightly sand dry compound with fine sandpaper to remove all irregularities.
  - 2. Apply final skim coat, feathering out approximately two inches beyond second coat.
  - 3. Third coat fastener recesses and metal trim and interior angles; allow to dry.
- D. "Smooth" finish:
  - 1. Carefully sand coat to uniformly smooth surface free from irregularities visible to unaided eye at distance of five feet.

### 3.05 CLEAN UP

- A. Do not allow accumulation of scraps and debris. Maintain the premises in a neat and orderly condition. In the event of spilling or splashing compound onto other surfaces, immediately remove spilled or splashed material and traces of residue.
- B. Remove all excess materials from project area after completion and dispose of legally.

END OF SECTION

## SECTION 09310

### CERAMIC TILE AND QUARRY TILE

#### 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.
- B. Summary of Work:
  - 1. Provide ceramic tile per Finish Schedule. Provide cement backer board behind ceramic tile, at in-fill of existing walls of corridors.

##### 1.02 REFERENCE STANDARDS

- A. ANSI A108.5 – Ceramic Tile Installed with Dry-Set Mortar or Latex–Portland Cement Mortar.
- B. ANSI A108.10 – Installation of Grout in Tilework.
- C. ANSI A118.4 – Latex – Portland Cement Mortar.
- D. ANSI A118.6 – Standard Cement Grouts for Tile Installation.
- E. ANSI A118.7 – Polymer Modified Cement Grouts for Tile Installation.
- F. ANSI A118.8 – Modified Epoxy Emulsion Mortar/Grout.
- G. ANSI A118.9 – Ceramic Tile Installed with Modified Epoxy Emulsion Mortar/Grout.
- H. TCA Handbook; (Tile Council of America), Anderson, SC ([www.tileusa.com](http://www.tileusa.com)).

##### 1.03 SUBMITTALS

- A. Submit 4 samples of each type of base and floor tile and threshold scheduled to be used on the project.
- B. Submit tile manufacturers recommended installation procedures.
- C. Submit manufacturer's technical data and installation instructions for tile grout. Technical data shall indicate compliance with applicable reference standards listed in 1.02.
- D. Submit product data on PVC Shower Pan Liner as specified for Manufacturer's Installation instructions.

#### PART 2 - PRODUCTS

## 2.01 CERAMIC TILE

- A. Walls: 4 1/4" x 4 1/4".
  - 1. Matching base: Where wall tile is scheduled, provide cove, 4 1/4" x 3 7/8", to match wall.
- C. Trim Units: As required by installation, to match characteristics of field tile or adjoining tile, provide cove bases and rounded caps and round external corners where needed for finished appearance.
- D. Colors: Only group (1) one or group (2) one standard colors shall be used; except for accent tiles. Accent tiles shall be groups (3) and (4).
- E. Approved Manufacturers:
  - 1. Dal-Tile Corporation, Dallas, TX ([www.daltile.com](http://www.daltile.com))
  - 2. American Olean Tile Company
  - 3. Other Pre-bid approved manufacturer (See Section 01630).

## 2.02 SETTING MATERIALS FOR CERAMIC TILE AND QUARRY TILE

- A. Portland Cement: ASTM C150 Type 1.
- B. Sand: ASTM C144.
- C. Water: Potable.
- D. Mortar: 1 part portland cement, 6 parts damp sand by volume.
- E. Dry Set Mortar: ANSI 118.1 or ANSI A118.4.
  - 1. Mortars:
    - a. Ardex L.P. "X7 ShearFlex" High Performance Commercial Tile Mortar. (Note: For non-porous tile, Ardex "701 Porcelain ShearFlex" Thin-Set Mortar.)
    - b. Bostik "Hydroment ReFlex" High Performance Mortar

## 2.04 GROUTING MATERIAL FOR CERAMIC TILE AND QUARRY TILE

- A. Approved Manufacturers:
  - 1. Ardex Engineered Cements, Inc.
  - 2. Bostick Findley, Inc. ("Hydroment")

3. Other manufacturers of comparable products meeting the requirements of this Section.
- B. Wall Grout:
1. Ardex FL or FS High Performance Polymer Cement Tile Grout
  2. Bostick Findley "Hydroment Ceramic Tile Grout" (Sanded) with 425 Multi-Purpose Acrylic-Latex Admixture.
- C. Floor Grout for ceramic tile and quarry tile:
1. Hydroment Ceramic Tile Grout (sanded) with "Hydroment 1900" epoxy modified grout and mortar admixture.
- D. Mix grout/joint filler and additive in proportions as recommended in writing by manufacturer.

## 2.05 SEALANTS

- A. Dow-Corning T84; one-part silicone rubber, match color and grout.

## PART 3 - EXECUTION

### 3.01 INSPECTION

- A. Examine surfaces to receive tile, setting beds or accessories before tile work begins for defects or conditions adversely affecting quality and execution of tile installation. Notify Architect and Owner's Representative if adverse conditions are encountered.
1. Substrates shall be structurally sound, clean, and free of dust, dirt, oil, grease, curing compounds, or other contaminants.
  2. New concrete slabs: Verify that concrete has cured for a minimum of 30 days.
- B. Do not proceed with installation until unsatisfactory conditions are corrected.

### 3.02 ENVIRONMENTAL LIMITATIONS

- A. Do not perform work in areas where temperatures are below 50° F.
- B. Do not install tile work over building control joints or expansion joints.

### 3.03 INSTALLATION

- A. Install tile in accordance with the following methods listed in the TCNA Handbook (latest edition), with grout as specified above.
1. Walls (renovation; over existing tile): TR713, Case II

2. Walls (renovation; over existing SGFT): TR711

- B. Follow TCNA recommendation for preparation of existing surfaces scheduled to be re-tiled.

### 3.04 LAYOUT

- A. Lay out tile to minimize cuts less than one-half tile.
- B. Locate cuts in walls and floors to be inconspicuous.
- C. Align wall joints to give straight uniform grout lines, plumb and level.
- D. Align floor joints to give straight uniform grout lines parallel with walls.
- E. Where new wall tile abuts existing wall tile align joints in wall tile vertically and horizontally to match existing patterns. Maintain full height courses and cut tile only as indicated or required to accommodate existing conditions; cutting shall be neatly and cleanly done. Cut edges shall be free of burrs, or chips.
- F. Provide expansion joints in accordance with TCA Method EJ171

### 3.05 REGROUTING

- A. Clean out existing joints and regrout where existing grout is deteriorated, cracked or missing. Match existing grout color and texture.

### 3.06 PROTECTION AND CLEANING

- A. Clean tile surfaces thoroughly on completion of grouting.
- B. Remove grout haze; follow tile manufacturers written recommendations regarding use of acid and chemical cleaners.
- C. Rinse tile thoroughly with clean water before and after using chemical cleaners.
- D. Polish surface of tile with soft cloth
- E. Prohibit traffic on newly installed tile flooring until assembly has fully cured; or provide plywood over Kraft paper to protect tile where traffic is unavoidable.
- F. Remove all excess materials, packaging and other debris resulting from ceramic tile installation from the work area and dispose of legally.

END OF SECTION

## SECTION 09510

### ACOUSTICAL TILE CEILINGS

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

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

##### 1.02 REFERENCE STANDARDS

- A. ASTM A366 - Standard Specification for Steel, Carbon Cold-Rolled Sheet, Commercial Quality.
- B. ASTM A641 - Standard Specification for Zinc-Coated (galvanized) Carbon Steel Wire.
- C. ASTM C635 - Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- D. ASTM C636 - Standard Practice For Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- F. ASTM E1264 - Classification for Acoustical Ceiling Products.
- G. Provide data that the products meet or exceed the VOC content requirements of CHPS and GreenGuard certification.

##### 1.03 WORK EXCLUDED

- A. Bulkheads (for changes in ceiling elevations greater than 8") and moisture resistant ceiling systems are covered elsewhere in applicable sections of Division 9.

##### 1.04 SUBMITTALS

- A. Product Data: Submit manufacturer's technical literature and installation instructions for each type of panel and grid suspension system specified in this section.
- B. Samples: Provide 6" x 6" samples of each type of specified panel, and 12" long samples of exposed grid system (main runner, cross tee, and wall molding). Provide four (4) samples of each component specified.
- C. Certifications:



1. Provide manufacturer's certifications indicating compliance with specified requirements, including laboratory test reports conducted in accordance with specified tests and standards.
2. Provide VOC Emission Test Certificate in compliance with California Department of Public Health (CDPH).
3. Provide data information of the Recycled Content.

#### 1.05 ENVIRONMENTAL REQUIREMENTS

- A. Do not install acoustical ceilings until building is enclosed, sufficient heat is provided, dust generating activities have terminated and overhead mechanical work is completed, tested and approved and until ceiling concealment inspection has been satisfactorily completed.
- B. Allow wet work to dry thoroughly prior to commencement of installation.
- C. Maintain uniform temperature of minimum (61 degrees F) and humidity of 20 percent to 40 percent prior to, during and after installation.

#### 1.06 WARRANTIES

- A. Provide manufacturer's 10 year limited warranty against visible sag of panels when subjected to environmental conditions of 104°F and 90% relative humidity.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original unopened packaging with all identification labels intact. Store in a dry; secure area, protected from exposure to moisture, sunlight, surface contamination, construction damage and other harmful conditions.
- B. Handle components to prevent damage to panel edges, grid components and panel and grid finishes.

#### 1.08 REPLACEMENT OF EXISTING ACOUSTICAL TILE CEILING (*RENOVATIONS*)

- A. Work shall include removal and replacement of existing acoustical tile ceilings (panels and grid) where called for on the drawings.
- B. Remove and replace acoustical tile ceilings (panels only) where called for on the drawings.

#### 1.09 REMOVAL, STORAGE, AND REPOSITIONING OF EXISTING TILE CEILING (*RENOVATIONS AND ALTERATIONS*)

- A. Where panels and/or grid members must be removed to accommodate work in existing ceiling space, carefully remove, store and protect such items from

construction damage. Prior to removing, tag any panels or grid that are damaged, and notify Architect and Owner's Representative. Carefully reposition panels and grid once overhead work in ceiling is completed.

## **PART 2 - PRODUCTS**

### **2.01 SUSPENSION SYSTEM**

- A. Acceptable System: ASTM C-635 heavy duty system, double web exposed main runners and cross tees. Intermediate duty shall not be acceptable. Approved manufacturers shall be as follows:
  - 1. Standard of Quality: Chicago Metallic Series 200 main runners and Series 229 cross tees, at 24" and 209 at 48".
  - 2. Armstrong "Prelude XL": Series 7301 for main runners and Series 7328 for 24" cross tees (Series XL 7348 for 48" cross tees).
  - 3. Pre-bid approved manufacturer in accordance with Section 01630.
- B. Standard Grid: Non-fire rated, 15/16" exposed face, with components die cut and interlocking. Where indicated on Drawings, provide fire rated grid in compliance with UL Design Assembly.
- C. Accessories: Splices, and edge moldings as required to complete and compliment suspended ceiling grid system.
- D. Materials/Finish: Commercial quality rolled steel with galvanized coating; white baked enamel finish on exposed surfaces.
- E. Hangers: Minimum 12 gauge (0.106") galvanized carbon steel wire per ASTM A641 (Class 1); soft temper, pre-stretched with a yield stress load of at least 3 times design load; size and type to suit application and to rigidly secure complete acoustic unit ceiling system, with maximum deflection of 1/360.
- F. Retention clips: for fire resistive ceiling/floor and ceiling/roof assemblies, and for ceiling areas adjacent to exterior doors in corridors; provide spring steel clips as required by rated assemblies, and as recommended by manufacturer for impact resistance.

### **2.02 LAY-IN PANELS**

- A. Standard Acoustical Panels (Type 1)
  - 1. General characteristics: Mineral fiber composition, wet formed, factory applied white finish, class A flame spread, Type III, Form 2 per ASTM E1264; square edge design. Surface pattern shall be available in Fire Rated panels where rated assemblies occur.

- a. Pattern: Fissured, non-directional surface
  - b. Light Reflectance: 0.70 - 0.81
  - c. NRC: .70
  - d. CAC: 40
  - e. Size: 24" x 48" x 5/8" thick
2. Approved Manufacturers
    - a. Armstrong World Industries, Inc., "School Zone Fine Fissured" with "HumiGuard Plus" #1714
    - b. United States Gypsum Company (USG) "Radar Clima Plus," #2444
    - c. Certain Teed "Fine Fissured" (HHF-497 DP)

### **PART 3 - EXECUTION**

#### **3.01 INSPECTION**

- A. Examine the areas where Work of this Section shall be installed. Notify the Architect and Owner's Representative of any adverse conditions encountered that would interfere with the proper installation of acoustical ceiling systems. Do not proceed until such conditions have been corrected. Work shall not commence until the work of "wet" trades has been finished and is thoroughly dry, and all major above-ceiling work is complete.

#### **3.02 INSTALLATION**

- A. Install acoustical ceiling systems in accordance with ASTM C-636 and manufacturer's written instructions to produce finished ceiling true to lines and levels, free from warped, soiled or damaged grid or lay-in panels.
- B. Install ceiling systems in a manner capable of supporting superimposed loads, including light fixtures, with maximum permissible deflection of 1/360 of span and maximum surface deviation of 1/8 inch in 20 feet.
- C. Coordinate the location of hangers with other installed work. Ensure hangers are located to accommodate fittings and units of equipment placed after installation of ceiling grid systems.
- D. Suspend main runners from overhead structure with hanger wires spaced 4'-0" on center along the length of the runner. Hanger wire shall be plumb and straight.

- E. Where ducts or other equipment prevent regular spacing of hangers, provide additional hangers to adequately support ceiling.
- F. Hang suspension system independently of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of the longitudinal axis or face plane of adjacent members.
- G. Center ceiling systems on room axis leaving equal borders unless indicated otherwise by reflected ceiling plan shown on drawings.
- H. Install edge moldings at intersection of ceiling and vertical surfaces, using maximum lengths, straight, true to line and level. Miter corners. Provide edge moldings at junctions with other ceiling finishes. Where bullnose concrete block corners occur, provide preformed closers to match edge molding.
- I. Fit acoustic lay-in panels in place, free from edge damage or other defects detrimental to appearance and function. Fit border units neatly against abutting surfaces.
- J. Install lay-in panels level, in uniform plane and free from twist, warp and dents.

### 3.03 ADJUSTMENTS

- A. Adjust sags or twists which develop in the ceiling systems and replace parts that are damaged or faulty. Remove and replace damaged components that cannot be successfully adjusted or restored.

### 3.04 CLEANING

- A. Clean acoustical ceilings, including trim, edge moldings and suspension members in accordance with manufacturer's written recommendations.
- B. Remove all excess materials, packaging, installation debris, and other rubbish associated with the work of this Section from the work site and dispose of legally.

END OF SECTION

## SECTION 09662

### RESILIENT TILE FLOORING, BASE AND ACCESSORIES (VCT)

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

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

##### 1.02 REQUIREMENTS OF REGULATORY AGENCIES

- A. VCT: Meet or exceed standards of ASTM F1066 Class 2 “through” pattern.
- B. Flammability: 1.0 critical radiant flux or higher when tested in accordance with ASTM E648, Flooring Radiant Panel Test.
- C. Smoke Density: Less than 450 when tested in accordance with ASTM E662 Smoke Chamber Test.
- D. Standard method for the testing and evaluation for emission of VOCs of concern with respect to chronic inhalation exposures of adhesives to comply with the specifications of the current version of the California Department of Public Health’s (CDPH).
- E. SCAQMD Rule 1168- Adhesive shall meet the VOC content requirements of South Coast Air Quality Management District and tested and third party certified (FloorScore) to comply with the CDPH standard.

##### 1.03 WORK INCLUDED

- A. All resilient base, including base installed at cabinet bases, shall be part of the work of this Section.
- B. Flash patching and skim coating of underlayments.

##### 1.04 QUALITY ASSURANCE

- A. Installer shall provide evidence of a minimum of five (5) years successful experience in installation of resilient flooring and base.or installer shall be a certified installer by the manufacturer

##### 1.05 SUBMITTALS

- A. Samples: Provide samples of each type of flooring material and accessory in manufacturer’s range of colors and patterns for each grade indicated.

- B. Manufacturer's Literature: Include descriptive information, installation, maintenance and cleaning instructions for each type of material specified in this Section.
- C. Primer and Adhesive: Provide specifications data and MSDS information for the type and brand that shall be used for installation, and which is recommended by floor covering manufacturer for the specific application.
- D. Provide data that the products meet or exceed the VOC content requirements of South Coast Air Quality Management District (SCAQMD) Rule 1168, Adhesive and Sealant Applications or current version.

#### 1.07 ENVIRONMENTAL CONDITIONS

- A. Maintain minimum 65°F and a maximum of 100 F temperature in the work area for at least 48 hours prior to, during, and after installation.
- B. Areas to receive resilient flooring shall be clean, fully enclosed, weather tight with permanent HVAC in operation.

#### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver flooring, adhesives and other accessories in original unopened packaging with identification labels intact, and store in a secure, dry location. Protect adhesive from freezing temperatures. Materials shall be allowed to reach and maintain the same temperature as the work area at least 48 hours prior to installation.

#### 1.09 WARRANTY

- A. Provide a minimum five (5) year full unconditional warranty, starting on effective date of warranty of commencement. The manufacturer shall warrant the floor will be free from manufacturing defects and will not:
  - 1. Permanently indent
  - 2. Rip, tear or gauge
  - 3. Permanently stain from normal household stain.
  - 4. Yellow from exposure to rubber backed mats.
  - 5. Permanently discolor from mold or mildew growth in the vinyl when installed directly over a concrete subfloor.
  - 6. Permanently scuff from shoe soles.
  - 7. Wear through the wearlayer so that the printed pattern or design of the floor is altered.

**PART 2 - PRODUCTS****2.01 BASE MATERIALS AND FLOORING ACCESSORIES**

- A. General:
  - 1. Uniform in thickness
  - 2. Base material shall be supplied in rolls.
- B. Standard rubber base:
  - 1. ASTM F 1861, Type TP – Thermoplastic, Group 1 – Solid, Style B Cove
  - 2. 4-inch high; coved style for resilient flooring and carpet
  - 3. Color shall match existing room base.
- C. Provide flooring accessories at junctions of flooring materials of differing thickness in order to provide a smooth transition. Refer to drawings in order to identify flooring junctions.
  - 1. Include reducers/transition joinery at carpet and VCT junctions.
- D. Acceptable Manufacturers
  - 1. Burke Flooring
  - 2. Flexco
  - 3. Tarkett/Johnsonite
  - 4. Roppe
  - 5. Armstrong Flooring (Basis of Specifications)
  - 6. Other pre-bid approved manufacturer(s) in accordance with Section 01630.

**2.05 APPLICATION MATERIALS**

- A. General: Provide type and brands of adhesives as indicated below for the covering materials, substrate conditions and times of installations:
  - 1. VCT Adhesive:
    - a. For work adjacent to occupied areas during school operating hours:

- 1) Henry, L.P., "530 TilePro" No Solvent, "Fast Track" Adhesive (water-based, acrylic). Suitable for use over existing cutback adhesives.
  - 2) Armstrong S-515 Clear Thin Spread VCT Adhesive. VOC content 0 g/l calculated & reported SCAQMD 1168.
  - 3) Tarkett "100 Clear Thin Spread Adhesive", "975 Two-Part Urethane Adhesive" or "901 SpraySmart Resilient Flooring Adhesive".
  - 4) Resilient Tile Manufacturer's privately labeled, solvent free adhesive, suitable for installation over existing substrates and existing cutback adhesive.
- b. For work in unoccupied areas after school operating hours:
- 1) Resilient Tile Manufacturer's privately labeled asphalt cutback adhesive.
2. Wall Base Adhesives:
- a. Henry, L.P., "595" Cove Base Adhesive. Zero VOC content; water based, rubber resin.
  - b. Armstrong S-725 Wall Base Adhesive. Low VOC content; water based, rubber resin.
- B. Primer: Type and brand recommended by floor covering manufacturer.
- E. Leveling and Patching Compounds for Floors:
1. Finishing Underlayment: ARDEX L.P., "SD-F Feather Finish" Cement-Based Finishing Underlayment.
  2. Patching Compound: ARDEX L.P., "SD-P Instant Patch" Concrete Underlayment Patch.
  3. Finishing Underlayment and Patching Compound: Armstrong S-194 Patch, Underlayment and Embossing Leveler / S-195 Underlayment Additive

## **PART 3 - EXECUTION**

### **3.01 INSPECTION OF SURFACES**

- A. Examine substrate for evidence of excessive moisture content, residues, contaminants, and unevenness that would prevent execution and quality of resilient flooring assembly as specified.



- B. Verify that new concrete substrates have been cured for at least 30 days. Verify that no chemical curing compounds have been used or are present on surface of substrates.
- C. Notify Owner of any adverse conditions encountered during examination of substrate. Do not proceed with installation of resilient flooring until defects have been corrected except where correction is indicated under PREPARATION in this Section.

### 3.02 PREPARATION

- A. Comply with the flooring manufacturer's written recommendations for existing and new substrate preparation as applicable.
- B. Remove dirt, oil, grease, or other foreign matter from surfaces to receive floor-covering materials.
- C. Broom clean or vacuum surfaces to be covered.
- D. Remove substrate ridges and bumps.
- E. Use finishing underlayment to fill small cracks and depressions in substrate including uneven existing glue residue that may telegraph through the new tile flooring. Assume finishing underlayment is required at 100 percent of all existing floor areas where new vinyl composition is scheduled. Provide at all locations where uneven existing floor slab conditions are not satisfactory for the application of the scheduled new floor finish. Apply finish underlayment in accordance with manufacturers written instructions.

### 3.03 APPLICATION OF ADHESIVES

- A. Mix and apply adhesives in accordance with manufacturer's instructions.
- B. Provide safety precautions during mixing and applications as recommended by adhesive manufacturer.
- C. Apply uniformly over surfaces.
  - 1. Cover only that amount of area that can be covered by flooring material within the recommended working time of the adhesive.
  - 2. Remove any adhesive that dries or films over.
  - 3. Do not soil walls, bases or adjacent areas with adhesives.
  - 4. Promptly remove any spillage.
- D. Apply adhesives with notched trowel or other suitable tool recommended by adhesive manufacturer.

3.04 INSTALLATION OF BASE

A. General:

1. Install base around perimeter of room and columns.
2. Unroll material and cut into accurate lengths as desired or as required for minimum number of joints.
3. Match edges at all seams or double cut adjoining lengths.
4. Install with tight butt joints with no joint widths greater than 1/64 inch.

B. Topset base:

1. Apply adhesive and firmly adhere to surfaces, utilizing hand roller.
2. Press down so that bottom cove edge follows floor.
3. Form internal and external corners by using premolded corners.
4. Scribe material accurately to abutting materials.

3.05 FINISHING, CLEANING AND PROTECTION

- A. Upon completion of the installation of floor covering, adjacent work, and after materials have set, sweep or vacuum thoroughly to remove all loose dust and dirt. Damp mop the floor with a neutral cleaner as recommended by the manufacturer for the type of floor covering material installed. Do not wet wash, scrub, or strip the floors prior to setting of adhesive (consult manufacturer's literature for setting time and maintenance recommendations ).
- B. Apply two coats of high-quality commercial floor polish. The use of a high quality stain-resistant sealer beneath the polish should be considered in areas of high traffic, high soil load and areas where staining potential is high.
- C. Protect completed work from traffic and damage until acceptance by the Owner.
- D. Remove all debris and excess material from the project site.

END OF SECTION

## SECTION 09900

### PAINTING

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

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

##### 1.02 RELATED WORK

- A. Section 15050: Basic Materials and Methods. (Mechanical Color Coding).

##### 1.03 PRODUCT HANDLING

- A. Deliver materials to the site in original, new and unopened packages and containers bearing manufacturer's name and label.
- B. Provide paint manufacturer's printed label on each container with the following information:
  - 1. Name or title of material
  - 2. Manufacturer's stock number
  - 3. Manufacturer's name
  - 4. Analysis of major pigment and vehicle constituents
  - 5. Thinning instructions
  - 6. Application instructions
  - 7. Color name or number
  - 8. Manufacturer's recommended wet and dry film thickness in mils

##### 1.04 COLOR SELECTION

- A. Prior to beginning work, the Architect will furnish sample color chips with a color schedule for surfaces requiring painting.
- B. Proprietary names of a specified manufacturer used to designate colors or materials are not intended to imply that products of the specified manufacturer are required to the exclusion of equivalent approved colors or materials of other manufacturers.

##### 1.05 PAINT COORDINATION

- A. Provide finish coats compatible with prime paints used. Review other sections of specifications in which prime coats are specified to ensure compatibility of the total coating system.

##### 1.07 DESCRIPTION OF WORK (EXISTING CONSTRUCTION ONLY)

- A. Addition and Alterations in Existing Building: All painting and staining required for all new work and existing surfaces affected by such work shall be as specified in the following painting schedule.
- B. Mechanical Equipment: Paint all exposed and concealed piping, valves, and pumps as scheduled in this Section for mechanical color coding.

#### 1.08 WARRANTY

- A. See Section 01740 for warranty requirements.

#### 1.09 SUBMITTALS

- A. Provide data that the products shall meet or exceed the VOC content requirements of South Coast Air Quality Management District (SCAQMD) Rule 1113.

### **PART 2 - PRODUCTS**

#### 2.01 MATERIALS

- A. Provide materials that meet or exceed the VOC content requirements of South Coast Air Quality Management District (SCAQMD) Rule 1113.
- B. Provide undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer, and use only within recommended limits.
- C. Painting materials scheduled are products of Akzo Nobel (Glidden Professional and Devoe Coatings) ([www.gliddenprofessional.com](http://www.gliddenprofessional.com)), except as otherwise noted. Comparable products produced by the following manufacturers are acceptable alternates to those scheduled:
  - 1. Sherwin-Williams Co., ([www.sherwin-williams.com](http://www.sherwin-williams.com))
  - 2. Benjamin Moore and Company ([www.benjaminmoore.com](http://www.benjaminmoore.com))
  - 3. PPG Paints-PPG Architectural Coatings ([www.ppg.com](http://www.ppg.com))
  - 4. Duron Paints and Wallcoverings ([www.duron.com](http://www.duron.com))
  - 5. Comparable products of other manufacturers, pre-bid approved in accordance with Section 01630, shall be acceptable.
- D. Paint materials specified in the Painting Schedules of Part 3 are compliant with the Ozone Transport Commission (OTC) Regulations, as required by the Federal Clean Air Act. Comparable materials by other approved manufacturers shall be compliant with these regulations.
- E. Renovations and Alterations: Oil-based paints shall not be applied on interior building surfaces, or other areas when exposure of occupants to fumes is a

possibility. Coordinate performance of this work with the Construction Phasing Plan for the Project

### **PART 3 - EXECUTION**

#### **3.01 INSPECTION**

- A. Examine areas and conditions under which painting work will be performed. Notify Architect, in writing, of conditions detrimental to proper execution of the work. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Starting of painting work will be construed as acceptance of surfaces within particular area.
- B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

#### **3.02 SURFACE PREPARATION**

- A. General:
  - 1. Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions for each substrate condition.
  - 2. Remove hardware, hardware accessories, machine surfaces, plates, lighting fixtures and similar items in place and not to be finish painted, or provide surface applied protection prior to surface preparation and painting operations. Following completion of painting of each space or area, reinstall removed items.
  - 3. Clean surface to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program the cleaning and painting so that dust and other contaminants from the cleaning process will not settle on to wet, newly painted surfaces.
  - 4. Dislodge dirt, mortar splatters, and other dry materials from surfaces by scraping and brushing. Remove loose material by brushing, sweeping and vacuuming.
- B. Previously Painted Surfaces:
  - 1. A representative from the approved paint manufacturer shall visit the site and, together with the Owner's Representative, Architect and Contractor, shall inspect existing painted surfaces prior to preparation and repainting.
  - 2. Thoroughly clean all surfaces in accordance with this Section, and the recommendations of the Paint Manufacturer's Representative.

3. Remove all loose or peeling paint by scraping or by means of low or non-VOC containing stripping system approved by the Owner's Representative and Architect.
4. Prepare existing epoxy surfaces by scuff sanding. Remove all loose particles.
5. Where new coatings are to be applied over existing oil-based paint, the surface shall be scrubbed clean and dried. The gloss shall be dulled using sandpaper or wire brushing. Remove all dust or other loose particles.
6. All previously painted surfaces shall be completely re-primed, using a primer recommended by Paint Manufacturer for type of substrate and compatible with new topcoats.
  - a. Prior to re-priming, perform a "patch test" covering approximately 2 to 3 square feet in area, by applying recommended primer and specified topcoats. Allow patch to dry thoroughly, and test for adhesion in the presence of Manufacturer's Representative, Owner's Representative, Architect and Contractor.

### 3.03 MATERIALS PREPARATION

- A. Mix and prepare paint materials in accordance with manufacturer's directions.
- B. Stir materials before application to produce a mixture of uniform density, and stir as required during the application of the materials. Do not stir surface film into the material. Remove the film and if necessary strain the material before using.

### 3.04 APPLICATION

- A. General:
  1. Apply paint by brush, roller, or spray in accordance with manufacturer's directions and paragraphs E and F. Use brushes best suited for type of material being applied. Use roller of carpet, velvet back or high pile sheep's wool as recommended by paint manufacturer for material and texture required. Spray paint uniformly with suitable equipment.
    - a. Spray applications shall not be allowed when adjacent areas are occupied.
  2. Number of coats and paint film thickness required is same regardless of application method.
  3. Apply additional coats when undercoats, stains, or other conditions show through the final coat of paint, until paint film is of uniform finish, color and appearance.

4. "Exposed surfaces" shall mean areas visible when permanent or built-in fixtures, convector covers, grilles, etc., are in place in areas scheduled to be painted.
  5. Paint interior surfaces of ducts, where visible through registers, grilles, decorative ceiling, with flat, non-specular black paint.
- B. Minimum Coating Thickness:
1. Apply each material at not less than manufacturer's recommended spreading rate, to provide a total wet and dry film thickness of not less than that indicated on manufacturer's printed label.
- C. Pigmented (Opaque) Finishes:
1. Cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage.
- D. Transparent (Clear) Finishes:
1. On exposed portions, use multiple coats to produce glass-smooth surface film continuity of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections.
  2. Provide satin finish for final coats, unless otherwise indicated.
- E. Brush Application:
1. Brush-out and work brush coats onto surface in an even film. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- F. Mechanical Applications:
1. Limit roller applications to interior wall and ceiling finish coats. Apply each roller coat to provide equivalent hiding as brush-applied coats.
  2. Confine spray application to metal framework, siding, decking, wire mesh, and similar surfaces where hand brush work would be inferior.
  3. Wherever spray application is used, apply each coat to provide the equivalent hiding of brush-applied coats. Do not double back with spray equipment for the purpose of building up film thickness of two coats in one pass.
    - a. Do not use spray applications at acoustical concrete block units.

- G. Complete Work:
1. Match samples for color, texture and coverage. Remove finish, or repaint work not in compliance with specified requirements.
- 3.05 PAINTING SCHEDULE, INTERIOR (See paragraph 3.02 for Surface preparation of existing surfaces; all existing surfaces shall be re-primed)
- A. Metal:
- 1 coat: PPG Paints; 90-912 Pitt Tech Plus WB DTM Metal Primer (eliminate on shop primed items).
  - 2 coats: PPG Paints; 90-1210 Series Pitt Tech Plus WB DTM S/G Enamel
  - 1 coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series.
  - 2 coats: S-W Pro Industrial DTM Acrylic Semi-Gloss Coating, B66 -1150 Series
- B. Hollow Metal Frames:
- 1 coat: PPG Paints; 90-912 Pitt Tech Plus WB DTM Metal Primer
  - 2 coats: PPG Paints; 90-1210 Series Pitt Tech Plus WB DTM S/G Enamel
  - 1 coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series.
  - 2 coats: S-W Pro Industrial DTM Acrylic Semi-Gloss Coating, B66 -1150 Series
- C. CMU:
- 1 coat: PPG Paints; Professional: Block Filler Interior/Exterior Primer 3010-1200
  - 2 coats: PPG Paints; 6-4510X series SPEEDHIDE zero Interior Zero-VOC Latex Semi-Gloss
  - 1 coat: S-W PreRite Latex Block Filler B25W00025 (new block).
  - 2 coats: S-W Pro Mar 200 Zero VOC Int. Latex Semi-Gloss B31-2600 Series.
- D. Wood - Transparent (wood surfaces):
1. 1 coat: PPG Olympic 42784; Water Based Gloss Varnish  
2 Coats: S-W Pro Classics Int. WB Polyurethane Varnish, Satin or Gloss  
1 coat: PPG Olympic 42786; Water Based Satin Varnish
  2. Sand prior to application of first coat, and between coats, using #220 grit sandpaper
- E. Wood – Transparent (Doors):
- 1 coat: PPG Olympic 42786; Water Based Satin Varnish, over factory finish (refer to Section 08211, Part 2.02).
  - 1 Coat: S-W Pro Classics Int. WB Polyurethane Varinis, Satin.
- F. Gypsum Wallboard:
- 1 coat: PPG Paints; 6-4900XI SPEEDHIDE zero Interior Zero-VOC Latex Sealer



- 2 coats: PPG Paints; 6-4310XI Series SPEEDHIDE zero Interior Zero VOC Latex Eggshell
- 1 coat: S-W Multi-Purpose Primer (repaint) or, Pro Mar Zero VOC Primer (new).
- 2 coats: S-W Pro Mar 200 Zero VOC Int. Latex Eg-Shel B20-2600 Series

3.07 PAINTING SCHEDULE - MECHANICAL

A. Mechanical Equipment: (eliminate on pre-finished items)

- 1 coat: PPG Paints; 90-912 Pitt Tech Plus WB DTM Metal Primer (eliminate on shop primed items) or
- 2 coats: PPG Paints; 90-1210 Series Pitt Tech Plus WB DTM S/G Enamel
- 1 coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series.
- 2 coats: S-W Pro Industrial DTM Acrylic Semi-Gloss Coating, B66 -1150 Series

B. Mechanical Color Coding:

1. Overflow and blowoff pipes to be painted LIGHT GREEN except as noted for boiler blowdown pipes. DO NOT PAINT motors, gauges, nameplates, A.S.M.E. labels, water gauge, and main operating control mechanism. Paint all valves with a color to match the pipe to which it is attached.
2. All exposed Fire Protection piping to be painted RED
3. All exposed Gas piping (indoor and outdoor) to be painted YELLOW
4. Direction arrows and letters, size proportioned to pipe size, shall be painted on all water, steam (if any), condensate (if any oil and gas piping, whether covered or uncovered, to indicate the direction of flow and pipe type. Direction arrows over painted pipe shall be black or white and located where it can be easily read from the floor and spaced at each change of direction and not more than 20 feet apart on any one pipe. Direction arrows and letters on piping concealed within the ceiling or crawl space (if any) shall be in the same color as the color code and not more than 20 feet apart on any one pipe.
5. Size of arrow and letters proportioned according to size of pipe or covering as follows:

<u>Diameter of Pipe or Covering</u>	<u>Size of Letter and Length of Arrow</u>
Less than 1-1/4"	1/2" - 6"
1-1/2 to 2"	3/4" - 6"
2-1/2 to 3"	7/8" - 8"
3-1/2 to 4"	1-1/4" - 12"
4-1/2 to 5"	1-1/2" - 12"
6"	1-3/4" - 12"
7"	2" - 12"
8 to 9"	2-1/2" - 12"
10 to 1	3" - 12"

12" and over

3-1/2" - 12"

## 6. Colors: Safety Colors Conforming to OSHA and ANSI Standards

Cold Water (Domestic)	Dark Blue
Hot Water 140 <sup>0</sup> (Domestic)	Orange
Hot Water Recirc. 140 <sup>0</sup> (Domestic)	Orange with Black Banding
Tempered Water (Domestic)	Beige
Tempered Water Recirc. (Domestic)	Beige with Black Banding
Gas	Yellow
Condensate	Black with Red Banding
Condensate Pump and Receiver	Black with Blue Banding
Receiver (Vac) Condensate	Black
Vacuum Pump and Air Separator (but not motor)	Green
Chilled Water Supply	White
Hot Water Supply	Red with White Banding
Chilled Water Return	White with Black Banding
Hot Water Return	Black with Red Banding

## 7. Letters shall be provided for piping as shown in symbols list on drawings.

## C. All equipment shall be labeled with a minimum of 4" high letters.

## 3.08 CLEANING

- A. Touch-up and restore where finish is damaged.
- B. Remove spilled, splashed, or splattered paint from all surfaces
- C. Remove all debris, painting accessories, paint cans, and other associated equipment from the premises and legally disposes of off-site. Do not leave surplus painting materials on the premises as "attic stock."

END OF SECTION

## SECTION 10100

### MARKERBOARDS AND TACKBOARDS

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract, including General Conditions and Division 1 Specifications, apply to the work of this section, with special attention to Section 01092 (Mounting Heights).

##### 1.02 SUBMITTALS

- A. Comply with requirements of Section 01340 for shop submittals, product data, and samples.
- B. Submit product data for each type of board specified.
- C. Submit Shop Drawings, indicating size, length, joints, and room location of each type of board.
- D. Submit GRENGUARD Indoor Air Quality Certification and must meet stringent standards for low chemical emissions based on established health standards.

##### 1.03 WARRANTY

- A. Provide manufacturer's written warranty agreeing to replace markerboards which have lost original writing and erasing qualities.
- B. Warranty Period: Manufacturer's standard warranty

##### 1.04 QUALITY ASSURANCE

- A. All markerboards and tackboards shall be provided by a single source manufacturer.
- B. Contractor shall, upon request by Architect and Owner's Representative, disassemble one board of each type specified in order to demonstrate that all components comply with requirements of this Section.

##### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store in a secure area, protected from weather and unauthorized access. Follow Manufacturer's written recommendations for storage and handling.

#### PART 2 - PRODUCTS

##### 2.01 ACCEPTABLE MANUFACTURERS

- A. Claridge Products and Equipment, Harrison, AR, 1-870-743-2200, [www.claridgeproducts.com](http://www.claridgeproducts.com), (shall be the basis of the specification and standard of quality).
- B. Best-Rite Manufacturing, Temple, TX, 1-866-886-6935, [www.bestrite.com](http://www.bestrite.com)
- C. ADP Lemco Corporation, West Jordan, UT, 1-800-575-3626, [www.adplemco.com](http://www.adplemco.com)
- D. Schalow Manufacturing Company, Powhatan, VA, 1-804-794-5102.
- E. Platinum Visual Systems, Corona, CA, 1-800-498-2990, [www.pvusa.com](http://www.pvusa.com)
- F. Marsh Industries, Cincinnati, OH, 1-800-260-2776, [www.SchoolOutfitters.com](http://www.SchoolOutfitters.com)
- G. Aarco Products Inc, Yaphank, NY, 1-800-989-2348, [www.aarcoproducts.com](http://www.aarcoproducts.com)
- H. Pre-bid approved manufacturer (see Section 01630).

## 2.02 WHITE MARKERBOARDS

- A. White markerboards shall be as follows:
  - 1. New boards: Series 1, Type "A" (Factory Built),
- B. Porcelain writing surface shall be a vitreous ceramic baked-on 24 gauge minimum steel at 1500° F White markerboards: "LCS-3" (#100 White Low Gloss suitable as a projection surface) - Claridge as the basis of design. All markerboards are to be Magnetic surface and 100% non-combustible surface.
- C. Surface shall conform to requirements set forth in "Standards for Architectural Porcelain" by the Porcelain Institute.
- D. Color of writing surface shall be as selected by Architect from Manufacturer's standard finishes.
- E. Particle board core shall be 3/8 inch thick.
- F. Backing sheet shall be minimum 0.015 inch thick aluminum sheet.
- G. Joints shall have concealed continuous steel splines, or a tongue and groove finished to a smooth even plane. "H" bars are not acceptable and shall be rejected.

## 2.03 TACKBOARDS

- A. Tackboards shall be as follows:
  - 1. Series 1, Type "CO".

- B. Tackboard Material: Claridge Bulletin Board Cork; cork and oxidized linseed oil, resin, jute, and pigments on burlap backing, self-healing, soil-resistant, washable, non-toxic, dimensionally stable.
- C. Board Construction: Burlap on hardboard; 1/4" thick tackable surface on 1/4" hardboard (1/2" total thickness).
- D. Color shall be as selected from Manufacturer's standard finishes.

#### 2.04 TRIM AND ACCESSORIES

- A. Trim for white markerboards, and tackboards shall be as noted below. Provide the following:
  - 1. Aluminum trim tray for white markerboards.
  - 2. Joint splines, end closures, and perimeter trim for white markerboards and tackboards.
  - 3. Trim shall be extrusions of not less than 3/32-inch thick aluminum, for installation without visible fastenings at full-face view; one piece with joints at corners only, no splices. Provide cast aluminum end closures for marker trays.
- B. Provide six map hooks and one flag holder per classroom. Provide one flag holder at all other markerboard locations.

#### 2.05 TACK STRIPS

- A. Tack strips shall be No. 74 Deluxe Map and Display Rail. Provide tack strip at each white markerboard of length equal to length of markerboard
- B. Provide tack strips along the corridors; 3'-0" min to any door for a max length of 20'-0" and a 5'-0" interval before another tack strip.
- C. Tack strips shall be constructed of heavy-gauge extruded aluminum.
- D. Tack strips shall be approximately 1 3/8" wide and 8'-0" long each.
- E. Insert: Same material as tackboard. Natural cork is not acceptable and shall be rejected.
- F. Provide end caps at terminations of strips.

### PART 3 – EXECUTION

## 3.01 INSTALLATION

- A. Series 1 – White markerboards and tackboards shall be surface-mounted with 2 inch clip angle hangers at 24 inch o. c. top and bottom. "Snap-on" installation shall utilize Manufacturer's standard ground clips.
- B. Grounds shall be continuous, aligned and shimmed to a true plane and shall be properly secured to wall surface. Maximum spacing of fasteners shall be 12-inch maximum o. c. under chalkboard and 20 inch o. c. maximum elsewhere.
- C. Clips shall be secured with cadmium-plated sheet metal screws. Power activating anchoring is not accepted.
- D. Markerboards and tackboards shall be set plumb and true, using spotting adhesive applied in spots 12 inch o. c., both horizontally and vertically.
- E. Mounting heights for markerboards and tackboards shall be as indicated by paragraph 1.04, Equipment Mounting Heights in Section 01092, Applicable Standards.
- F. Install corridor tackstrips in two rows, with clearances and maximum runs in accordance with criteria set forth in this section and Section 01092, and as indicated on the Drawings.

## 3.02 CLEANING

- A. Clean all materials in accordance with Section 01710 of these Specifications and with Manufacturer's printed recommendations.
- B. Remove all trash, debris, packaging, and other items associated with the work, and dispose of legally.

END OF SECTION

**SECTION 10200**  
**LOUVERS AND VENTS**

**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. Unit Masonry: Section 04200.
- B. Sealants: Section 07900.

1.03 QUALITY ASSURANCE

- A. Louvers shall comply with AMCA test standards for pressure drop and water leakage and carry AMCA certified ratings seal.
- B. Brick vents: Comply with NAAM "Metal Finishes Manual".

1.04 SAMPLES

- A. Provide 4 samples, minimum size 3 inches X 6 inches, of color specified on the actual base metal.

1.05 SHOP DRAWINGS AND CERTIFICATIONS

- A. Clearly indicate, in large scale, profile of frame and installation details, relation to adjacent construction, flashing, blade configuration connections to duct work, bird screens, and percentage of free air opening. Incorporate field measurements to minimize on-site adjustments, splicing, joints and field assembly.
- B. Provide evidence of AMCA Certified Ratings for water penetration and air performance as part of louver submittal.
- C. Include information on loadbearing extension as part of brick vent submittal.

1.06 PROTECTION

- A. Protect louvers and finishes from damage during delivery and installation.
- B. Protect adjacent surfaces, finishes, and material from damage during installation of louvers.

## **PART 2 - PRODUCTS**

### 2.01 ACCEPTABLE MANUFACTURERS

- A. Acceptable Manufacturers (Brick Vents)
  - 1. The Airlite Company, "E" series
  - 2. Airline Products
  - 3. Industrial Louvers, Inc., Delano, MN, 1-763-972-2981  
([www.industriallouvers.com](http://www.industriallouvers.com))
  - 4. Sunvent Industries (Sylvo Sales Corp.), Pelham, NH, 1-800-325-4115
  - 5. CS Group, Construction Specialties, Inc., Lebanon, NJ, 1-888-621-3344  
([www.C-Sgroup.com](http://www.C-Sgroup.com))

### 2.02 TYPE

- A. Brick Vents:
  - 1. Extruded aluminum, loadbearing, and masonry rib design. Sizes shall be as indicated on the drawings. Provide load-bearing extension in order to span full thickness of wall.
  - 2. Features and Accessories: Continuous sill drip and weep holes, integral water stop, extruded blades with integral drip; units furnished with aluminum wire, 1/2" mesh "bird" screens.

### 2.03 MATERIALS

- A. Brick Vents: 6063T5 Extruded aluminum, 0.125 inches thick (minimum).

### 2.04 FINISHES

- A. Louvers and Vents: Provide the following finish available in manufacturer's standard color range:
  - 1. Kynar: Fluoropolymer coating containing Kynar 500 resin.

## **PART 3 - EXECUTION**

### 3.01 PREPARATION

- A. Field verify dimensions related to openings for installation of vents. Notify Architect and Owner's Representative if conditions are encountered that will interfere with proper installation.
- B. Ensure that openings designated to receive vents are properly prepared and that flashings are correctly located to divert moisture to exterior.



- C. Do not proceed with the Work of this Section until unsatisfactory conditions are corrected.

### 3.02 INSTALLATION

- A. Install vents in openings level with 1/4 inch in 10 feet and plumb within 1/4 inch in 10 feet.
- B. Coordinate installation method with application of masonry and mechanical work. Where brick vents are indicated, ensure that brick vent and load bearing extension support full thickness of masonry wall.
- C. Set and tie in to flashings to ensure diversion of moisture to exterior.
- D. Clean exposed surfaces with mild soap and water. Rinse thoroughly and dry.

END OF SECTION

## SECTION 10440

### INTERIOR SIGNS AND ROOM SIGNAGE

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including Conditions and Division One Specification Sections, apply to work of this Section.

##### 1.02 RELATED WORK

- A. Building Identification Signage: Section 10430.

##### 1.03 DESCRIPTION OF WORK

- A. Furnish and install interior signs in the following locations:
  - 1. Each permanent room and space within the project area to **match existing building interior signage**.

##### 1.04 REQUIREMENTS OF REGULATORY AGENCIES

- A. Signage shall comply with applicable provisions of the Americans with Disabilities Act (ADA), including but not limited to, the following:
  - 1. 1/32" high raised letters, numerals and Grade 2 Braille in type, style and sizes as defined in ADA standards. (Braille not required for doors serving utility spaces).
  - 2. Locate on latch side of doors; except at door pairs, locate on nearest adjacent wall. Locate to comply with path of approach and to avoid protruding objects.
  - 3. Comply with finish and contrast requirements.

##### 1.05 SUBMITTALS

- A. Submit manufacturer's specifications and technical data indicating compliance with this Section.
- B. Submit samples of letters, numerals, sign type, colors and materials.
- C. Submit shop drawings for each type of sign showing dimensions of plaque and characters.
- D. Submit list of all signage required for permanent rooms and spaces, including directional signage where indicated on the drawings. Room names and numbers indicated on floor plans and Finish Schedule shall not be used for signage

fabrication. The list of actual names and numbers will be provided by the Architect or Owner's Representative prior to preparation of submittals.

#### 1.06 WARRANTY

- A. Submit manufacturer's written product warranty covering materials and fabricated signs.

### **PART 2 - PRODUCTS**

#### 2.01 ACCEPTABLE MANUFACTURERS

- A. Best Sign Systems, Inc., Montrose, CO, 1-800-235-BEST ([www.bestsigns.com](http://www.bestsigns.com))
- B. Mohawk Sign Systems, Inc., Schenectady, NY, 1-518-370-3433 ([www.mohawksign.com](http://www.mohawksign.com))
- C. National Sign, Inc., Ambridge, PA, 1-800-363-1203 ([www.natsign.com](http://www.natsign.com))
- D. Signs and Wonders, Inc.
- E. Bayuk Graphic Systems, Inc., Parkesburg, PA, 1-717-442-0247
- F. R&D Stamp & Sign Co., Inc, Lorton, Virginia 1-703-5501423
- G. Other pre-bid approved manufacturer(s) in accordance with Section 01630.

#### 2.02 MATERIALS AND FABRICATION

- A. Plaque: Basic stock shall be 1/8" thick, melamine laminate or matte acrylic with face and backplate; provide radiused corners.
- B. Characters: Provide 3/4" raised letters, 1" numerals, and braille characters where required on background stock by means of a blast process or by chemically welding characters to stock.
- C. Raised Copy: Provide up to seventeen (17) characters for letters, up to three (3) characters for numbers. Provide accompanying raised braille.
- D. Character Type: Upper case, sans serif or simple serif.
- E. Room signs, excluding utility rooms, gym, library, cafeteria, toilet rooms and storage rooms: Provide one 3/4" high window with Lexan insert.

### **PART 3 - INSTALLATION**

#### 3.01 SIGN MOUNTING

- A. Mounting Method: MM (Mechanical Fastening). Mounting by means of double-faced adhesive tape shall not be acceptable.
- B. Drill and insert appropriate type plugs or expansion anchors into wall substrate.
- C. Attach signs to wall using countersunk tamperproof screws. Screw heads shall be flush with sign face.
- D. Mount so that bottom of the letters above finished floor surface is as follows:
  - 1. All Schools: 48" min – 54" max.

### 3.02 CLEANING

- A. Remove all construction debris and excess materials associated with the work of this Section from the job site and dispose of legally.

END OF SECTION

## SECTION 12304

### PLASTIC LAMINATE FACED CASEWORK AND FIXTURES

#### PART 1- GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract, including Division One Specification Sections, apply to this Section with special attention to the following:
  - 1. Shop Drawings, Product Data and Samples: Section 01340
  - 2. Substitutions and Product Options: Section 01630.

##### 1.02 RELATED WORK

- A. Section 06651- Solid Surface Fabrications
- B. Section 08710- Finished Hardware
- C. Section 09660- Resilient Tile Flooring and Base

##### 1.03 REFERENCED STANDARDS

- A. Architectural Woodwork Institute (AWI), "Architectural Quality Standards Illustrated."
- B. National Electrical Manufacturer's Association (NEMA) "Architectural Quality Standards." ([www.awinet.org](http://www.awinet.org))

##### 1.04 DESCRIPTION OF WORK

- A. Full Overlay Door (Laminate Clad Casework)
- B. Countertops
- C. PVC body edging for doors and drawers and cabinet bodies.
- D. Independent toe base.
- E. Extent of plastic laminate-faced casework and fixtures is shown on the Drawings.
- F. Work shall include the fabrication and installation of base cabinets, wall cabinets, storage cabinets, shelf units, and other components as indicated on the Drawings.
- G. Tops, box curbs and splash rims associated with plastic laminate-faced casework are included in the work of this Section.

- H. Cutouts in tops to accommodate sinks, faucet assemblies, and other hardware are included in the work of this Section.

#### 1.05 WORK EXCLUDED

- A. All final connection to plumbing fixtures are provided by Division 15. Contractor shall coordinate with Division 15 trades to ensure proper location and size of such cutouts.
- B. Furnishing and installing of rough framing, in-wall reinforcement, or other means of support shall be provided under the Work of other Sections.

#### 1.06 QUALITY ASSURANCE

- A. Manufacturer: Provide single source responsibility for all plastic laminate-faced casework. Submit evidence of at least five years' experience in successful manufacturing for installations of laminated-faced casework similar in size and scope to the work required for this project.
- B. Casework: Manufacturer shall comply with the design, quality of materials, level of workmanship and standards of detailing established by the approved manufacturer in Part 2 of this Section.
- C. Installation: Install casework under the supervision of the Manufacturer's authorized representative, using mechanics certified by the Manufacturer.

#### 1.07 WARRANTY

- A. All casework shall be warranted for a period of five (5) years from date of warranty commencement against manufacturing defects and workmanship.

#### 1.08 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store casework, countertops and related products in undamaged condition and in original protective packaging. Protect from weather, temperature and humidity extremes, construction hazards and unauthorized access. Packaging shall remain intact on casework until ready for final placement.
- B. Remove casework from storage only when "wet trades" have completed their work in the area of placement.

#### 1.09 COORDINATION

- A. Coordinate layout and installation of rough framing, in-wall reinforcement, blocking, and other means of support for the work of this section.
- B. Coordinate locations of utilities that will penetrate tops, splashes and cabinets.

**1.10 SUBMITTALS**

- A. Product Data: Submit manufacturer's product data, specifications and installation instructions for each type of casework and hardware type.
- B. Samples: Submit 6" x 6" samples of each type of exposed and semi-exposed finish construction specified, including countertops, cabinet and drawer fronts, interior and underside cabinet surfaces, and edges.
- C. Colors: Provide manufacturer's standard color selections for high-pressure plastic laminate and pressure fused laminated finishes.
- D. Shop Drawings: Submit shop drawings for each type of casework, including the following:
  - 1. Plans and elevations showing relationship to surrounding and adjacent walls, doors, and windows.
  - 2. Cross sections
  - 3. Anchoring details and locations of anchorage
  - 4. Locations of sink cutouts
  - 5. Joinery details for each type of joinery condition used in the fabrication process.

**PART 2- PRODUCTS****2.01 ACCEPTABLE MANUFACTURERS**

- A. Case Systems, Inc., Midland, MI, as represented by Diversified Educational Systems (DES), 540-687-7060.
- B. Paragon Casework, Chantilly, VA 703 802-1517.
- C. TMI Systems Design Corporation, Dickinson, ND as represented by VA School Equipment, 434-455-2000.
- D. Stevens Industries, Inc., Teutopolis, IL, as represented by Nycom, Inc. 804-794-3044.
- E. Specified Woodworking, Laurel, MD, 301-598-8200.
- F. Blair-Dumond, Inc., Richmond, VA, 804-359-2090.
- G. Mastercraft Woodworking, Inc., Shoemakersville, PA, 610-926-1500.

- H. Other manufacturers pre-bid approved in accordance with Section 01630 and complying with the standard of quality described in this Section.

## 2.02 MATERIALS

- A. Definitions: The following definitions apply to casework units;

1. "Exposed" portions of casework include surfaces visible when doors and drawers are closed. Bottoms of cases more than 4'0" above floor shall be considered as exposed. Visible members in open cases or behind glass doors also shall be considered as exposed portions.
2. "Semi-exposed" portions of casework include those members behind solid doors and drawers, such as shelves, dividers, interior faces of ends, case back, drawer sides, backs and bottoms, and back face of doors. Tops of cases 6'-6" or more above floor shall be considered semi-exposed.
3. "Concealed" portions of casework include sleepers, web frames, dust panels, and other surfaces not usually visible after installation.

- B. Laminated Plastic Finishes

1. Exterior cabinet surfaces (exposed finish): High pressure decorative laminate (HPDL), NEMA LD3-1995-VGS 0.028" thick. Provide HPDL Manufacturer's full range of standard colors for selection. Exposed surfaces include the following:
  - a. Doors and drawer fronts (when closed).
  - b. Exterior cabinet ends.
  - c. Bottoms of wall cabinets
  - d. Interiors of open cabinets (no doors)
2. Semi-exposed surfaces: Pressure fused laminate; Melamine, resin-impregnated, 80-gram PSM minimum, complying with NEMA LD3-1995-VGS GP 28 and LD3-1991 CL20. All concealed surfaces shall be balanced with phenolic backer. Color: Colorfast "white", "gray", or "putty". Semi-exposed surfaces include the following:
  - a. Interior of all cabinet surfaces (cabinets with doors).
  - b. Tops of tall cabinets and wall cabinets.
3. Countertops: High pressure decorative laminate, NEMA LD3-1995 HGS .050" thick, solid color, horizontal grade. Provide HPDL Manufacturer's



- full range of standard colors for selection. All countertop edges shall be self-edge with laminate.
4. Balancing sheet: White or neutral colored, .020" cabinet liner, NEMA CL-20 for balanced construction.
- C. Cabinet Edging: High impact, solid, acid resistant PVC, with homogenous color throughout; machined applied with hot melt adhesive. Minimum number of color selections: 27.
1. Doors and Drawers: 3 mm thick.
  2. Cabinet body edging: 1 mm thick.
- D. Particle Board Core: minimum 47 lb. density; balanced construction with moisture content not to exceed 8%. Comply with ANSI A208.1-2009 or current edition, type M-2 Industrial Grade.
- E. Fiberboard: Fiberboard Core is not Acceptable.
- F. Hardware:
1. Hinges: Five knuckle 270° swing, institutional type hinge; wrap around, tempered steel. Provide one pair per door to 48" in height, one and one-half pair per door over 48" high. Finish: Chrome plated with satin finish.
  2. Pulls: Satin chrome, 4" wire pull.
  3. Drawer slides: Minimum 75-pound dynamic load rating, with adjuster cam to control side swat, and in-stop, out-stop and keeper to maintain 80% open position.
  4. Catches: 6-pound magnetic catch for base and wall cabinet doors. Provided two catches at tall cabinets.
  5. Elbow catches: Ives #2, A14 (chrome) or comparable.
  6. Shelf-supports: Adjustable type, twin pin design to prevent rotation and provided with anti-tip shelf restraints. Load rating: 300 pounds per support. Support shall retard shelf slide-off. Shelf supports shall friction-fit into end panels and intermediate vertical dividers.
  7. Locks: CompX National or CompX Timberline –Disc tumbler design; provide locks for all drawers and doors. All locks shall have metal strike/receiver. All locks shall be keyed alike by room.
    - a. Rough-ins for locks shall comply with manufacturer's recommendation to avoid gaps around the locks.

- b. Provide four (4) Master keys.

### 2.03 GENERAL WORKMANSHIP

- A. All casework shall be square, plumb and true.
- B. Cabinet parts shall be accurately machined and bored, utilizing concealed dados, dowels or interlocking mechanical fasteners, as appropriate.
- C. No nails, screws or other fasteners shall be visible on exposed surfaces.
- D. Provide 3/4" hang rails at all cabinets to provide rigidity and ease of installation.
- E. High-pressure decorative laminate tops shall be fabricated in longest possible lengths. Field joints shall not be allowed within 12" of a sink cutout. Splice field joints with bolt type fasteners.
- F. Bolt high-pressure decorative laminate sheets to core using adhesive recommended by the HPDL manufacturer.
- G. Provide balanced construction of all unfinished core stock surfaces (with the exclusion of stock edges).
- H. Fabricate casework, countertops and related products to dimensions, profiles and details as shown on drawings.

### 2.04 CABINET CONSTRUCTION

- A. Toe Base: Separate and continuous water resistant, 3/4" exterior grade plywood platform. Provide concealed fastening to cabinet.
- B. Cabinet tops and bottoms:
  - 1. Base cabinet and tall cabinet bottoms: 3/4" thick particle board backed with cabinet liner on concealed side, fused laminate on interior side.
  - 2. Base Cabinet: 3/4" particleboard, prefinished.
  - 3. Wall cabinet bottoms: 3/4" thick particle board with 0.30" plastic laminate on exposed side, fused laminate on the interior (semi-exposed side).
  - 4. Wall cabinet tops: 3/4" thick particle board with fused laminate on both sides.
- C. Exposed cabinet body edges: .020" PVC, color matched to cabinet, or as otherwise selected from standard colors.
- D. Wall and base cabinet ends (between units): 3/4" thick particle board with fused laminate on interior (semi-exposed) side, backing sheet on concealed side.

- E. Exposed wall and base cabinet ends: 3/4" thick particle board with .030" plastic laminate on exposed side; fused laminate on interior (semi-exposed) side.
- F. Fixed and adjustable shelves: 3/4" thick particle board for shelves in cabinets up to 27" wide; provide 1" thick particle board for shelves over 27" wide. Provide fused laminate on both sides with color matched PVC edges.
- G. Cabinet backs: 1/2" thick, particleboard, or 1/4" thick MDF, core pressure fused; cabinet backs shall be recessed and fully housed (4 sides), with stiffeners and hot melt adhesive. Finish: manufacturer's standard white or neutral finish.
  - 1. Optional back construction: Full overlay, plant-on back; edge of back shall not be exposed at finished ends. Secure with minimum #8, low root, high treated screws spaced 8" on center maximum.
  - 2. Comply with AWI Standards 400 B-T-10 and 1600-T-11.
- H. Door and Drawer Fronts: 3/4" particle board core with plastic laminate on exposed face, backing sheet on interior (semi-exposed) face; backing sheet to be color matched to interior faces of cabinet body. Doors and drawer fronts shall overlay cabinet body with a maximum 1/8" reveal. Exposed PVC edges shall be machine radiused and buffed for consistent finish and profiled, corners and length, inside and out.
- I. Door catches: Dual, self-aligning, magnetic type. Strike shall be plated steel. Inactive leaf of door pair shall have one (1) magnetic catch and one (1) elbow catch. Inactive doors over 4'-0" tall shall have one (1) magnetic catch and one (1) surface bolt.
- J. Countertops, and splashes for base cabinets: High pressure, decorative laminate on minimum 3/4" thick particle board, with 1/2" buildup for a total of 1 1/4" thickness. Concealed sides shall be balanced with backing sheet. Where multiple units are set end to end in a line, provide continuous tops to minimize seams.
- K. Vertical and Horizontal Dividers: 3/4" particle board with pressure fused laminate both sides, color matched PVC at edges.

## **PART 3- EXECUTION**

### **3.01 INSPECTION**

- A. Inspect areas where casework shall be installed in order to ensure that utility rough-ins, where applicable, have been correctly installed in the proper locations and are sufficiently complete to prevent damage to casework by rough-in trades. Verify that no adverse conditions exist that would prevent the proper installation

of casework. Notify Owner's Representative and Architect if any such conditions have been corrected.

- B. Verify dimensions of on-site cabinet locations prior to fabrication of casework.

### 3.02 PREPARATION

- A. Condition casework to the average prevailing humidity for the conditioned room and spaces in which the casework will be permanently installed.

### 3.03 INSTALLATION AND PROTECTION

- A. Install casework in accordance with the Drawings and final approved shop drawings. Install casework plumb, level, true and straight. Shim where required using only concealed shims.
- B. Where casework abuts other adjacent finished work, carefully scribe and cut for close, accurate fit.
- C. Provide filler strips, scribe strips, or other trim required by the drawings.
- D. Anchor casework securely in place using manufacturer's recommendations.
- E. Install all hardware using at least the minimum number of fasteners required by the manufacturer.
- F. Adjust all doors, hinges and drawers for proper operation, fit and finished appearance. Moving parts shall operate freely, without excessive bind.
- G. Repair minor damage in accordance with manufacturer's written recommendations. Replace other casework units, components and hardware that exhibit significant damage or defects.
- H. Protect installed casework and accessories from damage until acceptance by Owner, in accordance with manufacturer's recommended written instructions.

### 3.04 CLEAN UP

- A. Remove all installation debris such as cartons, protective wrapping, sawdust, scraps and fasteners from the premises, and dispose of legally off-site.
- B. Clean all exposed and semi-exposed surfaces of casework and tops in accordance with manufacturer's recommended written procedures.

END OF SECTION

**SECTION 12505**  
**LOCKDOWN SHADES**

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General General Conditions and Division 1 Specifications, apply to the work of this Section.

1.02 RELATED WORK

- A. Section 08100 – Metal Doors and Frames
- B. Section 08211 – Wood Doors

1.03 DESCRIPTION OF WORK

- A. Provide and install Lockdown shade to all doors with glass vision panels in the following areas:
  - 1. All instructional classroom doors accessible from the main corridor, lobby, Commons, courtyard and including exterior doors.
  - 2. All doors from corridors, lobby or common areas only leading into the administrative office suite, student services office suite, Health (clinic) office and Student activities office suite.
- B. The actual fabric size shall be (width of glass) plus 4" X length of glass plus 6"  
Where a door has two (2) vision panels one on top of the other, fabric shall be one piece covering the entire two (2) vision panels.
  - 1. Bottom of fabric panel shall have double weighted hem rod.
  - 2. Refer to door types for actual glass vision sizes and add the additional inches as required above.

1.04 REFERENCE STANDARDS

- A. NFPA 701-99 (or current requirement) – Fire Tests for Flame-Resistant Textiles
- B. GREENGUARD Environmental Institute Children & Schools.

1.05 SUBMITTALS

- A. Comply with Section 01340, Shop Drawings, Product Data and Samples.
- B. Product Data: Manufacturer's data sheets on each product specified, including:
  - 1. Preparation instructions and recommendations.
  - 2. Installation and maintenance instructions.

3. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
  4. Storage and handling requirements and recommendations.
  5. Mounting details and installation methods.
  6. Plans and elevations indicating locations of the lockdown shade and sizes.
- C. Flame spread rating: Provide certification of flame spread rating, for fabric for the door vision panel shade that meets requirement of NFPA bulletin 701 or current version.
- D. Samples: Provide actual finish product sample representing actual product, specified color, size and patterns. Mark face of material to indicate interior face.

#### 1.06 QUALITY ASSURANCE

- A. NFPA Flame-Test: Passes NFPA 701. Materials tested shall be identical to products proposed for use.
- B. Mock-Up: Provide a mock-up of the shade assembly specified for evaluation of mounting, appearance and accessories.
1. Locate mock-up in door vision panel(s) designated by Architect.
  2. Do not proceed with remaining work until mock-up is accepted by Architect.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver window shades until building is enclosed and construction within spaces where shades will be installed is substantially complete.
- B. Deliver products in manufacturer's original, unopened, undamaged containers with labels intact.
- C. Label containers and shades according to Window Shade Schedule.
- D. Store products in manufacturer's unopened packaging until ready for installation.

#### 1.08 PROJECT CONDITIONS

- A. Install door vision panel shades after finish work and ambient temperature, humidity and ventilation conditions are maintained at levels recommended for project upon completion.

#### 1.09 WARRANTY

- A. Hardware and Fabric: One year limited warranty.

**PART 2 - PRODUCTS**

## 2.01 MANUFACTURERS

- A. The Hideaway Helper, (School Safety Solution, LLC.)  
[www.schoolsafetysolution.com](http://www.schoolsafetysolution.com), 888-733-0406. Hamburg, NJ 07419
- B. The Security Roll, (The Specialty Group, LTD dba LuXout)  
[www.luxout.com/products/securityroll](http://www.luxout.com/products/securityroll), 804-264-3700. Richmond, VA 23220.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01630.

## 2.02 LOCKDOWN SHADES:

- A. FABRIC – 100% polyester with a minimum weight of 12 ounces and 22 mi thick
- B. FABRIC Color – shall be black (No Substitution)

**PART 3 - EXECUTION**

## 3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

## 3.02 PREPARATION

- A. Coordinate requirements for blocking, construction of shade pockets, and structural supports to ensure adequate means for installation of shades.

## 3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install lockdown shades level, plumb, square, and true. Allow proper clearances as required to cover the vision glass pane

## 3.04 TESTING AND DEMONSTRATION

- A. Demonstrate operation of shades to Owner's designated representatives.

## 3.05 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

## SECTION 12510

### HORIZONTAL LOUVER BLINDS

#### 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 DESCRIPTION OF WORK

- A. Provide all labor, materials and equipment, and performance of all operations related to new operating horizontal aluminum slat blinds as indicated, required and hereinafter specified.
- B. Blinds shall be products of same manufacturer or source; mixing of components of different manufacturers shall not be permitted.

##### 1.03 SUBMITTALS

- A. Comply with applicable provisions of Section 01630.
- B. Provide manufacturer's descriptive literature and installation instructions. Provide diagrams identifying major components of blind assembly.
- C. For large window areas, provide drawings or other information indicating maximum width and arrangement of blinds, where multiple blind assemblies are required.
- D. Furnish samples of slats and tape showing color and physical properties for approval.
- E. Provide manufacturer's written recommendations for cleaning and maintenance.

##### 1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver blinds to site wrapped and crated in manufacturer's original packaging, with identifying labels intact, so as to prevent damage to components or marring of surfaces.
- B. Store blinds in a clean, dry area, laid flat and blocked off ground to prevent sagging, twisting or warping.

##### 1.05 LOCATION

- A. Exterior: All exterior windows shall receive new blinds. Provide blind at all the door sidelight at exterior doorframe.



- B. Interior: New blinds shall be provided and installed at all interior windows and all interior doorframe sidelight locations.

## **PART 2 - PRODUCTS**

### **2.01 ACCEPTABLE MANUFACTURER**

- A. Basis of Specification: Hunter Douglas Contract Aluminum Blinds, Poway, CA; website: <http://contract.hunterdouglas.com>. Products of other manufacturers complying with the characteristics of the specification basis shall be acceptable. Materials shall be consistent with manufacturer's published literature for products specified.

### **2.02 MATERIALS**

- A. Slats: 1" wide, .008" thick (prior to painting) 0611 aluminum alloy, spring tempered and heat treated. Finish: manufacturer's baked on "Dust Shield" paint finish. Slats per foot: No less than 13.8.
- B. Slat Support: 100% polyester braided ladders. Yarn color shall be compatible with slat finish.
- C. Headrail: U-shaped profile, rolled edges, 1" x 1 1/2" x .024" all steel construction. Ends shall be finished with .030" steel end locks with adjustable tab. Finish: Baked on polyester paint, color matched to slats.
- D. Bottom Rail: Steel, formed with double lock seam into closed oval shape. Finish: Based on polyester paint, color matched to slats.
- E. Lifting Mechanism: Crash proof steel cord lock with manufacturer's corrosion resistant finish. Two-ply polyester cord filler in braided polyester left cords, with cord equalizers, cord lock adapter and safety tassel. Locate on side opposite of tilt-control wand.
- F. Tilt-Control Wand: Ribbed, tubular 7/16" diameter extruded clear plastic. Locate on side opposite of lifting mechanism.
- G. Tilting Mechanism: Permanently lubricated, die-cast worm and gear type tilter, in fully enclosed housing, with clutch action designed to prevent over rotation of tilt rod.
- H. Mounting Hardware: Manufacturer's standard steel box brackets with baked on polyester finish, color match to slats. For blind units 60" and wider, provide additional brackets.

### **2.03 FABRICATION**

- A. Blinds shall be fabricated in accordance with approved final submittals and sized to suit windows indicated. Blinds shall be furnished as complete functioning

assemblies, with all mounting hardware and support brackets required for installation within jambs as shown, and with all operating wands and hardware.

- B. Blind measurements shall be accurate to within  $\pm 1/8"$ , or as otherwise recommended by manufacturer.

### **PART 3 - EXECUTION**

#### **3.01 PREPARATION**

- A. Verify existing conditions and dimensions in field before beginning fabrication. Notify Architect and Owner's Representative in writing of any conditions that could affect proper installation and operation of blinds. Do not proceed until such conditions have been corrected.

#### **3.02 INSTALLATION**

- A. Install blinds in accordance with final approved shop drawings and manufacturer's written installation procedures. Provide intermediate support brackets where required and where recommended by manufacturer. Depending on actual conditions, the blind assembly head rail shall be attached to either a steel or concrete masonry lintel spanning the window opening. In no case shall blinds be attached to window frames. Blinds shall be installed with adequate clearance to permit unencumbered operation. Clearance shall not exceed 1/4" from each edge of window opening.

#### **3.03 ADJUSTMENT**

- A. Adjust parts as required for smooth operation.
- B. Replace bent, dimpled, marred, or otherwise damaged components.

#### **3.04 CLEANING**

- A. Clean soiled blind surfaces and components with a mild soap solution in strict accordance with manufacturer's printed recommendations. To ensure proper drying, provide adequate ventilation, remove end caps from bottom rails, and tip head and bottom rails to remove water that may have penetrated into the rails.
- B. Clean other surfaces affected by the work of this section.
- C. Remove all trash and debris resulting from the work of this section and dispose of legally.

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.

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. Construction of foundations, supports, pads, bases and piers where mounted on the floor, shall be of the same materials and same quality of finish as the adjacent and surrounding flooring material.

### 1.12 SCAFFOLDING, RIGGING AND HOISTING

- A. Unless otherwise specified, contractor shall furnish all scaffolding, rigging, hoisting, shoring and services necessary for erection and delivery into the premises for any equipment and apparatus furnished and shall remove same from premises when no longer required.

### 1.13 CUTTING AND PATCHING

- A. On new work the contractor shall furnish sketches showing the locations and sizes of all openings and chases, and furnish and locate all sleeves and inserts required for the installation of the mechanical work before the walls, floors and roof are built. The contractor shall be responsible for the cost of cutting and patching where any mechanical items were not installed or where incorrectly sized or located. The contractor shall do all drilling required for the installation of his hangers.
- B. On alterations and additions to existing projects, the contractor shall be responsible for the cost of all cutting and patching unless otherwise noted.



- C. No structural members shall be cut without the approval of the Owner, and all such cutting shall be done in a manner directed by him. All patching shall be performed to match the existing surface in shape, texture and color.

#### 1.14 ACCESSIBILITY

- A. The contractor shall locate equipment, which must be serviced, operated or maintained in fully accessible position. Equipment shall include but not be limited to: valves, traps, or low limit devices, damper operators, motors, controllers, drain points, fusible links of fire dampers, fire dampers, filters, etc. If required for better accessibility, furnish access doors for this purpose. Minor deviations from drawings may be made to allow for better accessibility, and any change shall be approved. Motor starters shall be installed not more than 6'-0" above finished floor unless otherwise approved by the Owner.
- B. All filters furnished with air handling equipment shall be readily removable from sides or bottom of cabinet as required by equipment location. Contractor shall verify location of all equipment and proper location of access to filters for removal before submitting shop drawings, placing order for equipment and setting and connecting of equipment. Any filters deemed by the owner to be inaccessible after installation will be made accessible by the contractor at no additional cost to the owner.

#### 1.15 RECORD DRAWINGS

- A. The contractor shall keep daily updated accurate records of all deviations in work as actually installed from work indicated on the contract drawings. The record drawings shall be kept at the job site, available to the Owner at all times and labeled as "Project Record Information - Job Set". When work is completed one complete set of marked-up prints shall be delivered to the Owner.

#### 1.16 PERSONNEL INSTRUCTION AND OPERATING INSTRUCTIONS

- A. Operation and Maintenance Manuals
  - 1. 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).
  - 2. 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.

3. Provide laminated as-built drawings and manufacturer's refrigeration piping layout showing the layout and refrigerant volume of each variable refrigerant system. This shall show actual room numbers, not from construction documents, and addressing scheme. Laminate shall have minimum thickness of 10 mil. Drawing size shall be 11" x 17". Provide multiple drawings should zones not fit onto one page. These will be mounted in the water heater room unless otherwise shown.
  4. Manuals shall be assembled in black vinyl hardback loose-leaf binders, labeled with job name, address and date. Information on each piece of equipment of system shall be in a separate tab labeled section. Provide a complete index of the contents. After approval by the Engineer the binders shall be forwarded to the Owner.
- B. After all tests are conducted and approved as specified below, furnish a competent operating engineer for a period of two days to instruct and demonstrate to the Owner or his authorized representative the operation of the system. The mechanical systems demonstration shall not coincide with the electrical demonstration. Notify the owner in writing of the person to whom this instruction was given and the date it was given.
- C. On phased construction projects the aforementioned equipment start-up records shall be completed and made available to the owner for review prior to the occupancy of the completed phase.

#### 1.17 TESTS

- A. The contractor shall, at his expense, conduct capacity and general operating tests on each system. The test shall demonstrate the specified capacities of the various pieces of equipment and shall be conducted in the presence of the Owner or his authorized representative. The general operating tests shall demonstrate that the entire equipment is functioning in accordance with the contract documents. Furnish all instructions and test equipment.
- B. After all systems are completely tested, submit three copies of the test results to the Owner for approval before final acceptance of project.

#### 1.18 EQUIPMENT AND SYSTEMS CHECKOUT AND START-UP

- A. This contractor is responsible for the checkout and start-up of all equipment and systems. Equipment start-up shall be in accordance with the manufactures requirements and recommendations and shall be performed by personnel who are knowledgeable with the equipment and its requirements. When required by the equipment manufacturer or as noted in the specifications, equipment

checkout and start-up shall be performed by personnel certified by the manufacturer. Evidence of proper certification of startup personnel shall be provided to the owner.

- B. All checkout and start-up activities are the responsibility of this contractor.
- C. This contractor shall notify FCPS two weeks prior to equipment checkout and start-up.
- D. Systems and equipment shall be operated at both full and part load conditions to ensure specified requirements can be achieved.
- E. The equipment manufacturer's checkout and start-up logs shall be completed in their entirety; should a reference be non-applicable it shall be marked as such. Copies of completed logs shall be submitted to FCPS personnel the day of checkout and start-up activities, as well as included in the Operation and Maintenance manual.

#### 1.19 WARRANTY

- A. The contractor shall deliver the work described herein in a first-class operating condition in every respect. The contractor shall also warrant that the material, equipment and workmanship furnished shall be entirely free from defects for a period of one year. All apparatus will develop capacities and characteristics specified, and that if during the period of one year - from date of substantial completion (See 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.

#### 1.20 CONNECTING INTO EXISTING UTILITIES

- A. Procedures: The procedures used for the accomplishment of connecting into existing work shall provide for safe conduct of the work, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services.
- B. Scheduling of Work: Work shall be performed in the sequence, locations and time periods agreed to by the Owner prior to commencement of work.

- C. Dust Control: The amount of dust resulting from connecting existing utilities shall be controlled to avoid creation of a nuisance in the surrounding area. Masks shall be worn for protection against dust inhalation by all persons in the vicinity of work involving removal of masonry.
- D. Protection of Existing Work:
1. Existing work and furnishings to remain shall be protected from damage. Work damaged by the Contractor shall be repaired to match existing work without any additional cost to the Owner.
  2. Cover equipment as necessary, to protect it from dust.
  3. Floors shall be protected from damage.
  4. At the end of each workday and during inclement weather, close exterior openings with weatherproof cover.
  5. Provide temporary filter media on any portions of existing ductwork which communicate with corridors and construction areas. This media shall be checked frequently and changed as necessary.
- E. Environmental Protection: Contractor shall comply with all Federal and local regulations pertaining to Environmental Protection.
- F. Removal of Existing Equipment and Materials: Existing equipment and materials shall be dismantled and/or cut-up so as to be removable through existing building's access passages. No alterations to the building shall be made for the purpose of removing existing equipment and material.
- G. Clean-up:
1. Debris and Rubbish: Remove debris and rubbish from the site daily. Do not allow to accumulate in building or on site.
  2. Debris Control: Remove and transport debris in a manner so as to prevent spillage on site or adjacent areas.
  3. Regulations: Local regulations regarding hauling and disposal shall apply.

#### 1.21 DOWNTIME

- A. The contractor shall so arrange his work that domestic water, gas, storm sewer, sanitary sewer, air conditioning, and heating systems shall be maintained at all times while the school classes are in session.

- B. Construct work in accordance with project schedule established under Section 01310. Coordinate the schedule and operations with the Owner's Representative. There shall be no shutdown of electricity, water, sanitary/storm sewers, air conditioning, or heat during the life of the project unless approved in writing by Owner. The Contractor is responsible for providing temporary air conditioning or heating for those areas which are scheduled to be occupied for school use and the Contractor has demolished the existing air conditioning or heating system. Maintain minimum corridor temperature at 68°F during heating season.
- C. In occupied areas or spaces, where existing HVAC systems are rendered nonfunctional, due to construction the contractor shall provide temporary HVAC and maintain space conditions per ASHRAE 55 section 5 and ASHRAE 62.1 section 6.
- D. 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.
- E. If contractor fails to provide domestic hot/cold water, gas, sewers, air conditioning and/or heating systems as specified herein it is understood and agreed that there will be liquidated damages deducted in the amount as stated in Division 01010, per school per consecutive calendar day.

#### 1.22 CONSTRUCTION LIMITATIONS

- A. In renewal projects which require work to be continually done, above the corridor ceilings, while school is in progress. The following requirements shall be met:
  - 1. No construction material may be stored in a corridor at any time.
  - 2. Any work done in the corridors after school hours must allow a minimum corridor of 72" to remain for safe egress. No work such as welding, soldering, etc., which is considered hazardous to the occupants of the building, may take place during school hours.
  - 3. The contractor shall immediately clean any area of debris, if work is done in any occupied space.
  - 4. No gas powered construction equipment will be allowed in the building during school hours.

END OF SECTION

## **SECTION 15050**

### **BASIC MATERIALS AND METHODS**

#### **PART I - GENERAL**

##### 1.01 GENERAL

- A. The Bidding and Contract Requirements, 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
 

1/2" 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
 

1/2" to 3/4" 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 DIVERSIFIED, 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 eighth (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.

- E. Filters- Filters shall have a minimum MERV rating of 13.

### **PART 3 - EXECUTION**

#### **3.01 PIPE, FITTINGS AND JOINTS**

A. Pipe and Fittings

1. Pipe, fittings and specialties stored at the job shall be stored in such a manner as to prevent dirt and moisture from collecting in the material. Openings in the piping system during construction shall be protected at all times from foreign matter entering the piping system. PVC piping shall not be stored in direct sunlight.
2. Installation - The piping shall be installed complete and shall be of the size required by code. When a size is not indicated or is in conflict with other drawings, the contractor shall request the pipe size from the engineer. All piping shall be cut accurately from dimensions established at the project site and allowances shall be made for the clearance of windows, doors and other openings. No part of the building structure may be cut to allow for the installation of piping unless specifically approved in writing.
3. All piping shall be installed parallel or perpendicular to the building construction and shall be installed so as to allow for expansion and drainage. Due to the small scale of the drawings, it is not possible to show all elbows and swing joints required to allow for expansion; however, the contractor shall install three elbow swing joints at all runouts and other connection to mains.
4. Install continuous galvanized sheet metal drip pan under all water piping passing through all rooms with electrical equipment such as electrical, elevator equipment and transformer rooms and all other spaces provided primarily for the installation of electrical equipment. Drip pan shall be channeled out of the space and be extended to the closest drain.

5. Eccentric reducing fittings or eccentric reducing couplings shall be installed to bring top of mains in line and prevent pockets. Eccentric fittings will not be required on water mains. Ends of pipes shall be reamed out before being installed.
  6. Pipe Sleeves
    - a. Pipe sleeves shall be installed on all pipes passing through walls, ceilings and floors except floor slabs on grade. On insulated pipes the sleeves shall be large enough to pass the insulation without damaging the vapor barrier. The ends of the sleeves shall extend 1/2" above the finished floor and made watertight around sleeve. Where pipes pass through fire rated floors and wall the space between the pipe and the sleeve shall be fire stopped and smoke stopped with the appropriate U.L. rated assembly. Sleeves not in contact with the earth shall be schedule 40 black steel pipes, except sleeves in poured concrete slabs above grade may be a manufactured pipe sleeve. PVC sleeves shall not be used in plenum spaces.
    - b. Pipe Sleeves in contact with the earth shall be cast iron. The space between the pipe and the cast iron pipe sleeve shall be packed with oakum with a lead joint and made watertight. The pipe passing through and under footings and wall below grade shall have cast iron sleeves. The sleeves not entering the building need not be watertight.
- B. Piping Joints
1. Screwed Joints - Screwed joints shall be made with full cut American Standard Pipe Thread. All pipes shall be reamed to full diameter of the pipe. Pipe thread compound shall be applied to the male thread only.
  2. Welded Joints
    - a. Welded joints for steel pipe 2 1/2" and larger shall be made in accordance with the procedure standard in the American Standards Association piping code, and before assigning any welder to work covered, the contractor shall provide for the approval of the name(s) of pipe welders to be employed in the work, together with certification that each of these welders has passed qualification tests as prescribed by the National Certified Pipe Welding Bureau or by other reputable testing laboratory or agency using procedures approved by the ASME or American Welding Society. The contractor shall use only approved factory manufactured welding type fitting for the intersection welding or

- branching to mains. Valves and specialties shall have screwed or flanged joints.
- b. Welding tees, ells, reducers and caps shall be of wrought or forged construction similar to those manufactured by TUBE TURNS, INC. In lieu of wrought or forged welding tees for branch outlets, weldolets or welding nipples may be used; provided, first that the nipples are accurately coped in the shop to fit the pipes and leveled for field welding; and provided, second that openings in the walls of pipes are cut to full inside diameter of the nipples; and third, that the outlet diameter shall be less than 3/4 the diameter of the main.
  - c. For connections on welded piping to valves 2 1/2" and over and that of other accessories required to be flanged, weld neck or slip-on companion flanges shall be used. The flange face shall be in every case perpendicular to the axis of the pipe valve.
3. Solder Joints - the solder joint above grade shall be made, unless otherwise noted, with 95/5, lead free solder using approved flux. All underground joints and refrigeration joints shall be made with an approved silver bearing solder. Cut pipe shall be reamed to full diameter. Copper to steel pipe shall be made with proper fittings.
  4. Cast Iron Pipe Joints - for bell-and-spigot soil pipe the joint shall be firmly packed with oakum and filled with molten lead not less than 1" deep and not to extend more than one-eighth inch below the rim. The use of a neoprene gasket when installed in accordance with the manufacturer's recommendations is also acceptable.
  5. Concrete Pipe Joint - Shall be bituminous joint compound or a cement plaster installed in accordance with the manufacturer's recommendations. Joints firmly packed with oakum and filled with a concrete mortar, which shall extend mortar to 3" beyond the hub, shall also be acceptable. All joints shall be made with precast concrete fittings.
  6. Flanged joint - The flanged joint shall be made with the proper number and size of bolts and with the proper gasket between the flanges.
  7. Plastic Pipe Joints - Shall be made with solvent as recommended by the pipe manufacturer.

### 3.02 PIPE SPECIALTIES

- A. Pipe specialties shall be installed as indicated in the specifications and as required to make a complete system.

- B. Escutcheon Plates shall be mounted on all exposed pipes extending through wall, floor, ceiling or cabinet bases. On insulated pipes the escutcheon shall be on the outside of the insulation.
- C. Pressure and Compound Gauges shall be installed with shut-off cock in the line to each gauge.

### 3.03 PIPE HANGERS AND SUPPORTS

- A. All pipes shall be supported from the building structure, and wherever possible, parallel runs of horizontal piping shall be grouped together on adjustable trapeze hangers. Single runs of horizontal piping shall be supported with clevis type hangers. The hangers shall be on the outside of the insulation. Vertical risers shall be supported at each floor line with steel pipe clamps. All hangers in contact with copper pipe shall be copper plated. The use of wire or perforated metal to support pipe will not be permitted. In no case shall copper pipe be in contact with a ferrous metal.
- B. The pipe hanger spacing and support shall be as listed under 2.03 in this section.
- C. Where piping is supported from the steel, the support shall be attached at the top of the steel. Attachments shall be made either by welding or using top beam clamps.
- D. Any supplemental steel required between building structural members shall be provided by this contractor.

### 3.04 VALVES

- A. The contractor shall install valves where indicated on the drawings and where required for adequate control of the system. Provide shut-off valves at the base of the risers and main branches at points of take-offs from the supply or return mains. Branches shall be considered main branches when they serve three or more units or fixtures. Provide valves necessary to isolate each piece of equipment separately from the remainder of the system. Valves shall be installed in accessible locations. Allow isolation for inspection, maintenance and repair of each piece of equipment and each service loop. Provide valves to allow for the phasing of work where required. Valve size shall be the same as the pipe size except for control valves.
- B. Valves shall be installed with their stems in an upright or horizontal position. Stems shall not be inverted.
- C. After approval of a particular valve, this type valve shall be used throughout the project. Do not mix styles or manufacturers.

- D. Ball valves shall be provided with a 2" extended handle of a non-thermal conductive material and shall include a protective sleeve that allows operation of the valve without breaking the vapor seal or disturbing the insulation. Extended handle shall be internally insulated.

### 3.05 ACCESS DOORS

- A. Install hinged and lock type access doors as required for operation and maintenance of equipment. The access doors shall be installed so that they maintain the rating integrity of the material in which they are mounted. Those with an exposed surface in a finished area shall be flush with the finished material with a recessed space for installation of flush matching materials when in panel or acoustical tile.

### 3.06 ELECTRIC MOTORS

- A. Electric motors shall be supplied with equipment furnished under Division 15. All moving parts shall be protected as required by OSHA.

### 3.07 ELECTRIC MOTOR STARTERS

- A. Electric motor starters and accessories shall be installed under Division 16.
- B. Three phase motor protectors shall be installed in accordance with manufacturers' recommendations and installation instructions. Unit shall be selected for voltage specified.

### 3.08 EQUIPMENT

- A. The contractor shall receive and properly store the equipment pertaining to the mechanical work. The equipment shall be tightly covered and protected against dirt, water, chemical or mechanical injury and theft. The manufacturer's directions shall be followed completely in the delivery, storage, protection and installation of all equipment and materials.
- B. The contractor shall provide and install all items necessary for the complete installation of the equipment as required by code without additional cost to the owner, regardless of whether the items are covered in the specifications. Such items could be - but are not limited to: concrete pad, supports, vibration eliminators, additional piping and valves, motor controllers, relief valves and piping, insulation, electrical wiring, lubrication, refrigerants and start-up and service.
- C. It shall be the responsibility of the contractor to clean the equipment, make necessary adjustments and place the equipment into operation before turning



equipment over to the Owner. Any paint that was scratched during construction shall be touched-up with factory color paint. Any items that were damaged during construction shall be replaced.

- D. Where equipment is supported from the steel, the support shall be attached at the top of the steel. Attachments shall be made either by welding or using top beam clamps.
- F. 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.
- G. 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.
- H. The mechanical contractor shall set all outside air dampers to the approximate minimum position during equipment installation and prior to the start- up of equipment.
- I. The installer shall be responsible for providing and installing new fan or motor sheaves and belts when required to obtain the designed airflow.

END OF SECTION

## **SECTION 15250**

### **INSULATION**

#### **PART I - GENERAL**

##### 1.01 GENERAL

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. Hot Water Heating Supply and Return

- a. Pipe Size 1-1/2" and Under - 1".
  - b. Pipe Size 2" and larger - 2".
  2. Chilled Water Supply and Return
    - a. Pipe Size 3" and under – 1 ½
    - b. Pipe Size 4" and larger – 2"
  3. Condensate Piping - 1".
  4. Where chilled/hot water piping is installed within the airstream of mechanical equipment, piping shall be insulated with flexible closed cell elastomeric pipe insulation. Insulation thickness shall be 3/4 inch.
- B. Sheet Metal Saddles - See section 15050 - 2.03.
- C. Finish - Exposed Piping - Cover with 8 oz. canvas jacket.

### 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. Hot water heating supply and return
  2. Chilled water supply and return
  3. Condensate piping
- C. Finish - Insulation on exposed piping fittings, valves and specialties shall be covered with an 8-oz. canvas jacket.

### 2.04 DUCTWORK INSULATION

- A. Concealed Supply/Return, including flexible connections (horizontal FCU's), Kitchen Hood Exhaust, and Outside Air Ductwork - Unless noted otherwise on the drawings shall be insulated with fiberglass duct wrap insulation at 1 pound per cubic foot density, having a facing of laminated composite aluminum foil and

kraft paper reinforced with a glass reinforcing, with a perm rating not exceeding .05. The 'K' value shall not exceed .29 @ 75 degrees F mean temperature. The duct wrap insulation shall have a minimum thickness of 2 inches. Insulate flexible connections on horizontal fan coil units.

- B. Exposed Supply/Return and Outside Air Ductwork - Unless noted otherwise on the drawings shall be insulated with 6 pounds per cubic foot density fiberglass insulating board having a facing of laminated composite aluminum foil and kraft paper reinforced with a glass reinforcing with a perm rating not exceeding .05. The 'K' value shall not exceed .23 @ 75°F mean temperature. The duct board shall have a minimum thickness of 1-1/2 inches. Exposed ductwork shall include but is not limited to, ductwork in accessible attics, equipment mezzanines, boiler rooms and equipment rooms The exposed supply/return and outside air ductwork shall also be covered with an 8-ounce canvas jacket and be prepared for painting.
- C. See Section 15840 for description of any additional ductwork that shall be lined.

### **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. Outdoor Piping - Weatherproofing Finishes for All Outdoor Insulation.
1. Piping - Apply aluminum metal jacket 0.016" with moisture barrier around pipe and slip edge into preformed Z lock positioned to shed water. Butt next jacket section leaving approximately 3/8" gap. Place preformed 2" butt aluminum band and wing seal.
  2. Fittings - Apply prefabricated metal fittings in composition to pipe jacketing.
- F. Sheet Metal Saddles shall be provided and installed on all pipe hangers as stated under section 15050, 2.03.
- G. Pipe Insulation Support - All insulated piping shall be supported at hanger and sleeve locations by either using a high density pipe insulation or wooden blocking, installed inside the vapor barrier for all pipe sizes one inch and larger. High-density pipe insulation shall be of the type as recommended by the manufacturer and shall be substituted for no less than the bottom half section of the fiberglass pipe insulation. The lengths of the high-density insulation shall be at least two inches longer (each end) than the length of the saddle. The lengths of wooden blocking shall be eight inches. Wooden blocking shall be the same thickness as the pipe insulation, the same width as the pipe, shall be tapered within the insulation and shall be centered at the hanger. Remove portions of

the fiberglass pipe insulation by peeling back the factory applied all service jackets from the insulation and cut out and replace the required sections for either method of insulation support. Re-wrap the vapor barrier to completely enclose the installation. Manually apply lap adhesive to the outside lap and apply butt strips. The installations shall also meet any additional requirements recommended by the insulation manufacturer.

### 3.03 DUCTWORK INSULATION APPLICATION

- A. Fiberglass Duct Wrap Insulation - The duct wrap insulation shall be secured to the ductwork with fire retardant adhesive in sufficient quantities to prevent sagging. Ducts with a width of over 30" shall be further secured on the underside with mechanical fasteners on 18" maximum centers. Insulation shall be butted with facing overlapping all joints at least 2" and sealed with fire retardant vapor barrier adhesive. Seal all breaks and punctures with vapor barrier tape and same type of fire retardant adhesive. Stapling is not acceptable.
  
- B. Fiberglass Insulating Board Application
  - 1. The insulating board shall be secured to the ductwork with mechanical fasteners. The fasteners shall be spaced 12" to 18" on center with a minimum of two rows per side of duct. Secure insulation in place with washers firmly embedded in insulation. Seal all joints, breaks and punctures with fire retardant vapor adhesive reinforced with a 3" wide strip similar to that of facing.
  
  - 2. Finish - A glass cloth shall be applied over the facing into a wet coat of fire retardant adhesive, overlapping seams at least 2". Apply finish coat of same fire retardant adhesive.

END OF SECTION

## SECTION 15500

### AUTOMATIC SPRINKLER SYSTEM

#### 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

- A. An automatic sprinkler system shall be designed, installed, tested and approved for the entire building in accordance with Fairfax County School standards, NFPA standards, state codes, local jurisdiction's requirements and contract documents.
- B. In projects where there is an existing sprinkler system, the existing sprinkler system shall be removed and replaced with a new sprinkler system. While work is being done in existing areas the existing sprinkler system may need to be removed and re-piped to allow for the installation of new equipment. When existing ceilings are removed for renovation, the existing sprinklers shall be removed and re-piped as upright sprinklers to provide sprinkler protection during phased construction.

##### 1.03 QUALITY ASSURANCE

- A. The automatic sprinkler system shall be tested in accordance with NFPA No. 13, FM 1637, UL 2443 and be approved by the local jurisdiction.
- B. The sprinkler contractor shall be licensed by the local jurisdiction to install the sprinkler system as required.
- C. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
  - 1. All castings used for coupling housings, fittings, and valve bodies shall be date stamped for quality assurance and traceability.

##### 1.04 SHOP DRAWINGS

This contractor shall prepare eight sets of shop drawings for the Architect to review. The local jurisdiction, the Architect and the Owner shall approve the shop drawings. The shop drawings shall include detailed working drawings at a scale no smaller than 1/8" per foot and shall also include lighting fixtures, ductwork, ceiling diffusers, grilles, HVAC and plumbing piping and any other possible obstructions. Calculations, sprinkler heads, alarm check valve, flow switches and other equipment shall also be included on the shop drawings. No sprinkler piping shall be installed until shop drawings have been reviewed.

**PART 2 - PRODUCTS**

## 2.01 SPRINKLER HEADS

The following sprinkler heads shall be manufactured by VICTAULIC. Sprinkler heads fully equal to the item as manufactured by VIKING, RELIABLE AUTOMATIC SPRINKLER CORPORATION of AMERICA or TYCO shall be acceptable. Sprinklers shall be glass bulb type, with hex-shaped wrench boss integrally cast into the sprinkler body to reduce the risk of damage during installation. Wrenches shall be provided by the sprinkler manufacturer that directly engage the wrench boss. Sprinklers with rubber O-Rings are not acceptable.

- A. Sprinkler heads, where there are ceilings, shall be recessed mounted with a polished chrome finish and escutcheon and shall be quick response type. Heads shall be as manufactured by Victaulic model "V2708". Sprinkler heads in locker rooms and shower rooms shall have a Victaulic VC-250 corrosion resistant coating.
- B. Sprinkler heads, upright or pendent, exposed, shall be factory brass and shall be quick response as manufactured by Victaulic model "V2704 (upright) and V2708 (pendant)".
- C. Sprinkler heads, dry sidewall, shall be glass bulb, quick response with white epoxy coating and escutcheon as manufactured by Victaulic model "V3610". In lieu of rigid connections to dry sprinkler heads, a Victaulic VicFlex™ dry sprinkler, Model VS1, may be used.
- D. Sprinkler heads, sidewall, shall be wall mounted with polished chrome finish and escutcheon and shall be extended coverage quick response as manufactured by Victaulic model "V3416".
- E. Sprinkler heads, dry pendant, shall be extended type glass bulb, quick response with VC-250 corrosion resistant coating and 304 stainless steel escutcheon as manufactured by Victaulic model "V3606". Provide and install dry sprinkler boot to eliminate the air gap at the wall or ceiling. In lieu of rigid connections to dry sprinkler heads, a Victaulic VicFlex™ dry sprinkler, Model VS1, may be used. In cooler boxes and freezers a Victaulic AB6 dry pendent with VC-250 coating and stainless steel escutcheon may be used. The connection to the branch line shall be made with a flexible hose to accommodate expansion and contraction. No rubber boot/foam is required.
- F. Sprinkler heads in unoccupied spaces may be rough brass.
- G. Sprinkler heads, concealed, shall have factory finished white painted cover plate and shall be quick response as manufactured by Victaulic model "V3904". For ceilings painted black, custom black painted cover plate shall be provided.
- H. Provide sprinkler guards on all heads in the physical education rooms, gymnasiums,



gym storage, walk-in coolers, loading docks, all storage rooms, gang toilets, locker rooms, boiler rooms and in mechanical rooms. Guards in occupied spaces shall be chrome plated. See 3.01.L for gang toilet and locker room exception.

- I. Escutcheons and guards shall be listed, supplied, and approved for use with the sprinkler by the sprinkler manufacturer.
- J. Sprinkler heads shall be of the same manufacturer for each type used.
- K. Escutcheon finishes shall match that of the sprinkler head they serve.
- L. Chrome plating is not an acceptable corrosion resistant coating.

## 2.02 PIPING

- A. All main and branch piping shall be schedule 40 or schedule 10 steel pipe. Schedule 10 piping shall only be allowed for piping larger than two inches. No piping less than schedule 10 shall be acceptable. Grooved end fittings shall be ductile iron, short-pattern, with flow equal to standard pattern fittings. Basis of Design: VICTAULIC FireLock, or approved equal.
- B. Grooved joint couplings shall consist of two ductile iron housing segments to ASTM A536, pressure responsive gasket to ASTM D2000, and zinc electroplated steel bolts and nuts to ASTM A449. Couplings shall comply with ASTM F1476 Standard Specification for the Performance of Gasketed Mechanical Couplings for Use In Piping Applications.
  - 1. Rigid Type: Coupling housings shall be cast with offsetting, angle-pattern bolt pads to provide joint rigidity and support and hanging in accordance with NFPA-13. Couplings shall be fully installed at visual pad-to-pad offset contact. Tongue-and-recess type couplings, or any coupling that requires exact gapping of bolt pads at required torque ratings, shall be installed in strict accordance with the manufacturer's published instructions. If tongue and recess couplings are utilized, a label - initialized by installer, shall be affixed to each coupling showing proper torque was applied to joint.
    - a. Basis of Design: Victaulic Style 109, 009N and 107N, Installation-Ready, for direct stab installation without field disassembly, or standard rigid couplings Victaulic Style 005 "FireLock" and Style 07 "Zero-Flex".
    - b. In lieu of threaded steel piping systems, the Victaulic FireLock IGS System with "Installation-Ready™" fittings and couplings may be used for NPS 1 Schedule 10 and Schedule 40 carbon steel pipe in fire protection applications.

2. Flexible Type: For use in locations where vibration attenuation and stress relief are required, and for the elimination of flexible connectors. Basis of Design: Victaulic Installation-Ready Style 177N or Style 77.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION**

The sprinkler system shall be installed and tested in accordance with NFPA NO. 13 and shall be approved by the local jurisdiction. Two copies of the test results approved by the jurisdiction shall be sent to the Architect.

- A. The sprinkler piping shall be installed concealed above the ceiling and be coordinated not to interfere with the ductwork, air devices, lighting fixtures HVAC piping, plumbing piping and other items. All mains shall run below the ductwork and all branches shall be as high as possible. Branch piping that is not installed as high as possible shall be removed and re-installed at the proper height at no additional cost to the owner. Piping shall be arranged to allow for the easy removal of acoustical ceiling tiles, piping shall be a minimum of 6" above ceiling grid.
- B. The sprinkler heads in ceilings shall be installed in the center (both longitudinally and laterally) of the ceiling tile in lobbies, corridors and large rooms such as cafeterias, media centers, libraries, lecture rooms, etc. Sprinkler heads installed in corridor ceilings shall be installed in the center of the corridor. The intent is that when the corridor width allows for a single row of sprinklers, the heads shall align with the centerline of the corridor. Sprinkler heads in tiles in other spaces shall be installed in the center of tiles in at least the lateral dimension (width). Flexible sprinkler drops shall be installed in the top or side of main or branch piping (see drawing detail) inverted attachment is not acceptable.
- C. All sprinkler heads installed within the same room or space, shall be set at a uniform elevation.
- D. Test or drain lines shall discharge to the exterior of the building and shall be kept away from any entrances and off of loading docks and sidewalks.
- E. Maintain a minimum clearance of 6" between sprinkler heads and any other obstruction such as lighting fixtures, clocks, etc.
- F. Piping shall be substantially supported from the building structure; the support shall be attached to the upper chord of the structure. Attachments shall be made either by welding or using top beam clamps. The supporting of piping from the supports of other disciplines is not acceptable.
- G. As phases of construction are completed, the sprinkler system shall be activated for

any additions to the building that are turned over to the owner for occupancy. Active sprinkler mains that run through portions of the building without sprinkler protection shall be protected as required by the Fire Marshal or the Authority Having Jurisdiction. Sprinkler valve signs shall be installed in these areas. Sprinkler systems shall remain activated throughout normal school hours and any subsequent connections into active systems shall be made outside of these hours. Once construction for all phases is complete the entire sprinkler system shall be hydrostatically tested.

- H. Sprinkler main and branch piping shall be flushed prior to installing any sprinkler heads. Flushing connections shall be provided on mains and shall be 2-1/2". Flushing connections shall consist of threaded nipples with hose valves and caps. Flushing connections shall remain after the flushing and testing has been completed for use as future drain valves. Two flushing connections shall be provided for each zone and shall be located within 50' of operable windows or exterior doors. Flushing connections shall be located on opposite ends of each zone. The flushing of each zone shall be witnessed and verified by the owner's representative.
- I. All inspectors' test/drain valves shall be located in chases with keyed alike, lockable access doors, minimum size is 10"x10". Key shall be compatible with owner's HL302 key. Provide one key for each location and store in sprinkler cabinet.
- J. Coordinate the spacing of heads with curtains and folding partitions.
- K. Provide concealed type sprinkler heads in all group toilets, locker rooms and shower rooms, for all middle, high and secondary schools. Provide concealed type sprinkler heads in bulkheads, and spaces where the ceiling height is 7 foot 6 inches or less. Provide concealed type sprinkler heads at folding partitions as to not interfere with the operation of the folding partition.
- L. The use of piping bushings is not acceptable.
- M. The shortest suitable length flexible braided sprinkler drop shall be used, however, avoid excessively sharp bends or stress at the takeoff from the branch line or main.
- N. The sprinkler bulb protector must remain in place until the sprinkler is completely installed and before the system is placed in service. Remove bulb protectors carefully by hand after installation. Do not use any tools to remove bulb protectors.
- O. Do not install sprinklers that have been dropped, damaged, or show a visible loss of fluid. Never install sprinklers with cracked bulbs.
- P. Grooved joints shall be installed in accordance with the manufacturer's written

recommendations. Grooved ends shall be clean and free from indentations, projections, or roll marks. The gasket shall be molded and produced by the coupling manufacturer of an elastomer suitable for the intended service.

3.02 SPECIAL CONDITIONS

- A. Sprinkler heads needed for sprinkler system design but not specifically referenced under paragraph 2.02 will be considered on a case by case basis.

END OF SECTION

**SECTION 15765**  
**UNIT VENTILATOR**

**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, complete, the unit ventilator as shown on the drawings and specified herein.

1.03 QUALITY ASSURANCE

- A. The unit ventilator shall be Underwriters Laboratories listed or be tested by an accepted independent testing agency.
- 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, 1.03 shall be held before the shop drawings are submitted.

**PART 2 - PRODUCTS**

2.01 UNIT VENTILATOR

Provide and install unit ventilator(s) of the type and capacity as shown on the drawings and specified herein. The unit ventilator shall be manufactured by TRANE. Unit ventilators fully equal to the specified manufacturer and manufactured by CARRIER or DAIKIN are acceptable providing they meet the specification requirements.

- A. Assembly Description - The unit shall consist of a finished room cabinet with configuration as shown, access openings, discharge and intake grilles, toe space base, connection pockets, noted coils, drain pan, fan and motor assembly, damper assembly, outside air inlet, filter and control box and factory supplied extension cabinet for housing shutoff and control valves.
- B. Cabinet

1. The cabinet shall be constructed of 14 gauge steel panels, acoustically and thermally insulated with glass fiber blanket material. All exposed edges shall be rounded. The interior chassis shall be constructed of not less than 16 gauge galvanized steel and shall be coated with rust inhibiting paint. Cabinet shall have baked enamel finish with color selected from manufacturer's selection chart by the Architect.
  2. Front panels shall be removable in sections. They shall be secured by allen wrench operated quick open fasteners. The cabinet shall have a separate space for piping and wiring crossover. Provide access opening for adjustment and service access.
  3. Return air intake grille shall be bottom front face located or recessed in toe space slotted kick plate type.
  4. Discharge air grille shall be top mounted, continuous; round edged steel bars with 10 degrees vertical deflection.
- C. The coils shall be constructed of aluminum fins mechanically bonded to seamless copper tubes, with continuous fin collars and sleeved coil and supports. Coils shall be factory tested at 300 psi. Coils connections shall be at opposite ends. Hot water coils shall be placed in a pre-heat position in all units. Chilled water coil connections shall be on the opposite end from the electrical connections. 2-pipe systems shall have coil connections on the opposite end from the electrical connections.
- D. The drain pan shall be an IAQ type non-corrosive positively sloped and cleanable drain pan. It shall fit under the coil and control valves and be sized to collect the water from all future component chilled surfaces. Pan insulation shall be selected to prevent condensation on pan surfaces.
- E. Motor and Fan - Shall be direct driven, forward curved, centrifugal, double width type, quiet operating design. The motor shall be multi-speed, permanent split capacitor, continuous duty, high efficiency type. Motor shall have built-in thermal overload protection. The electric inputs shall not exceed those listed on drawings.
- F. The filters shall be concealed and accessible without removing front panel. They shall be the throwaway type and 1" thick. Filters shall have a minimum MERV rating of 13.
- G. Controls - The fan shall be controlled with a multi-speed fan switch with auxiliary taps located in an accessible lockable end compartment. The temperature controls shall be as shown in Section 15900 - Automatic Temperature Controls.
- H. Provide factory installed float control safety switch in condensate drain pans. Float shall stop unit upon activation.

**PART 3 - EXECUTION**

## 3.01 INSTALLATION

- A. The unit ventilator shall be installed in accordance with the manufacturer's recommendations and as shown on the drawings.
- B. Piping - Shall be as described in Section 15701. Provide supply and return gate valves, manual air vents and drain plugs.
- C. Filters - Shall be changed at the end of the construction period and before the final inspection.
- D. Provide spare fuses for unit ventilators for each size of fuse used in accordance with the following schedule:

<u>NUMBER OF VENTILATORS</u>	<u>SPARES REQUIRED</u>
1-10	2

- E. Provide a typed list of all the different unit ventilators and their filter sizes to be included in the O & M manuals. In addition to this, submit to the Owner two additional copies of the list, distributed to:
  1. Project Manager, Office of Design and Construction Services, 8115 Gatehouse Road Suite 3500 Falls Church VA 22042.
  2. Coordinator, Mechanical Maintenance Division, Maintenance Services, 5025 Sideburn Road, Fairfax, Virginia, 22032.
- F. The unit ventilators shall be installed in accordance with the manufacturer's recommendations and as shown on the drawings. The first unit installed will be considered the typical mock-up and shall require notification, inspection and approval by the designated owner representative and/or architect and engineer before any additional installations will be allowed.

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.

## 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**

Steel

Maximum side (inches)	(Minimum Galvanized Sheet Gauge)	Aluminum (Minimum B & S Gauge)
Thru 12"	26 (0.022 inches)	24 (0.020 inches)
13" - 30"	24 (0.028 inches)	22 (0.025 inches)
31" - 54"	22 (0.034 inches)	20 (0.032 inches)
55" - 84"	20 (0.040 inches)	18 (0.040 inches)
Over 84"	18 (0.052 inches)	16 (0.051 inches)

**ROUND DUCTS**

Diameter (inches)	SPIRAL SEAM DUCT	LONGITUDINAL SEAM DUCT	FITTINGS
	Steel (Minimum Galvanized Sheet Gauge)	Steel (Minimum Galvanized Sheet Gauge)	Steel (Minimum Galvanized Sheet Gauge)
Thru 12"	28 (0.019 in.)	26 (0.022 in.)	26 (0.022 in.)
13" - 18"	26 (0.022 in.)	24 (0.028 in.)	24 (0.028 in.)
19" - 28"	24 (0.028 in.)	22 (0.034 in.)	22 (0.034 in.)
29" - 36"	22 (0.034 in.)	20 (0.040 in.)	20 (0.040 in.)
37" - 52"	20 (0.040 in.)	18 (0.052 in.)	18 (0.052 in.)

- F. When required, heavier ductwork shall be installed to meet the requirements of the UL Fire Resistance Index.
- G. Where indicated on the drawings or where insufficient space is available for round ductwork, flat oval ductwork may be used. The conversion from round duct sizes to flat oval should be made on an equivalent pressure loss basis, not on an equal cross-sectional area. The flat oval ducts shall be constructed in accordance with current SMACNA standards.
- H. Rectangular Duct Section Connections - Shall be as described in the SMACNA Standards. Contractor may use zero leakage four corner bolted companion angle transverse joint as manufactured by DUCTMATE INDUSTRIES, INC. or LOCKFORMER. Joint shall be constructed of galvanized steel with bolting corner pieces, roll formed double wall mating angles, gasketing, mastic sealer and snap-on flange cover cleats.

## 2.04 FLEXIBLE DUCTWORK

- A. Where shown on the drawings provide flexible ductwork between branch ducts and terminals or air outlets. It shall be of a low or medium pressure to match duct system served.
- B. Ductwork
  - 1. Insulated flexible ductwork shall be factory pre-insulated duct composed of a corrosion-resistant reinforcing wire or band helix permanently bonded and enclosed in polyester film, covered with minimum R-6 density fiberglass insulation blanket sheathed in a vapor barrier of aluminum polyester film laminated to glass mesh, elastomer back coated. The flexible duct shall be rated for a minimum working velocity of 2000 fpm, shall be listed by Underwriters Laboratories under their UL-181 standards as a Class 1 air duct material and shall comply with NFPA standard No. 90A.
  - 2. Taps for flexible ductwork shall be high efficiency gasketed air-tite type with manual damper
- C. The maximum length of flexible duct connection shall be ten feet., or as otherwise shown.
- D. Flexible ductwork shall not be used for return air or exhaust air ductwork.

## 2.05 MANUAL VOLUME CONTROL DAMPERS

Manual Volume Control Dampers in ducts not exceeding 12" on the longest side shall be as shown in SMACNA Duct Standards. For ducts over 12", dampers of the opposed multi-blade type shall be used. Dampers shall be galvanized steel, swivel end bearings at one end of the blade, and quadrant with level and lock-screw at the opposite end. Multi-blade dampers shall have steel washers at ends of damper rods with self-aligning blade interconnecting hardware.

## 2.06 COATED DUCT LINER

- A. Duct Liner: Low-Pressure Ductwork
  - 1. All plenums and transfer ducts shall receive duct liner. Supply air ductwork shall receive duct liner from the fan discharge to 20 feet downstream from the fan discharge or as otherwise shown. Return air duct work shall receive duct liner from the fan suction to 20 feet upstream from the fan suction or as otherwise shown. All supply air discharge ductwork from fan coil units shall

receive duct liner.

2. Duct liner shall be designed for use as an acoustical and thermal insulation for sheet metal heating and cooling ducts and plenums. The duct liner shall have a density of 1.5 pounds per cubic foot a "K" factor not to exceed .24 @ 50°F mean temperature and a minimum NRC rating of .75. The minimum duct liner thickness shall be 1 inch.
3. Duct liner shall be designed for use as an acoustical and thermal insulation for sheet metal heating and cooling ducts and plenums. The duct liner shall have a density of 1.5 pounds per cubic foot a "K" factor not to exceed .24 @ 50°F mean temperature and a minimum NRC rating of .75. The minimum duct liner thickness shall be 1 inch.
4. Duct liner air stream surface shall be coated with an immobilized, EPA-registered antimicrobial agent so it will not support microbial growth. Duct liner shall be Johns Manville Linacoustic RC. Duct liners with similar characteristics will be considered as long as all aspects of the specifications are met.

**B. Duct Liner: Medium Velocity**

1. All rectangular supply/return air duct and all air duct outside exposed to weather shall receive duct liner. Rectangular supply air duct shall receive duct liner from the fan discharge to 20 feet downstream from the discharge or as otherwise shown. Return air duct work shall receive duct liner from the fan suction to 20 feet upstream from the fan suction or as otherwise shown.
2. Duct liner shall be designed for use as an acoustical and thermal insulation for sheet metal heating and cooling ducts. The duct liner shall have a density of 1.5 lbs./cu. ft., a 'K' factor not to exceed .24 @ 50 degrees F mean temperature and a minimum NRC rating of .95. The minimum duct liner thickness shall be 2 inches.
3. Duct liner air stream surface shall be coated with an immobilized, EPA-registered antimicrobial agent so it will not support microbial growth. Duct liner shall be Johns Manville Linacoustic RC. Duct liners with similar characteristics will be considered as long as all aspects of the specifications are met.

### **PART 3 - EXECUTION**

#### **3.01 DUCT INSTALLATION**

- A. The ductwork, fittings, access doors, flexible connections, turning vanes, hangers and supports, fire dampers, volume dampers and other accessories shall be

- installed as recommended by SMACNA Duct Construction Standards. Ductwork shall not be supported from bottom chords of bar joists, bridging between bar joists or from metal decks. Ductwork shall be supported from the top chords of bar joists.
- B. All necessary allowances and provisions shall be made by this contractor for beams, columns or other obstructions of the building or the work of other contractors, whether or not same is indicated. Where necessary to avoid obstructions, the ducts shall be transformed, divided or moved to one side with the required free area being maintained, all as approved or directed by the Architect.
  - C. Flexible ducts shall be secured to the metal ductwork, terminal units and supply diffusers by use of a 3/4" minimum width stainless steel drawband pulled tight with an adjusting worm drive type screw. Flexible duct insulation shall be properly sealed at connections to maintain vapor seal/barrier.
  - D. All duct dimensions shown on the drawings are inside clear dimensions. The duct sizes of ducts with duct liner shall be increased accordingly.

### 3.02 DUCT LINER

Duct Liner Application: Coated duct liner shall be cut to assure overlapped and compressed longitudinal corner joints. Apply liner with coated surface facing the air stream and adhere with 100% coverage of fire retardant adhesive. Coat all exposed leading edges and all transverse joints with fire retardant adhesive. The liner shall be additionally secured with mechanical fasteners which shall compress the duct liner sufficiently to hold it firmly in place as follows:

- A. Low Velocity to 2000 FPM: Fasteners shall start within 3" of the upstream transverse edge of liner and 3" from the longitudinal joints and shall be spaced at a maximum of 12" o.c. around the perimeter of the duct, except that they may be a maximum of 12" from a corner break. Elsewhere they shall be a maximum of 18" o.c. except that they shall not be more than 6" from a longitudinal joint of liner nor 12" from a corner break. Coat all exposed joints with a fire retardant adhesive.
- B. Medium Velocity from 2000 FPM to 4000 FPM - Fasteners shall start within 3" of the upstream transverse edges of the liner and 3" from the longitudinal joints shall be spaced at a maximum of 6" o.c. around the perimeter of the duct, except that they may be a maximum of 6" from a corner break. Elsewhere they shall be a maximum of 16" o.c. except that they shall not be more than 6" from a longitudinal joint of liner nor 12" from a corner break.
- C. In addition to adhesive edge coating of transverse joints, any longitudinal joints shall be similarly coated with adhesive.

### 3.03 WATERPROOFING DUCTWORK ABOVE ROOF

- A. Exposed ductwork shall be waterproofed with a prefabricated self-adhering, sheet-type waterproofing membrane as manufactured by Venture Tape and offered as

VentureClad-1579CW series. Additional manufacturers will be considered providing all aspects of the specifications are met.

B. MATERIALS:

1. Prefabricated, Self-Adhering, Sheet-Type Waterproofing Membrane.

a. Description:

- 1) Top Layer: Stucco-embossed, UV-resistant aluminum weathering surface.
- 2) Middle Layer: Double layer of high-density polyethylene reinforcement.
- 3) Bottom Layer: Uniform layer of rubberized asphalt adhesive, protected by disposable silicone release paper.
- 4) Heat Aging, ASTM D 794: No visible blistering or deterioration.
- 5) Tear Resistance, ASTM D 1424, Average: 660 grams.
- 6) Elongation, ASTM D 412, Minimum: 450 percent.
- 7) Low Temperature Flexibility, 1,000,000 Cycles at -10 Degrees F, 1,200 Cycles at 20 Degrees F: No cracking.
- 8) Water Vapor Transmission, ASTM E 96: 0.009 perms.
- 9) Flame Spread Index, ASTM E 84.0.
- 10) Smoke Density Index, ASTM E 84.5.
- 11) Wind-Driven Rain, SFBC TAS-110-95, 100 mph: No leakage or failure.
- 12) UV Stability: Excellent.

C. SURFACE PREPARATION AND APPLICATION.

1. Prepare surfaces in accordance with manufacturer's instructions.
2. Ensure tops of ducts have sufficient slope to eliminate ponding water.
3. Remove dirt, dust, oil, grease, hand oils, processing lubricants, moisture,

frost, and other contaminants that could adversely affect adhesion of waterproofing membrane.

4. Ensure surfaces are clean and dry.
5. Apply membrane to clean, dry, primed metal ductwork and foil-faced rigid insulation boards. Do not apply over wet or nonrigid insulation.
6. Apply membrane in accordance with manufacturer's air, material, and surface temperature requirements.
7. Apply firm, uniform pressure with hand roller to entire membrane to ensure proper adhesion. Concentrate pressure at seams and on underside of ductwork.
8. Apply membrane to ducts in accordance with manufacturer's instructions.
9. Apply membrane shingle fashion to shed water over, not against laps.
10. Do not terminate membrane on bottom of duct.
11. Apply minimum 3-inch side laps and minimum 6-inch end laps for ductwork applications.

### 3.04 LEAKAGE

- A. All low pressure supply, return and outside air ductwork shall be tested and made substantially airtight at static pressure indicated for the system before covering with insulation or concealing in masonry. Substantially airtight shall be construed to mean that no air leakage is noticeable through the senses of feeling or hearing at all duct joints. Supply, return and outside air transverse duct joints shall be sealed a water based brush on duct sealant such as FLEX-GRIP550 as manufactured by HARDCAST or UNI-FLEX as manufactured by McGill LLC.
- B. The entire medium pressure ductwork system, including duct runouts to the variable air volume control units, shall be pressure tested for leakage at three (3) inches ductwork static pressure. Perform leakage tests in accordance with the SMACNA HVAC Duct Leakage Test Manual, using test forms equivalent to those outlined in manual. Tests shall be observed by the Architect, Engineer and owner's representative. A test log shall be maintained by the contractor which will contain the results of systems tested and approval from test observer. Copies of the test log will be included in the operation and maintenance manuals.

### 3.05 CLEANING/STORAGE

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 15870

### AIR DISTRIBUTION DEVICES

#### 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 various types of air outlets and inlets to be furnished and installed complete.

##### 1.03 QUALITY ASSURANCE

Air outlets and inlets shall be rated by a recognized testing agency such as the Air Diffusion Council, ASHRAE Standard 36-72, Air Movement and Control Association International, Inc., or an acceptable manufacturer's test laboratory.

##### 1.04 SUBMITTALS

Provide shop drawings on this equipment as described in Section 15010 - 1.04. Shop drawings shall include proposed uses of all items.

#### PART 2 - PRODUCTS

##### 2.01 GRILLES, REGISTERS AND CEILING DIFFUSERS

The grilles, registers and ceiling diffusers shall be provided as shown on the drawings along with accessories as required. The grilles, registers and ceiling diffusers shall be manufactured by CARNES, KRUEGER, TITUS, TUTTLE and BAILEY, NAILOR, PRICE or METALAIRE unless otherwise noted, provided the items are fully equal to the item specified below.

- A. Supply Air Diffuser, Ceiling, Square: lay-in type, steel, stamped type, fixed pattern, square louvered face, opposed blade volume damper, equalizing grid, (combination damper/grid are not acceptable) white powder coat finish. Price model SCD.
- B. Supply Air Louver, Exposed Duct Mounting, Drum Louver: Aluminum, adjustable pattern, aluminum finish with volume damper. Price model HCD1.
- C. Supply Air Registers: Steel adjustable vanes, double deflection, vertical front vanes, opposed blade dampers, Aluminum finish. Price model 520D.

- D. Air Extractor: Pivoted adjusting curved blades with adjusting strap. Price model AE1.
- E. Return Air Grille, Ceiling: Steel individual fixed horizontal face bars, 0° deflection, white finish, size shall be minimum 12" x 24". Price model 510HZ.
- F. Return Air Grille, Wall: Steel, individual fixed horizontal face bars, 40° deflection, heavy duty type, aluminum finish. Price model 91.
- G. Return Air Register, Ceiling: Steel, individual fixed horizontal face bars, 0° deflection, volume damper, white enamel finish. Price model 510ZD. Exhaust air register shall be the same except aluminum, Price model 610ZD.

## 2.02 LOUVERS

Louvers shall be furnished under Division 15 unless specified under the architectural sections.

Stationary Louvers: Shall be extruded aluminum, 4" blade spacing, 45° blades with rain hook and continuous underside reinforcing bosses. Provide boxed frame for mounting inside masonry openings and flanged frame for panel wall openings. Provide duct collar, 1/2" mesh aluminum bird screen and clear anodized finish; color selection shall be approved by Architect. Louver shall meet AMCA test standards for pressure drop and water leakage. Prototype - ARROW model EA-405-FF. Louvers fully equal to the specified manufacturer and manufactured by RUSKIN, AIRLINE, AIR BALANCE, UNITED ENERTECH or CARNES will be acceptable.

## PART 3 - EXECUTION

### 3.01 GRILLES, REGISTERS, DIFFUSERS, AND LOUVERS - INSTALLATION

- A. The grilles, registers and ceiling diffusers shall be installed in accordance with the manufacturer's recommendations. Dampers shall be installed where shown and where required to balance the air system.
- B. Before locating grilles and ceiling diffusers, check the Architectural and Electrical drawings to make sure that there is no conflict with floor moldings, electrical outlets, lighting fixtures or any other obstruction. Low sidewall grilles and registers shall be mounted with the bottom edge eight inches above the floor with the vanes turned down. High sidewall grilles and registers shall be mounted six inches below the ceiling or as shown on architectural drawings.

- C. Air extractors shall be provided and installed as shown on the drawings. Provisions shall be made to adjust air extractor from the exterior of the ductwork. When air extractor is installed, no damper for the register is required.

3.02 LOUVERS

Supply air, exhaust air and combustion air louvers shall be installed as shown on the drawings. The louvers shall be furnished under Division 15 unless specified under the architectural section. The louvers shall be provided with 1/2" aluminum bird screen, duct collars where required, and be installed in a manner where no water will enter the building.

END OF SECTION

**SECTION 15900  
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## SECTION 15900

### AUTOMATIC TEMPERATURE CONTROLS

#### PART 1. GENERAL

##### 1.01 RELATED DOCUMENTS

- A. The Bidding and Contract Requirements and Division-I – General Requirements for the Construction of this project shall apply to this section.
- B. Section 15010 - Mechanical General Provisions

##### 1.02 DESCRIPTION OF WORK

- A. Contractor shall integrate new control devices to existing direct digital control (DDC) and building automation system (BAS) Operator interface graphic software (GUI) and a web-based operator interface. This system shall reside on the owner's existing building automation server. The web-based operator interface shall allow access from a standard web browser. The BAS for this project shall generally consist of monitoring and control of central heating and cooling plants, air handling systems, terminal equipment, and other miscellaneous equipment. The extent of Automatic Temperature Control Systems work is indicated on the drawings, schedules and by requirements of this section.
- B. Single Source Responsibility - The control system shall be completely installed and placed in operating condition by a firm specializing in this type of work. The firm shall provide a single source responsibility for all system components, engineering services, maintenance and warranty. Qualifying conditions are more fully described in a separate paragraph.
  - 1. The ATC Contractor shall be qualified and thoroughly experienced in providing single source responsibility for the Automatic Temperature Control System.
  - 2. The ATC Contractor shall be fully responsible for the complete design, installation and proper operation of the system, including but not limited to: Data and control signal transmission systems, Intelligent field interface devices (IFID) and interfacing of all system equipment, sensors and controls, memory units and peripheral devices. The ATC Contractor shall also coordinate the installation with the security system (i.e. if Master controller loses power a general alarm will be generated). This alarm signal shall be furnished by the security system.

3. After the installation, the Contractor shall be responsible for the debugging and calibration of the system, including all software, and maintenance of the system until the system functions in accordance with these specifications and successfully completes the final operational acceptance Test described in this Section. The Contractor's responsibilities shall also include all software and software maintenance during the warranty periods.
  4. The ATC contractor shall coordinate with the mechanical equipment supplier to successfully create a communication interface with the factory supplied communication protocol. The ATC contractor shall be responsible for the mounting of the manufacturer supplied interface device(s), this includes power wiring, communication wiring, necessary switches and enclosures. The ATC contractor shall be responsible for the mounting of BACnet controllers/devices, in panels constructed in compliance with 2.02.F of this section.
- C. All documentation required shall be considered as much as part of this contract as the system installation itself. Its accuracy and applicability shall be considered for conformance to the specifications. Expenses incurred due to non-conformance shall be recoverable from the Contractor or his surety according to the conditions of the Performance Bond. Any system revisions and/or additions provided for or required under this contract shall be included in this documentation in the form of updated documents.
- D. Provide the following electrical work as work of this section, complying with requirements of Division-16 sections:
1. Power wiring from a dedicated circuit breaker at each 120 Volt panel to a junction box shall be provided by the Division 16 Contractor. Electrical circuits for use by the BAS Contractor are shown on the electrical drawings. This Contractor is responsible for all power wiring from this junction box to control panels, devices, controllers and components for a complete and operating system. See plans for details.
  2. Control wiring between field-installed controls, indicating devices, and unit control panels.
  3. Interlock wiring between electrically interlocked devices, sensors, and between a hand or auto position of motor starters as indicated.
  4. All other electrical wiring, conduit and additional electrical components required to complete the automatic temperature control system including, but not limited to, interlocking of motor controllers with all other control and building system components, power wiring between junction boxes and control transformers and power wiring of auxiliary power receptacles, shall be provided and installed under this section of the specifications.

Wiring shall comply with all requirements of Division 16 of this specification and the National Electrical Code. It shall be noted that while every attempt to show the sensor junction box locations on the Division 16 electrical drawings has been made, should a sensor or sensors, junction box location be inadvertently not shown and said sensor is required for operation or mentioned in the sequence of operation, the rough-in of these junction boxes shall be the responsibility of this contractor.

- E. Smoke Detectors – Shall be furnished and wired to the fire alarm system by the Division 16 contractor. Smoke detectors are to be furnished with one set of normally closed contacts for interface to the equipment starters. They shall be installed under Division 15 and interlocked to their respective starters under this section. Fire alarm modules for unit shutdown shall be provided and installed by the division 16 contractor. It shall interlock with the respective starters under this section.
- F. Contractor shall provide all LAN interface devices and software to provide an integrated system connecting Control Units, Operator Interfaces, printers, etc. as described in this Section. Communications throughout all levels shall be seamless and reliable.
- G. Furnish and provide all software, programming and dynamic color graphics for a complete and fully functioning system as specified.
- H. The Owner, and Commissioning Agent, shall work with the Contractor and the Design Engineer to ensure that the systems, equipment, and interfaces are installed, tested, and operate per the design intent and contract documents, that the systems are adequately documented; and that the Owner is adequately trained on system intent, operation, and maintenance.
- I. Completion - It is the intention of the specifications and drawings to call for furnished work, tested, and ready for operation. Wherever the word "provide" is used, it shall mean "provide and install complete and ready for use".

### 1.03 WORK BY OTHERS

- A. Coordination Meeting - The installer furnishing the DDC network shall meet with the installer(s) furnishing each of the following products to coordinate details of the interface between these products and the DDC network. The Owner or his designated representative shall be present at this meeting. Each installer shall provide the Owner and all other installers with details of the proposed interface including Protocol Implementation Conformance Statement (PICS) for BACnet equipment, hardware and software identifiers for the interface points, network identifiers, wiring requirements, communication speeds, and required network accessories. The purpose of this meeting shall be to ensure that there will be no unresolved issues regarding the integration of these products into the DDC

network. Submittals for these products shall not be approved prior to the completion of this meeting.

- B. Control Valves furnished under this section shall be installed under the applicable piping section under the direction of Section 15900 Contractor who shall be fully responsible for the proper operation of the valve.

#### 1.04 PROCUREMENT

- A. The BAS and digital control and communications components installed, as work of this contract shall be an integrated distributed processing system of one of the following manufacturers.
- B. Acceptable Manufacturers
  1. Automated Logic Corporation - Interop with WebCtrl access software and controllers
  2. Delta Controls with ORCAView/ORCAweb software and web access controls
  3. Trane – Tracer Summit software with web access through a Tracer Summit Enterprise Server.
  4. Substitutions: NONE
- C. The BAS shall be installed by competent mechanics regularly employed by a specialty firm that is in the full time business of designing and installing environmental control systems and is an authorized representative of one of the prequalified control equipment manufacturers listed.
- D. Acceptable Installers
  1. Engineered Services Inc.
  2. EMS Consultants, Inc.
  3. Boland Trane.



4. Substitutions: NONE

#### 1.05 QUALITY ASSURANCE

- A. ATC System Qualifications: System shall be based on Manufacturer's standard integrated hardware and software product offering, which has been installed and fully operational in similar service for 2 years.
- B. Codes and Standards – Refer to most recent issue and/or State Adopted Standard:
  1. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).
    - a. ASHRAE/ANSI 135-2012: Data Communication Protocol for Building Automation and Control Systems (BACNET).
  2. Underwriters Laboratories (UL).
    - a. UL 916 Energy Management Systems.
    - b. UL 864 Control Units and Accessories for Fire Alarm Systems.
  3. National Electrical Manufacturer's Association (NEMA):
    - a. NEMA 250 Enclosure for Electrical Equipment
    - b. NEMA ICS 1: General Standards for Industrial Controls.
  4. National Fire Protection Association (NFPA):
    - a. NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems" where applicable to controls and control sequences. NEMA ICS 1: General Standards for Industrial Controls
    - b. NFPA 70 National Electrical Code (NEC).
    - c. NFPA 72 National Fire Alarm Code (NEAC).
  5. Institute of Electrical and Electronics Engineers (IEEE)
    - a. IEEE 142 Recommended Practice for Grounding of Industrial and Commercial Power Systems.
  6. Electronics Industries Associations (EIA)

- a. EIA 232 Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange.
- b. EIA 485 Standard for Electrical Characteristics of Generator and Receivers for use in Balanced Digital Multipoint Systems.

#### 1.06 DEFINITIONS

- A. ASC – Application Specific Controller Intelligent control panel with limited capabilities designed for controlling terminal devices.
- B. BAS - Building Automation System - The entire integrated management and control system
- C. CA - Commissioning Agent and/or Owner
- D. CEF - Cabinet or Ceiling Exhaust Fan
- E. CHW - Chilled Water
- F. CHWR - Chilled Water Return
- G. CHWS - Chilled Water Supply
- H. CT - Cooling Tower
- I. CUH - Cabinet Unit Heater
- J. CW – Condenser water
- K. CZ - Control Zone
- L. DDC - Direct Digital Control - Microprocessor based control including Analog/Digital conversion and program logic.
- M. FCPS - Fairfax County Public Schools – The Owner
- N. HW - Hot water
- O. HWS - Hot water supply
- P. HWR- Hot water return
- Q. IFID/CU - Intelligent Field Interface Device/Control Unit, stand alone control panel, including both primary control units and application specific controllers

- R. O.A. - Outside Air
- S. OEM – Original Equipment Manufacturer
- T. OI - Operator Interface - A device used by the operator to manage the BAS including OW, POT, and HHD.
- U. OW - Operator Workstation - PC and connected devices used as the central graphic “front end” to the system.
- V. PCU - Primary Control Unit - Fully featured intelligent stand-alone control panel residing on the primary LAN.
- W. Physical Point - A point on the BAS that is physically connected to an I/O device such that a hardware point exists.
- X. POT - Portable Operators Terminal - Laptop PC used both for direct connection to a CU and for remote dial up connection.
- Y. Virtual Point - A point to store values (i.e.: a set point) that do not represent a physical device.
- Z. AHS - air handling system- any system which supplies conditioned air.
- AA. GUI - Graphical User Interface.
- BB. TU - terminal unit- unitary equipment ( fan coil unit, unit ventilator, valance, blower coil unit, VAV box etc.).

#### 1.07 SYSTEM SOFTWARE-GENERAL

- A. **Functionality and Completeness:** The Contractor shall furnish and install all software and programming necessary to provide a complete and functioning system as specified. The Contractor shall include all software and programming not specifically itemized in these Specifications, which is necessary to implement, maintain, operate, and diagnose the system in compliance with these Specifications.
- B. **Configuration:** The software shall support the system as a distributed processing network configuration.

#### 1.08 SUBMITTALS

- A. Submit under provisions of Section 15010.
- B. **Product Data:** Submit manufacturer's technical product data for each control device, panel, and accessory furnished, indicating dimensions, capacities,

performance and electrical characteristics, and material finishes. Also include installation and start-up instructions.

- C. Shop Drawings: Submit eight sets of shop drawings for each control system. Submit a completed drawing for each central plant system, air handling unit, terminal unit, system, pump, device, etc. with all point descriptors, addresses and point names indicated. Shop drawings for system control schematics shall be provided in a format matching the design documents. Provide sample graphic display screen types. Shop drawings shall be submitted both on paper and electronic media as an AutoCAD Version 2006 or newer version-drawing file. (All x reference and font files must be provided on disk also). Each shop drawing shall contain the following information:
1. Shop Drawings shall commence with Color-coded small-scale building plans showing different colors for each HVAC zone.
  2. Shop Drawings shall continue with scaled floor plans; CAD files showing all mechanical equipment and ducting are to be made available to the ATC contractor through the General Contractor or Mechanical Contractor for coordination. Floor plans produced and submitted by the ATC contractor are to show the location of all mechanical equipment, all ATC control panels, all space sensors, all communication/data bus routing, duct sensors remote from the units such as supply static pressures, etc. Floor plan drawings are to clearly identify all area 'zones' and equipment groupings.
    - a. Interior sensors locations noted on the contract drawings may be diagrammatic. The ATC contractor is responsible for the proper location/placement of all sensors. Interior sensors are to be located using the following criteria:
      - 1) Locations near the entrance door to the space are preferred.
      - 2) Locations near return air grills are preferred.
      - 3) Temperature and Humidity sensors must be located away from: supply air diffusers, mechanical or electrical equipment mounted in the room, shelving, lockers and anything that could adversely effect the sensor function.
      - 4) Any sensor that must be relocated from the position identified on the contract drawings must be reviewed with the Owner and Engineer.
  3. System architecture one-line diagrams, indicating schematic location of all control units, workstations, LAN interface devices, gateways, etc.

Indicate address and type for each control unit. Indicate protocol, baud rate, and type of each LAN.

4. Schematic flow diagram of each air and water system showing fans, coils, dampers, valves, pumps, heat exchange equipment and control devices. A verbal description of sequence of operation shall be on the same page as the flow schematic. Once construction is complete, contractor shall provide an "as built" reprint of the contractual sequence of operation.
5. All physical points shall be indicated with names, descriptors, and point addresses identified.
6. With each schematic, provide a detailed points list on the drawings with all physical points included.
7. Provide a Bill of Materials with each schematic. Indicate device identification to match schematic and actual field labeling, quantity, actual product ordering number, manufacturer, description, size, voltage range, pressure range, temperature range, etc. as applicable.
8. The ATC contractor shall submit for review a valve selection chart with data for each of the following items.
  - a. Valve Application or Location (indicate ATC supplied or OEM).
  - b. Line Size to Coil.
  - c. Coil GPM requirements (Coil requirements are to be based on the actual coils submitted by the mechanical contractor).
  - d. Coil Pressure Drop.
  - e. Control Valve Manufacturer and Part Number.
  - f. Control Valve Size.
  - g. Control Valve Type (Sweat, NPT, Flange).
  - h. Control Valve Configuration (2-way, 3-way).
  - i. Control Valve CV.
  - j. Control Valve Pressure Drop.
  - k. Control Valve Close Off Pressure.
  - l. Valve Actuator Manufacturer and Part Number.

- m. Valve Actuator Operation (2-position, 0-10 modulating, floating, etc.).
  - n. Valve Actuator Power Source Voltage (24, 120, etc.).
  - o. Spring Return (Yes/No).
9. The ATC contractor shall submit for review a damper selection chart with data for each of the following items.
- a. Damper Application or Location (indicate ATC supplied or equipment OEM)
  - b. Damper Manufacturer and Part Number
  - c. Damper Size/Shape
  - d. Damper Torque Requirements
  - e. Damper CFM (requirements are to be based on the actual units submitted by the mechanical contractor)
  - f. Damper Type (Parallel, Opposed)
  - g. Damper Actuator Manufacturer and Part Number
  - h. Damper Actuator Operation (2-position, 0-10 modulating, floating, etc.)
  - i. Damper Actuator Power Source Voltage (24, 120, etc.)
  - j. Damper Actuator Spring Return (Yes/No)
  - k. Damper Actuator End Switches (Yes/No/Quantity)
  - l. Damper Actuator Mechanical Limit Stops (Yes/No/CFM at stop0)
  - m. Provide cut sheets and support data for each selected damper and actuator.
10. Indicate all required electrical wiring. Electrical wiring diagrams shall include both ladder logic type diagram for motor starter, control, and safety circuits and detailed digital interface panel point termination diagrams with all wire numbers and terminal block numbers identified. Provide circuit number or panel termination drawings on separate drawings. Ladder diagrams shall appear on system schematic. Clearly

differentiate between portions of wiring that exist, factory-installed and portions to be field-installed.

11. Details of control panels, including controls, instruments, and labeling shown in plan or elevation indicating the installed locations.
12. Points list including all physical I/O and virtual points. Points list shall be provided in both hard copy and in electronic format (Quote and Comma Delimited, ACCESS data table, or EXCEL spreadsheet formats are acceptable formats)
13. Sheets shall be consecutively numbered.
14. Each sheet shall have a title indicating the type of information included and the HVAC system controlled.
15. Table of Contents listing sheet titles and sheet numbers.
16. Legend and list of abbreviations.
17. Override Panel control zone diagram graphic

D. Control Logic Documentation:

1. Submit control logic graphical flow diagrams (for block type programs) or program listings and logic flow charts (for line type programs) to document the control software of all control units.
2. Control logic shall be annotated to describe how it accomplishes the sequence of operation. Annotations shall be sufficient to allow an operator to relate each program component (block or line) to corresponding portions of the specified Sequence of Operation. Logic flow charts for line type programs shall graphically show the logic flow of each application program.
3. Include a complete and concise written description of each control sequence and include icon files.
4. Include control response, settings, setpoints, throttling ranges, gains, reset schedules, adjustable parameters and limits.
5. Sheets shall be consecutively numbered.
6. Each sheet shall have a title indicating the controller designations and the HVAC system controlled.
7. Include Table of Contents listing sheet titles and sheet numbers

8. For block type programs, any two interconnected blocks that are shown on one sheet shall be shown with an interconnecting line, with limited use of references. Any two interconnected blocks that are shown on separate sheets shall include references to the connected block and the sheet number where the connected block is located. For line type programs, any program that calls a subroutine located on a separate sheet shall reference the line number where the subroutine is located.
9. Submit one complete set of programming and operating manuals for all digital controllers concurrently with control logic documentation. This set shall count toward the required number of Operation and Maintenance manuals specified below and in Section 01700 and 01730.

#### 1.09 DELIVERABLES

- A. Start-Up Checklists: Prior to start up and checkout, provide a sample check sheet for each type of equipment. Manufacturer's start up and checkout procedures shall be included with the checklists. Completed check sheets shall be furnished.
- B. Laminated Control Drawings: Laminated control drawings including system control schematics, sequences of operation and panel termination drawings, shall be provided in panels for major pieces of equipment. Smaller equipment and terminal unit drawings shall be located in the central plant equipment panel or mechanical room panel. Laminating film shall be at least 10mil thick. Drawings for application specific controllers mounted above the ceiling shall be on plain paper and permanently attached to the inside of the door of the enclosure. Lamination is not required for these drawings.
- C. ATC/BAS Start Up Report:
  1. Submit Start Up Report documenting that the ATC/BAS has been fully tested, adjusted and calibrated and is ready for final inspection/demonstration. Report shall include, but shall not be limited to, completed test sheets and checklists. Required details of the report shall be as specified in "System Acceptance", Section 15900, Paragraph 3.09.
- D. Operation and Maintenance Manuals: Submit four copies for approval of Operation and Maintenance Manuals bound in hardback, loose leaf binders and turn over to the Owner prior to the time the systems or equipment test are performed. Provide an index and tabbed sections. The manual shall be identified with the contents of the manual on the cover.
  1. Submit maintenance instructions, installation and checkouts procedures for each type of control device, control unit, and accessory.



2. Submit BAS system User's Guides (Operating Manuals) for each controller type and for all workstation hardware and software and workstation peripherals.
  3. Submit BAS system advanced Programming Manuals for each controller type and for all workstation software.
  4. Include all submittals (product data, shop drawings, control logic documentation, hardware manuals, software manuals, installation guides or manuals, maintenance instructions and spare parts lists) in maintenance manual; in accordance with requirements of Division 1. Submit record copies of product data and control shop drawings updated to reflect the final installed condition in both reproducible hard copy and electronic format in AutoCAD 2016 (or later) drawing files.
  5. Submit record copies of approved control logic programming and database on paper and on CD. Accurately record actual setpoints and settings of controls, all BACnet objects and their properties, and actual sequence of operation, including changes to programs made after submission and approval of shop drawings and including changes to programs made during specified testing.
  6. Submit record copies of approved project specific graphic software on CD updated to reflect the final installed condition.
- E. Maintain project record documents throughout the warranty period and submit record of warranty calls at the end of the warranty period to the Project Manager, Office of Design and Construction Services, 8115 Gatehouse Road Suite 3500 Falls Church VA 22042.
- F. Project Record Documents
1. Two weeks prior to the ATC demonstration, provide record documents to represent the final control configuration with actual set points and tuning parameters as existed at acceptance.
  2. Record documents shall be modified control drawings with the actual installed information. Drawings shall be delivered in both reproducible hard copy and electronic format in AutoCAD 2006 (or later) drawing files. Provide all supporting files, blocks, fonts, etc. required by the drawings.
  3. Provide final points list-as-described above.
  4. Provide final detailed wiring diagrams with all wire numbers and termination points indicated.

5. Accurately record final sequences and control logic diagrams made after submission of shop drawings.

G. Spare Parts

1. Within 45 days of approved shop drawings provide a complete package of spare parts as follows:
  - a. Computer hardware:
    - 1) Primary Control Unit (PCU's)- minimum 1 or 10% of each type used.
    - 2) Application Specific Controller- minimum 1 or 10% of each used.
2. Provide an itemized listing of the proposed spare parts, for review, prior to submitting spare parts.

1.10 CONSTRUCTION AND WARRANTY MAINTENANCE

- A. Contractor shall warrant all products and labor for a period of one year after date of substantial completion. Refer to Section 01740 for clarification. The ATC system shall not be considered substantially complete until the successful completion of the final inspection and demonstration. Refer to section 3.08 system acceptance.

The warranty period shall begin only after the successful completion of the ATC final inspection and demonstration for new construction and renovation projects.

- B. At no cost to the Owner, during the construction and warranty period, the Contractor shall provide maintenance services for software and hardware components as specified below:
1. Maintenance services shall be provided for all devices and hardware specified in this Section. Service all equipment per the manufacturers recommendations. All devices shall be calibrated within the last month of the warranty period.
  2. Emergency Service: Any malfunction, failure, or defect in any hardware component or failure of any control programming that would result in property damage or loss of comfort control shall be corrected and repaired following telephonic notification by the Owner to the Contractor.
    - a. Response by telephone to any request for service shall be provided within one hour of the Owner's initial telephone request for service.

- b. In the event that the malfunction, failure, or defect is not corrected through the telephonic communication, at least one (1) hardware or software technician, trained in the system to be serviced, shall be dispatched to the Owner's site within two (2) hours of the Owner's initial telephone request for such services, as specified.
    - c. Failure to respond within the described time frames shall be cause to hold the Contractor liable for damages incurred due to the lack of response.
  3. Normal Service: Any malfunction, failure, or defect in any hardware component or failure of any control programming that would not result in property damage or loss of comfort control shall be corrected and repaired following telephonic notification by the Owner to the Contractor.
    - a. Response by telephone to any request for service shall be provided within one (1) working hour (contractor specified 40 hr per week normal working period) of the Owner's initial telephone request for service.
    - b. In the event that the malfunction, failure, or defect is not corrected through the telephonic communication, at least one (1) hardware or software technician, trained in the system to be serviced, shall be dispatched to the Owner's site within one (1) working day of the Owner's initial telephone request for such services, as specified.
  4. Owners Telephonic Request for Service: Contractor shall specify a maximum of three service technicians' telephone numbers for Owner to call in the event of a need for service. At least one of the lines shall be attended at any given time at all times. One of the three paged technicians shall respond to every call within 15 minutes.
  5. Technical Support: Contractor shall provide technical support by telephone throughout the warranty period.
  6. Preventive maintenance shall be provided throughout the warranty period in accordance with the hardware component manufacturer's requirements.

#### 1.11 DELIVERY, STORAGE, AND HANDLING

- A. Provide factory-shipping cartons for each piece of equipment and control device. Maintain cartons during shipping, storage and handling as required to prevent equipment damage, and to eliminate dirt and moisture from equipment. Store equipment and materials inside and protect from weather.

### 1.12 LISTING AND LABELING

- A. Only those components which are directly wired to the Building Fire Alarm System shall be listed by Underwriters Laboratories (UL 864) as a Control Unit and Accessories for Fire Alarm Systems.

### 1.13 LICENSING

- A. Provide licensing and original software copies for 2 (two) Owner provided Operator Workstations or Portable Operator Terminals. Include licensing for all required software packages.
- B. Upgrade all software packages to the release (version) in effect at the end of the Warranty Period and prior to the end of the Warranty Period.

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## **PART 2. PRODUCTS**

### 2.01 MATERIALS AND EQUIPMENT

- A. General:
  - 1. Materials shall be new, the best of their respective kinds without imperfections or blemishes and shall not be damaged in any way. Used equipment shall not be used in any way for the permanent installation except where drawings or specifications specifically allow existing materials to remain in place.
  - 2. Provide control products in sizes and capacities indicated, consisting of valves, dampers, thermostats, relays, controllers, sensors, and other components as required for complete installation. Except as otherwise indicated, provide manufacturer's standard materials and components as published in their product information; designed and constructed as recommended by manufacturer, and as required for application indicated.

### 2.02 BASIC MATERIALS, INTERFACE DEVICES, AND SENSORS

- A. All wiring installed in areas with accessible ceilings shall be installed bundled together and run exposed above the ceilings. Bundles shall be supported by "J" hooks mounted not more than four feet on center.
- B. COMMUNICATION WIRING:

1. All wiring shall be in accordance with National Electrical Codes and Division 16 of this specification. Exposed wiring or cabling installed in return air plenum ceilings or air cavities shall be rated for that application.
2. Contractor shall supply all communication wiring between Owners WAN active hubs and LANIDs/PCUs, between CUs and LANIDs/PCUs and local and remote peripherals (e.g., operator workstations, printers).
3. Primary LAN communication wiring shall be 100% individually shielded pairs. Communication wiring shall be 24 gauge minimum or of heavier/lighter gauge if recommended by the PCU manufacturer for the specific installation requirements, with overall PVC cover, with no splices, separate from any wiring over thirty (30) volts. Shield shall be terminated as recommended by PCU manufacturer. Cable shall be single-shielded pair type suitable for Arcnet (IEEE802.4), Ethernet (IEEE802.3)
4. Secondary LAN communication wiring shall be 100% individually shielded pairs. Communication wiring shall be 24 gauge minimum or of heavier/lighter gauge if recommended by the PCU manufacturer for the specific installation requirements, with overall PVC cover, with no splices, separate from any wiring over thirty (30) volts. Shield shall be terminated as recommended by PCU manufacturer. Cable shall be single-shielded pair type suitable for Arcnet (IEEE8802.4), Ethernet (IEEE8802.3), MS/TP, TP/FT-10.
5. Data communication wiring from CUs and peripherals (i.e., operator interface devices, printers, etc.) shall be minimum 4-conductor, 22-gauge wire, or of heavier/lighter gauge if recommended by control manufacturer, 100% shielded, with PVC cover and RS-232C connectors at both ends.
6. Contractor may elect to run unshielded cable if noise immunity is ensured by another means. Contractor shall fully responsible for noise immunity and rewire with shielded cable if electrical or RF noise affects

C. SIGNAL WIRING:

1. Signal wiring to all field devices, including, but not limited to, all sensors, transducers, transmitters, switches, etc. shall be twisted, 100% shielded pair, minimum 18-gauge wire, with PVC cover. Run with no splices, separate from any wiring above thirty (30) volts.
2. Signal wiring shield shall be grounded at CU end, only as recommended by the CU manufacturer.
3. Contractor may elect to run unshielded cable if noise immunity is ensured by another means. Contractor shall fully responsible for noise immunity

and rewire with shielded cable if electrical or RF noise affects performance.

D. LOW VOLTAGE OUTPUT WIRING:

1. Low voltage control wiring shall be minimum 18-gauge, twisted pair, stranded, 100% shielded, with PVC cover, separate from any wiring above thirty (30) volts.
2. Contractor may elect to run unshielded cable if noise immunity is ensured by another means. Contractor shall fully responsible for noise immunity and rewire with shielded cable if electrical or RF noise affects performance.

E. CONTROL POWER WIRING:

1. Power wiring shall be minimum 12-gauge stranded installed in conduit, separated from any other wiring.

F. CONTROL PANELS: (PCUS AND ASCS)

1. Provide control panels with suitable brackets for wall mounting for each control system. Locate panels in ceilings for unit ventilators, fan coil units, finned tube radiation, terminal units, variable refrigerant flow units, water source heat pumps and heating coils. Panels located in ceilings shall be identified with a nameplate attached with 1/4" head, self-tapping screw to the ceiling grid or access door identifying the equipment. Mounting control panels for VAV boxes on the VAV box itself is acceptable. See additional identification requirements in Section 15900, Paragraph 2.02 X, NAMEPLATES. Control panels may also be factory mounted inside terminal and packaged units (FCU's UV's RTU's VRF's WSHP's etc.)
2. Indoor enclosures shall meet the requirements of NEMA 250, Type 1.
3. Outdoor enclosures shall meet the requirements of NEMA 250 Type 3R.
4. Wall mounted enclosures below ceiling shall be fabricated panels of 16-gage furniture-grade steel, with hinged door and keyed lock. Keyed lock shall be compatible with Owner's 2052 key. Enclosures above the ceiling shall be fabricated panels of 16-gauge steel, with hinged door and coin lock. All enclosures shall be totally enclosed on four sides with back plate and shall have manufacturer's shop painted finish (KELE HC12124). Junction boxes are not acceptable. Minimum size: 12" x 12".
5. Provide UL-listed cabinets for use with line voltage devices.

6. Control panel shall be completely factory wired, and all electrical connections made to a separate terminal strip. Field wiring of panels is not acceptable. Terminal strip is not required on ASCs mounted above ceiling.
7. All control components shall be identified.
8. Complete as-built wiring diagrams shall be mounted in or adjacent to the panel.
9. All control wiring shall be run neatly and orderly in open slot wiring duct with cover. Not required for ASCs above ceiling.
10. PCU's shall be provided with a combination disconnect / receptacle with fuse holder and fuse (KELE part number PRK-FS) mounted within the enclosure and wired such that when the disconnect is opened, the receptacle remains energized. Provide single gang wiremold box in master control panel for punch down of the FCPS data drop.

#### G. CONTROL VALVES

1. General: Provide factory fabricated control valves of type, body material and pressure class indicated. Where type or body material is not indicated, provide selection as determined by manufacturer for installation requirements and pressure class, based on maximum pressure and temperature in piping system. Provide valve size in accordance with scheduled or specified maximum pressure drop across control valve. Equip control valves with heavy-duty actuators, with proper shutoff rating for each individual application. Required close-off pressure for water valve applications shall be the shutoff head of associated pump.
2. Ball Type
  - a. Body: Brass or Bronze, one, two, or three piece design, threaded ends.
  - b. Seat: Reinforced Teflon.
  - c. Ball: Stainless steel.
  - d. Port: Standard or 'V' style.
  - e. Stem: Stainless steel, blow out proof design, extended to match thickness of insulation. Provide stem protective sleeve that allows

operation of valve without breaking the vapor seal on chilled water service valves.

- f. Cold Service Pressure: 250 psi WOG.
- g. Acceptable Manufacturers: Subject to compliance with requirements approved manufacturers are as follows:
  - 1) Conbraco
  - 2) Worcester
  - 3) Nibco
  - 4) Jamesbury
  - 5) PBM
  - 6) Delta
  - 7) Belimo
  - 8) TAC

#### H. FIELD DEVICES – GENERAL

- 1. Provide field devices for input and output of digital (binary), and analog, signals into PCUs and ASCs. Provide signal conditioning for all field devices as recommended by field device manufacturers, and as required for proper operation in the system.
- 2. It shall be the Contractor's responsibility to assure that all field devices are compatible with CU hardware and software.
- 3. Field devices specified herein are generally "two-wire" type transmitters, with power for the device expected to be supplied from the respective CU. If the CU provided is not equipped to provide this power, or is not designed to work with "two-wire" type transmitters, or if field device is to serve as input to more than one CU, the Contractor shall provide "four-wire" type equal transmitter and necessary regulated DC power supply or 120 VAC power supply, as required.
- 4. For field devices specified hereinafter that require signal interface to CU's, Contractor shall furnish and install proper device, including 120V power as required. Such devices shall have accuracy equal to, or better than, the accuracy listed for respective field devices.



5. Accuracy, as stated in this Section, shall include combined effects of nonlinearity, nonrepeatability and hysteresis.

- I. TEMPERATURE SENSORS (TS)

1. Sensor range: When matched with A/D converter of PCU, or ASC, sensor range shall provide a resolution of no worse than 0.5°F.
2. Platinum RTD Sensors shall be 1000Ω two wire type unless provided with integral transmitter with current or voltage output.
3. Room temperature sensor shall be an element contained within a ventilated cover, suitable for wall mounting. The LAN broadcast of sensing values for control to multiple controllers is unacceptable. Provide slide setpoint adjustment, (2°F up and down), on all sensors except those located in locker rooms, corridors, auditoriums, gang toilets, and on all PRV's, CEF's, EWH's and ECH's. The following sensing elements are acceptable:
  - a. Sensing element – Platinum RTD, Thermistor, or integrated circuit, +/- 0.5°F accuracy at calibration point.
4. Single point duct temperature sensor shall consist of sensing element, junction box for wiring connections and gasket to prevent air leakage or vibration noise. Temperature range as required for resolution indicated in paragraph a) below. Sensor probe shall be 304 stainless steel. Probe length shall be selected so that the sensing point is minimum 8" from the center point of the medium being measured.
  - a. Sensing element – Platinum RTD, Thermistor, or integrated circuit, +/- 0.5°F accuracy at calibration point.
5. Averaging duct temperature sensor shall consist of an averaging element, junction box for wiring connections and gasket to prevent air leakage. Provide sensor lengths and quantities to result in one lineal foot of sensing element for each square feet of coil face area. Temperature range as required for resolution indicated in paragraph a) below.
  - a. Sensing element – Platinum RTD, or Thermistor, +/- 0.5°F accuracy at calibration point.
6. Liquid immersion temperature sensors for hot, chilled and condenser water systems shall include stainless steel thermowell, sensor and connection head for wiring connections. Temperature range shall be as required for resolution indicated in paragraph a) below.

- a. Sensing element – Platinum RTD, Thermistor, or integrated circuit, +/- 0.5°F accuracy at calibration point.
7. Pipe Surface Mount temperature sensor shall include metal junction box and clamps and shall be suitable for sensing pipe surface temperature and installation under insulation. Provide thermally conductive paste at pipe contact point. Sensors shall only be used where specifically called for or with prior approval of the Owner. Temperature range shall be as require for resolution indicated in paragraph a) below.
    - a. Sensing element – Platinum RTD, Thermistor, or integrated circuit, +/- 0.5°F accuracy at calibration point.
  8. Outside air sensors shall consist of a sensor, sun shield, utility box, and watertight gasket to prevent water seepage. Temperature range shall be as require for resolution indicated in paragraph a) below.
    - a. Sensing element – Platinum RTD, Thermistor, or integrated circuit, +/- 0.5°F accuracy at calibration point.
- J. HUMIDITY TRANSMITTERS (H)
1. Units shall be suitable for duct, wall (room) or outdoor mounting. Unit shall be two-wire transmitter utilizing bulk polymer resistance change or thin film capacitance change humidity sensor. Unit shall produce linear continuous output of 4-20 mA for percent relative humidity (% rh). Sensors shall have the following minimum performance and application criteria:
    - a. Input Range: 0 to 100% rh.
      - 1) Accuracy (% rh): +/- 2% (when used for enthalpy calculation, dewpoint calculation, dehumidification or humidifier control) or +/- 3% (monitoring only) between 20-90% rh at 77°F, including hysteresis, linearity, and repeatability.
      - 2) Sensor Operating Range: as required by application
      - 3) Long Term Stability: Less than 1% drift per year.
  2. Units shall be General Eastern, Microline, Hy-Cal HT Series, ACI or Vaisala HM Series. Provide one (1) Calibration Tool Kit per job.

1. : Square D, ITT Neo-Dyn, ASCO, Penn, Honeywell, and Johnson.

K. PIPE AND TUBING FOR PRESSURE SENSING AND CONTROL DEVICES

1. Piping for low pressure air sensing and control devices operating under 30 psig shall be instrument grade polyethylene tubing (plenum rated if used in plenums), ¼ inch OD, 120 psig working pressure assembled with brass barbed fittings or ¼ inch type 'L' soft copper tubing assembled with flared type fittings.

L. TRANSDUCERS

1. Pulse Width Modulating, Voltage or Current to Voltage or Current
  - a. Universal Electronic Analog Transducer for all three phase equipment and digital transducer for all single phase equipment
  - b. Electrical Power Supply: 24 VAC or 24 VDC
  - c. Input: 0-40 mA, 0-4 mA, 0-2 V, 0-20V, 100Ω min to 10kΩ max., pulse width modulated or tri-state input.
  - d. Output Span: 0-18 VDC or 0-20 VDC – Jumper Selectable
  - e. Zero and Span: Adjustable to full range
  - f. Action: Direct or Reverse Acting – Jumper Selectable
  - g. Operating Humidity & Temperature: 5-95% non-condensing, 32°F to 150°F
  - h. Linearity: <0.1% of span
  - i. Enclosure: Polymer designed for surface or panel mount.
  - j. Manufacturer: Kele Model UAT-1, PWA-1A

M. CURRENT SWITCHES

1. Clamp-On Design Current Operated Switch for Motor Status Indication
  - a. Range: 1.5 to 150 amps
  - b. Trip Point: Adjustable +/- 1 % of range

- c. Switch: Solid state, normally open, 1 to 135 VAC or VDC, 0.3 amps. Zero off state leakage.
  - d. Lower Frequency Limit: 6 Hz.
  - e. Trip Indication: LED
  - f. Approvals: UL, CSA
  - g. Max. Cable Size: 350 MCM
  - h. Manufacturer: RE Technologies SCS1150A-LED or equal.
2. Wire Thru and Current Operated Switch for Motor Status Indication
- a. Range: 0 to 200 A continuous amperage rating
  - b. Trip Point: Adjustable +/- 1 % of range
  - c. Switch: 8A @ 240 Vac resistive, 4A @ 120 Vac tungsten, 2A @ 240 Vac inductive (1/2 hp), load control contact power shall be induced from monitored conductor (minimum conductor current required to energize relay 5A, max. rating of 135A).
  - d. Manufacturer: Veris Industries, Inc.
  - e. Current switches for fractional horsepower motors (terminal equipment, UV's FCU's PRV's ECH CEF's etc.) shall be Veris H120

N. CURRENT TRANSFORMERS (CT)

- 1. Clamp-On Design Current Transformer for Motor Current Sensing
  - a. Range: 50 amps minimum, 4000 amps maximum
  - b. Accuracy:  $\pm 1\%$
  - c. Manufacturer: KELE Model 500T or Veris Industries.

O. ELECTRIC CONTROL COMPONENTS

- 1. Limit Switches (LS): Limit switches shall be UL listed, with adjustable trim arm. Limit switches shall be as manufactured by Square "D", Allen Bradley; SPDT or DPDT type.

2. Smoke Detectors – Shall be furnished and wired to the fire alarm system under Division 16. They shall be installed under Division 15 and interlocked to their respective starters under this section. Fire alarm modules for unit shut down shall be provided and installed by the division 16 contractor, and interlocked to their respective starters under this division.
3. Control Relays: All control relays shall be UL listed, with contacts rated for the application. Relays shall be mounted inside of an approved electrical enclosure such as a control panel, equipment control enclosure, or separate enclosure meeting the requirements specified for control panels, unless noted otherwise below. Relays mounted in equipment control enclosures shall be neatly installed in accordance with the electrical code, securely fastened to the enclosure, and shall be accessible for maintenance without obstructing access to other equipment control components.
  - a. Control relays for use on electrical systems of 120 volts or less shall have, as a minimum, the following:
  - b. AC coil pull-in voltage range of +10%, -15% or nominal voltage.
  - c. Coil sealed volt amperes (VA) not greater than four (4) VA.
  - d. Silver cadmium Form C (SPDT) contacts in a dustproof enclosure, with 8 or 11 pin type plug.
  - e. Pilot light indication of power-to-coil and coil retainer clips.
  - f. Coil rated for 50 and 60 Hz service.
  - g. Relays shall be KELE or Omron LY series.
  - h. Relays used for control (start/stop) of 120V motors, up to 1/3 HP, shall be rated to break minimum 10 Amps inductive load. Relays shall be RIB series and mounted externally to the starter or junction box.
  - i. Relays used for stop/start control shall have low voltage coils (30 VAC or less), and shall be provided with transient and surge suppression devices at the CU interface if required by equipment manufacturer.
  - j. All relays for motor starters and variable frequency drives, electric heaters, inline pumps, exhaust fans and electric heat trace shall be RIB series and mounted externally to the starter, drive or junction box.

- k. All RIB relays shall be mounted on the exterior of the electrical equipment.
4. General Purpose Power Contactors. NEMA ICS 2, AC general-purpose magnetic contactor. ANSI/NEMA ICS 6, enclosure meeting requirements stated for control panels. Manufacturer shall be Square 'D', Cutler Hammer or Westinghouse.
5. Control Transformers: Control transformers shall be machine tool type, and shall be UL and CSA listed. Secondary sides shall have re-settable overcurrent protection in accordance with the NEC. Transformer shall be proper size for application, and mounted in minimum NEMA 1 enclosure. Transformers shall be UL listed and Rated Class 2 when installed in plenums. Transformers shall be manufactured by Westinghouse, Square "D" Veris, RIB or Jefferson.
6. Time Delay Relays (TDR): TDRs shall be capable of on or off delayed functions, with adjustable timing periods, and cycle timing light. Contacts shall be rated for the application with a minimum of two (2) sets of Form C contacts, enclosed in a dustproof enclosure.
  - a. TDRs shall have silver cadmium contacts with a minimum life span rating of one million operations. TDRs shall have solid state, plug-in type coils with transient suppression devices.
  - b. TDRs shall be UL and CSA listed, Crouzet type.
7. Electric Push Button Switch: Switch shall be momentary contact, oil tight, push button, with number of N.O. and/or N.C. contacts as required. Contacts shall be snap-action type, and rated for minimum 120 VAC operation. Switch shall be 800T type, as manufactured by Allen Bradley, Square 'D', Cutler Hammer or Westinghouse.
8. Pilot Light: Panel-mounted pilot light shall be NEMA ICS 2 oil tight, transformer type, with screw terminals, push-to-test unit, LED type, rated for 120 VAC. Unit shall be 800T type, as manufactured by Allen Bradley, Square 'D', Cutler Hammer or Westinghouse.
9. Electric Selector Switch (SS): Switch shall be maintained contact, NEMA ICS 2, oil-tight selector switch with contact arrangement, as required. Contacts shall be rated for minimum 120 VAC operation. Switch shall be 800T type, as manufactured by Allen Bradley, Square 'D', Cutler Hammer or Westinghouse.
10. DIGITAL OVERRIDE TIMER - Override Timer: Digital time switch suitable for wall or panel mounting, 0-3 hour range, 24VAC/VDC, 12mA DC, 41mA AC, with LCD display. Switch shall be TSW-400-24 as manufactured by Wattstopper.

11. OVERRIDE TOUCH SCREEN- Configurable, high resolution, TFT override touch panel suitable for panel mounting as manufactured by Loytec model LVIS-3ME15-Gx or approved equal. Provide all mounting hardware.
12. INDUCTIVE ROTATION SENSOR – Proximity type sensor for rotation detection (Heat Recovery Wheel), 120-3000 cyc/min, 24..240VAC/DC, 10 mm nominal sensing range. Sensor shall be XSAV12801 as manufactured by Schneider Electric or approved equal. Include all manufacturers' recommended mounting hardware.

P. NAMEPLATES

1. Nameplates – Provide engraved phenolic or micarta nameplates for all equipment, panels, components, and field devices furnished. Each nameplate shall identify the items, such as "Main HW Flow-DI3". Nameplates shall be 1/8 thick, blue, with white center core, and shall be minimum 1" x 3", with minimum 1/4" high block lettering. Nameplates for devices smaller than 1" x 3" shall be attached to adjacent surface. Panels located in ceilings shall be identified with a nameplate screwed (1/4" self-taping), to the ceiling grid. Equipment identification shall be as shown in the equipment schedules on the drawings. Nameplates shall be applied to surfaces with mechanical fasteners. Each nameplate shall identify the function for each device. (Example: RTU-C1 ATC, PRV-4 ATC, Etc.) Labels for Terminal Equipment shall include the signage # of the room/space served. (Example VAV-RM100, FCU-RM201) The signage number shall be the final room number, not the room number from the construction documents.
2. Temperature Sensors – Provide labels on all temperature sensors to identify the equipment served and the location of the sensor. Abbreviations used to identify the equipment shall be as listed in paragraph 1.06 DEFINITIONS. Room numbers used to identify the locations of sensors shall be the same as those used for the approved signage schedule, not from construction documents, and shall be obtained from the Construction Manager, Design and Construction Services. (Example: VRF-RM 101 FCU-RM100, UV-RM103, etc). Sensors for equipment not located in classrooms, such as rooftop units, air-handling units, power roof ventilators, shall be labeled as shown in the equipment schedules on the drawings. (Example: RTU-C1, AHU-A3, PRV-4, etc.). Labels shall be BROTHER type "P-TOUCH", clear tape with upper case letters, black printing and shall be on the outside of the sensor cover. The inside of the sensor cover shall also be identified with permanent marker.

3. Actuators – Provide labels on all zone damper actuators in multi-zone units to identify the room the damper serves. When more than one room is served by a zone damper, the room with the temperature sensor located in it shall be the referenced room. Room numbers shall be the same as those used for lockset keying purposes, not from construction documents, and shall be obtained from the Construction Manager, Design and Construction Services. The actuators shall be labeled with permanent markers.
4. Warning Labels – In addition to the above, each item of motorized equipment and associated starters, including air handling units, exhaust fans, return fans, supply fans, pumps, cooling towers, condensers and similar equipment shall be provided with a label with wording as follows:

**WARNING**

**EQUIPMENT IS REMOTELY CONTROLLED AND  
MAY STOP OR START UNEXPECTEDLY**

Lettering shall be red on white base with integral adhesive and peel-off backing for attaching to existing equipment and shall be minimum 1" x 3". The Contractor shall submit a sample of the label material with the lettering sizes noted for approval prior to installation. Contractor shall thoroughly clean each item of motorized equipment and starters prior to application of labels.

**Q. TESTING EQUIPMENT**

1. Contractor shall test and calibrate all signaling circuits of all field devices to ascertain that required digital and accurate analog signals are transmitted, received, and displayed at system operator terminals, and make all repairs and recalibrations required to complete test. Contractor shall be responsible for test equipment required to perform these tests and calibrations. Test equipment used for testing and calibration of field devices shall be at least twice as accurate as respective field device (e.g., if field device is +/-0.5% accurate, test equipment shall be +/-0.25% accurate over same range).

**2.03 DISTRIBUTED DIRECT DIGITAL CONTROLLERS AND CONTROL SYSTEM**

- A. General: The functional intent of this specification is to allow application of manufacturer's standard products while maintaining the integrity and reliability of the control functions. A Primary Control Unit as specified below is generally fully featured and customizable whereas the Application Specific Controller refers to a



more cost effect unit designed for lower end applications. Specific requirements indicated below are required for the respective application.

- B. Standalone Capability: Each Control Unit shall be capable of performing the required sequence of operation for the associated equipment. All physical point data and calculated values required to accomplish the sequence of operation shall originate within the associated IFID/CU with only the exceptions enumerated below. Listed below are physical point data and calculated values, which shall allowed to be obtained from, or stored by other IFIDs/Cus via LAN.

1. SYSTEM ARCHITECTURE

- a. The system provided shall incorporate hardware resources sufficient to meet the functional requirements of these Specifications. The Contractor shall include all items not specifically itemized in these Specifications that are necessary to implement, maintain, and operate the system in compliance with the functional intent of these Specifications.
- b. The system shall be configured as a distributed processing network(s) capable of expansion as specified below.
- c. The system architecture shall consist of a single Local Area Network (LAN) or multi-leveled LANs all which support Control Units, both local and Remote Operator Interfaces, and LAN Interface Devices, and Remote Communication Devices. The following indicates a functional description of the system structure.
  - 1) Host LAN: high speed LAN used for supervision, and communication between primary controlling LANs. This shall be the Owner's existing WAN. This network shall be used for communication between buildings only. This contractor shall coordinate with division 16 contractor and owner to provide network connectivity as required. Modem connections to buildings are unacceptable. Communications within building shall be provided by contractor.
  - 2) Primary Controller LAN: High-speed peer-peer LAN generally used to connect Primary Control Units (PCUs- which generally control central plant equipment, air handling units) and LANIDs. Acceptable technologies include: Arcnet (IEEE802.4), Ethernet (IEEE802.3), TP/FT-10 (LonTalk), ASHRAE 135-2004 (BACnet).
  - 3) Secondary Controller LAN: Polling or peer-peer LAN to support connection of Terminal Control Units/application

specific controllers to LANIDs. Acceptable technologies include: ASHRAE 135-2004 (BACnet), Arcnet (IEEE8802.4), Ethernet (IEEE8802.3), MS/TP, TP/FT-10 (LonTalk), EIA-485 at a minimum speed of 19.2 kbps.

- 4) Auto Answer/Auto Dial communications to remote operator interfaces shall be supported to allow communication with all levels of the system.
- d. Dynamic Data Access: Any data throughout any level of the network shall be available to and accessible by all other devices, IFIDs/Cus, LANIDs, and OI's, whether directly connected or connected remotely.
  - e. The communication speed between the IFIDs/Cus, LAN interface devices, and operator interface devices shall be sufficient to ensure fast system response time under any loading condition. Contractor shall submit guaranteed response times with shop drawings including calculations to support the guarantee. In no case shall delay times between an event, request, or command initiation and its completion be greater than the following requirements. Contractor shall reconfigure LAN as necessary to accomplish these performance requirements.
    - 1) 5 seconds between a Level 1 (critical) alarm occurrence and enunciation at operator workstation
    - 2) 10 seconds between a Level 2 alarm occurrence and enunciation at operator workstation
    - 3) 20 seconds between and a Level 3-5 alarm occurrence and enunciation at operator workstation
    - 4) 10 seconds between an operator command via the operator interface to change a setpoint and the subsequent change in the controlling IFIDs/CU
    - 5) 5 seconds between an operator command via the operator interface to start/stop a device and the subsequent command to be received at the controlling IFIDs/CU
    - 6) 10 seconds between a change of value or state of an input and it being updated on the operator interface
    - 7) 10 seconds between an operator selection of a graphic and it completely painting the screen and updating at least 10 points

- f. Polling Secondary LANs shall operate at a minimum baud rate of 19200 BPS. Application and node restrictions for polling LANs based on application and communication speed are specified in "Distributed Direct Digital Controllers and Control System".
  - g. The operator interface shall provide for overall system supervision, operator interface, management report generation, alarm annunciation, remote monitoring and back up and loading of software and data to be stored in either Flash, EEPROM or EPROM Memory.
  - h. The primary and secondary control units shall monitor, control, and provide the field interface for all points specified. Each PCU or ASC shall be capable of performing all specified energy management functions, and all Distributed Digital Control (DDC) functions, independent of other PCUs or ASCs and operator interface devices as more fully specified in "Distributed Direct Digital Controllers and Control System".
  - i. Interruptions or fault at any point in the primary or secondary LAN shall not interrupt communications between other nodes on the network. If a primary LAN is severed, two separate networks shall be formed and communications within each network shall continue uninterrupted.
  - j. All line drivers, signal boosters, and signal conditioners etc. shall be provided as necessary for proper data communication.
- C. APPLICATION SPECIFIC CONTROLLER (ASC) (ASCs shall control FCU, UV, FTR, VAV,EF, BCU, Terminal devices etc...)
- 1. ASCs shall include Unitary Controllers (UC), and Terminal Equipment Controllers (TEC), which provide intelligent, limited stand-alone control of HVAC equipment. Each unit shall have its own internal RAM, non-volatile memory and shall continue to operate all local control functions in the event of a loss of communications on the secondary LAN. Refer to stand alone requirements by application specified in Section 2.03. In addition, it shall be able to share information with every other PCU and ASC on the entire network.
  - 2. Each ASC shall include self-test diagnostics that allow the ASC to automatically relay to the PCU, LAN Interface Device or workstation, any malfunctions or abnormal conditions within the ASC or alarm conditions of inputs that exceed desired parameters as determined by programming input.

3. Application programs, calculations, and commands resident in other controllers, with the exception of global information (further defined in this specification), and transmitted to the ASC for execution is unacceptable.
4. Each ASC shall contain both software and hardware to perform full DDC/PID control loops.
5. Each ASC must be capable of stand-alone direct digital operation utilizing its own processor, non-volatile memory, input/output, minimum 10 bit A to D conversion, voltage transient and lightning protection devices. All volatile memory shall have a battery backup of at least fifty (50) hrs with a battery life of five years.
6. All point data; algorithms and application software within an ASC shall be modifiable from the Operator Workstation, Portable Operators Terminal and Hand Held Device.
7. ASC Input-Output Processing
  - a. Digital Outputs (DO): Outputs shall be rated for a minimum 24 VAC or VDC, 1 amp maximum current. Each configurable as normally open or normally closed. Each DO shall be discrete outputs from the ASC's board (multiplexing to a separate manufacturer's board is unacceptable). Provide suppression to limit transients to acceptable levels.
  - b. Analog Inputs (AI): 0-5VDC, 0-10VDC; 0-20VDC, and 0-20 mA. Provide signal conditioning, and zero and span calibration for each input. Each input shall be a discrete input to the SCU's board (multiplexing to a separate manufacturers board is unacceptable unless specifically indicated otherwise). A/D converters shall have a minimum resolution of 10 bits.
  - c. Digital Inputs (DI): Monitor dry contact closures. Accept pulsed inputs of at least one per second. Source voltage for sensing shall be supplied by the ASC and shall be isolated from the main board.
  - d. Universal Inputs (UI-AI or DI): To serve as either AI or DI as specified above.
  - e. Electronic Analog Outputs (AO) as required by the application: voltage mode, 0-5VDC and 0-10VDC; current mode (4-20 mA). Provide zero and span calibration and circuit protection. Pulse Width Modulated (PWM) analog via a DO and transducer is acceptable unless stipulated otherwise for a given control loop.

Transducer shall be programmable for normally open, normally closed, or hold last position and shall allow adjustable timing. Each AO shall be discrete outputs from the ASC's board (multiplexing to a separate manufacturers board is unacceptable). D/A converters shall have a minimum resolution of 8 bits.

## 2.04 SYSTEM COMMUNICATION DEVICES

### A. LOCAL AREA NETWORK Interface Devices (LANID)

1. The LANID shall be a microprocessor-based communications device, which acts as a gateway between the Host LAN, Primary LAN, Secondary LAN, an operator interface, or printer. These may be provided within a PCU or as a separate device. LANID shall automatically report alarm conditions, download trend data, etc. as required elsewhere in these specifications.
2. The LANID shall perform information translation between the Host LAN, Primary LAN, and the Secondary LAN, supervise communications on a polling secondary LAN, and shall be applicable to systems in which the same functionality is not provided in the PCU. In systems that the LANID is a separate device, it shall contain its own microprocessor, RAM, battery, real time clock, communication ports and, power supply as specified for a primary control unit. Each gateway shall be mounted in a lockable enclosure.
3. Each LANID shall support interrogation, full control, and all utilities associated with all PCU's on the Primary LAN, all ASCs connected to all secondary LANs under the Primary LAN, and all points connected to those PCUs and ASCs.
4. Upon loss of power to a LANID, all programs and data shall be stored in either Flash, EEPROM or EPROM memory.
5. LANIDs shall support communications to the remote OW and POT. LANID functionality shall support
  - a. Automatic dial out to report alarm conditions, download trend data, etc. as required elsewhere in these specifications.
  - b. multiple retries for unsuccessful connection
  - c. multiple number dial out
  - d. buffering of incoming and outgoing data
  - e. automatic answer

- f. uploading and downloading of control unit programs
6. The LANID shall be transparent to control functions and shall not be required to control information routing on the Primary LAN

## 2.05 SYSTEM SOFTWARE AND PROGRAMMING

### A. CU SOFTWARE

1. PCU Software Residency: Each PCU as defined below shall be capable of control and monitoring of all points physically connected to it. All software including the following shall reside and execute at the PCU
  - a. Real Time Operating System software
  - b. Real Time Clock/Calendar and network time synchronization
  - c. PCU diagnostic software
  - d. LAN Communication software
  - e. Direct Digital Control software
  - f. Alarm Processing and Buffering software
  - g. Energy Management software
  - h. Data Trending, Reporting, and Buffering software
  - i. I/O (physical and virtual) database
  - j. Remote Communication Software unless its resident in a LANID on the primary LAN.
2. ASC Software Residency: Each ASC as defined below shall be capable of control and monitoring of all points physically connected to it. As a minimum, software including the following shall reside and execute at the ASC. Other software to support other required functions of the ASC may reside at the master PCU or LANID with the restrictions/exceptions per application provided in "Distributed Direct Digital Controllers and Control System".
  - a. Real Time Operating System software
  - b. Real Time Clock/Calendar and network time synchronization

- c. ASC diagnostic software
  - d. LAN Communication software
  - e. Direct Digital Control software
  - f. Control software applicable to the unit it serves shall support a single mode of operation
  - g. I/O (physical and virtual) database.
3. Stand Alone Capability: PCU/ASC shall continue to perform all functions independent of a failure in other PCUs/ASCs or other communication links to other PCUs/ASCs. Trends and runtime totalization shall be retained in memory. Runtime totalization shall be available on all digital input points that monitor electric motor status.
  4. Operating System: CU's shall include a real time operating system resident in ROM. This software shall execute independently from any other devices in the system. It shall support all specified functions. It shall provide a command prioritization scheme to allow functional override of control functions
  5. Network Communications: Each CU shall include software that supports the networking of CUs on a common communications trunk that forms the respective LAN. Network support shall include the following:
    - a. Primary LAN shall be a high speed peer to peer network designed and optimized for control system communication. If a Primary LAN communications trunk is severed, PCUs shall reconfigure into two separate LANs and continue operations without interruption.
    - b. CU communication software shall include error detection, correction, and re-transmission to ensure data integrity.
    - c. Operator/System communication software shall facilitate communications between other PCUs, all subordinate ASCs, gateways and LAN Interface Devices or Operator Workstations. Software shall allow point interrogation, adjustment, addition/deletion, and programming while the CU is on line and functioning without disruption to unaffected points. The software architecture shall allow networked CUs to share selected physical and virtual point information throughout the entire system.
  6. Point Database: Point/system database creation and modification shall be via a user friendly, menu driven program. System software shall

support virtual or logic point (points not representing a physical I/O) creation. Software shall support virtual points with all services specified herein. Database software shall support definition of all parameters specified in Part III of this section for a given point type. If database does not support all these parameters software module shall be created and attached to the points which accomplish the respective function.

7. Diagnostic Software: CU software shall include diagnostic software that checks memory and communications and reports any malfunctions.
8. Alarm/Messaging Software: CUs software shall support alarm/message processing and buffering software as more fully specified below.
9. Application Programs: CUs shall support and execute application programs as more fully specified below. All Direct Digital Control software, Energy Management Control software, and functional block application programming software templates shall be provided in a "ready-to-use" state, and shall not require (but shall allow) Owner programming. Line programs shall supply preprogrammed functions to support these energy management and functional block application algorithms. All functions shall be provided with printed narratives and/or flow diagrams to document algorithms and how to modify and use them. All programs shall reside in the controller serving the equipment being controlled.
10. Security: CU software shall support multiple level password access restriction as more fully specified below.
11. Direct Digital Control: CU shall support application of Direct Digital Control Logic. All logic modules shall be provided pre-programmed with written documentation to support their application. Provide the following logic modules as a minimum:
  - a. Proportional-Integral-Derivative (PID) Control with analog, PWM and floating output
  - b. Two Position control (Hi or Low crossing with deadband)
  - c. Single Pole double throw relay
  - d. Delay Timer (delay on make, delay on break, and interval)
  - e. Hi/Low Selection
  - f. Reset or Scaling Module
  - g. Logical Operators (And, Or, Not, Xor)



12. Psychrometric Parameters: CU software shall provide preprogrammed functions to calculate and present psychrometric parameters (given temperature and relative humidity) including the following as a minimum: Enthalpy, Wet Bulb Temperature,
13. Updating/Storing Application Data: Site specific programming residing in volatile memory shall be uploadable/downloadable from an operator interface connected either locally, to the primary LAN or remotely via Host LAN. Initiation of an upload or download shall include all of the following methods; manually, scheduled, and automatically upon detection of a loss or change.
14. Restart: System software shall provide for orderly shut down upon loss of power and automatic restart upon power restoration. Volatile memory shall be retained, outputs shall go to programmed fail (open, closed, or last) position. Equipment restart shall include a user definable time delay on each piece of equipment to stagger the restart. Loss of power shall be alarmed at operator interface indicating date and time.
15. Misc. Calculations: System software shall automate calculation of psychrometric functions, calendar functions, kWh/kW and flow determination and totalization from pulsed or analog inputs, curve-fitting, look-up table, input/output scaling, time averaging of inputs and A/D conversion coefficients.
16. PID Loop Tuning: Contractor shall provide a software tool for tuning PID loops. This tool shall preferably be provided as an integral part of the system software or graphic software package. Loop response trends shall be used to calculate suggested P, I, and D gains in the units used in the manufacturers PID algorithms. The following are acceptable:
  - a. Manual Tuning that accepts either automatic or manual amplitude and response time inputs and calculates PID gains for automatic or manual entry into control module.
  - b. Self Tuning algorithm that periodically upsets the process and automatically adjusts the PID gains.
  - c. Adaptive Tuning that continuously monitors natural disturbances in the process and adjusts the PID gains accordingly. This algorithm must include a user definable noise band to inhibit adjustments.
17. Trending Software: CU software shall support alarm/message processing and buffering software as more fully specified below.

**B. PROGRAMMING DESCRIPTION**

1. The application software shall be user programmable.
2. This specification generally requires a programming convention that is logical, easy to learn, use, and diagnose. General approaches to application programming shall be provided by one, or a combination, of the following conventions:
  - a. Database Creation: provide templates customized for point type, to support input of individual point information.
  - b. Graphical Block Programming: Manipulation of graphic icon "blocks", each of which represents a subroutine, in a functional/logical manner forming a control logic diagram. Blocks shall allow entry of adjustable settings and parameters via pop-up windows. Provide a utility that shall allow the graphic logic diagrams to be directly compiled into application programs. Logic diagrams shall be viewable either off-line, or on-line with real-time block output values.
  - c. Functional Application Programming: Pre-programmed application specific programs that allow/require-limited customization via "fill in the blanks" edit fields. Typical values would be setpoints gains, associated point names, alarm limits, etc.
  - d. Line Programming: Text programming in a language similar to BASIC or FORTRAN designed specifically for HVAC control. Subroutines or functions for energy management applications, setpoints, and adjustable parameters shall be customizable, but shall be provided preprogrammed and documented.
3. Provide a means for testing and/or debugging the control programs both off-line and on-line.

**C. ENERGY MANAGEMENT APPLICATIONS**

1. System shall perform all of the following energy management routines via preprogrammed function blocks or template programs.
  - a. Time of Day Scheduling
  - b. Calendar Based Scheduling
  - c. Holiday Scheduling
  - d. Countywide Schedules

- e. Individual Building Schedules
  - f. Snow Day Schedules and Override Schedules
  - g. Custom Group/Area/Zone Scheduling
  - h. Temporary Schedule Overrides
  - i. Optimal Start/Optimal Stop-based on space temperature offset, outdoor air temperature, and building heating and cooling capacitance factors as a minimum
  - j. Night Setback and Morning Recovery Control with ventilation only during occupancy.
  - k. Night Purge ventilation cycle to use the cool night/morning air to pre-cool the space prior to occupancy.
  - l. Economizer Control (enthalpy)
  - m. Peak Demand Limiting / Load Shedding
  - n. Dead Band Control
2. All programs shall be executed automatically without the need for operator intervention, and shall be flexible enough to allow operator customization. All programs shall reside in the controller serving the equipment being controlled.

#### D. PASSWORD PROTECTION

1. Multiple-level password access protection shall be provided to allow the Owners authorized BAS Administrator to limit workstation control, display and database manipulation capabilities as he deems appropriate for each user, based upon an assigned user name with a unique password.
2. Passwords shall restrict access to all control units
3. Each user name shall be assigned to a discrete access level. A minimum of four levels of access shall be supported. Alternatively, a comprehensive list of accessibility/functionality items shall be provided for enabling/disabling for each user. See Section 3.07.C.
4. A minimum of 100 user names shall be supported.

5. Operators shall be able to perform only those commands available for the access level assigned to their user name.
6. User-definable, automatic log-off timers of from 1 to 60 minutes shall be provided to prevent operators from inadvertently leaving interface device software on-line.

E. ALARM/MESSAGE REPORTING

1. Alarm management shall be provided to monitor, buffer, and direct alarms and messages to operator devices and memory files. Each PCU shall perform distributed, independent alarm analysis and filtering to minimize operator interruptions due to non-critical alarms, minimize network traffic, and prevent alarms from being lost. At no time shall a PCU's ability to report alarms be affected by either operator activity at an Operator Workstation or local handheld device or by communications with other panels on the network. To eliminate nuisance and invalid alarms and messages, alarms and messages shall not be reported if the software algorithm or point is inactive. See section 3.06 paragraph E line 9 for alarms during the construction and warranty period.
  - a. Alarm Descriptor: Each alarm or point change shall include the point's English language description, and the time and date of occurrence. In addition to the alarm's descriptor and the time and date, the user shall be able to print, display and store an alarm message to more fully describe the alarm condition or direct operator response.
  - b. Alarm Prioritization: The software shall allow users to define the handling and routing of each alarm by their assignment to discrete priority levels. A minimum of five priority levels shall be provided. For each priority level, users shall have the ability to enable or disable an audible tone whenever an alarm is reported and whenever an alarm returns to normal condition. Users shall have the ability to manually inhibit alarm reporting for each individual alarm and for each priority level.
  - c. Alarm Report Routing: Each alarm priority level shall be associated with a unique user-defined list of operator devices including any combination of local or remote workstations, printers and workstation disk files. All alarms associated with a given priority level shall be routed to all of the operator devices on the user-defined list associated with that priority level. For each priority level, alarms shall be automatically routed to a default operator device in the event that alarms are unable to be routed to any operator device assigned to the priority level.

- d. Auto-Dial Alarm Routing: For alarm priority levels that include a remote workstation (accessed by modem) or alpha-numeric pagers as one of the listed reporting destinations, the PCU shall initiate a call to report the alarm, and shall terminate the call after alarm reporting is complete. System shall be capable of multiple retries and buffer alarms until a connection is made. If no connection is made, system shall attempt connection to an alternate dial-up workstation. System shall also be able to dial multiple pagers upon alarm activation.
- e. Alarm Acknowledgment: For alarm priority levels that are directed to a workstation screen, an indication of alarm receipt shall be displayed immediately regardless of the application in use at the workstation, and shall remain on the screen until acknowledged by a user having a password that allows alarm acknowledgment. Upon acknowledgment, the complete alarm message string (including date, time, and user name of acknowledging operator) shall be stored in a selected file on the workstation hard disk.

#### F. TRENDING

- 1. The software shall be capable of displaying historical data in both a tabular or graphical format. The requirements of this trending capability shall include the following:
  - a. All points listed in the Input/Output summaries and all physical points and calculated variables shall be trended.
  - b. In the graphical format, the trend shall plot at least 4 different values for a given time period superimposed on the same graph. The 4 values shall be distinguishable by using unique colors. In printed form the 4 lines shall be distinguishable by different line symbology. Displayed trend graphs shall indicate the engineering units for each trended value.
  - c. The time period for each trend shall be for a minimum of seven days and shall be user selectable.
  - d. The trended value range shall be user selectable.
  - e. All points shall be included in series for commissioning purposes.
- 2. Control Loop Performance Trends: CUs incorporating PID control loops shall also provide high resolution sampling capability in less than six second increments for verification of control loop performance.

3. Data Storage and Archiving: Trend data shall be stored at the CU, and uploaded to hard disk storage when archival is desired. Uploads shall occur based upon user-defined interval, manual command, or when the trend buffers become full. Trended data shall include one row of descriptive column headings with all subsequent data in a contiguous stream. All trend data shall be available one of the following disk file formats:
  - a. Quote and Comma separated text
  - b. Microsoft ACCESS database
  - c. Microsoft EXCEL spreadsheet.

#### G. EQUIPMENT SCHEDULING

1. Provide a graphic utility for user-friendly operator interface to adjust equipment operating schedules.
2. Scheduling feature shall include multiple seven-day master schedules, plus holiday schedule, each with start time and stop time. Features shall also include countywide schedules, individual building schedules, custom group schedules within a building consisting of multiple pieces of equipment, snow day schedules, and override schedules. All schedules shall be individually editable for each day and holiday.
3. Scheduling feature shall allow for each individual equipment unit to be assigned to one of the master schedules.
4. Timed override feature shall allow an operator to temporarily change the state of scheduled equipment. An override command shall be selectable to apply to an individual unit, all units assigned to a given master schedule, or to all units in a building. Timed override shall terminate at the end of an operator selectable time, or at the end of the scheduled occupied/unoccupied period, whichever comes first. A password level that does not allow assignment of master schedules shall allow timed override features.
5. A yearly calendar feature shall allow assignment of holidays and automatic reset of system real time clocks for transitions between daylight savings time and standard time.

#### H. OPERATOR INTERFACE GRAPHIC SOFTWARE (Graphical User Interface)

1. Graphic software shall facilitate user friendly interface to all aspects of the System Software specified above as well as in sections 3.07 and 3.08

(System Software And Programming). The intent of this specification is to require a graphic package that provides for intuitive operation of the systems without extensive training and experience. Graphic software shall make maximum use of colors, graphics, icons, embedded images and dynamic symbols. It shall facilitate logical and simple system interrogation, modification, configuration, and diagnosis. This interface shall provide the web browser the same view of the system, in terms of graphics, schedules, calendars, logs, trends, point override etc., and the same interface methodology. Functions of this interface shall be identical when accessed via the web based browser and shall not require the use of proprietary software.

2. The home screen of the graphic software shall have a "button icon" which shall provide a Web gateway to the VRF control software in the VRF central controller.
3. Graphic software shall support multiple simultaneous screens to be displayed and resizable in a "Windows" like environment and shall include a tree view (similar to "Windows Explorer"). All except text entry functions shall be executable with a mouse.
4. Graphic software shall provide for multitasking such that third party programs can be used while the Operator Workstation Software is on line. Provide the ability to alarm graphically even when operator is in another software package.
5. Operating system software shall be Windows, the latest release and version supported by the manufacturer.
6. The software shall allow for Owner creation of user defined, color graphic displays of geographic maps, building plans, floor plans and mechanical and electrical system schematics. These graphics shall be capable of displaying all point information from the database including any attributes associated with each point (e.g., engineering units, etc.). In addition, operators shall be able to command equipment or change setpoints from a graphic through the use of the mouse. The user shall have the ability to import AutoDesk AutoCAD Release 2006 (or newer version) generated files as background displays.
7. Screen Penetration: The operator interface shall allow users to access the various system graphic screens via a graphical penetration scheme by using the mouse to select from menus or "button" icons. Each graphic screen shall be capable of having a unique list of other graphic screens that are directly "linked" through the selection of a menu item or button icon.

8. **Dynamic Data Displays:** Dynamic physical point values shall automatically updated at a minimum frequency of 3 updates per minute without operator intervention. Point value fields shall be displayed with a color code depicting normal, abnormal, override and alarm conditions.
9. **Point Override Feature:** Each displayed point shall be individually enabled/disabled to allow mouse driven override of digital points or changing of analog points. Such overrides or changes shall occur in the control unit, not just in the workstation software. The graphic point override feature shall be subject to password level protection. Points that are overridden shall be reported as an alarm, and shall be displayed in a coded color. The alarm message shall include the operator's user name. A list of points that are currently in an override state shall be available through menu selection.
10. **Dynamic Symbols:** Provide a selection of standard symbols, which change in appearance based on the value of an associated point.
  - a. **Analog symbol:** Provide a symbol that represents the value of an analog point as the length of a line or linear bar.
  - b. **Digital symbol:** Provide symbols such as switches, pilot lights, rotating fan wheels, etc. to represent the value of digital input and output points as appropriate. Animation for any operating machinery shall only represent digital inputs, and not outputs, in order to provide an accurate equipment status.
  - c. **Point Status Color:** Graphic presentations shall indicate different colors for different point statuses. (For instance, green = normal, red = alarm, gray (or???) for non-response.
  - d. **Use dynamic zone background colors (thermograph) to indicate thermal comfort based on temperature offset from setpoint on the zone graphic display screens. The colors are as follows:**

Red	5 DEG F or more below setpoint
Dark Blue	4 DEG F below setpoint
Light Blue	2 DEG F below setpoint
Green	Satisfied
Yellow	2 DEG F above setpoint
Orange	4 DEG f above setpoint
Red	5 DEG F or more above setpoint



11. Graphics Definition Package: Graphic generation software shall be provided to allow the user to add, modify, or delete new or existing system graphic displays.
  - a. The contractor shall provide libraries of pre-engineered screens and symbols depicting standard air handling unit components (e.g. fans, cooling coils, filters, dampers, etc.), mechanical system components (e.g., pumps, chillers, cooling towers, boilers, etc.), complete mechanical systems (e.g. constant volume-terminal reheat, VAV, etc.) and electrical symbols.
  - b. The graphic development package shall use a mouse to allow the user to perform the following:
    - 1) Define symbols
    - 2) Position items on graphic screens
    - 3) Attach physical points, virtual points or setpoints to a graphic
    - 4) Define background screens
    - 5) Define connecting lines and curves
    - 6) Locate, orient and size descriptive text
    - 7) Define and display colors for all elements
    - 8) Establish correlation between symbols or text and associated system points or other displays.
    - 9) Create hot spots or link triggers to other graphic displays or other functions in the software.

J. WORKSTATION DATA REPORTING AND STORAGE

1. Workstation software shall support Microsoft Dynamic Data Exchange (DDE) and Object Linking and Embedding (OLE) to facilitate historical data access from popular spreadsheet and database programs (e.g., Microsoft EXCEL and ACCESS). Data storage format shall be directly importable to the application without manual parsing. Programs external to the graphic software are acceptable to meet this requirement.

K. REMOTE PERSONAL COMPUTER WORKSTATION GRAPHIC SOFTWARE

1. Remote graphic operator software shall provide all the functionality specified for the local graphic software. It shall communicate with the Primary and Host LAN via a hardwired connection.
2. Software shall not require graphic images to be sent across the Host LAN or phone lines. Graphic images shall reside on the remote operator workstation hard drive. Terminal emulation software such as PC Anywhere, Carbon Copy, ProComm, PolyPM II, etc. are not acceptable.
3. Software shall be capable of connecting to the Host LAN or initiating phone calls to the primary LAN, upon user command, to perform all specified functions. Software shall be capable of connecting to the primary LAN in accordance with user-programmed time schedules to upload trend and report data. Software shall be capable of receiving calls or connections from the primary LAN in accordance with user-programmed time schedules to report alarms and upload trend and report data. Software shall automatically terminate the connection whenever all applications requiring communication are closed.
4. The combination of Remote Personal Computer Workstation Software, PCU software, and LAN Interface Device software shall provide the ability for seamless automatic upload of trend data and reports to the remote workstation. The feature shall allow for disk storage of continuous historical trend and report data without gaps or duplications.

L. TAB & CX PORTABLE OPERATORS TERMINAL

1. Contractor shall provide a portable operator's terminal or hand held device to facilitate TAB and calibration. This device shall support all functions and allow querying and editing of all parameters required for proper calibration and start up.
2. Connections shall be provided local to the device being calibrated. For instance, for VAV boxes, connection for the operator's terminal shall be at the wall sensor.

M. SOFTWARE MAINTENANCE

1. During warranty period, contractor shall be responsible to maintain, change, modify, correct, and optimize all software upon request by the Owner. During this period, when software problems cause comfort or equipment problems, contractor shall implement corrective measures within two hours of notification by Owner.

**PART 3. EXECUTION**

## 3.01 GENERAL

## A. INSPECTION

1. Examine areas and conditions under which control systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

## B. INSTALLATION OF CONTROL SYSTEMS

1. General: Install systems and materials in accordance with manufacturer's instructions, roughing-in drawings and details shown on drawings.
2. Refer to additional requirements in other sections of this specification.

## C. IFID/CU QUANTITY AND LOCATION

1. Individual Digital Control Stations (DCS) are referenced to indicate allocation of points to each DCS and DCS location. Digital control stations shall consist of one or multiple IFIDs/CUs to meet requirements of this specification.
2. Where a DCS is referenced, Contractor shall provide at least one IFID/CU, and additional IFIDs/Cus as required, in sufficient quantity to meet the requirements of this Specification. Restrictions in applying CUs are specified in "Distributed Direct Digital Controllers and Control System" (Section 15900, Paragraph 2.03B & 2.03C). If the control contractor wishes to further distribute panels to other locations, control contractor is responsible for extending power to that location. Furthermore, Contractor is responsible for ensuring adequate locations for the panels that do not interfere with other requirements of the project and maintain adequate clearance for maintenance access and to comply with local codes. DCS's shall be installed in locations, as specified in Section 15900, Paragraph 2.03.E, CONTROL PANELS. DSC's provided by the equipment manufacturer and factory installed within the equipment control enclosure are acceptable. Locate panels in ceilings for unit ventilators, fan coil units, fin tube radiation, terminal devices, and heating coils. Panels located in ceilings shall be identified with a nameplate attached with 1/4" head, self-tapping screw to the ceiling grid or access door identifying the equipment. No DCS's may be located in other areas without prior approval of the Owner.
3. Stand Alone Functionality: Provide IFIDs/CUs so that all points associated with and common to one air handling unit or other complete stand alone system/equipment shall reside within a single control unit. See related restriction in "Distributed Direct Digital Controllers and Control

System". When referring to the IFID/CU as pertains to the standalone functionality, reference is specifically made to the processor. One processor shall execute all the related functions. I/O point expander boards may be added to expand the point capacity of the IFID/CU. Where any I/O point expansion devices are connected to the main controller board via a communication sub LAN, that communication sub LAN shall be dedicated to that controller and include no other devices including secondary controllers. The sub-LAN communication speed shall be the same or higher than the main controller LAN.

4. Contractor shall locate DCSs as referenced. It is the Contractor's responsibility to provide enough IFIDs/Cus to ensure a completely functioning system, according to the point list and sequence of operations.
5. Contractor shall provide a minimum of the following:
  - a. One DCS (including at least one PCU) in the central control panel.
  - b. One IFID/CU shall be provided for each terminal unit unless indicated otherwise.
6. IFID/CU Mounting – see Section 15900, paragraph 2.02F
  - a. IFIDs/CUs that control equipment located in occupied spaces shall be mounted above the ceiling and shall be rated for plenum use within a suitable enclosure or factory mounted on unit.
  - b. IFIDs/CUs shall be suitable for operation in the ambient temperatures that may be encountered in the location they are installed. CU's located in ambient conditions must be approved by the Owner. CU's that are not suitable shall be replaced and at no cost to the Owner.
  - c. IFIDs/CUs mounted above ceilings shall be mounted no higher than 12" above the ceiling grid to the bottom of the control enclosure. All IFIDs/CUs mounted above ceilings shall have a nameplate attached to the ceiling grid.

#### D. SURGE PROTECTION

1. The Contractor shall furnish and install power supply surge protection, filters, etc. for proper operation and protection of all PCUs, SCUs operator interfaces, printers, and other hardware and interface devices. All

equipment shall be capable of handling voltage variations 10% above or below measured nominal value, with no effect on hardware, software, communications, and data storage.

E. CONTROL POWER SOURCE AND SUPPLY

1. Power wiring from dedicated circuit breaker at each 120 Volt panel to a junction box shall be provided by the Division 16 Contractor. Electrical circuits for use by the BAS Contractor are shown on the electrical drawings. This Contractor is responsible for all power wiring from this junction box to control panels, devices, controllers and components for a complete and operating system. If the control contractor wishes to further distribute panels to other locations, control contractor is responsible for extending power to that location. Furthermore, contractor is responsible for ensuring adequate locations for the panels that do not interfere with other requirements of the project and maintain adequate clearance for maintenance access.
2. All other electrical wiring, conduit, devices, transformers, components, etc. required for a complete BAS system including interlocking of controllers, equipment etc. shall be provided under this Section. Mechanical equipment supplied power transformers may be utilized if they are factory furnished and designed to be used with the control system. Mechanical equipment supplied power transformers shall not be utilized for non factory supplied control systems.

3.02 BASIC MATERIALS, INTERFACE DEVICES, AND SENSORS

A. INSPECTION

1. Examine areas and conditions under which control systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

B. INSTALLATION OF CONTROL SYSTEMS

1. General: Install systems and materials in accordance with manufacturer's instructions, roughing-in drawings and details shown on drawings. Install electrical components and use electrical products complying with requirements of National Electric Code and all local codes.
2. Control Wiring: The term "control wiring" is defined to include providing of wire, cable, conduit and miscellaneous materials as required for mounting and connection of electric control devices.
  - a. Wiring System: Install complete wiring system for electric control systems. Conceal wiring except in mechanical rooms and areas where other conduit and piping are exposed. Wiring run in walls

shall be run in electrical metallic tubing (EMT). Install in accordance with National Electrical Code and Division 16 of this Specification. Fasten flexible conductors bridging cabinets and doors, neatly along hinge side, and protect against abrasion. Tie and support conductors neatly. Wiring shall be run without splices. Any and all junction box covers shall be marked "ATC". Relays controlling equipment located above ceiling shall be located a maximum of 6" above acoustical ceiling tile. In areas without acoustical ceilings, relays shall be located a maximum 12' above finished floor. Wiring terminations which do not terminate at a terminal strip shall be made using insulated compression type connectors. Wiring terminations which do not terminate at a terminal strip shall be made using insulated compression type connectors.

- b. Control Wiring Conductors: Install control wiring conductors, without splices between terminal points, color-coded. Install in neat workmanlike manner, securely fastened. Install in accordance with National Electrical Code and Division 16 of this Specification.
- c. Communication wiring, signal wiring and low voltage control wiring shall be installed separate from any wiring over thirty (30) volts. Signal wiring shield shall be grounded at IFID/CU end only, as recommended by the IFID/CU manufacturer.
- d. Primary LAN Communication wiring shield shall be terminated as recommended by IFID/CU manufacturer and owners active hub manufacturer.
- e. Communication wiring shall be run without splices.
- f. Install all control wiring external to panels in electric metallic tubing or raceway. However, communication wiring, signal wiring and low voltage control wiring may be run without conduit in concealed, accessible locations if noise immunity is ensured. Accessible locations are defined as areas inside mechanical equipment enclosures, such as heating and cooling units, instrument panels etc.; suspended ceilings with easy access. Tie and support conductors neatly on "J" hooks. Conductors shall be pulled tight and be installed as high as practically possible in ceiling cavities. Conductors shall not be installed between the top cord of a joist or beam and the bottom of roof decking. Contractor shall be fully responsible for noise immunity and rewire in conduit if electrical or RF noise affects performance.

- g. Number-code or color-code conductors appropriately for future identification and servicing of control system. Code shall be as indicated on approved installation drawings.
  - h. Provide power disconnect switch in the interior for all main control panels.
3. Electric conduit ( EMT/IMC ect.) shall not be run exposed on the floor slab.
  4. Control Valves: Install so that actuators and wiring and tubing connections are accessible. Where possible, install with valve stem axis vertical, with operator side up. Where vertical stem position is not possible, or would result in poor access, valves may be installed with stem horizontal, if in accordance with manufacturer's written recommendation. Do not install valves with stem below horizontal, or down. Adjust and verify proper valve stroke operation to assure proper shut-off and full flow.
  5. Space Sensors: Install in accordance with the manufacturers recommendations. The cover of the sensor shall be attached by tamperproof fasteners to the recessed mounting box or plate. Provide insulated base. Classrooms shown with multiple units shall have one room sensor except those with folding partitions shall have separate sensors for each unit. Mount all sensors at 4'-0" AFF. Sensors located in Cafeterias, Gymnasiums, storage rooms and electric rooms shall be mounted at 5'-6" AFF. Sensors in corridors and group bathrooms shall be mounted at 6'-8" AFF. Provide welded wire enclosures securely mounted to the wall in gymnasiums, locker rooms, gang toilets, and corridors, for all temperature, humidity and CO<sub>2</sub>sensors. Sensors located in storage rooms and electric rooms, provide a locking metal enclosure. Submit a sample space sensor for approval prior to installation.
  6. Flow Switches: Where possible, install in a straight run of pipe at least 6 diameters in length to minimize false indications.
  7. Current Switches for Motor Status Monitoring: Adjust so that setpoint is below minimum operating current and above motor no load current.

### 3.03 SYSTEM OPERATOR INTERFACES

#### A. INSTALLATION

1. Set up and configure Operator Workstations at the school and at the Energy Management Department Offices, Sideburn Maintenance Support Facility and the Edison Maintenance Support Facility. Install all software and verify that the systems are fully operational via Host LAN.
2. Set up portable operator terminals and configure them as remote and/or local workstations. Install all software and verify that the systems are fully operational via Host LAN and dial-up connection from a remote location, as well as directly connected at IFIDs/Cus.
3. Install systems and materials in accordance with manufacturer's instructions.

### 3.04 SEQUENCE OF OPERATION

#### A. General:

1. Provide the operating sequence described in detail in the following paragraphs. The sequence shall not be deviated from unless a proposed change is submitted with justifying reasons approved by FCPS and a Change Order is issued. Inability of the proposed control system logic to produce the desired sequence is not grounds for approval of a change. Furnish adequate programming capability for the sequence outlined below.
2. Equipment Response Time – Operating program shall be arranged so that system components such as valve, damper and VAV box operators shall require no more than 12 minutes elapse time to complete a totally closed to totally open position cycle if space conditions are such that continued movement in one direction is necessary.
3. System operation printouts shall be accurate and sufficiently detailed to establish that the specified sequence is being affected.
4. Control shall be direct digital Owner programmable microprocessor located in the field, unless otherwise specified.
5. Equipment listed in the following Input/Output Summaries shall have the necessary electric and electronic equipment, material and supplies added to accomplish the indicated actions. Present time clock functions shall be done by the IFID.
6. Provide all equipment listed in the following input/output summaries with individual override switches located in the custodians office or as shown on drawings.



7. All points indicated in the Input/Output summaries shall be displayed on the proper computer graphic display screen.
8. Scheduling Terminology: When control zones are scheduled throughout the day, the following defines the terminology used:
  - a. Day or Occupied Period: period of time when the building is in use and occupied. This period is defined as follows:

Elementary Schools – 6:00 a.m. to 4:30 p.m. Monday – Friday  
SACC zone – 6:00a.m. to 6:30 p.m. Monday - Friday

Exclude all County holidays. Systems shall be fully operational throughout this period and ventilation air shall be continuously introduced.
  - b. Night or Unoccupied period: period of time when the building or zone is not in use and unoccupied. Ventilation air shall not be introduced. Systems shall be off except to maintain a night setting.
  - c. Occupancy During Construction: New equipment shall run during the period of time when spaces are turned over. This period is defined as follows:
  - d. All Schools – 6:00 a.m. to 12:00 p.m. Monday – Saturday.
  - e. Systems shall be fully operational throughout this period and ventilation air shall be continuously introduced.
9. Where any sequence or occupancy schedule calls for more than one motorized unit to start simultaneously, the BAS start commands shall be staggered by 5 second (adj.) intervals to minimize inrush current.
10. Alarm messages specified throughout the sequences are assigned to discrete priority levels. Priority levels dictate the handling and destination of alarm reports, and are defined in Section 3.07.E.
11. All setpoints, deadbands, PID gains, throttling ranges, requests etc. shall be adjustable and shall be easily modifiable, with the proper password level, from the operator interface or via a function block menu. For all setpoints, deadbands, throttling ranges, requests etc., it is unacceptable to have to modify programming statements to change the setpoint.
12. Each analog output shall include, as an integral function, a ramp control algorithm that limits the rate of change of an output on an increase in

value or a decrease in value. These values shall be adjustable from the graphic screen.

13. Where reset action is specified in a sequence of operation, but a reset schedule is not indicated on the drawings, one of the following methods shall be employed:
  - a. Contractor shall determine a proportional (P) fixed reset schedule, which shall result in stable operation and shall maintain the primary variable within the specified maximum allowable variance. Reset range maximum and minimum values shall limit the setpoint range.
  - b. A floating reset (utilizing integral (I)) algorithm shall be used which increments the secondary variable setpoint (setpoint of control loop being reset) on a periodic basis to maintain primary variable setpoint. The recalculation time and reset increment shall be chosen to maintain the primary variable within the specified maximum allowable variance. Reset range maximum and minimum values shall limit the setpoint range.
  - c. Primary variable shall control the devices directly using a PID feedback control loop without resetting the secondary variable. However, the control devices shall still modulate as necessary to maintain upper and lower limits on the secondary variable. Proportional band, integral gain, and derivative term shall be selected to maintain the primary variable within the specified maximum allowable tolerance while minimizing overshoot and setting time. Reset range maximum and minimum values shall limit the setpoint range. Contractor shall gain prior approval for implementing this method of reset.
14. A floating reset algorithm shall be used which increments the secondary variable (e.g., supply air temperature or duct pressure) setpoint on a periodic basis to maintain primary variable (e.g. space temperature) setpoint. The reset increment shall be determined by the quantity of "need heat" or "need cool" requests from individual ASC's. An ASC's "need heat" virtual point shall activate whenever the zone's space temperature falls below the currently applicable (occupied or unoccupied) heating setpoint minus a fixed value that is adjustable. An ASC's "need cool" virtual point shall activate whenever the zone's space temperature rises above the currently applicable (occupied, unoccupied, or economy) cooling setpoint plus a fixed value that is adjustable. The recalculation time and reset increment shall be chosen to maintain the primary variable within the specified maximum allowable variance while minimizing overshoot and setting time. Reset range maximum and minimum values shall limit the setpoint range.

15. Where a supply air temperature, duct pressure, or differential water pressure setpoint is specified to be reset by valve or damper position of the zone or zones calling for the most cooling/heating, the following method shall be employed:
  - a. A floating reset algorithm shall be used which increments the secondary variable (e.g., supply air temperature, pipe or duct pressure) setpoint on a periodic basis to maintain primary variable (e.g. cooling valve, heating valve, damper position) setpoint of 85% open. The reset increment shall be calculated based on the average position of the quantity of the worst (most open valve/damper) zone(s) as specified. The recalculation time, reset increment and control device position influence shall be chosen to maintain the primary variable within the specified maximum allowable variance while minimizing overshoot and setting time. The BAS analog output value shall be acceptable as indicating the position of the control device.
  - b. Rather than continuously calculating the average of the quantity of worst valve/damper positions, a method similar to the one described above may be employed whereby the “need heat” or “need cool” virtual point shall increment by one unit each time a zone’s valve/damper position rises to greater than 95%. The quantity of “need heat” or “need cool” points shall then be the basis for reset.
16. Where “prove operation” of a device (generally controlled by a digital output) is indicated in the sequence, it shall require that the BAS shall, after an adjustable time delay after the device is commanded to operate (feedback delay), confirm that the operational via the status input. If the status point does not confirm operation after the time delay or thereafter for an adjustable time delay (debounce delay) while the device is commanded to run, an alarm shall be enunciated audibly and via an alarm message at the operator interface and print at the alarm printers. A descriptive message shall be attached to the alarm message indicating the nature of the alarm and actions to be taken. Contractor shall provide messages to meet this intent.
- 17.
18. Wherever a value is indicated to be dependent on another value (i.e.: setpoint plus 5°F) BAS shall use that equation to determine the value. Providing a virtual point that the operator must set is unacceptable. In this case, three virtual points shall be provided: One to store the parameter (5°F); one to store the setpoint; and one to store the value that is the result of the equation.

19. Sequenced Heating and Cooling: BAS shall control the heating and cooling coils, mechanical cooling and heating and air side economizer as detailed for the particular equipment. Program logic shall directly prohibit the mechanical cooling and heating to be energized as well as the heating source to be energized and economizer damper to be open (or above minimum) simultaneously unless specifically noted. This does not apply to cooling and reheat valves that are used simultaneously for dehumidification.
- 20.
21. Smoke Safety: Upon indication of smoke by a smoke detector, the mechanical unit shall be de-energized by a hardwired interlock. OA dampers cooling valve and heating valve shall spring to the failsafe position.
22. Abbreviations used in the input/output summaries and sequences:

ACWC	AIR COOLED WATER CHILLER
AHU	AIR HANDLING UNIT (INCLUDES CONSTANT VOLUME AND VARIABLE VOLUME)
AHS	AIR HANDLING SYSTEM
BCU	BLOWER COIL UNIT
CEF	CABINET OR CEILING EXHAUST FAN
CHW	CHILLED WATER
CONF	CONFIRMATION
C.R.	CLASSROOM
CT	COOLING TOWER
CU	CONDENSING UNIT
CUH	CABINET UNIT HEATER
CZ	CONTROL ZONE
DAT	DISCHARGE AIR TEMPERATURE

DPS	DIFFERENTIAL PRESSURE SENSOR
ECON	ECONOMIZER
EF	EXHAUST FAN
ERU	ENERGY RECOVERY UNIT
EBB	ELECTRIC BASE BOARD HEATER
ECH	ELECTRIC CABINET UNIT HEATER
EDH	ELECTRIC DUCT HEATER
EWH	ELECTRIC WALL HEATER
EW	ENTHALPY WHEEL
FTR	FIN TUBE RADIATOR
FCU	FAN COIL UNIT
FZ STAT	FREEZESTAT
HEX	HEAT EXCHANGER
HW	HOT WATER
HRW	HEAT RECOVERY WHEEL
IFID	INTELLIGENT FIELD INTERFACE DEVICE
MAU	MAKE-UP AIR UNIT
O.A.	OUTSIDE AIR
OAT	OUTSIDE AIR TEMPERATURE
PRV	POWER ROOF VENTILATORS
RAHU	ROOFTOP AIR HANDLING UNIT
RAT	RETURN AIR TEMPERATURE
RTU	ROOFTOP UNIT (INCLUDES CONSTANT VOLUME AND VARIABLE VOLUME)

RTW	ROOFTOP UNIT WITH ENTHALPY WHEEL
RWC	REMOTE HOT WATER COIL
SF	SUPPLY FAN
SC	SELF-CONTAINED AIR CONDITIONING UNIT
TEMP	TEMPERATURE
TW	TOWER WATER
TWU	THRU-WALL UNIT
UH	UNIT HEATER
UV	UNIT VENTILATOR
UV	UTILITY VENT SET
VAL	VALANCE
VAVTU	VAV TERMINAL UNIT
VFD	VARIABLE FREQUENCY DRIVE
VRF	VARIABLE REFRIGERANT FLOW
WCWC	WATER COOLED WATER CHILLER
WSHP	WATER SOURCE HEAT PUMP

## Notes:

- 1) Provide the required number of inputs and outputs in each classroom or space to comply with the sequence of operations specified in Part 3, Execution, Paragraph 3.04 whether or not they are shown in the summaries.
- 2) When equipment is supplied and wired by the factory as a complete product, the factory points shall be acceptable for monitoring and control provided that all aspects of this specification and sequences are met.
- 3) The setpoints listed in the following sequences are recommended values. All setpoints shall be field adjusted during the

commissioning period to meet the requirements of the actual field conditions.

<b>ACTION ANALOG INPUTS</b>	<b>SPACE/EQUIP</b>	<b>LOCATION</b>	<b>RESPONSE</b>	<b>REMARKS</b>
1.	SPACE TEMP.	1 EACH ROOM	TEMPERATURE	NOTE #1
2.	SPACE TEMP.	1 EACH ROOM	TEMP. ADJUST	NOTE #1
3.	UV	SUPPLY AIR	TEMPERATURE	NOTE #2

**NOTES:**

1. ONE PER CLASSROOM OR SPACE.
2. ONE PER UNIT.



<b>ACTION ANALOG OUTPUTS</b>	<b>SPACE/EQUIP</b>	<b>LOCATION</b>	<b>RESPONSE</b>	<b>REMARKS</b>
1.	UV	HW VALVE	MODULATION	NOTE #1
2.	UV	CHW VALVE	MODULATION	NOTE #1

**NOTES:**

1. ONE PER UNIT AND DEVICE. BOILER ROOM OR MECHANICAL ROOM. SEE DRAWINGS.

ACTION DIGITAL INPUTS	SPACE/EQUIP	LOCATION	RESPONSE	REMARKS
1.	UV	FAN/UNIT	STATUS	NOTE #1

**NOTES:**

1. ONE PER UNIT.

ACTION DIGITAL OUTPUTS	SPACE/EQUIP	LOCATION	RESPONSE	REMARKS
12.	CZ	UV	STOP/START	NOTES #1,2,

**NOTES:**

1. EQUIPMENT WITHIN ZONE PER ZONE.
2. RTU/AHU FAN LOCKOUT BY SMOKE DETECTOR SHALL BE INDEPENDENT OF IFID CONTROL.
- 5.

B. For renovation projects Existing equipment - Shall be replaced and in first class operating condition to function as outlined below. Refer to drawings for mechanical equipment to remain.

C. Unit Ventilators and Fan Coil Units with outside air – 4 Pipe

1. With respective system pumps in occupied operation the combination heating-cooling room control shall modulate space located controls as described below. Each unit shall have a complete set of control components.
2. Heating
  - a. Control shall modulate fan coil unit or unit ventilator hot water valve to maintain its setting (71°F). Unit's fan shall operate constantly during the occupied heating mode.
  - b. During clock unoccupied position, heating pump shall be de-energized. When the reduced setting night control returns the pump to operation, the equipment shall operate as described above until the night setting (55°F) is satisfied.
3. Cooling
  - a. Fan coil unit or unit ventilator fans shall operate constantly during the occupied cooling mode. Heating-cooling room control shall modulate unit chilled water valve to maintain its setting (74°F).

- b. During clock unoccupied position, the chiller and cooling pump shall be de-energized. When the increased night setting control returns the chiller and cooling pump to operation, the equipment shall operate as described above until the night setting of 85°F is satisfied.
  - 4. Provide zone warm-up cycle with setpoint (68°F).
  - 5. During clock unoccupied position, during morning warm-up and when unit fan is turned off the respective make-up air unit shall be de-energized.
  - 6. Outside Air Damper
    - a) When the unit controller is unoccupied, the outside air damper will be closed.
    - b) During the occupied hours, the outside damper will be opened to maintain its minimum flow setpoint.
- U. Through the Wall Units
- 1. Units shall be operated through the time clock function and by the factory supplied on board controls. Unit controls shall include heating valve and system high, low, heat, off, and cool switches. Unit shall cycle to maintain setting heating 71°F - cooling 74°F - night 55°F. Unit shall have manual outside air damper.

### 3.05 SYSTEM COMMUNICATION DEVICES

- A. Provide a minimum of one LANID or equivalent function to support OW's.
- B. Provide gateways as required to support manufacturers configuration.

### 3.06 SYSTEM SOFTWARE AND PROGRAMMING

#### A. SYSTEM CONFIGURATION

- 1. Thoroughly configure ATC system software, network communications, remote operator workstations, portable operators terminals, printers, alarm printers.

#### B. SITE SPECIFIC APPLICATION PROGRAMMING

- 1. Provide all database creation and site-specific application control programming as required by these specifications for a fully functioning

system. Contractor shall provide all initial site-specific application programming and thoroughly document programming. Meet the written sequences of operation. It is Contractor's responsibility to request clarification on sequence issues that require such clarification.

2. All site specific programming shall be fully documented and submitted for review and approval, both prior to downloading into the panel, at the completion of functional performance testing, and at the end of the warranty period.

#### C. PASSWORD SETUP

1. Set up the following password levels to include the specified capabilities:
  - a. Level 1: (Owner's BAS Administrator)
    - 1) Level 2 capabilities
    - 2) View, add, change and delete user names, passwords, password levels
  - b. Level 2: (Programmer)
    - 1) Level 3 capabilities
    - 2) Configure system software
    - 3) Modify control unit programs
    - 4) Modify graphic software
    - 5) Essentially unrestricted except for viewing or modifying user names, passwords, password levels
  - c. Level 3: (HVAC Technician)
    - 1) Level 4 capabilities
    - 2) Override output points
    - 3) Change setpoints
    - 4) Change equipment schedules
    - 5) Exit BAS software to use third party programs
    - 6) Acknowledge alarms

- d. Level 4: (Non-Technician)
  - 1) Temporarily override equipment schedules
  - 2) Display all graphic data and alarms
  - 3) Trend point data
2. Assist owner's operators with assigning user names, passwords and password levels.

D. POINT PARAMETERS

1. Provide the following minimum programming for each analog input:
  - a. Name
  - b. Address
  - c. Scanning frequency
  - d. Engineering units
  - e. Offset calibration and scaling factor for engineering units
  - f. High and low alarm values and alarm differentials for return to normal condition
  - g. High and low value-reporting limits (reasonableness values) which shall prevent control logic from using shorted or open circuit values.
  - h. Default value to be used when the actual measured value is not reporting. This is required only for points that are transferred across the primary and/or secondary networks and used in control programs residing in control units other than the one in which the point resides. Events causing the default value to be used shall include failure of the control unit in which the point resides, or failure of any network over which the point value is transferred.
  - i. Selectable averaging function that shall average the measured value over a user selected number of scans for reporting.
2. Provide the following minimum programming for each analog output:
  - a. Name

- b. Address
  - c. Output updating frequency
  - d. Engineering units
  - e. Offset calibration and scaling factor for engineering units
  - f. Output Range
  - g. Default value to be used when the normal controlling value is not reporting.
3. Provide the following minimum programming for each digital input:
- a. Name
  - b. Address
  - c. Scanning frequency
  - d. Engineering units (on/off, open/closed, freeze/normal, etc.)
  - e. Debounce time delay
  - f. Message and alarm reporting as specified.
  - g. Reporting of each change of state, and memory storage of the time of the last change of state.
  - h. Totalization of on time (for all motorized equipment status points), and accumulated number of off-to-on transitions.
4. Provide the following minimum programming for each digital output:
- a. Name
  - b. Address
  - c. Output updating frequency
  - d. Engineering units (on/off, open/closed, freeze/normal, etc.)
  - e. Direct or Reverse action selection
  - f. Minimum on time

- g. Minimum off time
- h. Status association with a DI and failure alarming (as applicable)
- i. Reporting of each change of state, and memory storage of the time of the last change of state.
- j. Totalization of on time (for all motorized equipment status points), and accumulated number of off-to-on transitions.
- k. Default value to be used when the normal controlling value is not reporting.

#### E. ALARMS

1. Alarm Priority Levels: Alarm messages specified below and the section "Sequence of Operation" shall be assigned to one of the following priority levels. Level 1 is the most critical. Level 5 is the least critical. Unless otherwise specified, alarm messages shall be assigned to priority level 5. If the BAS does not have the capability of displaying the entire specified message, it shall condense the message as necessary; if the entire meaning of the message cannot be included, the message shall reference a code number that refers to an alarm code list. The alarm code list shall be provided by the contractor with a third party database, spreadsheet, or word processor software package in a format that is searchable and easy to interface using the alarm code number. Return to normal conditions for all alarms shall be reported at the same priority level. For those alarm level, which include the POT as a reporting location, alarms shall be reported to the POT only during scheduled off-shift hours.
2. Alarm message reporting locations for each alarm priority level shall be as follows:
  - a. Level 1: All Workstations and Energy Management Alarm Logger Printer
  - b. Level 2: Energy Management and Applicable HVAC Maintenance Shop Workstation, POT's, and Energy Management Alarm Logger Printers.
  - c. Level 3: Energy Management Engineer Workstation Screen and Applicable Zone Maintenance Shop Workstation Screen.
  - d. Level 4: Energy Management Engineer Workstation Screen.



- e. Level 5: Maintenance Shop Workstation Alarm Logging Printer.
3. Override alarms: Any point that is overridden through the override feature of the graphic workstation software shall be reported as a Level 3 alarm.
  4. Analog Input Alarms: For each analog input, program an alarm message for reporting whenever the analog value is outside of the programmed alarm limits. Report a return to normal message after the analog value returns to the normal range, using a programmed alarm differential. The alarm limits shall be individually selected by the contractor based on the following criteria:
    - a. Space temperature, except as otherwise stated in sequence of operation with a built in delay of 15 minutes (adjustable): Level 2
      - 1) low alarm: 10°F below setpoint
      - 2) low return to normal: 8°F below setpoint
      - 3) high alarm: 10°F above setpoint
      - 4) high return to normal: 8°F above setpoint
    - b. Space humidity: Level 2
      - 1) high alarm: 80%
      - 2) high return to normal: 70%
  5. HOA Switch Tampering Alarms: The sequences of operation are based on the presumption that motor starter HOA switches are in the auto position. If a motorized equipment unit starts without a prior start command from the BAS, (as sensed by status sensing device), then BAS shall perform the remaining sequence as specified. BAS shall also enunciate the following Level 3 alarm message if status indicates a unit is operational when the run command is not present.
    - a. *DEVICE XXXX FAILURE*: Status is indicated on even though it has been commanded to stop. Check the HOA switch, control relay, status-sensing device, contactors, etc. involved in starting the unit. Acknowledge this alarm when the problem has been corrected.

6. Maintenance Alarms: Enunciate Level 5 alarms when runtime accumulation exceeds a value specified by the operator
  - a. *DEVICE XXXX REQUIRES MAINTENANCE.* Runtime has exceeded specified value since last reset.
7. To eliminate nuisance and invalid alarms, alarms shall not be reported if the software algorithm or point is inactive.
8. See requirements for additional equipment-specific alarms specified under "Sequence of Operation".
9. During the construction and warranty period the following alarms and their parameters are the only alarms which are to be considered Level 1. These alarms will not require acknowledgement and display return to normal when the alarm condition has cleared.
  - a. Supply fan failure alarm- fan shall alarm when command= on and status is off, or command=off and status is on.
  - b. Freeze stat alarm- implement only on those projects which have this capability.
  - c. Communications room high temperature alarm- alarm if room temperature is greater than 90 Deg F.

#### F. TRENDING

The following constitutes those items, which, at a minimum, shall be included in a history submittal:

1. Outdoor Air:
  - a. Drybulb temperature
  - b. Wetbulb temperature
  - c. Calculated Enthalpy
  - d. Relative Humidity

2. Phase, Voltage, Frequency: Histories should indicate time and duration of any occurrence of power interruption and normal power resumption.
3. Overrides: Run status:
4. Water Heating /Cooling Coils:
  - a. Space or discharge (controlling) temperature
  - b. Valve position
5. Incremental Units (Units Ventilators, Fan Coil Units, Heaters, VRF, Valance, etc):
  - a. Fan command
  - b. Fan status
  - c. Dampers position
  - d. Valves positions
  - e. Space temperature
  - f. Space setpoint adjust
6. Provide trending of all inputs and outputs in a 24 hour period such that the occupied/ unoccupied schedule can be accurately observed. The school shall be programmed to the specified schedule prior to trending. Refer to section 3.04, A, 8.

#### G. EQUIPMENT SCHEDULES

1. Program the following master schedules with the stated equipment assignments according to the Control Zone Diagram on the mechanical drawings: Each zone shall have separate schedules as follows:
  - a. Weekdays: occupied time: unoccupied time:
  - b. Weekends: occupied time: unoccupied time:
  - c. Holidays: occupied time: unoccupied time:
  - d. Snow Days: occupied time: unoccupied time:

- e. Override: occupied time: unoccupied time:
  - f. Administrative Days (no students or faculty): occupied time: unoccupied time:
- H. GRAPHIC SCREENS
- 1. Floor Plan Screens:
    - a. Provide County Graphic Site Screen showing the location of each county school and support facility building. Provide links to and from each building plan. Adjacent to each school provide a separate alarm flag (or similar icon) for any level one alarm and power failure alarm (loss of phase or power). The condition flag or icon shall be green for normal and red for alarm.
    - b. Provide a graphic floor plan screen for each floor of the building.
    - c. Indicate location of all equipment that is not located on the equipment room screens.
    - d. Indicate locations of temperature sensors associated with each temperature control zone on control floor plan screens.
    - e. Display space temperature setpoint adjustment to each sensor symbol.
    - f. Use distinct colors to demarcate the air handling equipment and perimeter radiation zones.
    - g. Indicate room numbers as provided by the owner (final room signage number).
    - h. Provide a drawing link from each space temperature sensor symbol and equipment symbol shown on the graphic floor screen.
    - i. Provide graphic floor plan screen for each mechanical equipment room and a plan screen of the roof.
    - j. Indicate the location of each item of mechanical equipment.
    - k. Provide a graphic floor plan override screen of the entire building. Use a distinct line to demarcate each temperature control zone and identify each zone. The zone background color shall be a solid color, when a control zone is overridden this zone will be indicated as red on the graphic floor plan override screen.

- I. If multiple floor plans are necessary to show all areas, provide a graphic building key plan. Use elevation views and/or plan views as necessary to graphically indicate the location of all of the larger scale floor plans. Link graphic building key plan to larger scale partial floor plans. Provide links from each larger scale graphic floor plan screen to the building key plan and to each of the other graphic floor plan screens.
  - m. Provide a graphical link (button) to the trend graphs.
2. System Schematic Screens: Provide graphic system schematic screen for each HVAC subsystem controlled with each I/O point in the project appearing on at least one graphic screen. Provide at least one graphic per piece of equipment. System graphics shall include flow diagrams with status, setpoints, current analog input and output values, operator commands, etc. as applicable. General layout of the system shall be schematically correct. Input/output devices shall be shown in their schematically correct locations. Include appropriate engineering units for each displayed point value. Fully descriptive names (English language descriptors) shall be included for each point on all graphics; this may be accomplished by the use of a pop-up window accessed by selecting the displayed point with the mouse. Indicate all adjustable setpoints on the applicable system schematic graphic screen or, if space does not allow, on a supplemental linked setpoint screen.
  - a. Provide graphic screens for each air handling equipment system indicate outside air temperature, enthalpy and mode of operation (occupied, unoccupied, warm up, cool down).
  - b. Link screens for air handling equipment to the heating and cooling system graphics and associated perimeter radiation system graphic and associated terminal unit hydronic loop graphic.
  - c. Link screens for supply and exhaust systems if they are not combined on one screen.
  - d. Provide a graphic screen for each perimeter radiation terminal unit hydronic zone. Provide a link to graphic system schematic screens of air handling equipment that serve the corresponding zones.
  - e. Provide a graphic screen for each terminal unit. Indicate mode of operation (normal, occupied, unoccupied, warm up, cool down, maximum heat and maximum cooling).
  - f. Provide a cooling graphic screen showing all points associated with the chiller pumps indicate outside air dry bulb temperature

and calculate wet bulb temperature. A password protected button on this graphic screen labeled "Override" will, when enabled, place the chiller plant in manual operation regardless of the outside temperature.

- g. The cooling graphic screen shall display the supervisory message for start/ stop of the lead or lag chillers.
- h. Link screens for chilled and condenser water systems if they cannot fit on one cooling plant graphic screen.
- i. Provide a heating graphic screen showing all points associated with the boilers and heating pumps. Indicate outside air dry bulb temperature and relative humidity. A password protected button on this graphic screen labeled "Override" will, when enabled, place the heating plant in manual operation regardless of the outside temperature.
- j. Link screens for heating and cooling system graphics to utility history reports showing current and monthly use, demands, peak values ect.
- k. Provide a graphic link (button) from the equipment graphic screen to the written sequence of operation.

#### I. TREND GRAPHS

- 1. Prepare controller and workstation software to display graphical format trends. Trend graphs shall demonstrate compliance with contract documents.
- 2. Lines shall be labeled and shall be distinguishable from each other by using either different line types, or different line colors.
- 3. Indicate engineering units of the y-axis values; e.g. degrees F., inches w.g., Btu/lb, percent wide open, etc.
- 4. The y-axis scale shall be chosen so that all trended values are in a readable range. Do not mix trended values on one graph if their unit ranges are incompatible.
- 5. Trend outside air temperature, humidity, and enthalpy during each period in which any other points are trended.
- 6. All points trended for one HVAC subsystem (e.g. air handling unit, chilled water system, etc.) shall be trended during the same trend period.

7. Each graph shall be clearly labeled with HVAC subsystem title, date, and times.
8. All physical points and calculated variables shall be available for trending.
9. In the graphical format, the trend shall plot at least four different values for a given time period superimposed on the same graph.
10. The four values shall be distinguishable by using unique colors.
11. In the printed form the four lines shall be distinguishable by different line symbology. Displayed trend graphs shall indicate the engineering units for each trended value.
12. The trended value range shall be user selectable.

#### J. DYNAMIC SYMBOLS

1. Provide a selection of standard symbols which change in appearance based on the value of an associated point.
2. Analog symbol: provide a symbol that represents the value of an analog point as the length of line or linear bar.
3. Digital symbol: provide symbols such as switches, pilot lights, rotating fan wheels ect. to represent the value of a digital input or output point as appropriate. Animation for any operating machinery shall only represent digital inputs, and not outputs, in order to provide an accurate equipment status.
4. Point status color: graphic presentation shall indicate different colors for different point status. (For instance, green=normal, red= alarm, gray or??? for no response).
5. Use dynamic zone background colors (thermograph) to indicate thermal comfort based on temperature offset from setpoint on the zone graphic display screens.

The colors are as follows:

Red - 5 DEG F or more below setpoint

Dark Blue - 4 DEG F below setpoint

Light Blue - 2 DEG F below setpoint

Green - Satisfied

- Yellow - 2 DEG F above setpoint
- Orange - 4 DEG f above setpoint
- Red - 5 DEG F or more above setpoint

- K. ALARMS: In general, alarms shall be displayed on the graphic system schematic screen for the system that the alarm is associated with (e.g., chiller alarm shall be shown on graphic cooling system schematic screen). For all graphic screens, display analog values that are in an alarm condition in a red color. Indicate digital values that are in alarm condition in a red color.
- L. ALARM MANAGER: A master alarm management screen shall be provided on each workstation. The alarm management screen shall include the building location, the name of the piece of equipment in alarm, the nature of the alarm or alarm message. The alarm descriptor shall be fully descriptive and shall include the time of the alarm, the current status of the alarm (unacknowledged, acknowledged, return to normal) with appropriate reporting times. Once the alarm is acknowledged and has returned to normal the alarm shall be archived and the alarm shall be shaded on the screen. The operator, with the proper password, shall have the ability to delete those alarms that have been acknowledged and have returned to normal. The system shall be able to custom search for alarm types and locations. The system shall have the ability to print alarms to the workstation alarm printer and report alarms remotely to unlimited alphanumeric pagers and printers.

### 3.07 SYSTEM ACCEPTANCE

General: The following list outlines the general sequence of events for system acceptance:

1. ATC/BAS Start-up, Testing, Adjusting, Calibration
2. Trending
3. Correction of deficiencies from Items 1 and 2
4. ATC Final Inspection following the HVAC equipment demonstration.
5. Correction of deficiencies from Item 4
6. ATC Demonstration
7. Graphics Inspection
8. Substantial Completion



9. ATC/BAS Operator Training
10. "Off Season" Inspection as Required

A. ATC/BAS START-UP TESTING, ADJUSTING, CALIBRATION

1. Work and/or systems installed under this Division shall be fully functioning prior to final inspection. Contractor shall start, test, adjust, and calibrate all work and/or systems under this Contract, as described below, but not limited to the items listed:
  - a. Inspect the installation of all devices. Review the manufacturer's installation instructions and validate that the device is installed in accordance.
  - b. Verify proper electrical voltages and amperages, and verify that all circuits are free from faults.
  - c. Verify integrity/safety of all electrical connections.
2. Test, calibrate, and set all digital and analog sensing, and actuating devices. Calibrate each instrumentation device by making a comparison between the ATC display and the reading at the device, using an instrument traceable to the National Bureau of Standards, which shall be at least twice as accurate as the device to be calibrated (e.g., if field device is +/-0.5% accurate, test equipment shall be +/-0.25% accurate over same range). Record the measured value and displayed value for each device in the ATC/BAS Start Up Report.
3. Check and set zero and span adjustments for all transducers and transmitters.
4. For dampers and valves:
  - a. Check for adequate installation including free travel throughout range and adequate seal
  - b. Where loops are sequenced, check for proper control without overlap
5. For actuators:
  - a. Check to insure that device seals tightly when the appropriate signal is applied to the operator.

- b. Check for appropriate fail position, and that the stroke and range is as required
  - c. For sequenced electronic actuators, calibrate per manufacturer's instructions to required ranges
6. Check each digital control point by making a comparison between the control command at the CU and the status of the controlled device. Check each digital input point by making a comparison of the state of the sensing device and the OI display. Record the results for each device in the ATC/BAS Start-Up Report.
7. For outputs to reset other manufacturers devices (VSDs) and feedback from them, calibrate ranges to establish proper parameters. Coordinate with representative of the respective manufacturer and obtain their approval of the installation.
8. Verify proper sequences by using the approved checklists to record results and submit with ATC/BAS Start-Up Report. Verify proper sequence and operation of all specified functions.
9. Verify all safety devices trip at appropriate conditions. Adjust setpoints accordingly.
10. Tune all control loops to obtain the fastest stable response without hunting, offset or overshoot. Record tuning parameters and response test results for each control loop in the ATC/BAS Start Up Report. Except from a startup, maximum allowable variance from set point for controlled variables under normal load fluctuations shall be as follows. Within 3 minutes of any upset (for which the system has the capability to respond to) in the control loop, tolerances shall be maintained (exceptions noted):
  - a. Duct air temperature:  $\pm 1^{\circ}\text{F}$ .
  - b. Space Temperature:  $\pm 2^{\circ}\text{F}$
  - c. Chilled Water:  $\pm 1^{\circ}\text{F}$
  - d. Hot water temperature:  $\pm 3^{\circ}\text{F}$ .
  - e. Duct pressure:  $\pm 0.25''$  w.g.
  - f. Water pressure:  $\pm 1$  psid
  - g. Duct or space Humidity:  $\pm 5\%$

- h. Air flow control:  $\pm 5\%$  of setpoint velocity
  - i. Space Pressurization (on active control systems):  $\pm 0.05$ " wg with no door or window movements
11. For interface and DDC control panels:
- a. Ensure devices are properly installed with adequate clearance for maintenance and clearly labeled in accordance with the record drawings
  - b. Ensure termination's are safe, secure and labeled in accordance with the record drawings
  - c. Check power supplies for proper voltage ranges and loading.
  - d. Ensure wiring and tubing are run in a neat and workman-like manner, either bound or enclosed in trough.
  - e. Check for adequate signal strength on communication networks.
  - f. Check for stand-alone performance of controllers by disconnecting the controller from the LAN. Verify the event is enunciated at OIs. Verify that the controlling LAN reconfigures as specified in the event of a LAN disconnection
  - g. Ensure all outputs and devices fail to their proper positions/states.
  - h. Ensure buffered and/ or volatile information is held through power outage
  - i. With all system and communications operating normally, sample and record update/enunciation times for critical alarms fed from the panel to the OI.
  - j. Check for adequate grounding of all DDC panels and devices
12. For Operator Interfaces:
- a. Verify all elements on the graphics are functional and properly bound to physical devices and/or virtual points and that hot links or page jumps are functional and logical.
  - b. Output all specified BAS reports for review and approval.
  - c. Verify the alarm printing and logging is functional and per requirements

- d. Verify trend archiving to disk and provide a sample to the CA for review
  - e. Verify paging/dial out alarm enunciation is functional
  - f. Verify functionality of remote OIs and that a robust connection can be established consistently.
  - g. Verify that required third party software applications required with the bid are installed and functional.
13. Submit Start-Up Test Report. Report shall be submitted and approved prior to Final ATC Inspection.

**B. ATC/BAS INSPECTION**

1. Demonstrate the operation of the ATC/BAS hardware, software, and all related components and systems to the satisfaction of the Owner and/or the CA. Schedule the inspection with the Owner 2 weeks in advance. Demonstration shall not be scheduled until all hardware and software submittals, and the Start-Up Test Report is approved.
2. The Contractor shall supply all personnel and equipment for the demonstration, including, but not limited to, instruments, ladders, etc. Contractor supplied personnel must be competent with and knowledgeable of all project-specific hardware, software, and the HVAC systems. All training documentation and submittals shall be at the job site.
3. Demonstration shall include all major pieces of equipment, central plants and a small representative samples of terminal equipment randomly selected by the Owner.
4. The system shall be demonstrated following the same procedures used in the Start-Up Test Report. Demonstration shall include, but not necessarily be limited to, the following:
  - a. Demonstrate that required software is installed on BAS workstations. Demonstrate that graphic screens, alarms, trends, and reports are installed as submitted and approved.
  - b. Demonstrate that points specified and shown can be interrogated and/or commanded (as applicable) from all workstations, as specified.
  - c. Demonstrate that remote dial-up communication abilities are in accordance with these Specifications.

- d. Demonstrate correct calibration of input/output devices. A maximum of 10 percent of I/O points shall be selected at random by the Owner and/or Owner's Representative for demonstration. Upon failure of any device to meet the specified end-to-end accuracy, an additional 10 percent of I/O points shall be selected at random by Owner for demonstration. This process shall be repeated until 100 percent of randomly selected I/O points have been demonstrated to meet specified end-to-end accuracy.
  - e. Demonstrate that all DDC and other software programs exist at the respective distributed digital controllers. The Direct Digital Control (DDC) programming and point database shall be as submitted and approved.
  - f. Demonstrate that all DDC programs accomplish the specified sequences of operation.
  - g. Demonstrate that the panels automatically recover from power failures, as specified.
  - h. Demonstrate that the stand-alone operation of panels meets the requirements of these Specifications. Demonstrate that the panels' response to LAN communication failures meets the requirements of these Specifications.
  - i. Identify access to equipment selected by Owner. Demonstrate that access is sufficient to perform required maintenance.
  - j. Demonstrate that required trend graphs and trend logs are set up per the requirements. Provide a sample of the data archive. Indicate the file names and locations.
5. ATC/BAS Demonstration shall be completed and approved prior to Substantial Completion.

#### C. TRENDING

1. The Contractor shall have their software completely loaded and functional at least one week prior to the ATC final inspection and a complete set of histories shall have been submitted to the Engineer for his review. The intent of this is to determine whether installed software is functioning as intended. As there may be more points requiring trending than a single history program's capability, more than one run of histories may be necessary to provide all required data.
2. Prior to submitting a history, the Contractor shall perform a self-review to identify and correct problems. Histories shall be presented at hourly

intervals for an occupied 24-hour period, unless directed otherwise. During the final inspection and during the warranty period, if any malfunction occurs in the system operation, systems being monitored shall be operated with an occupancy schedule; i.e. indications that a system was scheduled off for the 24 hours of the history and remained off are of no value.

3. During the inspection all system setpoints (both calculated and manual inputs) shall be provided with the histories. If malfunctions occur during subsequent histories review, the system in question shall have all pertinent setpoints logged in the history.
4. Inspections shall not occur without the system/s operating in either the mechanical heating or cooling mode; if scheduled delivery of the project falls during a period in which the system/s are not operating, the inspection will be delayed until such time as the system/s have been operating under control for one week.

#### D. TREND LOGS

1. Trend logs are databases of ASCII characters (usually numbers) representing a historical record of the systems operation. Contractor shall establish and store these trend logs.
2. CA/Owner's representative shall analyze trend logs of the system operating parameters to evaluate normal system functionality. Contractor shall establish these trends, ensure they are being stored properly, and forward the data in electronic format to the CA/Owner's representative.
3. Sample times indicated as COV ( $\pm$ ) or change of value mean that the changed parameter only needs to be recorded after the value changes by the amount listed. When output to the trending file, the latest recorded value shall be listed with any given time increment record. If the BAS does not have the capability to record based on COV, the parameter shall be recorded based on the interval common to the unit.
4. Contractor shall provide the CA/Owner's representative with required passwords, phone numbers, etc. to allow the CA/Owner's representative access to the trend log data and allow downloading to a remote location. Contractor shall also provide step-by-step written instructions for accessing the data.

#### E. WARRANTY PERIOD ATC/BAS OPPOSITE SEASON TRENDING AND TESTING:

1. Trending: throughout the warranty period, trend logs shall be maintained. Contractor shall forward archived trend logs to the CA/OWNER for review

upon CA/OWNER's request. CA/OWNER shall review these and notify contractor of any warranty work required.

2. Opposite Season Testing: Within 6 months of completion of the Acceptance Phase, CA/OWNER shall schedule and conduct Opposite Season functional performance testing. Contractor shall participate in this testing and remedy any deficiencies identified.

F. SOFTWARE OPTIMIZATION ASSISTANCE

1. The contractor shall provide the services of a control technician as specified above at the project site to be at the disposal of the CA/OWNER. The purpose of this requirement is to make changes, enhancements and additions to control unit and/or workstation software that have been identified by the CA/OWNER during the construction and commissioning of the project and that are beyond the specified Contract requirements. The cost for this service shall be included with the bid. Requests for assistance shall be for contiguous or non-contiguous 8 hour days, unless otherwise mutually agreed upon by contractor, and Owner. The Owner's representative shall notify contractor 2 days in advance of each day of requested assistance.
2. The control technician provided shall be thoroughly trained in the programming and operation of the controller and workstation software. If the controls technician provided cannot perform every software task requested by the Owner in a timely fashion, contractor shall provide additional qualified personnel at the project site as requested by the Owner, to meet the total specified requirement on-site.

G. ATC/BAS OPERATOR TRAINING:

1. Provide services of controls contractor's qualified technical personnel for one 4-hour day to instruct Owner's personnel in operation and maintenance of BAS. CA/OWNER shall witness selected sessions. Instruction shall be in classroom setting at an Owner selected site for appropriate portions of the training. Training may be in non-contiguous days at the request of the Owner. The Owner's representative shall notify contractor 1 week in advance of each day of requested training.
2. Demonstrate to the Owners building operation personnel and custodial crews, the proper use of the building Override Panel.
3. Provide up to 4 complete sets of the approved Operations and Maintenance Manual to be used for training in addition to the requirements in Section 1.10.D OPERATIONS AND MAINTENANCE MANUALS.

END OF SECTION



## SECTION 15990

### TESTING, ADJUSTING AND BALANCING

#### 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

- A. The testing, adjusting and balancing of the air distribution systems, hot water heating systems chilled water cooling systems and condenser water systems, are specified under Section 01660 of Division 1.
- B. The installers shall give notice when the systems are ready for testing, adjusting and balancing, and give assistance in adjusting and correcting deficiencies.

#### PART 2 - PRODUCTS

##### 2.01 AIR FILTERS

- A. The installer shall be responsible for providing and installing new, clean, air filters. Filters shall be installed before final inspection and before giving notice for the testing, adjusting and balancing.

#### PART 3 - EXECUTION

##### 3.01 GIVING NOTICE TO PROCEED

- A. It shall be the responsibility of the installers to properly install, inspect and assure proper operation of each individual component of the system before giving notice to proceed with the testing, adjusting and balancing. The testing, adjusting and balancing shall not be performed until all mechanical equipment is properly installed and is 100 percent operational, all temperature controls are installed and calibrated and all systems are cleaned and clean filters installed.
- B. The mechanical contractor shall set all outside air dampers to the approximate minimum position during equipment installation and prior to start-up of equipment.
- C. The Balancing Contractor shall be responsible for properly plugging test holes which were made for testing purposes. Plugs shall be made of rubber and shall be sized to fit testing holes.

- D. The balancing contractor shall set relief vent counter balanced backdraft dampers per the manufactures installation instructions to maintain .05 " (positive) building static pressure.

### 3.02 CORRECTION OF DEFICIENCIES AND ASSISTANCE

The installers shall assist in the testing, adjusting and balancing the systems, shall adjust the system and make corrections of any deficiencies found such as: motor starters and horsepower; improper sheave and belt sizes; missing, improperly installed or malfunctioning volume control dampers, air extractors, air terminals, air monitors, variable or constant volume boxes, power wiring, controls and any other items that prevent the completion of the testing, adjusting and balancing of the systems.

### 3.03 ADDITIONAL MATERIAL

Any additional items or material required to be installed in the ductwork system to implement the testing, adjusting and balancing shall be furnished under Section 01660 along with the location. The installers shall install these items or materials.

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 (both normal and stand-by emergency power); branch circuit wiring; low voltage wiring; wiring devices; grounding; interior lighting; lighting control systems; fire detection and alarm system; wireless master clock and program system; sound and intercommunications system and program system; classroom amplification systems; telecommunications system; cable television/broadband distribution system; and multi-media systems 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. ELECTRICAL 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 Marshal's 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, system and the applicable Specification 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. Cable hook (J-hook) support systems
  - 3. Cable television/broadband distribution system
  - 4. Classroom amplifications systems.
  - 5. Conduit and associated fittings
  - 6. Disconnect /safety switches.
  - 7. Dry type transformers.
  - 8. Fire detection and alarm system
  - 9. Lighting control systems

10. Lighting fixtures
  11. Lighting occupancy sensors
  12. Multi-media systems
  13. New Breakers to be installed in existing panelboards
  14. Sound and intercommunications and program system
  15. Surface metal raceways and fittings
  16. Telecommunications system including outlets, equipment racks, and cables
  17. Wireless master clock system
  18. Wires, cables, and connectors
  19. 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.

- O. This Contractor shall furnish to the Owner, after approval of shop drawings, two (2) wiring sample boards. Each sample board shall be made of minimum space ½" thick plywood and sized as required to accommodate all wiring samples. Each board shall be painted white and shall have samples of fire alarm, all sound reinforcement systems (divided by system), multi-media, security, CATV, door access video entry, and telecommunications wiring. Each wiring sample shall be a minimum of 6 inches long with the manufacturer and model number clearly visible. Each wiring sample shall be properly labeled for its intended purpose using a labeling machine.

#### 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 VFDs or starters are actuated by automatic controls or other devices specified, all necessary components to actuate VFDs 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 VFDs 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 solid piece galvanized rigid steel conduit unless otherwise indicated on Drawings. Split sleeves are not allowed unless approved by the Owner.

## 2.06 FOUNDATIONS FOR EQUIPMENT

- A. The Contractor shall construct reinforced concrete foundations for floor mounted equipment where indicated on the Drawings. Foundations generally shall be built up from structural floor slabs and shall be made of 3000 psi concrete four (4) inches thick unless otherwise indicated or specified. Top edges shall be beveled. All exposed surfaces shall be finished with cement mortar troweled smooth. Reinforcing shall be 6 x 6-10/10 welded wire mesh.
- B. This Contractor shall provide reinforced concrete pole base foundations of cast-in-place for the exterior site lighting poles. The poles bases shall be sized and made of 3000 psi, air entrained, concrete with reinforcing as detailed on the Drawings. The top edges of the bases shall be beveled (chamfered) by using the proper type mold, not by grinding the edge once the concrete has set. All exposed surfaces shall be finished smooth without leaving any of the forms imperfections.

1. Cast-in-place concrete pole base foundations shall require this Contractor to provide all excavation and forms.
- C. Equipment shall be secured to foundations by this Contractor with anchor bolts embedded in the concrete of ample size and proper arrangements to suit equipment furnished.

### **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 EXCAVATING AND BACKFILLING**

- A. Mass excavation to approximate building level shall be carried out under DIVISION 1 of these Specifications. This Contractor shall do all trench and pit excavation and backfilling required for the electrical work inside and outside the building, including: repairing of finished surfaces; all required shoring, bracing, pumping; re-stripping; and all protection of safety of persons and property. The

method of backfilling shall conform to the requirements of Fairfax County. In addition, it shall be the responsibility of this Contractor to check the indicated elevations of utilities entering and leaving the building. If such elevations require excavations lower than the footing levels, the Architect/Engineer shall be notified of such conditions and redesign shall be made before excavations are commenced. It shall also be the responsibility of this Contractor to make the excavations at the minimum required depths in order not to undercut the footings.

- B. Conduits installed below the ground floor level shall have the bottom of the trench excavated to grade so that the conduit shall rest on a solid bed of undisturbed earth. If rock is encountered, the trench shall be excavated to not less than three (3) inches below required grade and filled to required grade with sand so as to provide a solid bed under the entire length of conduit.
- C. Where the trench is excavated below the required depth, the trench shall be filled with sand and fine gravel so that the entire length of conduit rests on solid bed of sand.
- D. Backfilling to one (1) foot above the top of the conduit pipe shall be done by hand, using clean dirt free of rocks or other debris. All backfill shall be properly compacted in accordance with DIVISION 2 of this Specification. Utility tracing tape shall be placed by this Contractor above underground electrical work approximately one (1) foot below finished grade for the entire length of the installation.

### 3.05 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.

## 3.06 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.

### 3.07 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.

### 3.08 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.

### 3.09 EQUIPMENT SUPPLIERS INSPECTION

- A. The following equipment and systems shall not be placed in operation until a competent installation and service representative of the manufacturer has made an on the job inspection of the installation, has certified that the equipment is properly installed and lubricated, that preliminary operating instructions have been given, and that equipment is ready for operation.
  1. Cable television/broadband distribution system (CATV)

2. Classroom amplification systems
3. Fire detection and alarm system
4. Lighting control systems
5. Multi-media systems
6. Sound, intercommunications and program systems
7. Telecommunications system including networking equipment
8. Wireless master clock system

### 3.10 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.

### 3.11 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.

### 3.12 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.

### 3.13 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.

### 3.14 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  $\pm$  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.
- C. Cables pulled through sleeves without bushings, cut bushings, or wrapped with tape will not be accepted and shall be replaced by the Contractor.

### 2.04 WIRING TROUGHS

- A. Wiring troughs complete with screwed covers shall be used where indicated and for mounting groups of switches and/or starters. Wiring troughs shall be the standard manufactured product of a company regularly producing wiring troughs and shall not be a local shop assembled unit. Wiring trough shall be UL listed and of sizes indicated or as required by NEC, if not indicated. The interior, including couplings shall be completely open without interference. Finish shall be ASA #49 medium light gray enamel over a rust inhibitor. Wiring troughs shall be UL listed "Suitable For Wet Locations" and so labeled where indicated "WP" on the Drawings.
- B. Wiring connection taps within wiring troughs shall be made using clear self-sealing, self-insulating, multi-tap connectors with transparent flexible insulating covers. The connectors shall be securely fastened. The multi-tap connector shall be manufactured by ILSCO, Series “PCT” ClearTap or approved equal.

### 2.05 CABLE HOOK SUPPORT SYSTEMS

- A. Cable hooks (also known as “J” hooks) shall be provided for low voltage cable systems as hereinafter specified in other sections of these specifications.
- B. Cable hooks shall provide a flat bottom bearing surface of sufficient width to comply with required bend radii of high-performance cables.
- C. Cable hooks shall have flare edges to prevent damage while installing cables.
- D. Cable hooks shall be designed so the mounting hardware is recessed to prevent cable damage.
- E. Cable hooks sized 1 5/16 inches and larger shall have a stainless steel cable latch retainer to provide containment of cables within the hook. The retainer shall be removable and reusable and be suitable for use in air handling spaces.
- F. Cable hooks shall be factory assembled for direct attachment to walls, hanger rods, beam flanges, purlins, strut, floor posts, etc. to meet job conditions.
- G. Multi-tiered cable hook assemblies shall be used where required to provide separate cabling compartments, or where additional capacity is needed. Assemblies may be factory assembled or assembled from pre-packaged kits. Assemblies shall consist of a steel angled hanger bracket holding up to six (6) cable hooks.
- H. Cable hooks for non-corrosive areas shall be pre-galvanized steel, ASTM A653. Where additional strength is required, cable hooks shall be spring steel with a zinc-plated finish, ASTM B633, SC3. Cable hooks for corrosive areas shall be stainless steel, AISI Type 304.
- I. Cable hooks shall be capable of supporting a minimum of 30 pounds with a safety factor of 3. Spring steel cable hooks shall be capable of supporting a minimum of 100 pounds with a safety factor of 3 where extra strength is required.
- J. Cable hook manufacturer shall be B-LINE SYSTEMS, INC. Series BCH21, BCH32, BCH64, or equal as manufactured by ERICO CADDY.

## 2.06 PULL-LINES (CORDAGE)

- A. Pull-lines (rope and cordage) types and strengths must be selected and calculated by the Contractor. The selection must be based on the intended use and expected pulling load applications. Design Factor (DF) selections and Working Load Limits (WLL) must be calculated with consideration of exposures to risk and actual conditions of use for each application. Pull-lines shall be in compliance with the latest Cordage Institute Standards and Guidelines.

- B. The minimum pull-line tensile strength for insertion into conduits shall be 500 pounds and of the low-friction type.
- C. Each utility service entrance conduit (raceway) for power company, telephone company and/or cable television (CATV) company shall have a MULETAPE® pulling tape with numerical values having sequential footage (feet and inches) markings, without splices. The MULETAPE® shall have a minimum tensile strength of 2500 pounds and shall be of the low-friction type with prelubrication, high abrasion resistant yarns.
- D. Where minimum pull-line strengths are given, they do not negate the Contractor's responsibility for proper selections and calculations for higher strength pull-lines to suit the application.

### **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 shall be provided 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.
- S. Conduits run shall not be more than one hundred (100) feet in length and two hundred seventy (270) total degrees of bend without the use of pull box(s).

### 3.03 CABLE HOOK SUPPORT SYSTEM

- A. Installation and configurations shall conform to the requirements of the current revision levels of ANSI/EIA/TIA Standards 568 & 569, NEC, the manufacturer's installation instructions and other sections of these project specifications.
- B. Cable hook assemblies shall be supported from the building structure. Where fastened to walls use appropriate anchors and screws, the use of drive pins and/or other methods using compressed air or gases are not acceptable. Supports shall not terminate or be fastened directly to the roof decking. Cables installed under roof decking shall not be less than 1½ inches from the nearest surface of the roof. Cable hook supports attached to structural steel joists shall only be attached within 3" of the top of the joist panel points. Supports attached at the bottom or beyond 3" of the joist panel points must be approved, in writing, by the Structural Engineer of Record and the Owner before attaching.
- C. Install cables using techniques, practices, and methods that are consistent with Category 5 cables or higher requirements and that support Category 5 or higher performance of completed and linked signal paths, end to end.
- D. Install cables without damaging conductors, shield, or jacket.
- E. Do not bend cables, in handling or in installing, to smaller radii than minimums recommended by cable manufacturers.
- F. Do not exceed load ratings and allowable fill capacity specified by the cable hook manufacturer.

- G. Install cable hooks to maintain a minimum three (3) inch clear or higher vertical space above the accessible ceiling tiles for the horizontal cabling and pathway.

#### 3.04 CUTTING AND HOLES

- A. Locate holes in advance where they are proposed in structural sections such as ribs or beams. Prior to drilling through any structural section or member, obtain the written approval of the Architect/Structural Engineer of Record and the Owner.
- B. Cut holes through concrete and masonry structures with a diamond core drill or concrete saw. Pneumatic hammer, impact electric, hand or manual hammer type drills are not allowed, except where permitted in advance by the Architect/Engineer and Owner, due 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 16115

### SURFACE METAL RACEWAYS

#### 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 surface mounted metal raceways complete for all electrical systems as shown on the Drawings and herein specified. Surface raceway systems shall consist of raceway bases, covers, appropriate fittings, dividers, and device mounting plates necessary for a complete installation.

##### 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.

##### 1.04 USES PERMITTED

- A. Surface mounted metal raceway shall be used primarily where new wiring is required on existing walls and on new walls as noted on the Drawings.

##### 1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver raceway systems in factory labeled packages.
- B. Store and handle in strict compliance with manufacturer's written instructions and recommendations.
- C. Protect from damage due to weather, excessive temperature, and construction operations.

**PART 2 PRODUCTS****2.01 MANUFACTURERS**

- A. Surface metal raceways shall be as manufactured by THE WIREMOLD COMPANY or equal product as manufactured by HUBBELL INCORPORATED, as described herein as the basis of design.
- B. All components and fittings shall be of the same manufacturer, or UL listed as an assembly.

**2.02 MATERIALS AND COMPONENTS**

- A. All surface metal raceways shall be galvanized steel, unless otherwise indicated. Finish shall be ivory in color (unless otherwise indicated) having a scratch-resistant surface (a polyester topcoat over ivory base) and shall be suitable for field repainting to match surroundings.
- B. A full complement of fittings must be available including but not limited to mounting clips and straps, couplings, flat, internal and external elbows, cover clips, tees, entrance fittings, wire clips, support clips, c-hangers, end caps, conduit connectors, bushings, and take-off fittings to adapt to flush wall boxes. The covers shall be painted with an enamel finish, ivory in color to match the raceway. They shall overlap the raceway to hide uneven cuts. All fittings shall be supplied with a base where applicable to eliminate mitering. Transition fittings shall be available to adapt to other raceways manufactured by The Wiremold Company. This Contractor shall provide all fittings, etc. for a complete installation.
- C. Device boxes shall be suitable for the type of raceways provided and for mounting standard devices and faceplates. Device boxes shall be provided in single- and multiple-gang configurations, up to six-gang. Single-gang boxes shall allow for snap-on and fastener applications. They shall range in depth from 0.94" to 2.75". Extension boxes shall be provided to adapt to existing standard flush switch and receptacle boxes.
- D. The raceway manufacturer shall provide a complete line of connectivity outlets and modular inserts for UTP/STP, fiber optic, coaxial and other cabling types with face plates and bezels to facilitate mounting. A complete line of preprinted station and port identification labels, snap-in icon buttons as well as write-on station identification labels shall be available. Provide as needed for a complete installation.
- E. Raceways used for communications cabling shall have a complete line of full capacity corner elbows and tee fittings, and used where required or shown on the Drawings, to maintain a controlled 2" cable bend radius which meets the specifications for Fiber Optic and UTP/STP cabling and exceeds the TIA 569 requirements for communications pathways.

**2.03 SURFACE METAL RACEWAYS**

- A. **WIREMOLD Series V500 or V700** raceway shall be one-piece design with a base and cover factory assembled. The total width shall be 3/4" x 17/32" high with a capacity of 1.19 square inches for V500 or 3/4" x 21/32" with a capacity of 0.26 square inches for V700. The raceway base and cover shall be a minimum thickness of 0.040". The raceway shall be available in five (5) foot and ten (10) foot lengths.
- B. **WIREMOLD Series V4000** raceway shall be a single-or dual-channel two-piece design with a metal base and snap-on metal cover. Base shall be dividable by means of a removable barrier section into two equal compartments. The assembled base and cover shall be 4 3/4" wide x 1 3/4" high with a capacity of 7.20 square inches for undivided raceway and a capacity of 3.10 square inches for each compartment of the divided raceway. The raceway base shall be a minimum thickness of 0.050 inches and the cover with a minimum thickness of 0.040". The raceway base shall be available in ten (10) foot lengths and the cover shall be available in five (5) foot lengths.
  - 1. Plastic device mounting bracket and trim plates shall be provided to install devices horizontally within the raceway. Trim plate shall overlap the cover-eliminating seam. Faceplates shall accept a variety of power and data/communication devices. Plastic must be compatible with UL 94 for Plastic Materials. Device brackets and trim plates shall be colored to match the raceway.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION

- A. Examine conditions under which surface raceways, boxes, distribution systems, accessories, and fittings are to be installed and substrate that will support raceways. Notify the Architect/Engineer and Owner of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected.

#### 3.02 INSTALLATION

- A. Surface raceways shall be installed in strict compliance with the manufacturer's installation instructions and recommendations and approved shop drawings. Coordinate installation with adjacent work to ensure proper clearances and to prevent electrical hazards.
- B. Surface raceways shall be installed parallel with or at right angles to building structure and at the mounting heights noted on Drawings.
- C. Surface raceway systems shall be mechanically continuous and connected to all electrical outlets, boxes, device mounting brackets, and cabinets, in accordance with manufacturer's installation sheets.

- D. Metal raceways shall be electrically continuous and bonded in accordance with the National Electrical Code for proper grounding.
- E. Surface raceway shall be supported at intervals not exceeding five (5) feet or in accordance with manufacturer's installation sheets using appropriate anchors and screws. The use of drive pins and/or other methods using compressed air or gases are not acceptable.
  - 1. V500 and V700 shall be supported using two (2) hole straps specifically designed for the application secured with plastic anchors and No. 6 screws.
- F. Provide accessories as required for a complete installation, including insulated bushings and inserts where required by the manufacturer.
- G. Close all unused raceway openings using manufacturer's recommended accessories.
- H. All surface raceway connections to outlet and/or junction boxes shall be made using adjustable offset connectors or combination connectors as detailed on the Drawings. The connectors shall be furnished by the manufacturer of the surface raceway.
- I. Field cutting of surface raceways base and covers shall be accomplished by the use of the manufacturer's raceway cutters specifically designed for this purpose.

### 3.03 CLEANING AND PROTECTION

- A. Clean exposed surfaces using non-abrasive materials and methods recommended by manufacturer.
- B. Protect raceways and boxes until final acceptance by the Owner.
- C. Repaint marred and scratched surfaces with touch-up paint to match original finish.

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:

<u>CONDUCTORS</u>	<u>SYSTEM VOLTAGE</u>	
	<u>120/208</u>	<u>277/480</u>
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 prevent 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 (except solid 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 LIGHTING SWITCHES

- A. Lighting switches shall be manufactured by PASS & SEYMOUR (P&S) as listed below or the equivalent as manufactured by COOPER (ARROW HART), HUBBELL, or LEVITON.
- B. Lighting switches shall be totally enclosed, 20 amp, 120-277 volt with screw-type wire terminals to accept No. 14 through No. 10 AWG solid copper conductors, ivory thermoplastic toggle, and grounding terminal, or Plug Tail Type. All locking type switches shall be keyed alike. Lighting switches shall be as follows:
- |     |   |                        |
|-----|---|------------------------|
| 1.  | Single pole   | P&S Cat. No. PS20AC1I  |
| 2.  | Single Pole (PlugTail Type)                           | PT20AC1I               |
| 3.  | Single pole, locking type                             | P&S Cat. No. PS20AC1IL |
| 4.  | Single pole, double throw-<br>Two circuit, center off | P&S Cat. No. 1221I     |
| 5.  | Three –way  | P&S Cat. No. PS20AC3I  |
| 6.  | Three-way (PlugTail Type)                             | PT20AC3I               |
| 7.  | Three-way, locking type                               | P&S Cat. No. PS20AC3IL |
| 8.  | Four-way  | P&S Cat. No. PS20AC4I  |
| 9.  | Four-way, locking type                                | P&S Cat. No. PS20AC4IL |
| 10. | Momentary contact                                     | P&S Cat. No. 1251I     |
| 11. | Momentary contact,<br>locking type                    | P&S Cat. No. 1251L     |
- C. All PlugTail lighting switches shall come complete minimum six (6) inch solid THHN Connector. Stranded connectors shall not be acceptable.
- D. Pilot lighting switches shall be totally enclosed, 20 amp, 120 volt and 277 volt with screw type wire terminals to accept No. 14 through No. 10 AWG solid copper conductors, red “lighted when ON” lighted toggle, and grounding terminal. Pilot lighted switches shall be as follows:

1. Single pole (120V) P&S Cat. No. PS20AC1RPL
  2. Single pole (277V) P&S Cat. No. PS20AC1RPL7
  3. Three-way (120V) P&S Cat. No. PS20AC3RPL
  4. Three-way (277V) P&S Cat. No. PS20AC3RPL7
- E. Digital lighting control switches required under Specification SECTION 16500 shall be part of the lighting control system.
- F. Wall switch occupancy sensors are specified under Specification SECTION 16506.

## 2.02 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.

## 2.03 WALL DIMMER SWITCHES

- A. Wall dimmer switches shall be with ivory faceplate 0 to 10 Volt, of the voltage indicated. PASS & SEYMOUR Cat. No. CD4FBL3PI, or equivalent.

## 2.04 RECEPTACLES

- A. Receptacles shall be manufactured by PASS & SEYMOUR (P&S) as listed below or the equivalent as manufactured by COOPER (ARROW HART), HUBBELL, or LEVITON.
- B. All straight blade 15A and 20A receptacles in elementary schools only, shall be

tamper-resistant type, except clock outlet receptacles.

- C. Receptacles shall be of the types listed below, complete with an impact resistant nylon face, screw type wire terminals to accept copper conductors, high strength thermoplastic back body, and grounding terminal, or Plug Tail Type.
1. Duplex 2P, 3W, 15A, 125V, NEMA 5-15R:  
P&S Cat. No. 5262-AI
  2. Duplex 2P, 3W, 20A, 125V, NEMA 5-20R:  
P&S Cat. No. 5362-AI
  3. Duplex (PlugTail Type), 2P, 3W, 20A, 125V, NEMA 5-20R:  
P&S Cat. No. PT5362-AI
  4. Controlled Receptacle, Duplex 2P, 3W, 20A, 125V, NEMA 5-20R:  
P&S Cat. No. 5362-AGRY
  5. Controlled Receptacle (PlugTail Type), Duplex 2P, 3W, 20A, 125V,  
NEMA 5-20R: P&S Cat. No. PT5362-AGRY
  6. Duplex 2P, 3W, 20A, 125V, NEMA 5-20R  
Tamper-Resistant (safety) type with two  
USB Charging Ports:  
P&S Cat. No. TR5362USBI
  6. Duplex 2P, 3W, 20A, 125V, NEMA 5-20R  
Weather-Resistant:  
P&S Cat. No. WR5362I
  7. Duplex 2P, 3W, 20A, 125V, NEMA 5-20R  
Ground Fault Circuit Interrupter type with Safe Lock:  
P&S Cat. No. 2097I
  8. Duplex (Plugtail Type) 2P, 3W, 20A, 125V, NEMA 5-20R  
Ground Fault Circuit Interrupter type with Safe Lock:  
P&S Cat. No. PT2095I
  9. Duplex 2P, 3W, 20A, 125V, NEMA 5-20R  
Connected to an emergency circuit:  
P&S Cat. No. 5362-ARED
  10. Duplex (Plugtail Type) 2P, 3W, 20A, 125V, NEMA 5-20R  
Connected to an emergency circuit:  
P&S Cat. No. PT5362-ARED

11. Duplex 2P, 3W, 20A, 125V, NEMA 5-20R  
Tamper-Resistant (safety) type:  
P&S Cat. No. TR63I
12. Duplex (PlugTail Type), 2P, 3W, 20A, 125V, NEMA 5-20R  
Tamper-Resistant (safety) type:  
P&S Cat. No. PTTR63I
13. Controlled Receptacle, Duplex 2P, 3W, 20A, 125V, NEMA 5-20R  
Tamper-Resistant (safety) type:  
P&S Cat. No. TR63GRY
14. Controlled Receptacle Duplex (PlugTail Type), 2P, 3W, 20A, 125V,  
NEMA 5-20R, Tamper-Resistant (safety) type:  
P&S Cat. No. PTTR63I
15. Duplex 2P, 3W, 20A, 125V, NEMA 5-20R  
Tamper-Resistant (safety), Ground Fault Circuit Interrupter type with  
Safe Lock:  
P&S Cat. No. 2097TRI
16. Duplex 2P, 3W, 20A, 125V, NEMA 5-20R  
Tamper-Resistant (safety), Ground Fault Circuit Interrupter type with  
Safe Lock:  
P&S Cat. No. PT2097TRI
17. Duplex 2P, 3W, 20A, 125V, NEMA 5-20R  
Weather-Resistant and Tamper-Resistant, Ground Fault Circuit  
Interrupter type with Safe Lock:  
P&S Cat. No. 2097TRWRI
18. Single 2P, 3W, 20A, 125V, NEMA 5-20R connector:  
P&S Cat. No. 5369-X
19. Single 2P, 3W, 15A, 125V, NEMA L5-15R:  
P&S Cat. No. 4710
20. Single 2P, 3W, 20A, 125V, NEMA L5-20R:  
P&S Cat. No. L520R
21. Single 2P, 3W, 20A, 125V, NEMA L5-20R connector:  
P&S Cat. No. L520C
22. Single 2P, 3W, 30A, 125V, NEMA 5-30R:  
P&S Cat. No. 3802

23. Single 2P, 3W, 30A, 125V, NEMA L5-30R:  
P&S Cat. No. L530R
24. Single 2P, 3W, 15A, 250V, NEMA 6-15R:  
P&S Cat. No. 5662AI
25. Single 2P, 3W, 20A, 250V, NEMA 6-20R:  
P&S Cat. No. 5862AI
26. Single 2P, 3W, 30A, 250V, NEMA 6-30R:  
P&S Cat. No. 3801
27. Single 2P, 3W, 50A, 250V, NEMA 6-50R:  
P&S Cat. No. 3804
28. Single 3P, 4W, 20A, 125/250V, NEMA 14-20R:  
P&S Cat. No. 3820
29. Single 3P, 4W, 30A, 125/250V, NEMA 14-30R:  
P&S Cat. No. 3864
30. Single 3P, 4W, 50A, 125/250V, NEMA 14-50R:  
P&S Cat. No. 3894
31. Single 3P, 4W, 60A, 125/250V, NEMA 14-60R:  
Hubbell Cat. No. HBL 9460A
32. Single 3P, 4W, 20A, 250V, NEMA 15-20R:  
Hubbell Cat. No. HBL 8420
33. Single 3P, 4W, 30A, 250V, NEMA 15-30R:  
P&S Cat. No. 5740
34. Single 3P, 4W, 50A, 250V, NEMA 15-50R:  
P&S Cat. No. 5750
35. Single 3P, 4W, 60A, 250V, NEMA 15-60R:  
P&S Cat. No. 5760
36. Single 3P, 4W, 50A, 125/250V P&S Cat. No. CS6369.
37. Single 2P, 3W, 15A, 125V, NEMA 5-15R  
Wireless Clock Outlet with stainless steel cover plate:  
P&S Cat. No. S3733-SS

E. Wiring devices mounted in WIREMOLD V4000 surface metal raceways shall be

ivory or light almond in color to match the raceway in lieu of the colors indicated above, except red wiring devices shall not change.

- F. All PlugTail receptacles shall come complete minimum six (6) inch solid THHN Connector. Stranded connectors shall not be acceptable.

## 2.05 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.
  - 1. Wall switch occupancy sensors shall have stainless steel cover plates, not the plastic cover plates that may be included in the switch packaging.
- B. Cover plates shall be of a configuration to match the type of wiring device to be covered. Where more than one flush outlet (switch, receptacle, etc.) is indicated in the same location and at the same mounting height, all (except dimmer switches) shall be ganged in a single multi-gang outlet box under a common cover plate.
- C. Wiring devices located in wet or damp locations, or noted "WP" on the Drawings shall be complete with a die-cast weatherproof metallic cover plate. Receptacles in damp locations only, may use this type of weatherproof cover plate. All weatherproof cover plates shall be UL listed.
- D. All 15 amp and 20 amp receptacle type wiring devices located in wet locations, or noted "WP" on the Drawings, shall have hinged weatherproof "while-in-use" covers. Other receptacle type wiring devices located in wet and damp locations where equipment is intended to be plugged into it and not attended while in use shall also have hinged weatherproof "while-in-use" covers. Provide these types of weatherproof covers at other locations identified on the Drawings. Covers, body and plates shall be gray die-cast aluminum, fully gasketed and suitable for mounting horizontally and vertically. Mounting screws shall be 302 stainless steel. Cover assembly shall be UL listed.
- E. All receptacles on an emergency circuit shall have a coverplate, PASS & SEYMOUR Type 302 (non-magnetic), labeled with 1/8" high engraved and filled lettering "EMERGENCY".
- F. Cover plates for receptacles shall be labeled with the circuit number including panelboard designations. Labeling shall be done with a BROTHER® Model No. PT-1400 (P-touch) professional label maker, or approved equal, using a laminated type extra strength adhesive tape, Letters/numerals shall be black with

a white background, minimum 3/16" high.

- G. Cover plates for lighting control digital switches shall be labeled with the lighting control panel designation and room number designation or as shown on the Drawings. Labeling shall be done with a BROTHER® Model No. PT-1400 (P-touch) professional label maker, or approved equal, using a laminated type extra strength adhesive tape, Letters/numerals shall be black with a white background, minimum 3/16" high.

### **PART 3 - EXECUTION**

#### **3.01 WIRING DEVICES**

- A. This Contractor shall furnish and install all wiring devices, material, and hardware as indicated on the Drawings, as specified, or as required for a complete installation.
- B. Before installation, the exact type of wiring devices shall be coordinated with all associated trades.
- C. This Contractor shall check all wiring devices for damages during construction and replace where necessary. All devices shall be cleaned and left in a complete operable condition.
- D. This Contractor shall verify all door swings before installing lighting switches.
- E. Receptacles shall be installed only on clear wall spaces, not in tackboards, chalkboards, pipe chases, mechanical equipment, or built-in type furniture and cabinets. If receptacles are shown on the Drawings to be installed therein, this Contractor shall call it to the attention of the Architect/Engineer and obtain a new location.
- F. Dimmer switches shall not be ganged together with other types of lighting switches. Multiple dimmer switches shall be ganged together using the number of outlet boxes and/or outlet box gangs in accordance with the manufacturer's instructions.

#### **3.02 CONNECTIONS**

- A. Ground equipment according to Specification Section 16460 "Grounding" and the National Electrical Code.
- B. Connect wiring according to Specification Section 16120 "Wire, Cables and Connectors".
- C. Tighten electrical connections and terminals according to manufacturer's

published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A/B.

### 3.03 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections:

1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

B. Remove malfunctioning units, replace with new units, and retest as hereinbefore specified.

END OF SECTION



## SECTION 16140

### DEVICE AND OUTLET BOXES

#### PART I - GENERAL

##### 1.01 REQUIREMENTS

- A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

##### 1.02 SCOPE

- A. The work covered under this Section shall include furnishing and installing device and outlet boxes and flush floor outlets (boxes) 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. Flush floor outlet boxes and/or poke-thru devices shall have been tested to meet UL514A and/or UL514C and bear the UL listing mark. Floor boxes/devices shall be classified for use in 2-hour rated unprotected reinforced concrete floors and concrete toppings (D900 Series Designs) or above grade concrete floors with suspended ceilings (fire resistive designs with suspended ceilings shall have provisions for accessibility in the ceiling below the floor boxes/devices). Floor boxes/devices shall also conform to the standards set in Section 300.21 of the National Electrical Code. Floor boxes/devices shall meet UL scrub water requirements, but are not suitable for wet or damp locations, or other areas subject to saturation with water or other liquids such as commercial kitchens. Floor boxes/devices shall also have been evaluated by UL to meet the applicable U.S. safety standards for scrub water exclusion when used on tile, bare concrete, terrazzo, wood, and carpet covered floors. Above grade floor boxes/devices shall be suitable for use in air handling spacers in accordance with Section 300.22 (C) of the National Electrical Code.
- E. 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. Outlet boxes for lighting switches and receptacles in finished walls shall be of a suitable size for the device to be mounted in the partitions in which they are installed. The boxes shall have covers with rectangular openings of appropriate size and shape. Provide covers with raised openings on all outlets in masonry walls with plaster or tile finishes. Wall switch outlets shall be located within eight (8) inches of the trim on the latch side of the door. Outlets shall be set flush with the wall.
- C. 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.
- D. 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).
- E. 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. Thoroughly coordinate casework and backsplash heights with mounting heights of boxes.
- F. Device and outlet boxes shall not be fastened in place with drive pins and/or other methods using compressed air or gases.
- G. 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
  - 3. Clocks and Program Clocks - Green
  - 4. Emergency - White
  - 5. Fire Alarm - Red
  - 6. Security System - Gray
  - 7. Sound - Blue
  - 8. Telecommunications - Yellow

9. Cable Television/Broadband - Tan
10. Cox Communications I-NET (fiber) - Purple

### 3.02 CONDUCTORS

- A. All conductors entering junction and pull boxes shall be of the same voltage. Do not mix voltages regardless of the conductors' voltage rating, unless specifically shown on the Drawings.
- B. Branch circuit conductors and feeder conductors shall not occupy the same junction or pull box. Maintain separate boxes for branch circuits and separate boxes for feeders, unless specifically shown otherwise on the drawings.

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. 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.

- B. 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. 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.
- E. Bonding conductors: This Contractor shall furnish and install a bonding conductor in all flexible conduits connected at each end to a grounding bushing.
- G. 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.

END OF SECTION



## SECTION 16500

### LIGHTING CONTROL SYSTEMS

#### 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 in this section shall include furnishing and installing complete lighting control systems for the control of selected interior lighting and other equipment as indicated on the Drawings, detailed in the manufacturer submittal and as further defined herein. Contractor is solely responsible to verify quantity, installation locations and wiring requirements for this project. Specific manufacturers' catalog numbers, when listed in this section are for reference only. It is the responsibility of this Contractor to verify with the lighting control manufacturer all catalog information and specific product acceptability.
- B. The systems shall include but not be limited by the following: intelligent lighting control devices that consist of one or more basic lighting control components such as occupancy sensor, photocell sensor, relay, dimming output, contact closure input, analog 0-10V input, and manual wall station capable of indicating switching, dimming, and/or scene control. Combining one or more of these components into a single device enclosure shall be permissible so as to minimize overall device count of system.
- C. Requirements are indicated elsewhere in these specifications for work including, but not limited to, raceways and electrical boxes and fittings required for installation of control equipment and wiring.
- D. It is the intent of this specification that the entire lighting control system, as specified herein, be available to all bidders and not "Packaged or Bundled" with any other lighting systems or equipment. Therefore the lighting control system shall be provided as a separate price, to all bidders, at bid time.

##### 1.03 QUALITY ASSURANCE

- A. The lighting control systems shall meet the requirements of the National Electrical Code (NEC), state and local codes, and these Specifications.
- B. All components and the manufacturing facility where product was manufactured must be RoHS compliant.
- C. All components shall be subjected to 100% end of line testing prior to shipment to the project site to ensure proper device operation.

#### 1.04 SUBMITTALS

- A. This Contractor shall furnish submittals for all components of the lighting control systems in accordance with SECTION 16010 of these Specifications. Submittals shall include the following for review. Submittals not containing all of the information listed below will be rejected.
1. Shop Drawings: Submit device layout drawings of complete lighting control systems and accessories including, but not necessarily limited to, switches, power packs, and other interfaces. Shop drawings shall indicate exact location of each device. Plans shall be diagrammatical. "Cut Sheet" submittals are not acceptable.
  2. Product Data: Submit for approval manufacturer's data on the specific lighting control systems and components. Submittal shall be in both electronic and hard copy formats. To prevent departures from approved system operation, electronic file submitted shall be able to be directly downloaded to the specified system at the manufacturer's facility. Submit a complete bill of materials with part numbers, description and voltage specifications.
  3. One Line Diagram: Submit riser diagram showing device wiring connections, size and number of conductors between each component, and each communication buss provided for the project. Submittals that show typical riser diagrams are not acceptable.
  4. Programming Forms: Submit programming forms with complete information describing the operation of the lighting control system and all other information necessary to show proper operation of the system.

#### 1.05 SPARE PARTS

- A. Manufacturer's software shall be available online for download at no charge. If software is not available online, it shall be provided in CD form with the most up to date software.
- B. Provide 2 extra sets of as-built and operating manuals.

#### 1.06 SYSTEM DESCRIPTION

##### A. System Architecture

1. System shall have an architecture that is based up on standalone rooms with intelligent lighting control devices.
2. The system shall be capable of providing individually addressable switching and dimming control of each space.
3. System shall be capable of 'out of box' sequence of operation for each

control zone. Standard sequence is:

- a. All switches control all power packs in a zone.
- b. All occupancy sensors automatically control all power packs in the control zone with a default time out.

B. Wired Network Control Zone Characteristics

1. Following proper installation and provisions of power, all networked devices connected together with low voltage network cable shall automatically form a functional lighting control zone without requiring any type of programming. The 'out of box' default sequence of operation is intended to provide typical sequence of operation so as to minimize the system start up and programming requirements and to also have functional lighting control operation prior to system startup and programming.
2. System shall be able to automatically discover all connected devices without requiring any provisioning of system or zone addresses.

### 1.07 SYSTEM TEST AND ACCEPTANCE

- A. Prior to the Architect/Engineer's final site visitation and acceptance of each construction phase, this Contractor shall conduct a complete operating test of each system including each device. The systems shall test free from grounds, shorts, and other faults. All connections shall be thoroughly checked for mechanical and electrical connection. All equipment shall be demonstrated to operate in accordance with the requirements set forth in these Specifications and as shown on the Drawings.
- B. This Contractor shall perform all tests in the presence of the Owner. This Contractor shall furnish all personnel for use in the tests.
- C. When the work on the system has been completed and is ready for final review, a visit shall be made by the Owner at which time the Contractor shall demonstrate that the requirements of the Contract as it applies to this system have been carried out and that the system has been adjusted and operated in accordance herewith.

### 1.08 DOCUMENTATION

- A. This Contractor shall furnish to the Owner point-to-point "As Built" wiring diagrams for the lighting control systems. Diagrams must indicate exact mounting location of each system and their devices. This accurate "as built" shall indicate the loads controlled by each relay and the identification number for that relay, placement of switches and location of photocell. Original shall be given to Owner, copies placed inside the door of each LCP.
- B. This Contractor shall furnish to the Owner, four (4) sets of factory operation and

maintenance manuals. These manuals shall include factory service manuals with complete parts lists, wiring and component schematics including circuit diagrams, programming forms with complete information and all other information necessary for the proper operation, service, and maintenance of the lighting control systems.

#### 1.09 TRAINING

- A. This Contractor shall furnish four (4) hours of technical service training to the Owner's technical staff using the factory operation manuals previously specified.
- B. This Contractor shall furnish four (4) hours of operating and programming training to the Owner's operating staff to be scheduled at the Owner's convenience during the warranty period.
- C. All training specified herein shall be performed by a factory certified technician.

#### 1.10 WARRANTY

- A. This Contractor shall deliver the work in first-class operating condition in every respect. This Contractor shall also warrant that the material, equipment, and workmanship furnished shall be entirely free from defects. Any materials, equipment, or workmanship in which defects may develop before or during the warranty period shall be repaired or replaced at the Contractor's own expense. Refer to SECTION 01740 for the start of the warranty period. This Contractor shall further warrant that all material, equipment, and workmanship used in the installation, but not specifically mentioned in the Drawings and Specifications, is the best of their respective kinds and that the construction and installation was performed in accordance with the best accepted standard practices in all details.

### **PART 2 - PRODUCTS**

#### 2.01 MANUFACTURER

- A. Lighting control systems products shall be manufactured by Acuity Brands Controls (nLight), or as listed herein. Such firms shall be regularly engaged in the manufacture of lighting control equipment and ancillary equipment, of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years. Any product or manufacturer other than those listed in this Specification must be pre-approved in accordance with these Specifications as hereinto described in SECTION 16010.

#### 2.02 SYSTEM ARCHITECTURE

- A. System Architecture
  - 1. System shall have an architecture that is based upon standalone lighting control zones
- B. Distributed System Power, Switching and Dimming Controls

1. Devices shall incorporate one optional Class 1 relay, optional 0-10 VDC dimming output, and contribute low voltage Class 2 power to the rest of the system.
2. Device programming parameters shall be available and configurable remotely from the software and locally via the device push-button.
3. Power packs shall accept 120 or 277 volt VAC and shall be plenum rated.
4. Devices shall be UL listed for load and load types as specified on the plans.

C. Wired Wall Switches, Dimmers, Scene Controllers

1. Wall switches & dimmers shall support the following device options:
  - a. Number of control zones: 1, 2 or 4
  - b. Control types supported: On/Off or On/Off/Dimming

D. Wired Occupancy and Photosensors

1. Sensors shall utilize passive infrared (PIR) or massive dual technology (PDT) to detect both the major and minor motion as defined by NEMA WD-7 standards.
2. Sensing technologies that are acoustically passive, meaning they do not transmit sound waves to any frequency and do not require additional commissioning. Ultrasonic or microwave based sensing technologies may require commissioning due to the active nature of their technology, if factory required.
3. Sensor coverage shall be coordinated with the floor plans. Sensors shall be available in standard and extended range, as well as being available with option for High Bay mounting. All occupancy sensors installed in ceilings above 10 ft. in height shall be the High Bay type.
4. Sensor programming parameter shall be available and configurable remotely from the software and locally via the device.
5. Sensor mounting type shall match project design requirements as shown on the plans.
  - a. Sensors shall have optional features for photosensor/daylight override, dimming control and low temperature/high humidity operations.
6. The system shall support the following types of photocell-based control:
  - a. On/Off: The control zone is automatically turned off if the photocell reading exceeds the defined setpoint and automatically

turned on if the photocell reading is below the defined setpoint. A time delay or adaptive setpoint adjustable behavior may be used to prevent the system from exhibiting nuisance on/off switching.

- b. Continuous Dimming: The control zone automatically adjusts its dimming output in response to photocell readings, such that a minimum light level consisting of both electric light and daylight sources is maintained at the task. The photocell response shall be configurable to adjust the photocell setpoint and dimming rates.

E. Wired Auxiliary Input / Output (I/O) Devices

- 1. Auxiliary Input/Output Devices shall be specified as an input or output device with the following options:
  - a. Contact Closure Input
    - i. Input shall be programmable to support maintained or momentary inputs that can activate local or global scenes and profiles, ramp light level up or down, or toggle lights on/off.
  - b. 0-10V Analog Input
    - i. Input shall be programmable to function as a daylight sensor.
  - c. RS-232/RS-485 Digital Input
    - i. Input supports activation of up to 4 local or global scenes and profiles, and on/off/dimming control of up to 16 local control zones.
  - d. 0-10V Dimming Control Output, Capable of Sinking a Minimum of 20 mA of Current
    - i. Output shall be programmable to support all standard sequence of operations supported by system.

J. Low Voltage Cable

- 1. This Contractor shall furnish and install the required low voltage cable with RJ45 connectors between all switches and panels. The cable shall be UL listed, plenum rated, unshielded, four (4) twisted pairs, No. 24 AWG, Category 6, extended distance, high speed data type with a flame retardant polyvinyl chloride jacket and a temperature range for dry locations of minus ten (10) degrees C to sixty (60) degrees C. A Category 6 cable which meets this specification is BERK-TEK cat. no. 10177147 (pink) or equal as manufactured by AMP, AT&T, BELDEN, THE CABLE COMPANY, GENISIS, HITACHI, MOHAWK, NORTHERN

TELECOM, OPTICAL CABLE CORP., PAIGE, or SUPERIOR.

2. Refer to Specification Section 16506 for low voltage three (3) conductor, No. 18 AWG, plenum rated wiring between lighting control panels and occupancy sensors.
3. Low voltage wiring for connections to photocells and contact closure switches to micro relay panels shall be three (3) conductors, No. 18 AWG, plenum rated with a temperature range for dry locations of minus ten (-10) degrees C to sixty (60) degrees C. A cable that will meet this specification is WEST PENN Cat. No. 25234B or equal by CONSULATED WIRE, GENERAL CABLE, PAIGE or TAPPAN.

### **PART 3 – EXECUTION**

#### **3.01 EQUIPMENT INSTALLATION**

##### **A. Digital Switches**

1. Provide outlet boxes, single or multi-gang as shown on the Drawings for the low voltage digital switches. All digital switches shall be ivory in color. Provide type 302 stainless steel coverplate for all switches. Provide labeling as indicated on the Drawings.

##### **B. Digital Occupancy Sensor**

1. It shall be the Contractor's responsibility to provide the quantity of occupancy sensors required for complete and proper volumetric coverage to completely cover the controlled areas. Rooms shall have ninety (90) to one hundred (100) percent volumetric coverage to completely cover the controlled areas to accommodate tall occupancy habits of single or multiple occupants at any location within the rooms. Proper judgement must be exercised in executing the work so as to ensure the best possible installation in the available space and to overcome local difficulties due to space limitations, interference of structural components, or furnishings in the room or spaces. The locations and quantities of sensors shown on the Drawings are based on coverage patterns of nLight (Acuity) sensors. Sensors of other approved manufacturers may require different quantities of sensors for full coverage of spaces being controlled. The sensors shown on the Drawings are diagrammatic and do not necessarily show the exact locations of the sensors. This Contractor shall confirm with the occupancy sensor's manufacturer the exact quantities of sensors and power packs at time of bid. This Contractor shall provide additional sensors if required to properly and completely cover the respective rooms at no additional cost to the Owner.
2. Digital wall switch type occupancy sensors shall be installed in a suitable wall outlet box in a method recommended by the equipment manufacturer similar to a standard line voltage light switch.

3. Low voltage occupancy sensors shall be securely mounted to a ceiling or wall mounted junction box in a method recommended by the sensor manufacturer. Ceiling mounted junction boxes shall be supported from the building structure with no less than one (1) ¼" threaded rod. Sensors shall be wired as detailed on the Drawings and as recommended by the equipment manufacturer.
4. Power packs shall be located in accessible ceiling spaces and securely mounted to a standard electrical enclosure (junction box) through a standard ½" chase nipple. Each power pack shall be mounted to individual junction box. Power pack/junction box shall be labelled for easy identification. Plastic clips into the junction box shall not be acceptable. Junction box shall be supported from the building structure with no less than one (1) ¼" threaded rod. All Class 1 wiring shall pass through the chase nipple into the junction box without any exposure of wire leads. Low voltage Class 2 wiring to the sensors shall not be exposed in finishing spaces. Power packs shall be wired as detailed on the Drawings and as recommended by the equipment manufacturer.
5. Location of power packs shall be identified on the ceiling grid.
6. Supports shall not terminate or be fastened directly to the roof decking except where specifically approved by the Owner.

#### C. Wiring

1. All vertical wiring for the Lighting Control Systems shall be installed by this contractor in conduit and/or surface metal raceway as shown on the Drawings.
2. All horizontal wiring for the lighting control systems to be installed in areas without a ceiling or in areas without an accessible ceiling shall be installed by the Contractor in conduit sized for maximum 40% fill, but not less than ½" trade size.
3. All horizontal wiring for the lighting control systems to be installed in areas with accessible ceilings shall be installed by this Contractor and run exposed above the ceiling. Cables shall be supported by 'J' hooks to be dedicated to the wiring specified in this Specification section.
4. All horizontal wiring for the lighting control systems shall be installed below the roof/floor structural supports (joist, beams, girders, etc). Wiring installed between the structural supports mentioned above and the roof or floor deck will not be acceptable.
5. All horizontal wiring penetrations for the lighting control systems through new and/or existing walls shall be sleeved. Minimum sleeve size shall be ¾ inch. All sleeves shall be bushed on both sides. Cables pulled through sleeves without bushings, cut bushings, or wrapped with tape will not be accepted and shall be replaced by the Contractor.



6. All wiring for the lighting control systems in millwork or casework only shall be installed in flexible metal conduit, complete with an additional 200-pound pull string.
7. All wiring for the lighting control systems shall be furnished and installed by this Contractor as hereinbefore specified and as shown on the Drawings. All junction box covers shall be stenciled for distinct identification.
8. All low voltage RJ45 wiring connections shall be made by this Contractor as detailed on the Drawings using the 568A data only configuration. Cables shall be run free of splices from the equipment enclosures to the outlets.
9. All wiring shall be checked and tested by this contractor to ensure the system is free from grounds, opens and shorts. This Contractor shall provide test results for low voltage cables associated with lighting control systems.
10. Do not mix low voltage and high voltage conductors in the same conduits.
11. Ensure low voltage conductors, conduits or control wires do not run within four (4) inches parallel to current carrying conduits or cables.
12. Place manufacturer supplied 'terminators' at each end of the system bus per manufacturer's instructions.
13. Neatly lace and rack wiring in cabinets.
14. Plug Category 5e cable in all the indicated RJ45 port provided at each network lighting control device, per manufacturer's instructions.
15. Do not exceed 300 ft-wire length for the system bus.
16. All items on the bus shall be connected in sequence (daisy chained). Star and spur topologies are not acceptable.

### 3.02 INSTALLATION AND SET-UP

- A. Contractor shall test all low voltage cable for integrity and proper operation.
- B. Unused openings in the cabinets shall be effectively closed.
- C. Lugs shall be suitable and listed for installation with the conductor being connected.
- D. Follow the manufacturer's torque values to tighten lugs.
- E. Follow manufacturer's instructions for installation and for all low voltage wiring.

- F. This Contractor shall tag the cable at either end at the connection point. Label with the lighting control panel designation and room number designation. 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.
- G. Power relay packs shall be securely mounted to a junction box through a threaded ½" chase nipple. Plastic clips into the junction box shall not be accepted. All Class 1 wiring shall pass through the chase nipple into the adjacent junction box without exposing of wire leads.

### 3.03 SERVICE, SUPPORT AND COMMISSIONING

- A. Preconstruction: Factory technician or factory trained rep shall meet with FCPS representative and Electrical Contractor to review project submittals, system requirements, and wiring best practices. Contractor shall coordinate meeting between all parties prior to start of construction.
- B. Start Up: This Contractor shall contact the system manufacturer at least 7 days before activation of the system.
- C. Upon completion of the installation of the entire lighting control system and prior to the substantial completion of the project, this Contractor shall have the system commissioned by an authorized system manufacturer's representative. This Contractor shall be responsible for participation and coordination within the commissioning process including but not limited to:
  - 1. Verify proper installation and performance of the lighting control system.
  - 2. Manipulate the lighting control systems to facilitate verification and performance testing.
  - 3. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the Owner.
  - 4. Address current A/E punchlist items before functional testing.
  - 5. Correct deficiencies (differences between specified and observed performance) as interpreted by the CA, Owner and A/E and retest the equipment.

### 3.04 CLEANING

- A. Remove debris from the lighting control panels, wipe dust and dirt from all components, and repaint marred surfaces with touch-up paint to match the original finish.
- B. Clean photocell lens as recommended by manufacturer.

- C. Clean all switch faceplates.

### 3.05 ON-SITE AS-BUILT DRAWINGS

- A. The Contractor shall provide one (1) set of the as-built lighting floor plans (including site lighting plans associated with this lighting control system) and one (1) set of the lighting control system supplier's point-to-point as-built wiring diagrams and supporting drawings as hereinbefore described for permanent use on-site. The Contractor shall: laminate each page of these drawings; provide a rigid means for mounting such as 1/4 inch thick x two (2) inch wide x width of the drawings through-bolted wood along the left edge of the drawings; furnish and install hanging hooks on the back of the main communication room door; and hang the bound set of drawings.

END OF SECTION

## SECTION 16506

### LIGHTING OCCUPANCY SENSORS

#### 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 a complete operational occupancy sensor based lighting control system as shown on the Drawings, as detailed in the manufacturer's submittal and as herein specified.
- B. Work described in this section shall be coordinated with all applicable plans and specifications, including but not limited to, interfacing with microprocessor based lighting control systems, wiring, raceways, boxes and fittings, luminaires, and HVAC systems.

##### 1.03 QUALITY ASSURANCE

- A. Occupancy sensors shall conform to the requirements of the National Electrical Code (NEC), state and local codes, and these Specifications.
- B. All components shall be listed by Underwriter's Laboratories, Inc. (UL) for their intended use and shall bear the UL label.
- C. Products supplied shall be from a single manufacturer that has been continuously involved in manufacturing of occupancy sensors for a minimum of five (5) years. Mixing of manufacturers shall not be allowed.
- D. Products shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rating of less than 1/3 of 1%.
- E. Wall switch products must be capable of withstanding the effects of inrush current. Submittals shall clearly indicate the method used.

##### 1.04 SUBMITTALS

- A. Submittals are required in accordance with SECTION 16010 of these specifications. Submittals shall include, but not be limited to (comma) the following for review. Submittals not containing all of the information listed below will be rejected.

- 1. Manufacturers shall substantiate conformance to this specification by

providing the necessary documents, performance data and wiring diagrams. Any deviations to the specifications must be clearly stated by letter and submitted.

2. Submit a scaled building lighting plan (minimum size of 1/16" = 1'-0") clearly marked by the manufacturer showing proper product, location and orientation of each sensor and power pack (switch pack). Plans shall show detection coverage patterns. If necessary for clarity, provide a 1/8" = 1'-0" scaled plan or one plan with coverage areas shown and another plan with the other information shown. Illegible drawings will be rejected.
3. Submit interconnections diagrams per major subsystem and interfacing with lighting control panels (LCP) [Refer to SECTION 16500, showing proper wiring].
4. Submit standard catalog literature which includes performance specifications indicating compliance to the specification.
5. Catalog sheets must clearly state any load restrictions when used with electronic ballasts.

#### 1.05 SYSTEM DESCRIPTION

- A. The objective of this specification section is to ensure the proper installation of the occupancy sensor based lighting control system so that lighting is turned off automatically after reasonable time delay when a room or area is vacated by the last person to occupy said room or area.
- B. The occupancy sensor based lighting control shall accommodate all conditions of space utilization and irregular work hours and habits.

#### 1.06 SYSTEM TEST AND ACCEPTANCE

- A. Prior to the Architect/Engineer's final site visitation and acceptance of each construction phase, this Contractor shall conduct a complete operation test of each system including each device. The systems shall test free from grounds, shorts, and other faults. All connections shall be thoroughly checked for mechanical and electrical connection. All equipment shall be demonstrated to operate in accordance with the requirements set forth in these Specifications and as shown on the Drawings.
- B. This Contractor shall perform all tests in the presence of the Owner. This Contractor shall furnish all personnel for use in the tests.
- C. When the work on the system has been completed and is ready for final review, a visit shall be made by the Owner at which time the Contractor shall demonstrate that the requirements of the Contract as it applies to this system have been carried out and that the system has been adjusted and operated in accordance herewith.

#### 1.07 Training

- A. Upon completion of the project, the Contractor and manufacturer's factory authorized representative shall provide a minimum of four (4) hours of training to familiarize the Owner with the operation, use, adjustment, and problem solving diagnosis of the occupancy sensing devices and systems.

#### 1.08 WARRANTY

- A. This Contractor shall warrant all equipment furnished in accordance with this specification to be undamaged, free of defects in materials and workmanship, and in conformance with these Specifications. The warranty shall include repair or replacement, and testing without charge to the Owner on all or any parts of equipment which are found to be damaged, defective or non-conforming. There shall be no deductibles applied to such warranty. Satisfactory warranty documents shall be furnished. Refer to SECTION 01740 WARRANTIES AND BONDS.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. The lighting occupancy sensors shall be manufactured by SENSORSWITCH, as listed or equal by GREENGATE (COOPER CONTROLS), HUBBELL, or WATTSTOPPER.
- B. The listing of any manufacturer as "equal" does not imply automatic approval. This Contractor shall ensure submittals made are for sensors and associated equipment which meet or exceed the specifications included herein.

#### 2.02 LIGHTING OCCUPANCY SENSORS

- A. Occupancy sensors shall consist of, but not be limited to the following:
  - 1. Sensing technology shall be passive infrared (PIR), MicroPhonics (or ultrasonic), dual technology having both PIR and MicroPhonics (or ultrasonic).
  - 2. Passive infrared sensors shall provide high immunity to false triggering from RFI (hand-held radios) and EMI (electrical noise in the line). The PIR sensors shall have a multiple segmented Fresnel lens, in multi-tier configuration, with grooves-in to eliminate dust and residue build-up.
  - 3. MicroPhonics shall be used in conjunction with PIR (passive infrared) sensing technology to enable a sensor to provide dual-technology sensing that is completely passive. MicroPhonics shall detect an occupant by detecting leading edge noises typical of human activity while filtering out building noises. The MicroPhonic sensing circuitry shall have automatic gain control to dynamically adapt to the sensor to its environment allowing it to filter out background noise.

4. Ultrasonic sensors shall be able to adjust the detection threshold dynamically to compensate for constantly changing levels of activity and air flow throughout controlled spaces. Ultrasonic operating frequency shall be crystal controlled at 32 kHz within  $\pm 0.002\%$  tolerance, or 40 kHz within  $\pm 0.002\%$  tolerance to assure reliable performance and eliminate sensor cross-talk. Sensors using multiple frequencies are not acceptable.
  5. Dual technology sensors shall consist of PIR and MicroPhonics (or ultrasonic) technologies for occupancy detection.
  6. All sensors shall be capable of operating normally with electronic ballasts, PL lamp systems and rated motor loads.
  7. Coverage of sensors shall remain constant after sensitivity control has been set. No automatic reduction shall occur in coverage due to the cycling of air conditioner or heating fans.
  8. All sensors shall have readily accessible, user adjustable settings for time delay and sensitivity. Settings shall be located on the sensor (not the control unit) and shall be recessed to limit tampering. Time delay shall be set to 10 minutes for all sensors.
  9. In the event of failure, a bypass manual override shall be provided on each sensor. When bypass is utilized, lighting shall remain on constantly or control shall divert to a wall switch or lighting control panel until the sensor is replaced. This control shall be recessed to prevent tampering.
  10. All sensors shall provide an LED as a visual means of indication at all times to verify that motion is being detected during both testing and normal operation.
- B. Ceiling mounted room occupancy sensors shall be low voltage dual technology type consisting of passive infrared (PIR) and MicroPhonic (or ultrasonic) technologies with 360° coverage for large classrooms, open office spaces or areas up to 1600 square feet; SENSORSWITCH Model CM PDT 10. Sensors shall operate on 12 to 24 VAC or VDC and NEC Class 2 wiring. Each sensor shall be complete with one (1) power pack or two (2) power packs for rooms requiring two (2) lighting branch circuits. Rooms requiring multiple sensors may only require one (1) power pack for multiple sensors, where shown on the Drawings. Sensors shall also be equipped with an additional isolated relay.
1. Occupancy sensors shown on the Drawings to be powered from a lighting control panel generally will not require a power pack.
- C. Ceiling mounted (or wall mounted where shown on the Drawings) room occupancy sensors shall be low voltage dual technology type consisting of passive infrared (PIR) and MicroPhonics (or ultrasonic) technologies for directional one-way coverage for classrooms, offices or areas up to 1000 square feet; SENSORSWITCH Model WV PDT 16. Sensors shall operate on 12 to 24 VAC or VDC and NEC Class 2 wiring. Each sensor shall be complete with one (1) power pack or two (2) power packs for rooms requiring two (2) lighting branch

circuits. Rooms requiring multiple sensors may only require one (1) power pack for multiple sensors, where shown on the Drawings. Sensors shall also be equipped with an additional isolated relay.

### 2.03 POWER PACKS AND AUXILIARY RELAY PACKS CONTROL UNITS

- A. Power packs shall accept 120 or 277 volts, be plenum rated, and provide Class 2 power to a minimum of two (2) occupancy sensors. Power packs shall be able to externally mount through a 1/2" knock-out on a standard electrical enclosure (junction box) and be an integrated, self-contained unit consisting internally of an isolated load switching control relay (load rated 20 amperes at 120 or 277 volts) and a transformer to provide low voltage power; SENSORSWITCH Model PP 20. Power pack shall provide a minimum of 150mA at 15 VDC to drive occupancy sensors and auxiliary relay packs.
- B. Power packs shall use zero-cross circuitry to detect when the sine wave crosses at the "zero-point" so as to minimize wear on the switching contact.
- C. Auxiliary relay packs shall be the same self-contained type unit as the power pack hereinbefore described, except shall not include a transformer; SENSORSWITCH Model SP 20. The auxiliary relay pack shall be used to control another lighting load with a different line voltage than the power pack. Auxiliary relay packs shall be powered from a power pack with 15 VDC.

### 2.05 WIRING

- A. Low voltage wiring between occupancy sensors and power packs shall be three (3) conductor, No. 18 AWG, unshielded, plenum rated with a temperature range for dry locations of minus ten (10) degrees C to sixty (60) degrees C. A cable that will meet this specification is WEST PENN Cat. No. 25234B.
- B. Low voltage wiring between occupancy sensors and lighting control panels (LCP) shall be three (3) conductor, No. 18 AWG, unshielded, plenum rated with a temperature range for dry locations of minus ten (10) degrees C to sixty (60) degrees C. A cable that will meet this specification is WEST PENN Cat. No. 25234B.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. It shall be the Contractor's responsibility to provide the quantity of occupancy sensors required for complete and proper volumetric coverage to completely cover the controlled areas. Rooms shall have ninety (90) to one hundred (100) percent volumetric coverage to completely cover the controlled areas to accommodate all occupancy habits of single or multiple occupants at any location within the rooms. Proper judgment must be exercised in executing the work so as to ensure the best possible installation in the available space and to overcome local difficulties due to space limitations, interference of structural



components, or furnishings in the rooms or spaces. The locations and quantities of sensors shown on the Drawings are based on coverage patterns of SENSORSWITCH sensors. Sensors of other approved manufacturers may require different quantities of sensors for full coverage of spaces being controlled. The sensors shown on the drawings are diagrammatic and do not necessarily show the exact locations of the sensors. This Contractor shall confirm with the occupancy sensors' manufacturer the exact quantities of sensors and power packs at time of bid. This Contractor shall provide additional sensors if required to properly and completely cover the respective rooms at no additional cost to the Owner.

- B. Low voltage occupancy sensors shall be securely mounted to a ceiling or wall mounted junction box in a method recommended by the sensor manufacturer. Ceiling mounted junction boxes shall be supported from the building structure with no less than one (1) ¼" threaded rod. Sensors shall be wired as detailed on the Drawings and as recommended by the equipment manufacturer.
- C. Power packs shall be located in accessible ceiling spaces and securely mounted to a standard electrical enclosure (junction box) through a standard 1/2" chase nipple. Plastic clips into the junction box shall not be acceptable. Junction box shall be supported from the building structure with no less than one (1) ¼" threaded rod. All Class 1 wiring shall pass through the chase nipple into the junction box without any exposure of wire leads. Low voltage Class 2 wiring to the sensors shall not be exposed in finished spaces. Power packs shall be wired as detailed on the Drawings and as recommended by the equipment manufacturer.
- D. Supports shall not terminate or be fastened directly to the roof decking except where specifically approved by the Owner.
- E. Wiring:
  - 1. All low voltage field wiring in finished and unfinished spaces shall be installed by this Contractor in 1/2-inch conduit and/or surface metal raceway as shown on the Drawings or hereinbefore specified elsewhere. Conduit fill shall not exceed the conduit space capacity.
  - 2. All low voltage field wiring to be installed in areas without a ceiling or in areas without an accessible ceiling shall be installed by this Contractor in 1/2-inch conduit.
  - 3. All low voltage field wiring to be installed in areas with accessible ceilings shall be installed by this Contractor bundled together and run exposed above the ceilings. Bundles shall be supported by "J" hooks mounted not more than four (4) feet on center. "J" hooks shall be dedicated to the wiring specified in this specification section.
  - 4. All low voltage field wiring shall be run at right angles to the building structure.
  - 5. All low voltage field wiring shall be installed below the roof/floor structural

supports (joists, beams, girders, etc.). Wiring installed between the structural supports mentioned above the roof or floor deck will not be acceptable.

6. All low voltage field wiring penetrations through new and/or existing walls shall be sleeved. Minimum sleeve size shall be one (1) inch. All sleeves shall be bushed both sides.
  7. All low voltage field wiring for the occupancy sensor systems shall be furnished and installed by this Contractor. All junction box covers shall be stenciled for distinct identification.
  8. All wiring connections shall be made by this Contractor as shown on the Drawings and as recommended by the equipment manufacturer. Splices shall be made only in junction boxes.
  9. All occupancy sensor system wiring shall be checked and tested by this Contractor to ensure the system is free from grounds, opens, and shorts.
  10. Contractor shall test all low voltage cable for integrity and proper operation of the system.
- G. The Contractor shall arrange a pre-installation meeting with the occupancy sensors manufacturer's factory authorized representative, at the project facility to verify proper placement of sensors and installation criteria.

### 3.02 TESTING

#### A. Sensor Testing and Adjustment:

1. At the time of installation, the Contractor shall be responsible for testing and adjusting each sensor for proper detection of motion appropriate to room usage. The Contractor shall follow the testing and adjustment procedures as written in the installation instructions for each sensor model. **Note: Due to room conditions it may be necessary for the Contractor to make adjustments, change the location or type of sensor to obtain proper operation and coverage of the system in each room and should therefore make labor and material allowances for such changes and adjustments.**

END OF SECTION

## SECTION 16512

### INTERIOR L.E.D. AND EXIT LIGHTING

#### 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 light-emitting diode (L.E.D.) luminaires (lighting fixtures) complete as shown on the Drawings, as described in the "Luminaire (Lighting Fixture) Schedule", and as herein specified.

##### 1.03 QUALITY ASSURANCE

- A. This Contractor shall provide luminaires that are of a manufacturer engaged in the production of luminaires that are equal in material, design and workmanship. The manufacturer's luminaire shall have been in satisfactory commercial or industrial use for a minimum of three (3) years. The manufacturer's luminaire shall have been available on the commercial market during the three (3) year period.
- B. L.E.D. luminaires shall conform to the requirements of the National Electrical Code (NEC), state and local codes, and these Specifications.
- C. The luminaires shall be listed by Underwriters Laboratories, Inc. (UL) or listed by a nationally recognized testing laboratory acceptable to Fairfax County DPWES.
- D. Submittals are required in accordance with SECTION 16010 of these Specifications.

##### 1.04 DESCRIPTION

- A. This Contractor shall furnish, assemble, and install L.E.D. luminaires complete with sockets, louvers, lenses, internal wiring, leads, trims, rings, frames, hangers, straps, reflectors, light engine, and power supply unit (driver) as applicable and required for a complete installation.
- B. Luminaires that require remote mounting of any components needed for its operation, such as drivers, or light engine electronics are not permitted. All components needed to make the luminaire operational shall be integral to the luminaire housing.

##### 1.05 WARRANTY

- A. This Contractor shall deliver the work described herein in a first class operating condition in every respect. This Contractor shall also warrant that the material and workmanship shall be entirely free from defects. Any materials, equipment, or workmanship in which defects may develop before or during the warranty period shall be repaired or replaced at the Contractor's own expense. Refer to SECTION 01740 for the start of the warranty period. The Contractor shall further warrant that all material, equipment, and workmanship used in the installation, but not specifically mentioned in the Drawings and Specifications, is the best of their respective kinds and that the construction and installation was performed in accordance with the best accepted standard practices in all details.

## PART 2 - PRODUCTS

### 2.01 MATERIALS AND COMPONENTS

- A. The L.E.D. luminaires supplied shall have the proper trim, frames, mounting devices, configuration, and accessories necessary to be properly installed in the building construction. Catalog numbers of luminaires in the "Luminaire Schedule" or "Lighting Fixture Schedule" on the Drawings are to establish a type of luminaire and not to determine a method of mounting.
1. Catalog numbers scheduled on the Drawings may indicate luminaire compatibility with certain types of ceiling construction. The Contractor shall determine exact type of ceilings actually to be furnished in each area and shall obtain luminaires to suit, deviating from specified catalog numbers or descriptions only where necessary, and only to the extent necessary to ensure luminaire-ceiling compatibility. The Contractor shall notify the Architect/Engineer and Owner in writing where such changes are to be made.
- B. Where L.E.D. luminaires are specified on the Drawings to be complete with a flat diffusing lens, the lens shall be virgin acrylic Type 19 pattern with a minimum thickness of 0.156 inches unless otherwise shown on the Drawings.
- C. When L.E.D. luminaires are specified on the Drawings to be complete with a curved or rounded lens refractor/diffuser, the lens shall be impact resistant 100% virgin acrylic type with diffusing optical film.
- D. Double lock nuts shall be used at the load bearing ends of threaded pipe used as part of a stem mounting assembly.

### 2.02 POWER SUPPLY UNIT (DRIVERS)

- A. Luminaires shall be equipped with an L.E.D. driver(s) that accepts the voltage as indicated on the "Luminaire (Lighting Fixture) Schedule". Individual driver(s) shall be replaceable.

- B. Driver(s) shall be UL8750 class 2 compliant for their intended purpose.
- C. Total harmonic distortion (THD) for current:  $\leq 20\%$
- D. Driver(s) shall be rated to operate between  $-30^{\circ}\text{C}$  to  $50^{\circ}\text{C}$  minimum.
- E. Individual driver(s) shall be equipped with surge protection (2kV minimum) in accordance with IEEE/ANSI C62.4.1. Driver shall be protected against damage due to either an open circuit or short circuit fault condition on the driver output.
- F. Driver(s) shall have a minimum efficiency of 85%.
- G. Drivers shall deliver dimming to 1% light output from 0-10V control signal.

#### 2.03 L.E.D. LIGHT SOURCE (LIGHT ENGINE)

- A. Individual light engine(s) shall be replaceable.
- B. L.E.D. light engine(s) shall have a minimum lifetime of 50,000+ hours at  $25^{\circ}\text{C}$  and shall have a minimum efficiency of 80 lumens per watt.
- C. L.E.D. dies shall be tested in accordance with I.E.S.N.A. LM-80-08 standards.
- D. Thermal management shall be passive by design and shall consist of heat sinks with no fans, pumps, or liquids.

#### 2.04 SPARE PARTS

- A. The Contractor shall furnish to the Owner at the completion of the project, a minimum of 5% spare L.E.D. driver assemblies. LED drivers shall be turned over to the Owner representative in their manufacturer's protective packaging. LED drivers not in their protective packaging will not be acceptable.
- B. The Contractor shall furnish to the Owner at the completion of the project, a minimum of 5% spare L.E.D. light engine assemblies. LED light engines shall be turned over to the Owner representative in their manufacturer's protective packaging. L.E.D. light engines not in their protective packaging will not be acceptable.

#### 2.05 EXIT LIGHTS

- A. Exit lights (signs) shall be universal mount and complete with factory installed light-emitting diodes (L.E.D.s) mounted behind a red diffusing panel and with direction arrows as shown on the Drawings.
- B. Exit lights shall have wire guards where shown on the Drawings.
- C. For exit signs mounted at curtain walls, refer to drawings and light fixture

schedule for additional requirements.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION**

- A. L.E.D. luminaires (lighting fixtures) shall be installed as shown on the Drawings and in accordance with the manufacturer's recommendations.
- B. Recessed lay-in type linear L.E.D. luminaires shall be supported from the building structure independently of the ceiling grids with a minimum of four (4) steel tie wires per luminaire or as detailed on the Drawings.
- C. Recessed lay-in type linear L.E.D. luminaires installed in lay-in type ceiling tile shall be securely fastened from the building structure and be installed in the lay-in type ceiling in such a manner that the louver/lens housing may be easily opened and so that the luminaires may be removed and relocated without forcing the luminaires or changing the grid system tie wires. This Contractor shall coordinate with the ceiling installer before the ceiling grid is installed to ensure a mutually satisfactory installation of ceiling and luminaires.
- D. 1-1/2 inch x 1-1/2 inch steel framing channel shall be used where required to span bar joists and otherwise facilitate structural support for luminaires and exit lights.
- E. Ceiling grid layouts when indicated on the electrical Drawings are for convenience only. This Contractor shall coordinate the luminaires layout with the Architect/Engineer and all other trades before the ceiling grid, air outlets, and luminaires are installed.
- F. L.E.D. luminaires installed in mechanical room and other similar equipment rooms shall be located in the field to clear all obstructions such as ducts, piping, bracing, and supports. Where the location of luminaires shown on the Drawings must be radically changed, approval from the Architect/Engineer shall be obtained before the luminaire is placed.
- G. Pendant mounted luminaires and exit lights shall be located to avoid mechanical systems, ductwork, piping, structural members, and the like.
- H. Supports shall not terminate or be fastened directly to the roof decking.

#### **3.02 GENERAL CONFORMANCE**

- A. Recessed luminaires shall not have gaps between the luminaire trim and the adjacent surface. Where light leaks occur, suitable gaskets shall be furnished and installed.
- B. Install luminaires level, plumb and true. Align rows accurately in three (3) dimensions.

- C. Recessed luminaires shall be connected with flexible metal conduit or MC Cable (maximum 6'-0" length) from outlet boxes mounted above or alongside of luminaire. Luminaires shall be wired in such a way that removal of one shall not disrupt the continuity of power to the others.
- D. Prior to final inspection, this Contractor shall check all L.E.D. luminaires for damages during construction and replace the damaged luminaires where necessary at no additional expense to the Owner. All luminaires shall be cleaned at the time of final acceptance of the building.

END OF SECTION

## SECTION 16610

### FIRE DETECTION AND ALARM SYSTEM

#### PART 1 - GENERAL

##### 1.01 REQUIREMENTS

- A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

##### 1.02 SCOPE

- A. The work covered under this Section shall include engineering, designing, testing, furnishing and installing a complete and operable addressable type analog fire detection and alarm system shown on the Drawings and herein specified. The system shall include, but not be limited to: control panel including backbox; remote graphic annunciator panel including backbox; alarm initiating and indicating peripheral devices; outlet boxes; conduit; line and low voltage wiring; and all accessories required.
- B. The existing fire detection and alarm system shall remain in operation throughout construction.

##### 1.03 QUALITY ASSURANCE

- A. All devices and equipment for this system shall be listed by the Underwriter's Laboratories, Inc. (UL), bear the UL label and shall conform to the applicable sections of National Fire Protection Association (NFPA) 72 and 90A, and the Americans with Disabilities Act (ADA) Code of Federal Regulation.
- B. The installation shall be in accordance with all requirements of NFPA, the National Electrical Code (NEC), all state and local codes and requirements, and these Specifications.
- C. This Contractor shall furnish shop drawings submittals for all components of this system in accordance with SECTION 16010 of these specifications. Submittals shall include the following for review. Submittals not containing all of the information listed below will be rejected.
  - 1. A complete list by model number of each component of the system with a statement of how many pieces of each model are to be furnished and a listing of the specific data sheet.
  - 2. A description of the system as it functions by component in the system using model numbers where applicable.
  - 3. A complete battery calculation listing by module for the system.
  - 4. A data sheet shall be furnished for each component of the system. The



- specific information shall be highlighted.
5. A detailed drawing of the control panel shall be furnished showing all modules in their specific location with the specific terminal terminations shown.
  7. A detailed drawing shall be furnished of each type of device showing the exact terminal designations.
  8. A detailed list shall be furnished of each type of device in the system stating its program function in the system.
  9. A detailed list shall be furnished of the relays in the system and their program function.
- D. Following review of the submittals by the Architect/Engineer and Owner, and prior to release of the fire alarm equipment, this Contractor shall submit to the Fairfax County Fire Marshal's office all copies of the corrected submittals for review, comment, and approval. This contractor shall not release any equipment prior to receiving the Fairfax County Fire Marshal approved shop drawing. This contractor shall be responsible for paying all fees associated with the Fire Marshal's review.
- E. The installation of all equipment and the final connection of all components and wiring shall be performed under the direct supervision of the system manufacturer's technical staff.
- F. Upon completion, the system shall be thoroughly tested by this Contractor to ensure proper interfacing of all components.
- G. Prior to final inspection, this Contractor shall furnish to the prime Contractor, five (5) copies of the manufacturer's submittal drawings up-dated to reflect: any and all revisions to the system made during construction; and the final addresses of all devices. A printed list of system devices, which will include the following: device type, address, and custom message.
- H. The equipment to be furnished by this Contractor under these Specifications shall be the standard product of one manufacturer. Acceptable manufacturers shall be engaged in the manufacture of multiplexed fire alarm equipment for at least seven (7) years and have a fully equipped, factory trained and authorized service organization that will have a response time of four (4) hours or less to the job site. The provided manufacturers' equipment for this project shall be compatible with the existing GE EST-3 Fire Alarm Control Panel.
- I. The fire detection and alarm system shall be furnished by a factory authorized distributor certified to design, program, and service the system. This distributor must show evidence of successfully furnishing systems as specified for at least five (5) years. This distributor shall provide twenty four (24) hour, seven (7) day a week (including holidays) service capability with a maximum four (4) hour

response time. This distributor shall provide certification of this capability as part of the submittals.

#### 1.04 DESCRIPTION OF SYSTEM

- A. This project will alter the existing addressable fire alarm notification system in the building to the extent shown on the drawings. This will include the addition of visual and audible devices in the two Classrooms shown. The existing fire alarm control panel in the building is a GE EST-3 FACP.

#### 1.05 TESTING

- A. Upon final completion of the installation, and acceptance of each construction phased space, and after satisfactory pre- testing of the system by this Contractor in the presence of the equipment supplier, this Contractor shall perform FCPS fire alarm testing of the system in the presence of the FCPS Technical Inspector(s) and after satisfactory completion of testing in their presence, further testing shall be done in presence-of-Fire Marshal, Owner, and other authorities having jurisdiction.

#### 1.06 WARRANTY

- A. This Contractor shall deliver the work described herein in a first-class operating condition in every respect. This Contractor shall also warrant that the material, equipment, and workmanship furnished shall be entirely free from defects. Any materials, equipment, or workmanship in which defects may develop before or during the warranty period shall be repaired or replaced at the Contractor's own expense. The contractor shall further warrant that all material, equipment, and workmanship used in the installation, but not specifically mentioned in the Drawings and Specifications, is the best of their respective kinds and that the construction and installation was performed in accordance with the best accepted standard practices in all details.
- B. It is the intention of this Specification that a complete life-safety system be furnished from a single manufacturer. Equipment shall be UL listed for fire alarm use.
- C. The warranty shall commence after the complete testing and acceptance by Fire Marshal, Fairfax County on the final completion of the project.

#### 1.07 INSTRUCTION AND MANUALS

- A. The equipment manufacturer shall provide two (2) hours of instruction to the Owner's maintenance personnel and shall furnish three (3) complete field service manuals.

#### 1.08 SPARE PARTS

- A. This Contractor shall furnish to the Owner spare parts as follows. Spare parts

shall be furnished prior to the installation of the system.

1. Two (2) audio/visual alarm signals.

## **PART 2 - PRODUCTS**

### **2.01 INTELLIGENT PERIPHERAL REQUIREMENTS**

- A. This Contractor shall furnish and install intelligent devices as shown on the Drawings and herein specified. All remote intelligent devices shall have a microprocessor with non-volatile memory to support their functionality and serviceability. Each device shall store as required for its functionality the following data: device serial number; device address; device type; personality code; date of manufacture; hours in use; time and date of last alarm; amount of environmental compensation left/used; last maintenance date; job/project number; current detector sensitivity values; diagnostic information (trouble codes); and algorithms required to process sensor data and perform communications with the loop controller. Each device shall be capable of electronic addressing either automatically or application programmed assigned, to support physical/electrical mapping and supervision by location. Setting a device's address by physical means shall not be necessary.

### **2.02 WALL MOUNTED AUDIO/VISUAL ALARM SIGNALS**

- A. This Contractor shall furnish and install wall mounted electronic alarm signals as shown on the Drawings and herein specified. The alarm signals shall be of solid-state construction and shall produce a temporal horn sound output of 94.5 dBA avg. and 97.6 dBA peak at ten (10) feet. The strobes shall be selectable to produce a minimum of 15, 30, 75 or 110 candela effective intensity as shown on the drawings. The flash rate shall not exceed three (3) flashes per second nor be less than one (1) flash every three (3) seconds. This Contractor shall furnish and install wall mounting styles for surface, semi-flush, or flush installation as shown on the Drawings. Alarm signals shall be complete with screw terminals for in-out field wiring of up to No. 12 AWG conductors and a red finish.
- B. Audio/visual alarm signals shall be listed to: UL 1971; UL 1638; UL 464; ULC S525 and S526; ADA Chapter 28, Part 36 Final Rule; and NFPA 72.
- C. All audio/visual alarm signals shall be UL listed for fire protective service.
- D. Audio/visual alarm signals shall be capable of operating from standard signaling circuits or from addressable intelligent signal modules.
- E. Audio/visual alarm signals in areas noted on the Drawings shall be installed complete with wire guards furnished and installed by this Contractor. The wire guards shall be listed for use with the appliance as per NFPA 72.

- F. The wall mounted audio/visual alarm signals, which meet this Specification, are EST Model No. G4AVRF multi-candela strobe field selectable at 15, 30, 75 or 110 candela and model No. G4RSB red finished surface mounting box (where indicated on the Drawings to be surface mounted). Contractor to verify final compatibility with existing GE EST-3 FACP signalling circuit.

#### 2.03 CEILING MOUNTED AUDIO/VISUAL ALARM SIGNALS

- A. This Contractor shall furnish and install ceiling mounted electronic alarm signals as shown on the Drawings and herein specified. The alarm signals shall be of solid state construction and shall produce temporal horn sound output of 94.5 dBA avg. and 97.6 dBA peak at ten (10) feet. The strobes shall be selectable to produce a minimum of 15, 30, 75, 95, 115, 150 and 177 Candela. The flash rate shall not exceed three (3) flashes per second nor be less than one (1) flash every three (3) seconds. This Contractor shall furnish and install a mounting style for installation flush in the ceiling as shown on the Drawings. Alarm signals shall be complete with screw terminals for in-out field wiring of up to No. 12 AWG conductors and a red finish.
- B. Audio/visual alarm signals shall be listed to: UL 1971; UL 1638; UL 464; ULC S525 and S526; ULC S525; ADA Chapter 28, Part 36 Final Rule; and NFPA 72.
- C. Audio/visual alarm signals shall be capable of operating from standard signaling circuits or from addressable intelligent signal modules.
- D. The ceiling mounted audio/visual alarm signals, which will meet this Specification, are EST model no. GCAVWF multi-candela strobe field selectable at 15, 30, 75 or 95 Candela, and GCF-HDVMH multi-candela strobe field selectable at 95, 115, 150 or 177 candela. Complete with white finish, mounting plate and ceiling orientated lettering. Contractor to verify final compatibility with existing GE EST-3 FACP signalling circuit.

#### 2.04 WALL MOUNTED VISUAL ONLY ALARM SIGNALS

- A. This Contractor shall furnish and install wall mounted electronic visual only alarm signals as shown on the Drawings and herein specified. The visual only alarm signal strobes shall be selectable to produce a minimum of 15, 30, 75 or 110 candela effective intensity as shown on the drawings. The flash rate shall not exceed three (3) flashes per second nor be less than one (1) flash every three (3) seconds. This Contractor shall furnish and install wall mounting styles for surface or semi-flush installation as shown on the Drawings. Visual only alarm signals shall be complete with screw terminals for in-out field wiring of up to No. 12 AWG conductors and a red finish.
- B. Visual only alarm signals shall be listed to: UL 1971; UL 1638; ULC S525 and S526; ADA Chapter 28, Part 36 Final Rule; and NFPA 72.
- C. Visual only alarm signals shall be capable of operating from standard signaling circuits or from addressable intelligent control modules.

- D. Visual only alarm signal noted on the Drawings shall be complete with wire guards furnished and installed by this Contractor. The wire guards shall be listed for use with the appliance as per NFPA 72.
- E. The wall mounted visual alarm signals, which will meet this Specification, are EST model no. G4VRF multi-candela strobe field selectable at 15, 30, 75 or 110 and Model No. G4RSB red finished surface mounting box (where indicated on the Drawings to be surface mounted). Contractor to verify final compatibility with existing GE EST-3 FACP signalling circuit.

## 2.05 CEILING MOUNTED VISUAL ONLY ALARM SIGNALS

- A. This Contractor shall furnish and install ceiling mounted electronic visual only alarm signals as shown on the Drawings and herein specified. The visual only alarm signals strobes shall be selectable to produce a minimum of 15, 30, 75, 95, 115, 150 and 177 candela effective intensity as shown on the drawings. The flash rate shall not exceed three (3) flashes per second nor be less than one (1) flash every three (3) seconds. This Contractor shall furnish and install a ceiling mounting style for flush installation as shown on the Drawings. Visual only alarm signals shall be complete with screw terminals for in-out field wiring of up to No. 12 AWG conductors and a red finish.
- B. Visual only alarm signals shall be listed to: UL 1971; UL 1638; ULC S525 and S526; ADA Chapter 28, Part 36 Final Rule; and NFPA 72.
- C. Visual only alarm signals shall be capable of operating from standard signaling circuits or from addressable intelligent control modules.
- D. The ceiling mounted visual only alarm signals, which will meet this Specification, is EST model no. GCVWF multi-candela ceiling strobe field selectable at 15, 30, 75 or 95 candela and **GCF-HDVMH** multi-candela strobe field selectable at 95, 115, 150 or 177 candela complete with white finish, mounting plate, and ceiling orientated lettering. Contractor to verify final compatibility with existing GE EST-3 FACP signalling circuit.

## 2.06 FIELD WIRING

- A. Field wiring for each intelligent loop shall consist of cables furnished and installed by this Contractor in minimum 1/2 inch conduit and as hereinbefore specified. The type, size, and number of conductors in the cable shall be in strict compliance with the manufacturer's requirements.
- B. Field wiring for all alarm signals shall consist of cables furnished and installed by this Contractor in minimum 1/2 inch conduit and as hereinbefore specified. The type, size, and number of conductors in the cable shall be in strict compliance with the manufacturer's requirements.

**PART 3 EXECUTION****3.01 ALARM SIGNALS**

- A. Audio/visual and visual only alarm signals shown on the Drawings to be installed on existing walls or partitions shall be furnished and installed by this Contractor over surface device boxes of appropriate size and suitable for use with surface metal raceways.
- B. Audio/visual and visual only alarm signals shown on the Drawings to be installed in new construction shall be furnished and installed by this Contractor over concealed device boxes of appropriate size with the appropriate trim rings.
- C. Audio/visual and visual only alarm signals shown on the Drawings to be installed flush and/or semi-flush mounted in ceilings shall be installed by this Contractor over concealed flush mounted device boxes of appropriate size with the appropriate trim rings. The box shall be supported by ceiling support bridges and steel wire directly to building structure.
- E. Audio/visual and visual only alarm signals shown on the Drawings to be ceiling mounted in areas with open structure (no suspended ceiling) shall be furnished by this contractor over surface device boxes of the appropriate size and suitable for use with surface conduit. The boxes shall be mounted directly to the underside of the structural members or metal framing channels bridging the structural members.

**3.02 FIELD WIRING**

- A. All line and low voltage wiring, conduit, backboxes, device mounting boxes, and junction boxes required for the fire detection and alarm system shall be furnished and installed by this Contractor.
- B. All low voltage field wiring shall be installed, by this Contractor, in ½" conduit and/or surface metal raceway.
- C. This Contractor shall make all connections to panels, devices, and detectors with crimp type spade terminal connectors. Splices in station circuits shall be made only in junction boxes and shall be crimp connected.
- D. All wiring shall be checked and tested by this Contractor to ensure the system is free from grounds, opens, and shorts.
- E. The installation and final connections of all components and devices shall be performed in accordance with manufacturer's instructions and recommendations. Manufacturer's technical staff shall verify proper installation during testing.
- F. A maximum of ten (10) T-taps on the Signaling Line Circuit (SLC) shall be

allowed only at the FACP head end cabinet location. (**Note: T-taps in the field are prohibited**).

- G. A copy of the SLC device map shall be provided to the owner upon completion and acceptance of the system.
- H. The end of line (EOL) resistor shall be terminated on barrier strip and from barrier strip, #14AWG wiring shall go to the fire alarm device.

### 3.14 FIELD PROGRAMMING

- A. The manufacturer's technical representative shall field program the fire detection and alarm system after all related equipment has been installed and prior to any final testing. The technical representative shall be factory certified for programming. The initial program shall be developed by the equipment supplier in conjunction with the Owner and Fire Marshal.
- B. In addition to the initial field programming described above, the manufacturer shall furnish an additional two (2) sessions of field programming changes to be performed at any time during the warranty period at no additional expense to the Owner.

END OF SECTION

## SECTION 16630

### WIRELESS MASTER CLOCK AND PROGRAM SYSTEM

#### PART 1 - GENERAL

##### 1.01 REQUIREMENTS

- A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

##### 1.02 SCOPE

- A. The work covered under this Section shall include expanding existing wireless clock system to provide two new clocks in the Classrooms as shown on contract documents. **These clocks will be owner provided, contractor installed.**

##### 1.06 DESCRIPTION OF OPERATION

- A. Transmitter Operation: When power is first applied to the master transmitter, the master transmitter checks for and displays the software version. The master transmitter then checks the position of the switches and stores their position in memory. The master transmitter looks for the GPS time signal. Once the master transmitter has received the GPS time, it sets its internal clock to that time. The master transmitter then starts to transmit its internal time once every second. The master transmitter updates its internal clock every time it receives valid time data from the GPS. The wireless master clock and program system shall be connected to the master clock and program system in the sound and intercommunications system for time and tone synchronization.
- B. Analog Clock Operation:
  - 1. Apply power then follow set up procedures detailed in manufacturer's instructions.
  - 2. After initial setup, the clock will shut off the receiver. Six times each day, the microprocessor will activate the receiver and starting with the stored channel, it will again look for a valid time signal. If necessary, the clocks will resynchronize to the correct time.
  - 3. If the clock has not decoded a valid time signal a pre-determined number of days, it will go to a step mode.

##### 1.07 SYSTEM TEST AND ACCEPTANCE

- A. Prior to the final site visitation, this Contractor shall conduct an operating test of the complete wireless master clock and program system. The system shall test free from grounds, shorts, and other faults. All connections shall be thoroughly



checked for mechanical and electrical connections. All equipment shall be demonstrated to operate in accordance with the requirements set forth in these Specifications and as shown on the Drawings.

## **PART 2 - PRODUCTS**

2.01 A. This Contractor shall install owner-provided clocks where shown on the Drawings.

### **2.02 CLOCK RECEPTACLE**

B. Refer to specification section 16130.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

A. Analog clocks (AC): Perform the following operations with each clock:

1. Apply power (120 VAC).
2. Observe clock until valid time signals are received and analog clock adjusts itself to correct time.
3. Install the analog on the wall in the indicated location, plumb, level, and tight against the wall. All wireless system clocks shall be mounted over a flush mounted clock outlet where indicated on floor plans. Analog clocks shall be mounted with two (2) Primex Wireless, Inc. clock locks.

### **3.02 FIELD WIRING**

- A. Local 120 VAC power shall be provided to the system clocks.
- B. All clock system connections and wiring shall be made by this Contractor as directed by the equipment manufacturer.
- C. All clock system wiring shall be checked and tested by this Contractor to ensure the system is free from grounds, opens, and shorts.

END OF SECTION

## SECTION 16710

### SOUND AND INTERCOMMUNICATIONS SYSTEMS

#### 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 new sound and intercommunications equipment within the building in the locations shown on the Drawings and herein specified for: the pick-up, amplification, reproduction, and distribution of voice and/or music; intercommunications between areas.

##### 1.03 QUALITY ASSURANCE

- A. All equipment described herein shall be the product of a manufacturer of established reputation and experience who shall have produced similar apparatus for a period of at least ten (10) years and who shall be able to, upon request, refer to similar installations now rendering satisfactory service.
- B. The sound and intercommunications system shall be furnished by a factory authorized distributor certified to design, program, and service the system. The distributor must show evidence of successfully furnishing systems specified for at least five (5) years
- C. All equipment for this system shall be listed by Underwriters Laboratories, Inc. (UL), bear the UL label, and shall be installed in accordance with all requirements of the National Electrical Code (NEC), all state and local codes, and these Specifications.
- D. All equipment with digital apparatus (microprocessors) that generates and utilizes timing signals at a rate in excess of ten thousand (10,000) pulses per second to compute and operate shall be Federal Communications Commission (FCC) approved. Equipment without the above approval will not be accepted.
- D. The entire sound and intercommunications system installation shall be performed under the direct supervision of a factory trained service specialist.
- F. Shop drawing submittals are required per SECTION 16010 and shall include the following for review. Submittals not containing all of the information listed below will be rejected.

1. A complete list of equipment shall be furnished indicating the specific quantities to be furnished by the manufacturer. The catalog or model number for each module of the system shall be listed next to the quantities. This shall be provided in the front of the submittal.
2. A specific description of the system shall be furnished describing each module and how it shall function in the system.
3. A detailed set of floor plans for the complete building shall be furnished showing the locations of all equipment, loudspeakers, and devices and their required interconnections. The interconnections shown shall indicate the number, size, and type of wires as described in this Specification. Loudspeakers shall be zoned as shown on the Drawings. The layout of all sound and intercommunications system equipment, and devices, shall closely follow that shown on the Drawings. Electronic microdisks or disquettes containing the building's background (only) will be available from the Architect for this purpose. However, this Contractor will be responsible for maintaining the accuracy of these Drawings.
4. A data sheet shall be furnished for each module, component, and device. The information shall be highlighted that applies to the module or device.
5. A detailed diagram on how to connect each device shall be furnished showing exact hook-up information.

#### 1.04 DOCUMENTATION

- A. This Contractor shall furnish to the Owner one (1) set of "As Built" drawings depicting the complete field wiring system and component interconnections in the system equipment rack.
- B. This Contractor shall furnish to the Owner four (4) sets of factory service manuals. These manuals shall include factory service manuals with complete parts lists, wiring and component schematics including circuit diagrams, and other information necessary for the proper operation, service, and maintenance of the system.
- C. This Contractor shall furnish to the Owner a typed written sound system zone legend. This legend shall include the following; zone card numbers, default numbers, dial numbers, room locations, comments, ACS, paging zone numbers, mic cable numbers, and zone cable numbers.

#### 1.05 TRAINING

- A. This Contractor shall furnish two (2) hours of technical service training to the Owner's technical staff using the factory service manuals previously specified.

- B. All training specified herein shall be performed by a factory certified technician.

#### 1.06 DESCRIPTION OF OPERATION

- A. This Contractor shall furnish and install a microprocessor controlled voice communication system with all low voltage wiring and equipment as shown on the Drawings and as herein specified to furnish a complete sound, program, distribution, and intercommunication system in the building.

B. System Capacity:

1. It shall be possible to field program any Owner furnished telephone instrument to function as part of the sound and intercommunications system.
2. Room stations reporting to different programmed telephone instruments and/or an ACS shall be capable of calling simultaneously without interference.
3. Programmed telephone instruments and/or an ACS calling to assigned rooms shall be capable of calling simultaneously without interference.

C. System Configuration:

1. Programmed telephone instruments and/or an Administrative Control Station (ACS) shall receive calls from classrooms and other indicated areas as shown on the Drawings.
2. Specific classrooms and other areas as shown on the Drawings shall contain a flush wall mounted callback switch to signal the designated programmed telephone instrument and/or ACS.
3. Classrooms, corridors, and other areas as indicated on the Drawings shall contain flush ceiling mounted speakers.

D. Calling Sequence of Operation:

1. Classroom station calls shall initiate manually a preset status of call to the designated programmed telephone instrument and/or ACS.
2. Programmed telephone instrument and/or ACS to classroom calls shall establish two-way voice communication with classrooms and/or any or all other areas equipped with a loudspeaker.
3. ACS to ACS, or programmed telephone instrument to ACS, or

programmed telephone instrument to programmed telephone instrument calls shall establish a two-way telephone conversation.

#### 1.07 SYSTEM OPERATION

- A. The system shall allow for user-programmable room number assignment in the form of 3, 4, 5 or 6-digit alphanumeric format for architectural room numbering and a 60 character alpha-numeric caller ID description associated with each audio port.
- B. The system shall allow for a minimum of 64 page/time/program zones that can be assigned and configured as desired.
- C. The system shall allow for the assigning of each call-in button to one or more of 32 distinct call-in destination groups.
- D. The system's administrative telephone shall allow for the user to view the alphanumeric room address and the caller-ID information of the calling station and the call priority (e.g., emergency, normal) on the display. The administrative telephone shall use distinctive ringing patterns to announce the type of call.
- E. The system shall be capable of receiving 2048 call-ins simultaneously without data collisions or loss of any call-ins. Call-ins shall remain in the system call queue until answered. Emergency call-ins shall automatically move to the top of the call-in queue and announced in the in-use telephone earpiece to notify the user of an emergency call.
- F. The system shall communicate with each classroom phone. The classroom phone shall be integrated with the classroom speaker. If the staff member or occupant in the classroom lifts the classroom phone while in communication over the classroom loud speaker classroom, audio will automatically be transferred to the classroom phone.
- G. The system shall operate under the following audio priority scheme.
  - a. An emergency page suspends all other audio.
  - b. An emergency tone suspends all other audio except the above.
  - c. A normal page suspends all other audio except the above.
  - d. A tone suspends all other audio except the above.
  - e. A program source audio event suspends nothing.
  - f. Interrupted lower priority functions shall be restored after conclusion of the higher priority function.
- H. The system shall allow a call-in to be escalated from a normal call-in to an emergency call-in at any time by pressing the call button twice within 2 seconds.

- I. The system shall allow for any connected telephone to place an emergency voice paging announcement.
- J. The system shall allow for operation via a GUI based PC based application. The PC application shall allow for emergency paging, normal paging, intercom, activation of any system/user tone, schedule changes, program distribution, call-in management, and on the fly room exclusion.
- K. The system shall use a PC based GUI scheduling tool for schedules and tone management. This tool shall not allow access to any system configuration controls. This tool shall not prevent the system from operating when being used. This tool shall allow the user to schedule events and manage tones over the local LAN/WAN and the Internet. It shall not be required to be directly connected to the central system to use this tool.
- L. The system shall have a built in 30 day log of every system function and access.
- M. The system shall have a built in real time system diagnostics application.
- N. The system shall allow for system diagnostics, system log access firmware updates, and programming over the local LAN/WAN or over the Internet.

#### 1.08 SYSTEM TEST AND ACCEPTANCE

- A. Prior to the final site visitation, and acceptance of each construction phase, this Contractor shall conduct an operating test of the complete sound and intercommunications systems. The system shall test free from grounds, shorts, and other faults. All connections shall be thoroughly checked for mechanical and electrical connections. All equipment shall be demonstrated to operate in accordance with the requirements set forth in these Specifications and as shown on the Drawings.
- B. This Contractor shall perform all tests in the presence of the Architect/Engineer and Owner. This Contractor shall furnish all personnel and test instruments for use in the test.
- C. When the work on the entire sound and intercommunications system has been completed and is ready for final review, this Contractor shall demonstrate that the requirements of the Contract as it applies to this work have been carried out and that the system has been adjusted and operated in accordance therewith.

#### 1.09 EQUIPMENT LOCATIONS

- A. This Contractor shall furnish and install where shown on the Drawings.

#### 1.10 WARRANTY

- A. This Contractor shall deliver the work described herein in a first-class operating condition in every respect. This Contractor shall also warrant that the material, equipment, and workmanship furnished shall be entirely free from defects. Any materials, equipment, or workmanship in which defects may develop before or during the warranty period shall be repaired or replaced at the Contractor's own expense. Refer to SECTION 01740 for the start of the warranty period. The Contractor shall further warrant that all material, equipment, and workmanship used in the installation, but not specifically mentioned in the Drawings and Specifications, is the best of their respective kinds and that the construction and installation was performed in accordance with the best accepted standard practices in all details.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURER**

- A. The sound and intercommunications system shall be the DUKANE "CareHawk" system and shall be compatible with the existing Carehawk headend equipment located at the site.

### **2.02 ADMINISTRATIVE CONTROL STATION**

- A. The Administrative Control Station (ACS) is existing and shall remain in use. New devices shall integrate into the existing system.

### **2.03 CLASSROOM CALLBACK SWITCHES**

- A. This Contractor shall furnish and install where shown on the Drawings, wall mounted callback switches suitable for flush or surface mounting in a single gang outlet box as noted on the Drawings. The call-back switches shall have a call-in push button to provide a method to annunciate a normal intercom call or an emergency intercom call that is received by the DA1 Display Administrative Console. The call switch shall interface with the existing switching card audio port and shall provide RJ45 connectivity for a Cat 6 cable from the switching card port. A classroom callback switch that meets this Specification is DUKANE Model No. CS100. Contractor to verify final compatibility with existing Carehawk headend equipment prior to providing shop drawings.

### **2.04 FLUSH CEILING MOUNTED SPEAKER ASSEMBLIES**

- A. This Contractor shall furnish and install where shown on the Drawings, flush 1'x2' drop-in ceiling speaker assemblies consisting of a loudspeaker, backbox, and baffle. A flush 1'x2' drop-in ceiling speaker assembly that meets this specification is Quam Model No. SYSTEM 5URS (complete with 2' T-Bar) or equal by Atlas

Sound. Contractor to verify final compatibility with existing Carehawk headend equipment prior to providing shop drawings.

## 2.05 VOLUME CONTROLS

- A. This Contractor shall furnish and install where shown on the Drawings, wall mounted speaker volume controls as specified herein.
- B. Volume controls shall provide for control of area speaker volume on 25 volt or 70 volt speaker distribution lines controlling up to 10 watts of audio power. Attenuation shall be accomplished in eleven (11) steps, including "0". The switch shall be a twelve (12) position rotary type. Volume controls shall be complete with a satin finished, stainless steel coverplate and the knob shall have a clearly visible white indicator line. The volume control shall mount in a single gang outlet box, flush or surface mounted as noted on the Drawings. A volume control that meets this Specification is Atlas Model No. AP-30TC.

## 2.06 MICROPHONE OUTLETS

- A. This Contractor shall furnish and install where shown on the Drawings, wall mounted microphone outlets suitable for flush or surface mounting in a single gang outlet box as noted on the Drawings. Microphone outlets shall consist of CANNON "XLR" series audio jacks of the type required so as to be compatible with the type of microphone cable connector furnished, and a stainless steel coverplate. A microphone outlet that meets this Specification is Pro Co WP1049DF complete with a five-pin XLR.

## 2.07 SOUND AND INTERCOMMUNICATIONS SYSTEM CABLE

- A. This Contractor shall furnish and install the following cables for each speaker zone shown.
  - 1. One (1) two (2) conductor, twisted shielded pair, No. 22 AWG stranded plenum rated cable with a temperature range for dry locations of minus ten (10) degrees C to sixty (60) degrees C. A cable, which meets this Specification, is WEST PENN Cat. No. 25291B or equal as manufactured by BELDEN, BERK TEK, CONSOLIDATED WIRE, and GENERAL CABLE, PAIGE, WINDY CITY WIRE or TAPPAN.
  - 2. Outside plant (flooded) cable, one (1) two (2) conductor, No. 22 AWG stranded, having two (2) twisted conductors shielded. A cable, which meets this Specification, is WEST PENN Cat. No. AQC 291 or equal as manufactured by BELDEN, BERK TEK, CONSOLIDATED WIRE, and GENERAL CABLE, PAIGE, WINDY CITY WIRE or TAPPAN.



- B. This Contractor shall furnish and install the following cables for each microphone outlet shown.
1. One (1) stranded, No. 20 AWG, shielded, single twisted pair plenum rated cable with a temperature range for dry locations of minus ten (10) degrees C to sixty (60) degrees C. A cable that meets this Specification is WEST PENN Cat. No. 25292B or equal as manufactured by BELDEN, BERK TEK, CONSOLIDATED WIRE, GENERAL CABLE, PAIGE, WINDY CITY WIRE or TAPPAN.
- C. This Contractor shall furnish and install the following cables for each callback switch.
1. One Cat 6 4-pair UTP Cable, plenum with White Jacket, West Penn Model No. 254246WH or equal as manufactured by BELDEN, BERK TEK, CONSOLIDATED WIRE, and GENERAL CABLE, PAIGE, SUPERIOR, ESSEX, WINDY CITY WIRE or TAPPAN.
- D. This Contractor shall furnish and install the following cables for each volume control shown.
1. One (1) four (4) conductor, No. 20 AWG stranded plenum rated cables with a temperature range for dry locations of minus ten (10) degrees C to sixty (60) degrees C having two (2) twisted conductors shielded and two (2) twisted conductors unshielded. A cable that meets this Specification is WEST PENN Cat. No. 25291B or equal as manufactured by BELDEN, BERK TEK, CONSOLIDATED WIRE, GENERAL CABLE, PAIGE, or TAPPAN.

### **PART 3 - EXECUTION**

#### **3.01 RACK MOUNTED EQUIPMENT**

- A. Rack mounted equipment shall be installed by this Contractor with the proper adapters, rack mounting kits, brackets, and closure panels for unused spaces. All interconnecting wiring shall be labeled, bundled, secured, and terminated by this Contractor in a neat and professional manner.
- B. All rack mounted equipment AC power cords shall be plugged into the mounted power strip by this Contractor.

#### **3.02 SPEAKERS**

- A. Flush ceiling mounted speaker assemblies shall be supported by this Contractor from the building structure with a minimum of two (2) steel wires. Ceiling baffles shall be finished flush with the ceiling. The speakers shall be secured to the grid

with four (4) Caddy 515A lay-in/troffer support clips. Flush ceiling mounted speakers shall be tapped at 0.5 watts unless otherwise indicated.

### 3.03 MICROPHONES

- A. This Contractor shall unpack each microphone and assemble with cables and stands and connect ready for operation. Microphones shown for permanent installation shall be mounted by this Contractor in accordance with the Drawings in a manner appropriate for the location.

### 3.04 CALL-BACK SWITCHES

- A. Call-back switches shall be installed by this Contractor at mounting heights and locations as shown on the Drawings, in outlet boxes appropriate for the location and wire ready for operation.

### 3.05 FIELD WIRING

- A. All vertical low-voltage field wiring shall be installed by this Contractor in conduit and/or surface metal raceway as shown on the Drawings. Conduit fill shall not exceed the conduit space capacity.
- B. All horizontal low voltage wiring to be installed in areas without a ceiling or in areas without an accessible ceiling shall be installed by this Contractor in ½-inch conduit. Conduit is not required in areas designed on the Drawings as "Communications" rooms or closets.
- C. All horizontal low voltage field wiring to be installed in areas with accessible ceilings shall be installed by this Contractor bundled together and run exposed above the ceilings. Bundles shall be supported by "J" hooks mounted not more than four (4) feet on center. "J" hooks to be dedicated to the wiring specified in this specification section. Provide eight to ten feet service loop within one foot of point of entry for any cabling supported by "J" hooks.
- D. All horizontal low-voltage field wiring shall be run at right angles to the building structure.
- E. All horizontal low voltage field wiring shall be installed below the roof/floor structural supports (joists, beams, girders, etc.). Wiring installed between the structural supports mentioned above and the roof or floor deck will not be acceptable. Cables pulled through sleeves without bushings, or cut bushings wrapped with tape will not be accepted and shall be replaced by the Contractor.
- F. All horizontal low voltage field wiring penetrations through new and/or existing walls shall be sleeved. Minimum sleeve size shall be 3/4 inch. All sleeves shall be bushed both sides.

- G. All low voltage field wiring shall be installed, terminated, and labeled by this Contractor as shown on the Drawings. Cables shall not be nicked, strained, or damaged during the pulling operation. Splices shall be permitted at equipment enclosures and junction boxes only. All splices shall utilize insulated crimp type connectors. All junction box covers shall be stenciled for distinct identification.
- H. All low voltage wiring shall be checked and tested by this Contractor to ensure the system is free from grounds, opens, and shorts.
- I. All work shall be under the supervision of a factory accredited sound engineer. It shall be the responsibility of the sound engineer and this Contractor to check and inspect this installation to the Owner's and Architect/Engineer's approval.

END OF SECTION

## SECTION 16713

### CLASSROOM AMPLIFICATION SYSTEMS (Phonak)

#### PART 1 - GENERAL

##### 1.01 REQUIREMENTS

- A. The general provisions of the Contracts, 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 a locally controlled complete and satisfactorily operating classroom amplification system where shown on the Drawings for the pick up, amplification, and reproduction of voice/audio at classroom locations.

##### 1.03 QUALITY ASSURANCE

- A. All equipment specified herein shall be the product of a manufacturer of established reputation and experience who shall have produced similar apparatus for a period of at least ten (10) years and who shall be able to refer to similar installations now rendering satisfactory service.
- B. The classroom amplification system(s) shall be a dynamic digital modulation (DM) type system. Specifically, it must utilize digital transmission technology in the 2.4 GHz band with automatic frequency hopping to avoid interference issues.
- C. The classroom amplification system(s) shall be furnished by a factory authorized distributor certified to design, program, and service the system. The distributor must show evidence of successfully furnishing similar systems for at least five (5) years.
- D. All equipment for this system shall be listed by Underwriters Laboratories, Inc. (UL), bear the UL label and shall be installed in accordance with all requirements of the National Electrical Code (NEC), state and local codes, and these Specifications.
- E. The classroom amplification system(s) shall be furnished and installed by this Contractor as shown on the Drawings and as specified herein.
- F. Shop drawing submittals are required per SECTION 16010 and shall include the following for review. Submittals not containing all of the information listed below will be rejected.
  - 1. A complete list of equipment shall be furnished indicating the specific quantities to be furnished by this Contractor. The catalog or model number for each module of the system(s) shall be listed next to the quantities. This information shall be furnished in the front of the submittal.
  - 2. A specific description of the system(s) shall be furnished describing each

module and how it shall function in the system.

3. A data sheet shall be furnished for each module and device. The information shall be highlighted that applies to the particular module or device to be furnished.
4. A detailed diagram showing how to connect the audio hub device to a computer and the CATV system shall be furnished indicating the exact final connection information.

#### 1.04 DOCUMENTATION

- A This Contractor shall furnish to the Owner four (4) sets of factory operation and maintenance manuals. These manuals shall include factory service manuals with complete parts lists, wiring and component schematics including circuit diagrams, and all other information necessary for the proper operation and service maintenance of the system.

#### 1.05 TRAINING

- A. This Contractor shall furnish two (2) hours of technical service training to the Owner's technical staff using the factory operation manuals previously specified.
- B. All training specified herein shall be performed by a factory certified technician.

#### 1.06 DESCRIPTION OF OPERATION

- A. Each system shall provide for the distribution of voice/audio to associated loudspeaker.
- B. Each system shall provide auxiliary inputs for the connection to a computer and/or the building CATV system.
- C. **Each system shall provide an auxiliary output for the connection to a computer and/or network.**
- D. **Each system shall support Bluetooth v4.2**
- E. Each system shall have the capability to interact with a student's hearing aid and/or cochlear implant device .

#### 1.07 SYSTEM TEST AND ACCEPTANCE

- A. Prior to the final site visitation and acceptance of each construction phased spaces, this Contractor shall conduct an operating test of each complete classroom amplification system. Each system shall test free from grounds, shorts, and other faults. All connections shall be checked for mechanical and electrical connection. All equipment shall be demonstrated to operate in accordance with the requirements set forth in these Specifications and as shown on the Drawings.
- B. This Contractor shall perform all tests in the presence of the Architect/Engineer.

This Contractor shall furnish all personnel and test instruments required for use in the test.

#### 1.08 WARRANTY

- A. This Contractor shall deliver the work described herein in a first class operating condition in every respect. This Contractor shall also warrant that the material, equipment, and workmanship shall be entirely free from defects. Any materials, equipment, or workmanship in which defects may develop before or during the warranty period shall be repaired or replaced at the Contractor's own expense. Refer to SECTION 01740 for the start of the warranty period. The contractor shall further warrant that all material, equipment, and workmanship used in the installation, but not specifically mentioned in the Drawings and Specifications, is the best of their respective kinds and that the construction and installation was performed in accordance with the best accepted standard practices in all details.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURER

- A. The classroom amplification system(s) shall be as manufactured by PHONAK or approved equal.

#### 2.02 WALL MOUNTED SPEAKER

- A. This Contractor shall furnish and install a wall mounted classroom amplification system speaker where shown on the Drawings and herein specified.

1. One (1) PHONAK Digimaster 5000 **V2** wall mounted speaker complete with the following:
  - a. Wall mounted bracket
  - b. 12 speaker-line array
  - c. Mini USB port
  - d. 3.5 mm audio input
  - e. **3.5 mm audio output**
  - f. **Support Bluetooth v4.2**
  - g. LED status indicating light
  - h. Power supply with mini USB connection

#### 2.03 TRANSMITTER

- A. This Contractor shall furnish at each classroom amplification wall mounted speaker location shown on the Drawings one (1) PHONAK Transmitter complete with the following:
1. DM transmitter mode
  2. Voice activity detector
  3. Built in automatic and manual directional microphone system
  4. One (1) Pass Around (handheld) microphone

5. Touchscreen display
6. Lanyard device to be worn around neck of user
7. **Charging rack – 4 slot design to charge up to 4 devices simultaneously. Accommodates: Roger Touchscreen Mi, Roger Pass-Around, Roger Multimedia Hub.**

#### 2.04 AUDIO HUB

- A. This Contractor shall furnish at each classroom amplification wall mounted speaker location shown on the Drawings one (1) PHONAK Roger Multimedia Hub complete with the following:
1. One (1) audio input
  2. Micro USB charging hub
  3. On/off switch
  4. Connect button
  5. One (1) 3.5mm male to 3.5mm male patch cable. Minimum 10ft. in length.
  6. Power supply with micro USB connection

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. All work shall be under the direct supervision of an accredited factory sound engineer. It shall be the responsibility of the sound engineer and this Contractor to check and inspect this installation to the Owner's approval.
- B. All transmitters, microphones, audio hubs and patch cables shall be properly stored and protected during construction.

#### 3.02 WALL MOUNTED SPEAKER

- A. The classroom amplification system wall mounted speaker(s) shall be installed by this Contractor with the proper adapters, mounting kits, and brackets at 48" above finished floor to bottom of speaker. All interconnecting power wiring shall be secured and terminated by this Contractor in a neat and professional manner.

#### 3.03 TRANSMITTER/MICROPHONES

- A. This Contractor shall unpack each transmitter and microphone, assemble, connect and make ready for operation.

#### 3.04 AUDIO HUB

- A. This Contractor shall unpack each audio hub, connect power and 3.5mm patch cables and make ready for operation.

END OF SECTION

## SECTION 16750

### TELECOMMUNICATIONS SYSTEM

#### PART 1 - GENERAL

##### 1.01 REQUIREMENTS

- A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

##### 1.02 SCOPE

- A. The work covered under this Section shall include furnishing and installing an addition to the existing telecommunications system as shown on the Drawings and as herein specified for the distribution of telephone and/or networked data signals.
- B. The telephone service into the building is existing. It shall be the responsibility of this Contractor to coordinate with the telephone utility company to ensure timely delivery of permanent telephone service.
- C. The electronic telephone switch and all telephone instruments shall be furnished and installed by the Owner.

##### 1.03 QUALITY ASSURANCE

- A. All equipment and materials for this system shall be listed by Underwriter's Laboratories, Inc. (UL), bear the UL label, and shall be installed in accordance with all requirements of the National Electrical Code (NEC), all state and local codes, and these Specifications.
- B. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.
- C. All work relating to the telephone service entrance shall comply with the requirements of the telephone utility company.
- D. Shop drawing submittals are required per Section 16010 and shall include the following for review. Submittals not containing all of the information listed below will be rejected.
  - 1. Manufacturer's shop drawings for the networking main and sub-distribution frames including the equipment mounting rack and all associated accessories, components, and equipment to be installed therein.



- 2. Manufacturer's data sheets for the telecommunications outlets and the telecommunications cable.
- 3. A detailed set of floor plans for the complete building shall be furnished showing the locations of all equipment and devices and their required interconnections. The interconnections shown shall indicate the number, size, and type of wires as described in this Specification. The layout of all telecommunications system equipment, devices, and conduit routings shall closely follow that shown on the Drawings.
- E. This Contractor shall be prepared, upon request by the Owner, to provide proof of the ability to provide the above listed drawings in a mechanical form.
- F. This Contractor shall be an AMP, HUBBELL, P&S ACTIVATE, LEVITON, PANDUIT, ORTRONICS, and BICSI certified installer of copper and fiber optic cabling systems and have a fully equipped and trained service organization that will have a response time of thirty six (36) hours or less to the job site. This Contractor shall have a minimum of one (1) certified installer on site during construction of this project. This Contractor must show evidence of successfully furnishing systems specified for at least five (5) years. This Contractor shall be prepared to show proof of such certification upon request by the Owner. This Contractor shall also be prepared to offer to the Owner upon request, a fifteen (15) year manufacturer's warranty covering defects in material and workmanship in the passive components of the telecommunications wiring system (outlets, patch panels, etc.).
- G. Prior to final inspection, this Contractor shall furnish two (2) complete as-built sets of drawings prepared by mechanical drafting methods.

1.04 SYSTEM TEST AND ACCEPTANCE

- A. Prior to the final site visitation, and acceptance of each construction phased spaces, this Contractor shall conduct an operating test of all telecommunications system cabling. The cabling shall test free from grounds, shorts, and other faults. All connections shall be checked for mechanical and electrical connection. Phased space test results shall be furnished to the Owner in bound binders prior to acceptance.
- B. This Contractor shall perform the following tests certifying each telecommunications outlet Cat 6 cable. Test results shall be tabulated listing each outlet (by number), the cable, and the test results.

<u>TEST</u>	<u>FREQUENCY</u>	<u>REQUIREMENTS</u>
1. Impedance	1 MHz	100 ohms ± 15%
	10 MHz	
	25 MHz	

	100 MHz	
	250 MHz	
2. Attenuation	1 MHz	2 dB max. per 100m
	10 MHz	6 dB max. per 100m
	25 MHz	9.5 dB max. per 100m
	100 MHz	19.8 dB max. per 100m
	250 MHz	32.8 dB max. per 100m
3. Crosstalk (Next)	1 MHz	min. 62 dB
	10 MHz	min. 47 dB
	25 MHz	min. 41 dB
	100 MHz	min. 44.3 dB
4. PS-Next (min)	100 MHz	42.3 dB
5. EL-FEXT (min)	100 MHz	27.8 dB
6. PS-ELFEXT (min)	100 MHz	24.8 dB
7. Return Loss (min)	100 MHz	20.1 dB
8. Delay Skew (max)	100 MHz	45 nS
9. Mutual Capacitance:	less than 46 pf per meter	
10. Cable Length:	less than 100 meters	

- C. Each fiber optic cable shall have a FOIRL specification, bi-directional testing at both 850 nm and 1300 nm with 3 db light signal loss per km and 2000/500 MHz-km bandwidth at 850/1300nm.
- D. This Contractor shall perform all tests in the presence of the Architect/Engineer. This Contractor shall furnish all personnel and test instruments required for use in the test.
- E. This Contractor shall be prepared, upon request by the Owner, to show current ownership of all instruments and equipment necessary to perform all of the tests listed above.

#### 1.05 WARRANTY

- A. This Contractor shall deliver the work described herein in a first class operating condition in every respect. This Contractor shall also warrant that the material

and workmanship shall be entirely free from defects. Any materials, equipment, or workmanship in which defects may develop before or during the warranty period shall be repaired or replaced at the Contractor's own expense. Refer to SECTION 01740 for the start of the warranty period. The Contractor shall further warrant that all material, equipment, and workmanship used in the installation, but not specifically mentioned in the Drawings and Specifications, is the best of their respective kinds and that the construction and installation was performed in accordance with the best accepted standard practices in all details.

## **PART 2 - PRODUCTS**

### **2.01 CONDUITS**

- A. This Contractor shall furnish and install telecom distribution conduits, minimum 1/2 inch, only as shown on the Drawings and as hereinbefore specified.

### **2.02 TELECOMMUNICATIONS EQUIPMENT LOCATIONS**

- A. This Contractor shall furnish and install where shown on the Drawings, wall mounted main and sub-distribution telecommunications equipment locations consisting of fire resistant 3/4 inch thick plywood backboards and networking hubs as hereinafter described and as detailed on the Drawings.

### **2.03 TELECOMMUNICATIONS OUTLETS**

- A. This Contractor shall furnish and install where shown on the Drawings, wall mounted telecommunications outlets each consisting of: one (1) ORTRONICS part no. OR-403STJ14 single-gang faceplate; one (1) ORTRONICS part no. OR-TJ600-00 (black) single category 6, RJ-45 (568A/B) TrackJack insert; two (2) ORTRONICS part no. OR-63700005 single RJ-25C TrackJack inserts; and one (1) ORTRONICS part no. OR-42100002 blank TrackJack insert mounted in a single-gang outlet box. The equivalent outlets as manufactured by AMP, HUBBELL, P&S ACTIVATE, LEVITON or PANDUIT will also be considered provided they are fully equal to the type specified herein.
- B. This Contractor shall furnish and install where shown on the Drawings, wall mounted data only outlets each consisting of: one (1) ORTRONICS part no. part no. OR-403STJ13 single-gang faceplate; two (2) ORTRONICS part no. OR-TJ600-00 (black) single category 6, RJ-45 (568A/B) TrackJack inserts mounted in a single-gang outlet box. The equivalent outlets as manufactured by AMP, HUBBELL, P&S ACTIVATE, LEVITON or PANDUIT will also be considered provided they are fully equal to the type specified herein.
- C. This Contractor shall furnish, and install were detailed on the drawings,

telecommunications and data only outlets in the surface raceway manufactured by ORTRONICS or EQUAL AS MANUFACTURED BY PASS AND SEYMOUR ACTIVATE SERIES, or PANDUIT.

- D. This Contractor shall furnish and install where shown on the Drawings, wall mounted telephone outlets consisting of a four (4) inch square flush outlet box with plaster cover and a single gang stainless steel coverplate with a 3/8 inch diameter bushed opening.

#### 2.04 CABLE

- A. This Contractor shall furnish and install telecommunications distribution cables as shown on the Drawings and specified herein. The cable shall be UL listed, plenum rated, unshielded, twenty-five (25) twisted pairs, no. 24 AWG, category 3, UTP/100 type with a flame retardant polyvinyl chloride jacket and a temperature range for dry locations of minus ten (10) degrees C to sixty (60) degrees C. A telecommunications distribution cable, which meets this specification, is BERK-TEK Cat. No. 10032111 or equal as manufactured by AMP, AT&T, BELDEN, THE CABLE COMPANY, GENERAL CABLE, GENISIS, HITACHI, MOHAWK, NORTHERN TELECOM, PAIGE, SUPERIOR ESSEX or OPTICAL CABLE CORPORATION.
- B. This Contractor shall furnish and install telecommunications and data only station cables where shown on the Drawings and specified herein. The cable shall be UL listed, plenum rated, unshielded, four (4) twisted pairs, no. 23 AWG, category 6, extended distance, high speed data type with a flame retardant polyvinyl chloride jacket and a temperature range for dry locations of minus ten (10) degrees C to sixty (60) degrees C. A telecommunications cable, which meets this specification, is BERK-TEK Cat. no. 10132983 (Gray) or equal as manufactured by AMP, AT&T, BELDEN, THE CABLE COMPANY, GENERAL CABLE, GENISIS, HITACHI, MOHAWK, NORTHERN TELECOM, PAIGE, SUPERIOR ESSEX or OPTICAL CABLE CORPORATION.
- C. This Contractor shall furnish and install wireless access point station cable where shown on the Drawings and specified herein. The cable shall be UL listed, plenum rated, unshielded, four (4) twisted pairs, no. 23 AWG, category 6A, extended distance, high speed data type with a flame retardant polyvinyl chloride jacket and a temperature range for dry locations of minus ten (10) degrees C to sixty (60) degrees C. A telecommunications cable which meets this specification is SUPERIOR ESSEX Cat No. 6A-246-6B (Yellow) or equal as manufactured by AMP, AT&T, BELDEN, BERK-TEK, THE CABLE COMPANY, GENERAL CABLE, GENISIS, HITACHI, MOHAWK, NORTHERN TELECOM, PAIGE, or OPTICAL CABLE CORPORATION.

- D. This Contractor shall furnish and install two way communication cables where

shown on the Drawings and specified herein. The cable shall be UL listed, plenum rated, unshielded, four (4) twisted pairs, no. 23 AWG, category 6, extended distance, high speed data type with a flame retardant polyvinyl chloride jacket and a temperature range for dry locations of minus ten (10) degrees C to sixty (60) degrees C. A telecommunications cable, which meets this specification, is BERK-TEK Cat. No. 10136748 (Green) or equal as manufactured by AMP, BELDEN, CORNING, GENERAL CABLE, MOHAWK, OPTICAL CABLE CORP., PAIGE, SIECOR, SUMITOMO ELECTRIC, SUPERIOR ESSEX or WEST PENN.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. All horizontal wiring for the telecommunications system to be installed in areas without a ceiling or in areas without an accessible ceiling shall be installed by this Contractor in 1/2-inch conduit. Conduit is not required in areas designated on the Drawings as "Electric/Communications" rooms or closets.
- B. All horizontal wiring for the telecommunications system to be installed in areas with accessible ceilings shall be installed by this Contractor bundled together and run exposed above the ceiling. Bundles shall be supported by "J" hooks mounted not more than four (4) feet on center. "J" hooks to be dedicated to the wiring specified in this Specification section. Provide eight to ten feet service loop within one foot of point of entry for any cabling supported by "J" hooks.
- C. All horizontal wiring for the telecommunications system shall be run at right angles to the building structure.
- D. All horizontal wiring for the telecommunications system shall be installed below the roof/floor structural supports (joists, beams, girders, etc.). Wiring installed between the structural supports mentioned above and the roof or floor deck will not be acceptable.
- E. All horizontal wiring penetrations for the telecommunications system through new and/or existing walls shall be sleeved. Minimum sleeve size shall be 3/4 inch. All sleeves shall be bushed both sides. Cables pulled through sleeves without bushings, cut bushings, wrapped with tape will not be accepted and shall be replaced by the Contractor.
- F. All wiring for the telecommunication system in millwork or casework only shall be installed in flexible metal conduit complete with an additional 200-pound pull string.

- G. All wiring for the telecommunications system shall be furnished and installed by this Contractor as hereinbefore specified and as showed on the Drawings. All junction box covers shall be stenciled for distinct identification.
- H. All wiring connections shall be made by this Contractor as detailed on the Drawings. Cables shall be run free of splices from the equipment enclosures to the telecommunications outlets.
- I. All wiring shall be checked and tested by this Contractor to ensure the system is free from grounds, opens, and shorts.

### 3.02 TELECOMMUNICATIONS OUTLETS

- A. This Contractor shall assemble telecommunications outlets and install, connect, and label as shown on the Drawings.

### 3.06 OWNER FURNISHED EQUIPMENT

- A. The networking electronic hub equipment and wireless access points shall be furnished and installed by the Owner.

END OF SECTION

## SECTION 16760

### CABLE TELEVISION/BROADBAND DISTRIBUTION SYSTEM

#### PART 1 - GENERAL

##### 1.01 REQUIREMENTS

- A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

##### 1.02 SCOPE

- A. The work covered under this Section shall include furnishing and installing An expansion of the existing bi-directional cable television/broadband distribution system in the building to distribute both analog and digital RF carriers up to a frequency of 860 MHz, utilizing 860 MHz passive and 860 MHz active components and hardware, as shown on the Drawings and herein specified for the distribution of cable television and/or broadband data signals.
- B. The cable television/broadband distribution system shall deliver the following minimum performance requirements:
- Sub-split, (return): inbound: 5MHz – 36MHz (took out all periods after bullets in this list)
  - Outbound, (forward): 44 MHz – 860 MHz
  - Drop cable outlet level: + 10dBmv, +/- 5dB
  - Minimal distribution system carrier to noise ratio (CNR): 49 dB
  - Composite Second Order, (no comma) (CSO), distortion: 53 dBc or greater
  - Composite Triple Beat, (CTB), distortion: 53dBc or greater, 49 dBc or greater (HRC & IRC carrier systems)
  - No more than +/- 3.0 dB difference between adjacent channel video carriers
  - Maximum outlet spectral bandwidth tilt: +/- 10dB on any visual carrier on system up to 300MHz with a +/- 1 dB of separation for every additional 100MHz of total system bandwidth
  - RF channel aural carrier level: -15dB below RF channel visual carrier
  - HUM: maximum of 3% of visual signal level
  - RF leakage: per FCC, part 76
- C. Existing cable television service into the building is provided by COX COMMUNICATION. It shall be the responsibility of this Contractor to coordinate with the cable television utility to ensure timely delivery of permanent cable television service.
- D. The cable television head-end equipment and cabinet is existing and shall remain in place.

## 1.03 QUALITY ASSURANCE

- A. All active devices for this system shall be listed by Underwriters Laboratories, Inc. (UL), bear the UL label, and shall be installed in accordance with all requirements of the National Electrical Code (NEC), all state and local codes, and these Specifications.
- B. Equipment shall be constructed with National Electrical Manufacturer's Association (NEMA) standards.
- C. All work relating to the cable television service entrance shall comply with the requirements of the cable television utility company.
- D. Shop drawing submittals are required per SECTION 16010 and shall include the following for review. Submittals not containing all of the information listed below will be rejected.
  - 1. Manufacturer's shop drawings for the main and sub-distribution equipment location layouts and equipment.
  - 2. Manufacturer's data sheets for all system components including cables.
  - 3. A detailed set of engineered floor plans for the complete bi-directional system for building shall be furnished showing the locations of all equipment and devices and their required interconnections. The shop drawings shall including the cable path from each wall outlet to its respective main or sub-distribution location. The interconnections shown shall indicate the device designation number, size, type of devices and wires as described in this Specification. The layout of all cable television/broadband distribution system equipment and devices shall include the engineered Db levels at each designated wall outlet as described below in this specification section and shall closely follow that shown on the Drawings.
- E. Prior to final inspection, this Contractor shall furnish two (2) complete sets of as-built drawings prepared by mechanical drafting methods. The Drawings shall include: the measured Db level at each outlet on Channel 2 and Channel 9; and the exact locations and descriptions of all outlets, tap equipment, and the like and the location and number of all spare ports.
- F. The entire cable television/broadband distribution system installation with the exception of pulling of cable shall be performed by a factory certified installer having a minimum record of five (5) years of successful installations. The installer must show evidence of successfully furnishing systems specified for at least five (5) years. The installer of the cable television/broadband distribution system shall be named within fourteen (14) days of the bid opening. The contractor shall be prepared, upon the Owner's request, to provide proof of factory certifications.

## 1.04 SYSTEM TEST

- A. Prior to the final acceptance at total completion of project, this Contractor shall



conduct an operating test of the complete system. The system must test free from grounds, shorts, and other faults. The system shall provide ten (10) dBmV (+/- 5 dBmV) at each outlet when a signal of 50 DBMV is applied from the headend cable. This Contractor shall inform the Owner of any slope injected into the system during testing. All connections shall be thoroughly checked for mechanical and electrical connections. All equipment shall be demonstrated by this Contractor to operate in accordance with the requirements set forth in these Specifications and shown on the Drawings.

- B. This Contractor shall perform all tests in the presence of the Architect/Engineer. This Contractor shall furnish all personnel and test instruments required for use in the test, including signal generator and amplifier. This contractor is not permitted to use building CATV headend equipment for testing purposes.
- C. The maximum deviation of drop signals between 50 and 860 MHz (slope) shall not exceed fifteen (15) dBmV. This Contractor shall furnish to the Owner, in the final test documents, the exact slope setting used. Upon request of the Owner, this Contractor shall test the bi-directional system at a maximum of five (5) locations, selected by the owner, to show compliance.

#### 1.05 WARRANTY

- A. This Contractor shall deliver the work described herein in a first class operating condition in every respect. This Contractor shall also warrant that the material, equipment, and workmanship shall be entirely free from defects. Any materials, equipment, or workmanship in which defects may develop before or during the warranty period shall be repaired or replaced at the Contractor's own expense. Refer to SECTION 01740 for the start of the warranty period. The Contractor shall further warrant that all material, equipment, and workmanship used in the installation, but not specifically mentioned in the Drawings and Specifications, is the best of their respective kinds and that the construction and installation was performed in accordance with the best accepted standard practices in all details.

### **PART 2 - PRODUCTS**

#### 2.01 MANUFACTURER

- A. The cable television/broadband distribution system equipment shall be manufactured by BLONDER-TONGUE, PPC., PICO MACOM, INC., TONER CABLE EQUIPMENT, INC. Contractor to verify final compatibility with existing CATV Headend Equipment prior to submitting shop drawings.

#### 2.02 EQUIPMENT LOCATIONS

- A. This Contractor shall furnish and install where shown on the Drawings, wall mounted main and sub-distribution equipment locations consisting of fire resistant 3/4 inch thick plywood backboards and the distribution equipment as detailed on the Drawings.

#### 2.03 MODULAR TAP DEVICES

- A. This Contractor shall furnish and install modular tap units in each CATV equipment location as shown on the drawings, in the quantity required to terminate all of the CATV wall outlets.

#### 2.04 AMPLIFIERS

- A. This Contractor shall furnish and install bi-directional, self-attenuating amplifiers as required to complete the system. Amplifiers shall be BLONDER-TONGUE series "5800" and shall have all necessary internal components for a complete bi-directional system. Amplifiers shall only be installed in CATV main and sub-distribution equipment locations.

#### 2.05 CONNECTORS

- A. This Contractor shall furnish and install CATV compression type, color coded cable connectors to complete the system. Connectors shall be specifically designed for plenum rated cable. The connectors shall be PPC Model No. EX6, and EX11 as appropriate for RG-6 and RG-11 coaxial cables.
- B. The connectors shall be compressed by the appropriate compression tool. The compression tool shall be PPC Model No. VT300 for RG-6 and RG-11 cable.

#### 2.06 CABLE TELEVISION/BROADBAND DISTRIBUTION WALL OUTLETS

- A. This Contractor shall furnish and install where shown on the Drawings, wall outlets consisting of "F" type connectors complete with stainless steel outlet coverplates. The cable television/broadband wall outlets shall be TONER CABLE EQUIPMENT, INC., Model No. F-81-NW.

#### 2.07 TERMINATORS

- A. This Contractor shall furnish and install terminators on all unused female "F" connector jacks throughout the system. The terminator shall be PICO MACOM, INC., Model No. F-59T.

#### 2.08 CABLE

- A. This Contractor shall furnish and install all cable television/broadband distribution system zone cables as shown on the Drawings. The cables shall be UL listed, plenum type, coaxial RG-6/U, No. 18 AWG, seventy-five (75) degree C solid bare copper with a maximum resistance of 6.5 ohms per 1,000 feet, foam polyethylene insulation with a tape barrier, and a bifoil (100% coverage) plus an aluminum braid (65% coverage) shield. The television/broadband distribution system zone cable shall be WEST PENN Cat. No. 25841 or equal as manufactured by BELDEN, PAIGE, GENERAL CABLE, or THE CABLE COMPANY.

#### 2.10 LABELING

- A. This Contractor shall label all cable television/broadband distribution wall outlets

as shown on the drawings.

- B. This Contractor shall label all cable television/broadband distribution system zone and trunk cables at each new main and sub distribution equipment location.
  - 1. Each zone cable shall be clearly labeled with the correct corresponding wall outlet designation. Each zone cable shall be labeled using a labeling machine with minimum ¼" high letters. Each label shall be wrapped around the zone cable and securely fastened.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION**

- A. All cable television/broadband distribution system homerun cables shall be routed from each CATV outlet to the main or sub distribution equipment location indicated through the corridors. Routing homerun cables through adjacent spaces is not acceptable.
- B. All horizontal cable television/broadband distribution system cable to be installed in areas without a ceiling or in areas without an accessible ceiling shall be installed by this Contractor in 3/4-inch conduit. Conduit is not required in areas designated on the Drawings as "Electric/Communications" rooms or closets.
- C. All horizontal cable television/broadband distribution system cable to be installed in areas with accessible ceilings shall be installed by this Contractor bundled together and run exposed above the ceilings. Bundles shall be supported by "J" hooks mounted not more than four (4) feet on center. "J" hooks to be dedicated to the wiring specified in this specification section. Provide eight to ten feet service loop within one foot of point of entry for any cabling supported by "J" hooks.
- D. All horizontal cable television/broadband distribution system cable shall be run at right angles to the building structure.
- E. All horizontal cable television/broadband distribution system penetrations through new and/or existing walls shall be sleeved. Minimum sleeve size shall be 3/4 inch. All sleeves shall be bushed both sides. Cables pulled through sleeves without bushings, cut bushings, wrapped with tape will not be accepted and shall be replaced by the Contractor.
- F. All cable television/broadband distribution system cable shall be terminated and labeled by this Contractor as shown on the Drawings. Cables shall not be nicked, strained, or damaged during the pulling operation. Cables shall be run free of splices from the equipment enclosures to the outlets. All junction box covers shall be stenciled for distinct identification.
- G. All cables shall be checked and tested by this Contractor to ensure the system is free from grounds, opens, and shorts.

- H. This Contractor shall notify the Owner when the service entrance conduit system is complete, ready for installation of the service entrance cable.
- I. All work shall be under the direct supervision of a factory accredited engineer. It shall be the responsibility of the Contractor to check and inspect this installation to the Architect/Engineer's approval.
- J. This Contractor shall demonstrate, to the Owner's technical staff, the ability to properly terminate RG-6 connectors prior to commencement of work.

### 3.02 WALL MOUNTED EQUIPMENT

- A. Cable television/broadband distribution system equipment shown on the Drawings or otherwise required to be mounted at a main or sub-distribution equipment location shall be furnished and installed by this Contractor with the proper adapters, mounting kits, and brackets.
- B. All equipment enclosure mounted equipment AC power cords shall be plugged into the associated duplex receptacle by this Contractor.
- C. All modular tap devices shall be properly grounded to the main building grounding system with minimum #12 A.W.G. grounding conductor.

### 3.03 CABLE TELEVISION/BROADBAND DISTRIBUTION OUTLETS

- A. This Contractor shall install, connect, and label all cable television/broadband wall outlets, as shown on the Drawings.

END OF SECTION

## SECTION 16770

### MULTI-MEDIA PRESENTATION CONTROL SYSTEM

#### PART 1 - GENERAL

##### 1.01 REQUIREMENTS

- A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

##### 1.02 SCOPE

- A. The work covered under this Section shall include furnishing and installing an HD Base T.2. UTP multi-media presentation control system as shown on the Drawings and herein specified for the distribution of audio/visual signals from cable television and/or broadband data signals.

##### 1.03 QUALITY ASSURANCE

- A. All active devices for this system shall be listed by Underwriters Laboratories, Inc. (UL1863), bear the UL label, and shall be installed in accordance with all requirements of the National Electrical Code (NEC), all state and local codes, and these Specifications.
- B. All active products shall be HDCP 2.2.compliant for all 4K and HDR applications.
- C. Equipment shall be constructed with National Electrical Manufacturer's Association (NEMA) standards.
- D. Shop drawing submittals are required per SECTION 16010 and shall include the following for review. Submittals not containing all of the information listed below will be rejected.
  - 1. Manufacturer's data sheets for all system components including cables.
  - 2. A detailed set of engineered floor plans for the complete multi-media presentation control system for the building shall be furnished showing the locations of all equipment and devices and their required interconnections. The shop drawings shall include the cable path from each wall outlet to its respective ceiling outlet location. The interconnections shown shall indicate the device configuration, number, size, type of devices and wires as described in this Specification and detailed on the Drawings. The device locations and wiring shall closely follow that shown on the Drawings.

#### 1.04 SYSTEM TEST

- A. Prior to the final acceptance of each phase of construction and at total completion of project, this Contractor shall conduct an operating test of the complete system. The system must test free from grounds, shorts, and other faults. All connections shall be thoroughly checked for mechanical and electrical connections.

#### 1.05 WARRANTY

- A. This Contractor shall deliver the work described herein in a first-class operating condition in every respect. This Contractor shall also warrant that the material, equipment, and workmanship shall be entirely free from defects. Any materials, equipment, or workmanship in which defects may develop before or during the warranty period shall be repaired or replaced at the Contractors own expense. Refer to SECTION 01740 for the start of the warranty period. The contractor shall further warrant that all material, equipment, and workmanship used in the installation, but not specifically mentioned in the Drawings and Specifications, is the best of their respective kinds and that the construction and installation was performed in accordance with the best accepted standard practices in all details.

### **PART 2 - PRODUCTS**

#### 2.01 MANUFACTURER

- A. The multi-media presentation control system equipment shall be manufactured by HUBBELL PREMISE WIRING, EXTRON, PEERLESS or approved equals.

#### 2.02 MULTI-MEDIA PRESENTATION CONTROL SYSTEM

- A. MULTI-MEDIA PRESENTATION CONTROL SYSTEM RECEIVER(S)
  - 1. This Contractor shall furnish and install where shown on the Drawings, wall/ceiling mounted multi-media HDBaseT receiver(s) HUBBELL Model No. ISFHDR4BK or part of the HUBBELL ISFHD4BK kit. One receiver for each multi-media presentation control system outlet shown. Each receiver shall be capable of video signals over one solid, unshielded, twisted-pair (UTP) cable, allowing video display devices to be located a maximum of 328 feet away from a digital source. Additionally, it shall support bidirectional RS232, IR, and USB control signals. The HDBase system shall feature LEDs to indicate that power and signal are working properly.
- B. MULTI-MEDIA PRESENTATION CONTROL SYSTEM OUTLET

1. This Contractor shall furnish and install where shown on the Drawings, wall mounted multi-media control system outlet. The system outlet shall come complete with one (1) 3.5mm mini-jack connector; one (1) HDMI connector and one (1) USB 2.0 connector. A multi-media control system outlet that meets this specification is HUBBELL Model No. ISFHDT4BK or part of the HUBBELL ISFHDT4BK kit. Where shown on the Drawing to be flush mounted, the devices shall be installed in a two gang, extra deep (min 3" depth) device box, refer to floor plans and details. Transmitter (source device) and receiver (display device) each will be mounted in a One Gang Standard Decora Style opening with stainless steel face plate. The two-gang box and decora opening is required for power receptacle on both ends (transmitter and receiver).
2. Transmitter/receiver power; front or rear 5V DC input (HUBBELL Model No. AVPS152BK Power Supply) on each device (both ends).  
DC power wire length: up to 50 ft. with 20 AWG  
Power supply features: tamper-resistant receptacle with 5V DC output USB charging, DC power and AC power in a standard single gang electrical opening. Designed to provide DC power to support active AV components by eliminating the need for external power supplies, it also provides a high speed USB charging port for charging personal electronics. A DC power supply switch is provided to turn off DC power for servicing troubleshooting. The tamper-resistant Style Line® decorator AC outlets provide additional power for AV components and displays. USB port is rated for a minimum 10,000 insertions.  
Power supply electrical ratings: 15A, 125V AC; input voltage: 125v AC. 60Hz; output voltage: 2A, 5V 125V circuit feed-through 20A, 125V.  
  
Transmitter/receiver cover plate; wall plates and boxes, metallic plates, 2-Gang, 2-GFCI openings, standard size, stainless steel (HUBBELL Model No. SS262).

#### C. MULTI-MEDIA PRESENTATION CONTROL SYSTEM CABLE

1. This Contractor shall furnish and install all multi-media presentation control system cables between transmitters and receivers or as shown on the Drawings. The cable shall be UL listed, plenum rated, unshielded, four (4) twisted pairs, No. 23 AWG, category 6, extended distance, high speed data type with a flame retardant polyvinyl chloride jacket and a temperature range for dry locations of minus ten (10) degrees C to sixty (60) degrees C. A multimedia cable, which meets this Specification, is Superior Essex Model No. 77-240-2B (blue) or equal as manufactured by AMP, AT&T, BELDON, BERK-TEK, THE CABLE COMPANY, GENERAL CABLE, GENISIS, HITACHI, MOHAWK, NORTHERN TELECOM, OPTICAL CABLE CORP., WINDY CITY WIRE or PAIGE.
2. This Contractor shall furnish and install field wiring for multi-media

presentation control sound system cables from ceiling mounted projector to Auxiliary Sound System or as shown on the Drawings. Wiring shall be two (2) conductor, No. -20 AWG stranded and shielded cable. A cable that meets this Specification is WEST PENN Cat. No.25292B or equal as manufactured by BELDEN, CONSOLIDATED WIRE, GENERAL CABLE, WINDY CITY WIRE, PAIGE, or TAPPAN.

D. MULTI-MEDIA PRESENTATION CONTROL SYSTEM PATCH CABLES

1. This Contractor shall furnish and install all multi-media presentation control system patch cables as shown on the Drawings. The cables shall be UL listed, plenum type, and shall consist of the following.
  - a. One (1) HDMI patch cable - BTX Technologies Cat. No. BTX-HDMM06 or approved equal. Maximum 6 feet length.
  - b. All multi-media system patch cables shall be complete with factory terminated male connectors. Field terminated connectors shall not be acceptable.

2.03 MULTI – MEDIA CEILING INTERFACE ADAPTOR AND PROJECTOR UNIVERSAL MOUNTING BRACKET

- A. This contractor shall furnish and install at each ceiling mounted projector location shown on the Drawings, one (1) lightweight, adjustable, suspended ceiling plate complete with turn buckles, fasteners, escutcheon ring and 1-1/2" diameter extension column. A multi-media ceiling interface adaptor that meets this specification is PEERLESS Model No. CMJ500R1 or approved equal. Refer to floor plans for ceiling mounted projector locations.
- B. This Contractor shall furnish and install at each ceiling mounted projector location shown on the Drawings, one (1) lightweight, adjustable, universal multi-media projector mounting bracket. A universal multi-media projector mounting bracket that meets this specification is PEERLESS Model No. PRG-UNV or approved equal. Refer to floor plans for ceiling mounted projector locations.
- C. This Contractor shall furnish and install where shown on the Drawings, one (1) ceiling mounted projector vibration isolator and (1) 6" extension pole. A ceiling mounted projector vibration isolator that meets this specification is PEERLESS Model No. ACC845 or approved equal. Refer to floor plans for locations.

**PART 3 - EXECUTION**

3.01 INSTALLATION

- A. All vertical multi-media presentation control system cables shall be installed by  
Belvedere Elementary School - 16770-4 (Rev 04/23)  
Construction Set



this Contractor in conduit and/or surface metal raceway as shown on the Drawings.

- B. All horizontal multi-media presentation control system cables to be installed in areas with accessible ceilings shall be installed by this Contractor bundled together and run exposed above the ceilings. Bundles shall be supported by "J" hooks mounted not more than four (4) feet on center. "J" hooks shall be dedicated to the wiring specified in this specification section.
- C. All horizontal multi-media presentation control system cables shall be run at right angles to the building structure.
- D. All multi-media presentation control system cables shall be terminated and labeled by this Contractor as shown on the Drawings. Cables shall not be nicked, strained, or damaged during the pulling operation. Cables shall be run free of splices. All junction box covers shall be stenciled for distinct identification.
- E. All cables shall be checked and tested by this Contractor to ensure the system is free from grounds, opens, and shorts.
- F. The exact length of the extension column shall be field determined by this contractor prior to installation.
- G. This Contractor shall install, Owner furnished, wall/ceiling mounted LCD projector(s). This Contractor shall make all final connections and leave a complete, tested and operational multi-media system.
- H. This Contractor shall select a classroom, approved by the owner, to serve as a mock-up/prototype for all LCD projector wall/ceiling mounted installations. This Contractor shall install a typical ceiling mount and LCD projector (LCD projector furnished by Owner) to determine the focal length/location and extension column length required. Prior to continuing with the installation(s), coordinate with Owner's representative for review and approval of installation.
- I. For all the wall mounted locations, Hubbell ISFHD4BK extender kit shall be installed in 2-gang box; Hubbell Cat. No. HBL 2444D2AIV.

### 3.02 ON-SITE AS-BUILT DRAWINGS

- A. The Contractor shall provide one (1) set of the multi-media system supplier's as-built drawings for permanent use on-site. The Contractor shall: laminate each page of these drawings; provide a rigid means for mounting such as 1/4-inch thick x two (2) inch wide x width of the drawings through-bolted wood along the left edge of the drawings; furnish and install hanging hooks on the back of the Communications Room door; and hang the bound set of drawings.

END OF SECTION