



**SOFTBALL FIELD NO. 2
LIGHTING
REPLACEMENT PROJECT**

For

South Lake High School

IFB# 19-025

**South Lake Dr.
Reston, VA 22181**

April 24, 2019

Owner:

Fairfax County Public Schools
8115 Gatehouse Road
Suite 3500
Falls Church, VA 22042



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SECTION 00020

INVITATION TO BID

PART 1 - GENERAL

- 1.01 Notice is hereby given that the Fairfax County School Board (the "Owner") will receive bids for the **South Lake High School Softball Field No. 2 Lighting Replacement Project** up to, but not later than, **2:00pm on April 24, 2019**. A Pre-Bid Conference will be held at **1:00pm on April 17, 2019, at Gatehouse Administrative Building, 8115 Gatehouse Road, Falls Church, Virginia, 22042**.
- 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 examined at the Owner's Office of Design and Construction Services Gatehouse Administrative Office location. Contract document sets may be obtained from the Fairfax County Public School Office of Design and Construction Services Gatehouse Road Falls Church, VA 22042 and Phone number (571)423-2200. Bidding documents are available at www.fcps.edu, search for Design and Construction Current Solicitation.
- 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 11/17)

NAME	ADDRESS	PHONE	FAX
Builders Exchange Assoc of VA	3207 Hermitage Road Richmond, VA 23227 editor@BXAVA.com	804-353-2788	804-353-8640
DODGE Data	Please Send CD & Hard Copy to: <i>Dodge Data and Analytics</i> 4300 Beltway Place, Suite 180 Arlington, TX 76018-5253 support@construction.com www.construction.com	800-393-6343	800-625-3488
Construct Connect	30 Technology Parkway South Suite 100 Norcross, GA 30092 docprocessing@cmdgroup.com content@cmdgroup.com addenda@cmdgroup.com	800-364-2059 Ext. 8232	866-570-8187
Valley Construction News	426 West Campbell Avenue, SW Roanoke, VA 24016 emilyvcn@yahoo.com	540-344-8127	540-344-0292
The Blue Book	800 E. Main Street Jefferson Valley, NY 10535 ATTN: Mary O'Connor moconnor@mail.thebluebook.com	800-431-2584, Ext. 3028	914-243-4396

- 1.09 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, 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 Design & Construction 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 Design and Construction 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

Karen Corbett Sanders
Chairman

Dr. Scott S. Brabrand
Superintendent of Schools

Jeffrey K. Platenberg
Assistant Superintendent
Facilities and Transportation Services

Brady Rauch
Director
Design and Construction

END OF SECTION

SECTION 00100

INSTRUCTIONS TO BIDDERS

1. PROSPECTIVE BIDDER

- A. Notice is hereby given that the Fairfax County School Board ("The owner") will receive bids for the **South Lake High School Softball Field No. 2 Lighting Replacement Project** up to but no later than 2:00 p.m., April 24, 2019, in suite 3400 at Gatehouse Administration Center (GAC) 8115 Gatehouse Road. Falls Church. Virginia 22042.
- B. 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.
- C. 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 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 Design and Construction Services. 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 fax to Keith Kessler, buyer at 571-423-2317. 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. The addenda are acquired at www.fcps.edu search for Design and Construction current solicitations or call Keith Kessler, buyer at (571)-423-2262 prior to bid submission in order to determine whether any addenda have been issued in connection with this solicitation." Not with standing 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. 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 Design & Construction 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 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. Within ten (10) days after issuance of a Notice of Award, the successful bidder shall execute and deliver to the Owner an Agreement on the form prescribed herein and 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 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; and (3) one 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. 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 in Suite 3400, 8115 Gatehouse Road, Falls Church, VA 22042, 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:

Brady Rauch, Director
Fairfax County Public Schools
Office of Design and Construction
8115 Gatehouse Road, Suite 3400
Falls Church, VA 22042
Telephone Number 571-423-2280; Fax 571-423-2217
Email: bbrauch@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 Design and Construction (D&C), 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 D&C 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, D&C 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 search for Design and Construction 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 inquires 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 Design and Construction 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 Design and Construction 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 Design and Construction 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 Assistant Superintendent, or designee, for the Department of Facilities and Transportation Services 8115 Gatehouse Road, Suite 3400, 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 Assistant Superintendent, or designee, for the Department of Facilities and Transportation Services 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 Assistant Superintendent, or designee, for the Department of Facilities and Transportation Services 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 Assistant Superintendent, or designee, for the Department of Facilities and Transportation Services 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 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")
8115 Gatehouse Road, Suite 3400
Falls Church, VA 22042

RE: **South Lake High School**
Softball Field No. 2 Lighting Replacement Project

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	Food Service Equipment
Plumbing	Roofing
Mechanical	Automatic Temperature Controls
Communication and Special Systems	Casework
Site and Site Utilities	

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 Design and Construction Services. The determination of eligibility rendered by the Director of Design & Construction 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.

Principal

(SEAL)

By: _____

Name: _____

Title: _____

Address: _____

Surety

(SEAL)

By: _____

Attorney-in-Fact (Attach Copy
of Power of Attorney)

Name: _____

Title: _____

Address: _____

Countersigned for the
Commonwealth of Virginia:

By: _____
Resident Agent

Address: _____

END OF SECTION

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 Obligees declares the Principal to be in default, the Surety will promptly, at the Obligees 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 Obligees; (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 Obligees and the Surety of the lowest responsible and responsible bidder, (i) arrange for a contract between such bidder and the Obligees and (ii) make funds available directly to the Obligees, or to such contractor(s) as the Obligees 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 Obligees specifying the Obligees 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 Obligees election. In the event the Surety fails to resume the Work within such 45 day period, the Obligees 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 Obligees. As employed herein, the phrases (i) "balance of the contract price" shall mean the total amount payable by the Obligees to the Principal under the Contract after all proper adjustments have been made, less the aggregate of all amounts paid by the Obligees 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 Obligees omission to call upon the Surety in any instance shall in no event release the Surety from any obligation hereunder.

All notices, requests, demands and other communications which are provided hereunder, shall be in writing and shall be deemed to have been duly given upon the hand delivery thereof during business hours, or upon the earlier of receipt or three (3) days after posting by registered mail or certified mail, return receipt requested, or on the next business day following delivery to

a reliable overnight delivery service, if to the Principal or the Obligee, to the addresses set forth in the Contract, and if to the Surety, to the address set forth beneath its signature.

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

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

[SIGNATURES ON FOLLOWING PAGE]

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

(SEAL)

Principal

By: _____

Name: _____

Title: _____

Address: _____

Surety

(SEAL)

By: _____

Attorney-in-Fact (Attach Copy
of Power of Attorney)

Name: _____

Title: _____

Address: _____

Countersigned for the
Commonwealth of Virginia:

By: _____

Resident Agent

Address: _____

END OF SECTION

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 _____

By: _____

Name: _____

Title: _____

Address: _____

Surety _____

(SEAL)

By: _____

Attorney-in-Fact (Attach Copy
of Power of Attorney)

Name: _____

Title: _____

Address: _____

Countersigned for the
Commonwealth of Virginia:

By: _____

Resident Agent

Address: _____

END OF SECTION

SECTION 00700

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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 Design and Construction. 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 Design and Construction Services, Fairfax County Public Schools, Gatehouse Administration Center, 8115 Gatehouse Road, Suite 3400, Falls Church, Virginia 22042, fax number (571)-423-2317.
- 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 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.
- 1.21 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.
- 1.22 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.
- 1.23 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.
- 1.24 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.

- 1.25 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.
- 1.26 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.
- 1.27 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.
- 1.28 Work. Everything explicitly or implicitly required to be furnished or performed under the Contract Documents. The Work may represent the whole, or a necessary and interdependent part of, the Project.

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

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 **[twenty (20)]** sets 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 Design and Construction.
- 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 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. 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. 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(A)(1) above, and state the reason in reasonable detail for such withholding.
- B. 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(A)(1).
- C. 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(A)(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.
- D. 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.

- E. 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.
- F. 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(A) through 6.04(D) 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 Design and Construction 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. Temporary Trailer Allowance: Section 01020
- B. Applicable Standards: Section 01091
- C. Temporary Utilities: Section 01510
- D. Construction Aids: Section 01520
- E. Barriers: Section 01530
- F. Temporary Controls: Section 01560
- G. Cleaning: Section 01710
- H. Selective Demolition: Section 02070

1.02 SCOPE OF WORK COVERED BY CONTRACT DOCUMENTS

- A. *(Provide a general description of the project, including site work, building renovation scope, additions, and upgrades or replacement of major systems, such as HVAC, Plumbing, Electrical and Special Systems.)*
- B. The work shall be completed in phases as indicated on the Construction Phasing Drawings, in order to allow the Owner partial and continuing occupancy of the existing building during construction.
- C. Normal operations shall be maintained during the course of the school year. The FCPS School year calendar is attached for Contractor's reference *(Insert a copy of the calendar here or at the end of Section)*.
- D. To protect students and staff health and enhance the learning environment of school children, the new school building has been designed with CHPS (Collaborative for High Performance Schools) criteria in mind and must achieve the CHPS Designed status. The Contractor must be familiar with VA-CHPS criteria and responsibilities that accompany a CHPS project.

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.
- D. The Owner shall obtain and pay for the General Building Permit. The Contractor shall obtain and pay for all other permits required by law for the execution of this Work.
- E. The Contractor shall also obtain and pay for certificates, inspections including but not limited to Fire Marshal's review and inspection fees and other legal fees required, both permanent and temporary, including plumbing, mechanical, sprinkler, electrical and highway permits. NOTE: Sewer frontage or availability and water frontage and tap-on fees or charges will be paid by Owner.

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 _____. The work shall be finally complete on or before _____.
- B. Liquidated Damages:

1. Total Project: Should the Work not be performed on or before the times stated, there will be deducted from the Contract Balance the sum of _____ (\$_____) per consecutive calendar days, as Liquidated Damages, but not as a penalty, for each day's delay after expiration of such period, and until final completion of the Work and its acceptance by the Owner.

2. Work phases: Should the Work of each phase not be performed on or before the completion dates established by the Work Sequence, there will be deducted from the contract balance the following sums for each phase, per consecutive calendar days, as Liquidated Damages, but not as a penalty, for each days delay after expiration of the completion dates, and until acceptance by the Owner:

3. Submittals required under section 01340: Should submittals not be received by the architect within the time periods indicated in Section 01340, there will be deducted from the contract balance the sum of one hundred dollars (\$100.00) per consecutive calendar days, per submittal, as liquidated damages, but not as a penalty, for each day beyond the allowable time periods.

(List Phase or Phases and Dollar amount of Liquidated Damages per day.)

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.

<u>Portion of Work</u>	<u>Date of Commencement of Work</u>	<u>Date of Substantial Completion</u>
	June 14, 2019	August 9, 2019

- 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.
- 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, furniture 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 file cabinets and 2 bookcases.
 - b. Computer Labs: Approximately 30 computer desks and 30 chairs.
 - c. Administrative and Guidance Offices: Approximately 1 desk, 1 chair, 1 credenza, and 1 bookshelf for each office.
 - d. Subschool Offices (High School): Approximately 1 desk, 1 chair, 1 credenza and 1 bookshelf for each office.
 - e. Itinerant and Miscellaneous Offices: Approximately 1 desk, 1 chair, 1 credenza and 1 bookshelf for each office.
 - f. Library (Elementary School): Approximately 250 boxes, 10 tables, 40 chairs, 3 desks and 3 chairs for staff.
 - g. Library (Middle School): Approximately 350 boxes, 15 tables, 60 chairs, 3 desks and 3 chairs for staff.
 - h. Library (High School): Approximately 500 boxes 25 tables, 100 chairs, 4 lounge chairs, 3 desks and 3 chairs for staff.
 - i. Kitchen (Elementary School): Approximately 2 work tables, 2 pan racks, 3 carts, 8 pan carriers, 2 dunnage racks, 2 ice cream cabinets, 2 milk coolers, 8 mobile shelving units and other miscellaneous equipment.
 - j. Kitchen (Middle School): Approximately 3 work tables, 6 pan racks, 4 carts, 14 pan carriers, dunnage racks, 3 ice cream cabinets, 3 milk coolers, 10 mobile shelving units and other miscellaneous equipment.

- k. Kitchen (High School): Approximately 6 work tables, 6 pan racks, 4 carts, 14 pan carriers, 2 mixers, 1 slicer, 1 lidding machine and conveyor, 30 dunnage racks, 5 ice cream cabinets, 5 milk coolers, 20 mobile shelving units and other miscellaneous equipment.
 - l. Gymnasium (Elementary School): Mats, portable game standards, equipment transporters and other miscellaneous equipment.
 - m. Gymnasium (Middle School): Landing mats, portable game standards, fitness room equipment, equipment transporters and other miscellaneous equipment.
 - n. Gymnasium Complex (High School): Pommel horses, wrestling mats, landing mats, balance beams, parallel bars, portable game standards, equipment transporters, weight room equipment (such as bench, leg and shoulder presses, weight sets, plate racks) and other miscellaneous equipment.
- 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.
- D. 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.
- D. Owner will arrange for rental of trailers to facilitate continuation of classes during work on classrooms. Contractor shall provide allowance for installation and utility hook-up: See Section 1020 for allowance requirements.

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 01020

ALLOWANCES

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. This Section pertains to the provision of all items of Work which may or may not be defined in other Sections, but shall be provided in the Contract Price as defined by the allowances specified in Part two of this Section.

1.03 REQUIREMENTS

- A. Basis of Quantity Allowances: The stated quantity allowances represent the complete estimate of material or items contemplated to be furnished and installed in the Project. The Contract Price shall include all storage or additional transportation costs due to timing of delivery and installation.
- B. Guarantee for Allowances: All allowance materials or items shall be included in the Contractor's guarantee for the Project.
- C. All overhead, profit, taxes, licenses, fees or other expenses related to the purchase and installation of the referenced allowance materials or items shall be included in the base bid, except for work covered by the contingency allowance.
- D. Any money remaining in the Allowances at the close of the project shall be credited to the Owner.
- E. No samples, Shop Drawings, or catalog cuts of allowance items will be reviewed unless the total cost or unit price is included with the Contractor's submission.
- F. Contractor shall obtain Owner's written approval to exceed any allowance amount prior to ordering materials or performing the work involved.

PART 2 - ALLOWANCES

2.01 LIST OF ALLOWANCES:

- A. Contingency Allowance: _____.
 - 1. The cost of any items paid for out of this allowance shall be confirmed by a Change Order including materials, labor, insurance, payroll taxes,

supervision, bond premium costs, transportation, equipment rental, etc., and the percentages for overhead and profit set forth in the Conditions of the Contract. Contractors shall not include any additional mark-up on the allowance in the bid.

- B. The Contractor shall allow the sum of \$ _____ for Testing, Adjusting and Balancing (TAB) as specified in Section 15990.
- C. The Contractor shall allow the sum of \$ _____ for Commissioning as specified in Section 15995.
- D. The Contractor shall allow the sum of \$ _____ for installation and utility hook-up of temporary classroom trailers.
- E. New Schools: The Contractor shall allow the sum of \$ _____ for traffic control devices (Wink-O-Matics).
- F. High School Renovations: The Contractor shall include in the base bid the cost to construct and remove a total of 10,000 square feet of temporary partitions for separation of phased construction from occupied portions of the building.
- G. The Contractor shall allow the sum of \$ _____ for provision and installation of modular playground equipment, including ground cover and edging (New Elementary Schools Only).
- H. The Contractor shall allow the sum of \$ 15,000 for provision and installation of school sign (Elementary Schools Only).

END OF SECTION

**INSTRUCTIONS FOR EDITING
AND COORDINATION
SECTION 01040**

SUPERVISION AND COORDINATION

1. Paragraph 1.03.A: Delete this paragraph if this is not a new high school or high school renovation.
2. Paragraph 1.03.B: Edit this paragraph to require only one superintendent if this is a new school or an addition.

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. (New High Schools and High School Renovations Only): Contractor shall employ and pay for the services of a full time, qualified Project Manager, located at the project site, dedicated solely to the project, for the duration of the construction work.
- B. 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.
- C. 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. Check anchor bolt settings.
- E. Review the effect of any changes on the work of other contracts or trades.
- F. 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 01050
FIELD ENGINEERING

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

- A. Provide and pay for field engineering services required for the Project.
- B. Provide and pay for survey work required in execution of the Project.
- C. Provide and pay for civil, structural or other professional engineering services specified, or required to execute Contractor's construction methods.
- D. Owner's Representative will identify existing control points and property line corner stakes indicated on the Drawings as required.

1.03 RELATED WORK

- A. General Conditions: Section 00700
- B. Summary of Work: Section 01010
- C. Storm/sanitary sewers and water mains: Section 02721

1.04 QUALIFICATIONS OF SURVEYOR OR ENGINEER

- A. Qualified engineer or registered land surveyor, acceptable to Contractor and Owner.

1.05 SURVEY REFERENCE POINTS

- A. The Owner will provide a benchmark on the site and property corners or references for the location and stakeout of this work.
- B. Locate and protect control points prior to starting site work, and preserve all permanent reference points during construction.
- C. Make no changes or relocations without prior written notice to Architect.
- D. Report to Architect when any reference point is lost or destroyed or required relocation because of necessary changes in grades or locations.

- E. Require surveyor to replace Project Control points which may be lost or destroyed at no cost to the Owner.

1.06 ACCURACY OF EXISTING TOPOGRAPHY

- A. The existing contours shown on the site plans are correct within one half a contour interval (1') on at least eighty percent (80%) of the site, and contours on the remaining twenty percent (20%) are in error by no more than 1 contour interval (2').

1.07 STAKES & GRADES

- A. The Contractor shall set rough grade stakes in sufficient number so that the site can be accurately graded to meet the intent of the site plan. Stakes for final grading will be set and topsoil of the required thickness shall be spread to the required grade. Stakes, with appropriate cut sheets, shall be set for all sanitary and storm sewers on all curbs and gutters. The stakes shall be set on minimum 50-foot stations and at all odd pluses.
- B. Upon completion of subgrade excavation and embankment in all areas to be paved, the subgrade elevation may be checked by the Owner. Grade stakes indicating the finished compacted surface of the base course shall be set, prior to installing base material. The Contractor shall save all such stakes. Upon completion of all work, and before acceptance of same, proper tests for determination of compaction, gradation, thickness, etc., of base and surface courses shall be made by the Owner.

1.08 EASEMENTS

- A. The Contractor shall verify the acquisition of all off-site easements prior to the start of any off-site construction. This shall be done by contacting the Architect.
- B. The Contractor shall restore all off-site easements in accordance with the terms of the easement agreement. He shall clean up all rubbish and surplus materials, and leave the easement in presentable shape at least comparable with the condition that it was before the construction work began. Upon completion of said restoration, the Contractor shall obtain a written release from the property owner granting the easement.
- C. Information as to existing underground construction and sub-surface conditions such as rock, unstable material or ground water is shown in accordance with the best available data. All must be investigated or verified in the field prior to or upon construction by the Contractor. Location and elevation of points of pickup or discharge of sanitary or storm sewage and surface water and inverts for sanitary or storm connections shall be verified prior to construction by the Contractor.

- D. The existence and location of underground utilities and/or other construction indicated on the plans are not guaranteed and shall be investigated and verified in the field by the Contractor. Trenches, in which these utilities and/or construction are placed, are not guaranteed as to degree of compaction and shall be investigated and verified in the field by the Contractor. If these trenches are not up to present standards of 95% compaction, they shall be compacted to 95% compaction prior to or upon construction by the Contractor. Work in the vicinity of existing structures and utilities shall be carefully done by hand. The Contractor shall be held responsible for any damage to and for maintenance and protection of existing facilities and structures.
- E. Any existing structures, services or other appurtenances located in or affected by the construction of the work herein shall be adjusted, moved or relocated as required. The work shall be performed by the Contractor.
- F. Utility poles, lines and gas mains that are the property of the utility companies will be relocated when required by others upon reasonable advance notification.

1.09 RECORDS

- A. On completion of foundation walls and major site improvements prepare a certified survey showing all dimensions, locations, angles and elevations of construction.
- B. Storm and Sanitary "As-Built:" The Contractor shall provide the Owner with "As-Built" storm and sanitary sewer plans traced on Mylar, showing plan and profile, both in ink. The plans shall be prepared by a duly licensed engineer or land surveyor and certified by him as accurately showing the rims, inverts, and percents of grade of the sewers and shall meet all other requirements of Fairfax County for "As-Built" storm and sanitary sewer plans. Submit to Fairfax County Department of Public Works and Environmental Services (DPWES) for approval.
- C. Grading "As-Built:" Upon completion of all site work and improvements, the Contractor shall so notify the Owner in writing stating that the work has been completed in accordance with the plans and specifications. The Contractor shall prepare at his expense "As-Built" drawings of the site work. Final acceptance of the on-site and off-site improvements shall be contingent upon the "As-Built" drawings showing substantial compliance with the contract documents. The Contractor shall pay for subsequent "As-Built" drawings required by his noncompliance with the contract documents.

1.10 SUBMITTALS

- A. Submit name and address of Surveyor or professional engineer to Architect.
- B. On request of Architect submit documentation to verify accuracy of field engineering work.

- C. Submit certificate signed by registered engineer or surveyor certifying that elevations and locations of improvements are in conformance or non-conformance with Contract Documents.
- D. Rough grade cut sheets shall be submitted to the Department of Public Works for approval 24 hours prior to the start of construction. Furnish to Owner's Field Representative a copy of the approved cut sheets.

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., Lejeune 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., 17th 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 24th Street, 6th 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 – 2000 Edition (SIFC-2000), 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, 142 Minna Street, 2nd Floor, San Francisco, CA 94105.

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 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. Allowances: Section 01020.
- D. Construction Progress Schedules: Section 01310.
- E. Schedule of Values: Section 01370.
- F. 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, and 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, and 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 8 rows (A-H) and 3 columns: Description, Percentage, and Amount. Rows include: (A) TOTAL COST OF WORK PERFORMED TO DATE, (B) LESS AMOUNT RETAINED, (C) NET AMOUNT EARNED ON CONTRACT TO DATE, (D) MATERIALS STORED (ATTACH SCHEDULE), (E) ADD OR DEDUCT CHANGE ORDERS (ATTACH SCHEDULE), (F) TOTAL AMOUNT EARNED ON CONTRACT TO DATE, (G) LESS PREVIOUS PAYMENTS, (H) 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
TOTALS:							

**FAIRFAX COUNTY PUBLIC SCHOOLS
REQUISITION FORM**

STORED MATERIAL LOG

PROJECT:
DATE:
REQUISITION #:

ITEM #	DESCRIPTION	PREVIOUS VALUE	RECEIVED THIS MONTH	INSTALLED THIS MONTH	CURRENT VALUE
	<i>Example</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>A+B-C=</i>
	SUBTOTALS:				
	LESS 10% RET.				
	TOTAL:				

**FAIRFAX COUNTY PUBLIC SCHOOLS
REQUISITION FORM**

CHANGE ORDER LOG

PROJECT:

DATE:

REQUISITION #:

CO #	CP #	PM #	DESCRIPTION	CHANGE VALUE	PREVIOUS VALUE	VALUE THIS REPORT	TOTAL VALUE TO DATE	BALANCE TO COMPLETE
			<i>SUBTOTALS:</i>					
			<i>LESS 5%:</i>					
			<i>TOTAL:</i>					

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. General Conditions of the Contract: Section 00700.
- B. Section 01020: Contingency Allowance.
- C. Section 01152: Applications for Payment.
- D. Section 01370: Schedule of Values.
- E. Section 01630: Substitutions

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 Design and Construction or his designated representative. All claims must be filed with the Office of Design and Construction 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 Design and Construction 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 Rental Rate Blue Book for construction Equipment and dividing it by 176. An allowance shall be made for operating costs for each and every hour the equipment is actually operating in accordance with the rates listed in the aforesaid Rental Book. The Contractor shall be allowed no more than 65% of the rental rate on Contractor owned equipment.
 5. Base Cost is defined as the total of labor, material, and equipment rentals as described in Subparagraphs 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, 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. Pre-Bid Conferences: Instructions to Bidders.
- B. Summary of Work: Section 01010.
- C. Construction Progress Schedules: Section 01310.
- D. Shop Drawings, Product Data and Samples: Section 01340.
- E. Project Record Information: Section 01720.
- F. 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. Reproduce and distribute copies of minutes after each meeting and furnish six (6) copies of minutes to Contractor.
- 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. Two-week look-ahead
17. Maintenance of quality standards and controls
18. Site Cleanliness
19. Security Issues
20. Project Closeout related items
21. 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 a minimum of four (4) sets of prints; one (1) set of prints shall be returned to the Contractor for reproduction and distribution. Electronic PDF submissions are acceptable for review. Two (2) paper sets of approved prints shall be retained by 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 a minimum of five (5) copies. One (1) copy shall be returned to the Contractor for duplication and distribution. Two (2) copies shall be retained by 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 re-inspection shall be performed by the testing lab. The Contractor shall pay for any retesting and re-inspection.

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

INSTRUCTIONS FOR EDITING

SECTION 01510

TEMPORARY UTILITIES

1. Page 01510-1, Paragraph 2.02: Delete this paragraph if project scope involves additions or alterations to an existing facility.
2. Page 01510-2, Paragraph 2.03: Delete this paragraph if project scope involves new construction only.
3. Page 01510-3, Paragraph 2.06: Edit this paragraph depending upon scope of work.

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.
 - 2. Field Offices and Sheds: Section 01590.

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. Provide adequate power and artificial light to field offices for Contractor and Owner's Representative.
- E. 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.
- 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.
- E. Provide adequate power and artificial light to field offices for Contractor and owner's Representative.

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.
- D. Provide adequate heat and cooling to field offices of Contractor and Owner's Representative.
- E. Pay all costs of installation, maintenance, operation and removal and for fuel consumed.
- F. 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. Service required shall be as follows:
1. One direct line instrument in Field Office, and one dedicated line for fax machine.
 2. One direct line instrument for the Owner's Representative, and one dedicated line for fax machine.
 3. Other instruments at the option of the Contractor, or as required by regulations.
 4. 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. 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 exit ways adjacent to work that is occurring overhead, provide structural roof construction that is adequate to protect building occupants using the enclosures or exit ways.
 - 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 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 specify or to original condition.

END OF SECTION

INSTRUCTIONS FOR EDITING

SECTION 01530

BARRIERS

1. Paragraph 1.02(B): Delete this paragraph if project involves only new construction.

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 01580
CONSTRUCTION SIGNS

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

- A. Provide temporary on-site information signs.
 - 1. As required and regulated by codes, laws and regulatory agencies.
 - 2. To identify key elements of the construction facilities.
 - 3. To direct traffic.
- B. The Architect and Contractor will be allowed to install their own identification signs.
- C. Remove signs on completion of construction.
- D. Allow no other signs to be displayed.

1.03 INFORMATION SIGNS

- A. Painted signs with painted lettering or standard products.
- B. Size of signs and lettering: As required by regulatory agencies or as appropriate to the usage.
- C. Colors: As required by regulatory agencies, otherwise of uniform colors throughout the Project.
- D. Erect at appropriate locations to provide the required information.

1.04 QUALITY ASSURANCE

- A. Sign Painter: Professional Experience in the type of work required.

- B. Finishes, Painting: Adequate to resist weathering and fading for the scheduled construction period.

PART 2 - PRODUCTS

2.01 SIGN MATERIALS

- A. Structure and Framing: May be new or used, wood or metal in sound condition structurally adequate to the work and suitable for specified finish.
- B. Sign Surfaces: Exterior softwood plywood with medium density overlay, standard large sizes to minimize joints.
- C. Thickness: As required by standards to span across framing members, to provide even, smooth surface without waves or buckles.
- D. Rough Hardware: Galvanized.
- E. Paint: Exterior quality, as specified in Section 09900.
- F. Use Bulletin colors for graphics.

PART 3 - EXECUTION

3.01 INFORMATION SIGNS

- A. Paint All Exposed Surfaces: One coat of primer and one coat of exterior paint.
- B. Paint graphics in the styles, sizes, and colors as required.
- C. Install at a height for optimum visibility, on ground-mounted poles or attached to temporary structural surfaces.

3.02 MAINTENANCE

- A. Maintain signs and supports in a neat, clean, condition; repair damages to structure, framing, or sign.

3.03 REMOVAL

- A. Remove signs, framing, supports, and foundations at completion project.

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 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

INSTRUCTIONS FOR EDITING

SECTION 01730

OPERATING AND MAINTENANCE DATA

1. Paragraph 3.01: Edit as appropriate to project scope to add or delete equipment or material data required herein.

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 a 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 2 – Site Work
 - 1. Synthetic athletic surfaces (running track and tennis courts): Provide manufacturer’s written recommendations for care and maintenance.
 - 2. Field irrigation Systems: Provide Maintenance and Operating instructions, including “as built” drawings, suggested operating schedule, shutdown procedures, and home and phone number of installation Contractor.
- C. Division 3 - Concrete
 - 1. Precast Units: Identify each type.
- D. 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.
- E. Division 5 - Metals
 - 1. Floor and Roof Deck: Identify each type of deck; include gauge and other structural properties.
- F. Division 7 - Thermal and Moisture Protection
 - 1. Metal Roofing and Siding: Identify each type; include description of profile, gauge and color.
 - 2. Membrane Roofing System: Identify system type, system components, insulation type and thickness.
 - 3. Skylights and Roof Hatches: Provide product description; identify major components.
- G. 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. Side Folding Gates: Provide manufacturer’s catalog data and parts list. Include operating and maintenance instructions, along with lubrication requirements.

3. Overhead Coiling Grilles, Folding Gates and Rolling Service Doors: Provide manufacturer's catalog data and parts list. Include operating and maintenance instructions, along with lubrication requirements.
 4. Storefronts: Identify type of curtain wall framing used.
 5. Windows: Identify each type and include product data and parts list for operating hardware.
 6. 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.
 7. Glass: Identify each type, design or pattern.
- H. 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.
 5. Room Carpet:
 - a. Identify type; include product data and name of each color used.

- b. Provide manufacturer's recommended maintenance and cleaning instructions.
 - 6. Wood Flooring-Athletic: Provide manufacturer's product data and written recommended maintenance instructions.
 - 7. Paint and Coatings: Identify each type of paint and coating by schedule.
 - I. Division 10 - Specialties
 - 1. Plastic Toilet Partitions: Provide catalog data and parts list for hardware.
 - 2. Metal Lockers: Provide catalog data and parts list for hardware, for each type of locker used.
 - 3. Operable Partitions (Folding and Accordion)
 - a. Identify each type, include manufacturer's catalog data.
 - b. Provide a service manual and parts list.
 - J. Division 11 – Equipment
 - 1. Library Materials Security System: Provide data, parts list, and operating and maintenance instructions. Include service contract and service point of contact
 - 2. Stage curtains, tracks and accessories:
 - a. Provide catalog data for each type of curtain fabric specified, including certification of flame resistance and fire retardant treatment.
 - b. Provide manufacturer's written instructions for care and maintenance.
 - c. Provide parts list for track and accessories.
 - 3. Theater and Stage Rigging Equipment
 - a. Identify each item of equipment. Include catalog data indicating all accessories.
 - b. Provide Operating and Maintenance Manuals and parts list. Include lubrication schedules.
 - 4. Motorized Projection Screens

- a. Provide manufacturer's catalog data and parts list.
 - b. Provide manufacturer's operating and maintenance instructions.
5. Food Service Equipment
 - a. Identify each item of equipment. Include catalog data showing options and accessories. Arrange by item number in numerical order.
 - b. Provide operating, cleaning and maintenance instructions, inventory list of repair and replacement parts, and parts sources.
6. Athletic Laundry Equipment: Provide manufacturer's catalog data, maintenance instructions, and parts list for washer/extractor and dryer.
7. Gymnasium Equipment
 - a. Identify each type of motorized gymnasium equipment; include manufacturer's catalog data.
 - b. Provide operating and maintenance instructions for each type of motorized equipment.
- K. Division 12 - Furnishings
 1. Casework, tops and accessories: Provide manufacturer's recommended maintenance procedures for care and cleaning of finished surfaces.
 2. Telescoping Bleachers: Provide the following:
 - a. Manufacturer's catalog data describing type of bleacher system.
 - b. Manufacturer's recommended operating and maintenance instructions.
- L. Division 13 – Special Construction
 1. Aluminum Grandstands: Include manufacturer's parts list and parts description for decking, treads and risers, footboards, seat risers and seat boards.
- M. Division 14 - Conveying Systems
 1. Elevators and lifts:

- a. Provide manufacturers catalog data, parts list and control wiring diagrams.
 - b. Provide maintenance and lubrication instructions on manufacturers letterhead.
- N. Division 15 - Mechanical
1. Plumbing Systems: Include the following:
 - a. Manufacturer's catalog data and parts list for each item of equipment, along with preventative maintenance instructions.
 - b. Maintenance and lubrication instructions for each item of equipment furnished.
 2. 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.
 3. 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.
- O. 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

INSTRUCTIONS FOR EDITING

SECTION 01800

SUSTAINABLE DESIGN REQUIREMENTS

1. Include VA-CHPS scorecard in paragraph 3.06 of this section-edit scorecard for project requirements to meet the required minimum CHPS design criteria developed for this project scope of work.

SECTION 01800

SUSTAINABLE DESIGN REQUIREMENTS

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 SUMMARY

- A. This is a registered Collaborative for High Performance Schools (CHPS) designed project. Refer to VA-CHPS criteria for sustainable design requirements. Requirements can be viewed at www.chps.net.
- B. This Section includes general requirements and procedures for compliance with VA-CHPS, as part of Fairfax County Public Schools, sustainable design for the Project.
 - 1. Other sustainable features are dependent on material selections and may not be specifically identified requirements. Compliance with requirements needed to achieve sustainable design may be used as one criterion to evaluate substitution requests.
 - 2. Additional sustainable requirements depend on the Architect's design and other aspects of the project, which are not part of the Work of the Contract.
 - 3. Refer to Divisions 01 through 16 sections for sustainable requirements specific to the work of each of these sections. Requirements may or may not include reference to sustainability.

1.03 CONTRACTOR'S RESPONSIBILITIES

- A. Achieve sustainable design requirements, document compliance, and complete a project totals document for the credits listed in the VA-CHPS Scorecard of this section.

1.04 DEFINITIONS

- A. Composite Wood and Agrifiber Products: Particleboard, medium density fiberboard (MDF), plywood, wheatboard, strawboard, panel substrates, and door cores.
- B. Controlled Wood: A component of the "mixed" label which allows mfg. companies to mix FSC certified material with non-certified material. The non-

certified component must comply with the origins standards of FSC and must avoid: 1. Illegally harvested wood. 2. Wood harvested in violation of traditional and civil rights. 3. Wood harvested in forests with high conservation values and is threatened through management practices 4. Wood harvested from conversion of natural forests. 5. Wood harvested from areas where genetically modified trees are planted.

- C. FSC: Forest Stewardship Council.
- D. MERV: Minimum Efficiency Reporting Value.
- E. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site. If only a fraction of a product or material is extracted/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.
- F. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.
 - 1. "Post-consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
 - 2. "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.
- G. Vendor: The entity that sells the product to the party responsible for installation.
- H. VOC: Volatile Organic Compounds.

1.05 SUBMITTALS

- A. General:
 - 1. Submit sustainable design documentation submittals required by the project specification sections.
 - 2. Sustainable design submittals should be clearly identified as sustainable design submittals. Circle or highlight information that is intended to fulfill associated sustainable design requirement, and indicate which sustainable design credit(s) the information is intended to fulfill.
- B. Sustainable Design Documentation Submittals:

1. Manufacturers' product data indicating roof material compliance with Solar Reflectance Index requirement (Metal Roofing).
2. WE.C1-Product data for plumbing fixtures indicating water consumption including aerators.
3. Product data for glazing and window, storefront, and curtain wall frames indicating system U-value, solar heat gain coefficient (SHGC), and visible light transmittance (VLT).
4. Product data for HVAC and other refrigeration equipment indicating type and quantity of refrigerant used.
5. Construction Waste Management Plan- submit a completed Plan within 30 days of Notice to Proceed.
6. Manufacturer's certification letter and product data indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating costs for each product having recycled content.
7. Manufacturer's certification letter and product data for regional materials indicating location and distance from Project of material manufacture and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
8. Manufacturer's product data showing Noise Reduction Coefficient (NRC) of 0.70 or greater for ceiling tile installed in classrooms and core learning spaces.
9. Construction Indoor Air Quality Management Plan: Submit a completed Plan within 14 days after Notice to Proceed.
10. Manufacturer's product data indicating MERV for temporary filters used at return air inlets during construction.
11. Report from testing and inspecting agency indicating results of indoor air quality testing and documentation showing compliance with indoor air quality testing procedures and requirements. Provide results indicating that the maximum chemical contaminant concentration requirements are not exceeded.
12. Manufacturers' product data for adhesives and sealants field-applied inside the weatherproofing system indicating VOC content of each product in grams per Liter (g/L).

13. Manufacturers' product data for paints, coatings, clear wood finishes, floor coatings, stains, primers and shellacs field-applied inside the weatherproofing system indicating VOC content of each product used in grams per Liter (g/L).
 14. Manufacturers' product data for each carpet product installed inside the weatherproofing system indicating compliance with the Carpet and Rug Institute's (CRI's) Green Label Plus Indoor Air Quality Carpet Testing Program thresholds.
 15. Manufacturers' product data for each carpet adhesive installed inside the weatherproofing system indicating VOC content in grams per Liter (g/L).
 16. Manufacturer's product data for each carpet product installed inside the weatherproofing system indicating the presence or absence of styrene butadiene rubber (SBR) latex in the carpet backing material.
 17. Manufacturers' product data for all hard surface flooring installed inside the weatherproofing system indicating compliance with the Resilient Floor Covering Institute's (RFCI's) FloorScore standard. Mineral-based flooring products (tile, masonry, terrazzo, cut stone) and unfinished/untreated wood flooring are excluded from this requirement.
 18. Manufacturers' product data for concrete, wood, bamboo, and cork floor finishes such as sealer, stain and finish field-applied inside the weatherproofing system indicating VOC content of each product in grams per Liter (g/L).
 19. Manufacturers' product data for tile setting adhesives and grout field-applied inside the weatherproofing system indicating VOC content of each product in grams per Liter (g/L).
 20. Manufacturers' product data for any products installed inside the weatherproofing system containing composite wood, agrifiber, or laminating adhesives indicating that they contain no added urea formaldehyde. Materials considered fit-out, furniture, and equipment (FF&E) are not considered base building elements and are thus excluded from this restriction.
- C. Materials considered fit-out, furniture, and equipment (FF&E) are not considered base building elements and are thus excluded from this restriction.

1.06 QUALITY ASSURANCE

- A. Sustainable Coordinator: Engage an experienced person to coordinate sustainable design requirements. Sustainable coordinator may also serve as waste management and IAQ management coordinator.

PART 2-PRODUCTS**2.01 MATERIALS, GENERAL**

- A. Provide products and procedures necessary to obtain CHPS credits required in this Section. Although other Sections may specify some requirements that contribute to CHPS credits, the Contractor shall determine additional materials and procedures necessary to obtain CHPS credits indicated.

2.02 RECYCLED CONTENT OF MATERIALS

- A. Credit W.C2 : Building materials shall have recycled content such that post-consumer recycled content plus one-half of pre-consumer content for Project constitutes a minimum of 20 percent of cost of materials used for Project.
1. Cost of post-consumer recycled content plus one-half of pre-consumer recycled content of an item shall be determined by dividing weight of post-consumer recycled content plus one-half of pre-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.
 2. Do not include furniture, plumbing, mechanical and electrical components, and specialty items such as elevators and equipment in the calculation.

2.03 REGIONAL MATERIALS

- A. Credit MW.C5: Not less than 20 percent of building materials (by cost) shall be regional materials.

2.04 LOW EMITTING MATERIALS

- A. Credit EQ.C4: The following products and systems, where installed inside the weatherproofing system, shall meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
1. Adhesives and sealants.
 2. Paints and coatings.
 3. Flooring systems.
 4. Composite wood and agrifiber products.

- 5. Ceilings and wall systems.
- B. Comply with Division 1 Section "Indoor Air Quality Requirements".

PART 3- EXECUTION**3.01 COMMISSIONING AND ENHANCED COMMISSIONING**

- A. Comply with Divisions 1, and 15 specifications and the Project's Commissioning Plan regarding system performance testing.
- B. Comply with Divisions 1, and 15 specifications and the Project's Commissioning Plan regarding commissioning process activities in addition to the requirements of EQ Prerequisite 1.

3.02 REFRIGERANT AND CLEAN-AGENT FIRE-EXTINGUISHING-AGENT REMOVAL

- A. Comply with Division 15 EE.P4 Eliminate ozone depleting refrigerants.

3.03 CONSTRUCTION WASTE MANAGEMENT

- A. Comply with Division 1 Section 01505 "Construction Waste Management".

3.04 CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT

- A. Comply with Division 1 Section 01810 "Indoor Air Quality Requirements."

3.05 SUSTAINABLE DESIGN DOCUMENTATION SUBMITTAL REQUIREMENTS BY SECTION

- A. Submit the corresponding sustainable design submittals under each pertinent specification section.

3.06 SCORECARD

(ADD SCORECARD)

END OF SECTION

SECTION 02010

SUBSURFACE INVESTIGATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 RELATED WORK

- A. Section 02200: Earthwork.

1.03 TEST BORINGS

- A. The Owner has explored subsurface conditions by making test borings.
- B. A Geotechnical Engineering report, including Test Boring Logs (***and asphalt core samples where applicable***), is included herein for information only, and is not a part of the Contract Documents. The Owner assumes no responsibility for the accuracy of the information. The report was prepared for design purposes only and may or may not be sufficient to prepare an accurate bid.
- C. The test borings are believed to be a reasonable indication of existing soil conditions. The Contractor shall verify conditions affecting the work and make his own interpretation of the test boring information. The Contractor may conduct additional test borings upon receiving permission from the Owner.
- D. The Contractor's use of this information is at his own risk. The availability of this information does not guarantee that the entire site or soil conditions are as indicated by the report.

END OF SECTION

REPORT TO FOLLOW

EDITING INSTRUCTIONS

SECTION 02070

SELECTIVE DEMOLITION

1. Renewals and Additions: In conjunction with 1.04A, incorporate the information contained in the school ACM Management Plan into the contract documents (include on the demolition drawings and in a general summary of work in 1.04 and/or 1.06 of this specification as applicable).

SECTION 02070
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General Conditions and Division 1 Specifications Sections, apply to the Work of this Section, with special attention to the following:
 - 1. Summary of Work: Section 01010
 - 2. Temporary Utilities: Section 01510
 - 3. Construction Aids: Section 01520 (Temporary Enclosures)
 - 4. Barriers: Section 01530

1.02 RELATED WORK

- A. Site Preparation: Section 02100
- B. Earthwork: Section 02200

1.03 REFERENCE STANDARDS

- A. Occupational Safety and Health Standards for the Construction Industry (29 CFR Part 1926) as promulgated by OSHA.
 - 1. Subpart D – Occupational Health and Environmental Controls, 1926.62-Lead.
 - 2. Subpart T – Demolition.
- B. Virginia Erosion and Sediment Control Handbook
- C. Fairfax County Public Facility Manual

1.04 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.
- B. For removal of existing elevator, the contractor shall use subcontractors licensed for such work. The subcontractor shall obtain a permit for the work and have the work inspected after demolition is complete.

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, including asbestos containing materials (ACM) as noted below. Regulated hazardous materials shall require specialized disposal in accordance with applicable regulations. The Contractor will coordinate the scheduling of the removal of all hazardous materials with the Owner and provide the Owner with documentation that the hazardous waste is disposed at an authorized waste disposal facility.
 - a. Regulated hazardous materials include the following:
 - 1) Fluorescent lamps and PCB containing ballasts.
 - 2) Lead paint, glazed surfaces, putty and sealants in windows/frames.
 - a) Remove primer from existing steel prior to making modifications required by the structural drawings. Where modifications run along the structural steel

completely, remove primer from area or work. Where modifications intersects at 90 degrees+/-, remove primer 1 foot each side of the connection for a minimum of 2 feet total.

- 3) Metal primer on structural steel and steel windows.
 - 4) CFC type refrigerants such as R-12 ("Freon").
 - 5) ACM putty and caulk at steel windows. The Contractor must coordinate removal activities to allow the Owner to schedule the presence of a project monitor. Provide the Owner with documentation that the ACM waste generated is disposed at an authorized waste disposal facility.
 - 6) Wood utility poles treated with creosote.
2. Lead-containing painted and glazed surfaces that contain detectable concentrations of lead, including concentrations less than the definition of LBP, must be handled in accordance with the OSHA Lead in Construction Standard. Contractors performing work that could impact paint films or glazing that have detectable concentrations of lead should be informed of the testing results, and should take appropriate actions to comply with the OSHA Lead in Construction Standard. Appropriate actions would include but not limited to performing air monitoring to measure worker exposure; assuring that the workers are provided with adequate respiratory protection; and assuring that workers are provided with appropriate training.
 3. Workers performing demolition of LCSC (lead-containing surface coatings) must have, at a minimum, two-hour lead awareness training in accordance with OSHA Standard 29 CFR Part 1926.62. If LCSC are required to be stripped or removed from the building component substrate, then additional training would be required based upon the measured lead concentration of the surface coating and the airborne lead concentrations measured or anticipated to be generated during the each work activity.
 4. The disposal of waste generated during any restoration, renovation, or demolition operations, including items coated with lead paint, is regulated by EPA Standard 40 CFR Part 261, Subpart C.
- B. Performance of Work
1. Construction of the proposed work will be performed while school is in use. The Contractor shall give full cooperation to the school administration and staff in scheduling and performing the work.

2. The Contractor shall provide, install and maintain safety and dust barriers as required by applicable health and safety regulations and as specified in Section 01520.
 3. The Contractor shall schedule his work and deliveries so as not to interfere with the normal operation of the school, including morning arrivals and afternoon departures.
 4. The Contractor shall give seventy-two hours advance written notice to Owner when work is to be performed that might endanger and inconvenience occupants.
 5. The Contractor shall provide all erosion and sediment control devices as required by site inspector, owner, owner's agent, architect or engineer.
 6. The Contractor shall keep open, protect and maintain all existing fire exits and fire lanes during the entire course of construction.
- C. Protection
1. Erect barriers, fences, guard rails, enclosures, chutes, and shoring to protect personnel, structures, and utilities remaining intact.
- D. Maintaining Traffic
1. Minimize interference with normal use of roads, streets, driveways, sidewalks, and adjacent facilities.
 2. Do not close or obstruct streets, sidewalks, alleys, or passageways without written permission from authorities having jurisdiction.
 3. If required by governing authorities, provide alternate routes around closed or obstructed traffic ways.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify that areas to be demolished are unoccupied and discontinued in use.
- B. Verify that all utilities within the area to be demolished have been cut off and capped.

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

3.02 PREPARATION

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

3.03 DEMOLITION

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

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

- C. Walls

1. At areas where windows are removed, protect adjacent work which shall remain.
2. Where openings are cut in walls, such openings shall be cut with care to avoid damage to work that shall remain.
3. Infill masonry shall be toothed, with the exception of face brick which shall be flush vertically with adjoining existing work.
4. New work shall be carefully installed with materials that match existing, and shall conform to existing planes unless indicated otherwise.

- D. Finishes

1. Existing ceiling, wall and floor finish or trim that is disturbed or destroyed by these operations shall be replaced to abut adjoining walls, floors, ceiling and new construction with material to match existing.
2. At locations where existing tile floors are disturbed by new construction, existing tile shall be removed to nearest tile joint that parallels new construction and shall be replaced.

- E. Connecting work and new work in extension of existing work shall correspond in all respects with that to which it connects, or similar existing work, unless

otherwise indicated or specified. Existing work shall be cut, drilled, altered or temporarily removed and replaced as necessary for performance of Contract.

- F. No structural member shall be cut or altered without written authorization of Architect.
- G. Work remaining in place that is damaged or defaced by work under this contract shall be restored to the original condition at the time of award of contract.
- H. If removal of existing work exposes discolored, unfinished surfaces or work out of alignment, such surfaces shall be refinished or material replaced as necessary to make contiguous work uniform and harmonious.

3.04 DISPOSAL

- A. Remove demolition debris daily.
- B. Do not store or burn materials on site.
- C. Transport demolition debris to off-site legal disposal facilities.
 - 1. Hazardous materials such as fluorescent lamps and PCB-containing ballasts shall be disposed of at special collection centers offering specialized recycling and treatment procedures.

3.05 SALVAGE

- A. Owner assumes no responsibility for loss or damage to materials or structures on site, salvage value of which Contractor may have reflected in his bid.
- B. Right of first refusal: All existing items of construction, building materials and furnishings (doors, frames, hardware, windows, chalkboards, tackboards, kitchen, heating ventilation, air conditioning, plumbing and electrical equipment, etc.) located in renovated or altered areas of the project shall be carefully removed without damage and remain the property of the Owner unless indicated for re-use in the new work. Any equipment not desired to be retained by the Owner shall be removed from the site and legally disposed of by the Contractor.

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General Conditions and Supplementary Conditions and Division 1 through Division 16 Specification Sections, apply to the Work of this Section, with special attention to the following:
 - 1. Division One Sections for Testing Laboratory Services

1.02 RELATED WORK

- A. Section 02010: Subsurface Investigation
- B. Section 02070: Selective Demolition
- C. Section 02100: Site Preparation
- D. Section 02250: Temporary Shoring
- E. Section 02510: Paving and Surfacing
- F. Section 02930: Top soiling, Seeding and Sodding

1.03 REFERENCE STANDARDS

- A. ASTM D698 - Moisture - Density Relations of Soils and Soil Aggregate Mixtures
- B. ASTM D1556-82 - Density of Soil in place by the Sand - Cone Method
- C. ASTM D2167-84 - Density and Unit Weight of Soil in Place by the Rubber Balloon Method
- D. ASTM D2487-85 - Soils for Engineering Purposes

1.04 REQUIREMENTS OF REGULATORY AGENCIES

- A. Do not close or obstruct any street, sidewalk, alley, or passageway. Conduct operations to minimize interference with the normal use of roads, driveways, alleys, sidewalks, or other facilities adjacent to the Work.
- B. 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.

1.05 LAYOUT AND GRADES

- A. Contractor shall provide construction surveying by a registered land surveyor or professional civil engineer licensed to practice in the Commonwealth of Virginia for the following:
1. Establishment of field survey control lines and temporary benchmarks.
 2. Providing line and grade offset stakes for curb/gutter and furnishing of cut sheets to the Architect and the Owner.
 3. Providing line and grade survey for water, storm and sanitary sewer pipes and location of structures.
 4. Providing building layout lines and grading stakes.
 5. Provision and maintenance of all surveying stakes, lines, and benchmarks.
- B. "Finished grades" are the required final grade elevations indicated on the civil drawings. Spot elevations govern over proposed contours. Where not otherwise indicated, project site area outside of buildings shall be given uniform slopes between points for which finished grades are indicated or between such points and existing established grades.
- C. "Subgrade" is the required surface of subsoil, borrow fill or compacted fill. This surface is immediately beneath site improvements, specially dimensioned fill, paving, loaming, or other surfacing material.

1.06 QUALITY CONTROL

- A. The Owner shall retain the services of an experienced Geotechnical Engineer for the purpose of inspecting the earthwork.
- B. The Contractor shall be responsible for coordinating the required testing and inspections with the Soils Engineering Company retained by the Owner. Any additional costs incurred by the Special Inspections agency due to missed readiness dates or times, or inaccessibility of the site, shall be the responsibility of the Contractor.

1.07 EXISTING UTILITIES

- A. Locate and identify active utilities prior to excavation including notifying "Miss Utility" at 1-800-552-7001. Carefully protect active site utilities from damage and

relocate or remove as required by the drawings. Should an active utility line be exposed during construction, its location and elevation shall be plotted on record drawings. Notify both the Owner and the Utility Owner in writing. Provide all required coordination to prevent delays.

- B. Inactive or abandoned utilities encountered during construction operation and utilities to be removed shall be removed, abandoned, plugged or capped as indicated on the drawings or per Section 02100 of the Specifications or in accordance with the utility owner's standards and regulations, as applicable.

1.08 PROTECTION

- A. Shoring and Sheeting:

1. Provide shoring, sheeting and bracing at excavations, as required, to ensure complete safety against collapse of earth at side of excavations.
2. Comply with local safety regulations and with the provisions of the Manual of Accident Prevention in Construction of the Associated General Contractors of America, Inc.
3. Remove shoring, as backfilling operations progress, taking necessary precautions to prevent collapse of excavation sides.
4. Shoring or sheeting shall not constitute a condition for which an increase may be made in the Contract Sum.

- B. Make no excavations to the full depth indicated when freezing temperatures may be expected, unless the footings or slabs can be placed immediately after the excavation has been completed. Protect the bottom so excavated from frost if placing of concrete is delayed. Should protection fail, remove frozen materials and replace with concrete or gravel fill, as directed by the Owner's Representative. Stockpiled materials shall be protected at all times from inclement weather and other conditions which can affect the suitability for re-use as fill or structural fill. Moisture control of stockpiled materials shall be the responsibility of the contractor.

1.09 DISPOSAL AND STOCKPILING

- A. Remove all excavated materials not suitable for fill or backfill, including surplus excavated materials, from site and dispose of material legally.
- B. Stockpiling of excavated material suitable for reuse will be permitted where convenient on site and does not interfere with the Work or Owners use of the premises. Owner's Representative shall approve stockpile location prior to placement of material.

- C. Stockpiled materials shall be protected at all times from inclement weather and other conditions which can affect the suitability for re-use as fill or structural fill. Moisture control of stockpiled materials shall be the responsibility of the contractor.

1.10 TOP SOIL

- A. Contractor shall provide all topsoil required for finishing to grades shown on Drawings. Topsoil shall be provided from site stockpiles, or from off-site sources as necessary.

1.11 DEFINITIONS

- A. Material shall be "unclassified" insofar as removal of material to be excavated is concerned including rock, regardless of the nature or manner in which they are removed. Removal of paving, curbs and paving foundations is classified as "general excavation".
- B. Unsuitable material is defined as topsoil, organic soils, underlying silty and slightly organic subsoil, existing fill and other material judged unsuitable by the Geotechnical Engineer, and located beyond normal or design limits of excavation (i.e. below design subgrade levels).
- C. Rock excavation shall be defined as removal of boulders larger than one (1) cubic yard in volume and removal of ledge rock, concrete or masonry structures which cannot be ripped with a one and one-half (1 ½) cubic yard backhoe or equivalent and requires drilling, blasting, or other special methods for removal.

1.12 SUBMITTALS

- A. Location and source of off-site sources providing additional topsoil, as necessary.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Excavated materials may not be suitable for compacted structural fill. Soil materials used as fill under floor slabs and footings shall be SM, or better, ASTM D2487. Soil materials used as fill under pavements and as general site fill shall be SC or better, ASTM D2487. Soil material for fill or backfill shall be free of organic matter or debris, waste materials, frozen materials, vegetable matter and rock or stones exceeding three inches in any dimension, shall be non-frost susceptible soils, and shall have a liquid limit of less than 40 and a plasticity index of less than 20.

1. Fill material used within the top 12 inches of fill shall be free of rocks or stones exceeding two inches in any dimension.
 2. Provide materials from off-site source if available on-site materials do not meet the above requirements at no increase to contract sum. Imported materials shall be approved by the Geotechnical Engineer.
- B. Gravel Fill: Washed gravel, or crushed stone, coarse aggregate No. 21B, VDOT.
- C. Porous Fill (Below Building Slabs): ASTM C 33 Coarse Aggregate, size number 467 (1-1/2 inch to No. 4), blast furnace slag shall be prohibited.
1. Contractor's Option: VDOT size 57 Stone.
- D. Topsoil: Fertile, friable, natural surface topsoil capable of producing and sustaining satisfactory turf and landscaping and free of roots, rocks, gravel, sand, spilled concrete, mortar and other debris. Obtain topsoil from project site stockpiles established during clearing operations. Obtain additional topsoil required for landscape development from off-site sources and transport to the project site at no increase to contract sum. Topsoil shall not be delivered in frozen or muddy condition.
- E. The use of clayey soils for backfill for below grade walls is strictly PROHIBITED. Backfill for below grade walls shall consist of silty sands, coarse grained drainage material, USCS SM or more permeable with an impermeable clay cap, two foot thick with positive slope away from building per foundation drain detail as outlined in Section 02010: Subsurface Investigation.
- F. Use of recycled materials such as existing brick, CMU block, Portland cement concrete, gravel base course stone and existing fill soils which have been processed at a recycling facility to produce suitable structural fill materials meeting the requirements for suitable structural fill material contained in the structural fill requirements of this specification may be approved by the Owner. Recycled materials that are proposed for use as structural fill materials for use in grading operations shall be sampled, tested and classified by the Geotechnical engineer for suitability.
- G. Underground Plastic Utility Identification Tapes: All underground utilities shall be properly marked with 6" wide, 4 mil thick continuously printed plastic tape, properly marked and color keyed for the type of utility to be identified.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Prior to beginning work, become familiar with site, conditions and portions of work specified.

- B. Backfilling prior to approvals:
 - 1. Do not allow or cause work performed or installed to be covered up or enclosed prior to obtaining all necessary inspections, tests, and approvals required.
 - 2. Should work be enclosed or covered up before approval, uncover work and restore disturbed areas at no additional cost to Owner.

3.02 EXCAVATING

- A. Excavate to lines, elevations and limits indicated on the drawings, allowing sufficient distance and space to permit erection of forms, shoring and inspections. Excavate as required for placement of utilities and foundations, regardless of type, condition or moisture content of material encountered. If suitable bearings for foundations are not encountered at the depths indicated, immediately notify the Architect and the Owner and do not proceed further until instructions are received.
- B. Excavation is unclassified and no consideration will be given to nature of materials encountered within normal excavation limits. Unclassified excavation comprises and includes satisfactory removal and disposal of all materials encountered. Remove excess earth, including excess topsoil, debris, and material not suitable for fill from site; retain best quality soil for backfilling.
- C. Foundation excavations shall not be exposed for extended periods of time. Footing construction shall be inspected by the Geotechnical Engineer and shall be completed during the same day they are excavated. Footing excavations left open overnight shall be re-inspected by the Geotechnical Engineer prior to foundation construction. The cost of re-inspection and any required remedial measures required due to deterioration of the footing subgrade shall be the sole responsibility of the contractor.
- D. Shore and brace excavations for footings, sumps, areaways, pits, and tanks with members of suitable size and arrangement where necessary to prevent injury to persons, caving or erosion. Remove shoring and bracing as excavations are backfilled.
- E. Contractor shall determine quantities of cut and fill in order to grade site to elevations shown on the civil drawings. Any excess material will be removed from the site in accordance with Paragraph 1.09 (Disposal and Stockpiling) of this section. Any imported material needed to bring site to grades shown on the civil drawings shall be approved by the Geotechnical Engineer prior to bringing such material on site. No additional compensation for importing or removal of soil, in order to bring site into conformance with site plan grades and elevations, shall be considered by the Owner.

- F. During demolition, site preparation, grading, trenching or any other construction related activity if rock is encountered, the contractor shall excavate, remove and dispose of rock within the limits required and in accordance with the contract documents. For pipe and conduit installation, rock excavation shall be carried to a level at least six (6) inches below the bottom of the pipe or conduit for placement of select bedding. Rock excavation and disposal shall be part of the base bid contract and no additional payment considered.
- G. Blasting shall be done only when authorized by the Architect and Owner. All blasting shall be done in accordance with local and state ordinances. Blasting shall not be allowed on Renewal and Addition projects.

3.03 EXCESS WATER CONTROL

- A. Do not place, spread, or roll fill material during unfavorable weather conditions.
- B. Do not resume operations until moisture content and fill density are acceptable to the Geotechnical Engineer.
- C. Provide berms and channels to prevent flooding of subgrade. Promptly remove water collecting in depressions.
- D. Where soil has been softened or eroded by flooding or placed during unfavorable weather, remove damaged areas and re-compact as specified for fill and compaction.
- E. Provide and maintain during construction, ample means and devices with which to promptly remove and dispose of water from every source entering excavations.
- F. Dewater by approved means outlined in the current version of Virginia Erosion and Sediment Control Handbook to ensure dry excavations and preservation of final lines and grades at bottoms of excavations.

3.04 SITE PREPARATION

- A. Prior to the construction of slabs or pavements or the placement of any fill in slab or pavement areas, all topsoil and other organic materials, frozen, wet, soft or loose soils, and other deleterious materials shall be removed and legally disposed.
- B. Upon completion of excavation activities, exposed subgrade shall be proofrolled utilizing a heavily loaded dump truck or other pneumatic-tired vehicle of similar size and weight, in the presence of the Geotechnical Engineer. Proofrolling shall not be performed during or following wet weather conditions. Any unsuitable materials discovered during proofrolling operations shall be removed and replaced as specified below. Upon completion of proofrolling activities and

approval of the subgrade by the Geotechnical Engineer, exposed subgrade shall be further prepared as follows:

1. Unpaved Areas: Scarify subgrade to six inch depth prior to topsoil placement.
2. Paved Areas: Scarify subgrade to minimum twelve-inch depth and compact to 95 percent maximum dry density. The soils should be aerated or moistened as necessary to maintain the moisture content within 2 percentage points of optimum moisture content. Density test methods: ASTM D 698. Remove unsuitable earth, exhibiting excessive heaving during compaction operations, as specified.

3.05 UNSUITABLE EARTH

- A. Immediately notify the Architect/Owner and Geotechnical Engineer in the event unsuitable earth is encountered during earthwork or subsequent construction operations. Stop all work within immediate area of unsuitable earth. Do not remove unsuitable earth until authorization is obtained from the Owner and Geotechnical Engineer and proper measurements are obtained followed by written authorization. Excavate and dispose of all unsuitable earth under the supervision of the Geotechnical Engineer and in accordance with paragraph 1.09. Backfill excavated area as specified.

3.06 FILLING AND BACKFILLING

- A. Provide structural fill or backfill from approved on-site material stockpiles, or from off-site if required, to raise all grades to elevations shown on the drawings. Gravel fill (crushed stone) may be substituted in place of fill.
- B. All structural fill or backfill, and fill in sloped areas, shall be placed in loose lifts not exceeding 8 inches. Fill in landscaped areas may be placed in loose lifts not exceeding 12 inches. All fill and backfill shall be uniformly compacted with suitable equipment to at least the specified minimum degree of compaction. The soils should be aerated or moistened as necessary to maintain the moisture content within 2 percentage points of optimum moisture content.
 1. Fill and backfill in structural and pavement areas should be compacted to at least 95 percent of the Standard Proctor maximum dry density (ASTM D-698). The upper 12 inches below slabs on grade shall be compacted to a minimum of 98 percent of the Standard Proctor maximum dry density (ASTM D-698).
 2. Fill and backfill in slope areas shall be compacted to at least 95 percent of the Standard Proctor maximum dry density (ASTM D-698). Subgrade for fills on slopes shall be benched into the existing slopes.

3. Fill and backfill in landscaped areas shall be compacted to at least 90 percent of the Standard Proctor maximum dry density (ASTM D-698).
- C. The Geotechnical Engineer shall perform field density tests on each lift of fill necessary to ensure that adequate compaction is achieved. If any compaction problems are encountered during construction, the Geotechnical Engineer shall be contacted. The Geotechnical Engineer shall recommend modifications to the compaction procedures if required.
 - D. Do not begin backfilling until construction below finish grade has been approved, forms removed, and the excavations cleaned of trash and debris. Bring backfill to required grades. Do not place backfill in wet or frozen areas. Do not operate heavy equipment for spreading and compacting backfill near foundations, curbs, or walls closer than distance equal to height of backfill above top of structural members. Compact area remaining by power-driven hand tampers suitable for material being compacted. Do not place backfills against walls until at least seven days after completion of the walls, and unless walls are adequately braced.

3.07 CLEANUP

- A. Thoroughly clean the entire project of trash and other debris. Haul excess materials away and legally dispose of off site. Public streets shall be kept clear of mud and construction debris.

3.08 QUALITY CONTROL

- A. The Geotechnical Engineer shall field inspect the installation of the earthwork. Upon completion of the inspection, the Geotechnical Engineer shall certify by a seal of a professional engineer, licensed in the Commonwealth of Virginia, that the Earthwork was installed in accordance with the Contract Documents.
- B. Site Preparation and Proofrolling: The Geotechnical Engineer shall inspect the site after it has been stripped and excavated. The Geotechnical Engineer shall determine if any undercutting or in-place densification is necessary to prepare a subgrade for slab support. The Geotechnical Engineer shall witness the proofrolling with a fully loaded dump truck (minimum 20 tons) provided by the Contractor prior to the placement of engineered fill. Areas of proposed excavation shall be proofrolled after rough finished grade has been established. Proofrolling shall not be performed within 10 feet of an existing building or structure.
- C. Fill Placement and Compaction: The Geotechnical Engineer shall witness any required filling operations and shall take sufficient in-place density tests to verify that the specified degree of fill compaction is achieved. He shall observe and approve borrowed materials used and shall determine if the existing moisture contents are suitable.

- D. Footing Excavation Inspections: The Geotechnical Engineer shall inspect the excavations for the building foundations. He shall verify that the design bearing pressures are available and that no loose or soft pockets exist beneath the bearing surfaces of the footing excavations. Based on the inspection, the Owner's Representative shall either approve the bearing surface or shall require that loose or soft soils be undercut to expose satisfactory bearing materials.
- E. The Geotechnical Engineer shall provide the Architect and Owner with written verification of all testing regarding fill selection, fill placement, and soil bearing capacity at all footings.
- F. Infiltration Trench: The Geotechnical Engineer shall provide the Architect and Owner with written verification that the material used to construct the infiltration trench meets the requirements of contract drawings and specifications.

END OF SECTION

SECTION 02250
TEMPORARY SHORING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General Conditions and Division One through Division Five Specification Sections, apply to work of this Section.

1.02 REFERENCE STANDARDS

- A. Latest Edition, "Special Inspections: Implementation in Fairfax County," as administered by Fairfax County Department of Public Works and Environmental Services (DPWES), Office of Code Services, with special attention to Chapters 3 and 12 (Earth Retention Systems).
- B. Pertinent requirements of the "Occupational and Health Standards for the Construction Industry," as promulgated by OSHA.

1.03 WORK DESCRIPTION

- A. Design and construct temporary shoring at excavations to prevent collapse of adjacent materials, and to protect workmen, the general public, and structural and site components associated with the Work, and adjacent properties and structure.
- B. The Contractor shall be solely responsible for materials, means and methods for construction of temporary shoring.
- C. The Contractor shall secure all required approvals, including Fairfax County DPWES, and adjacent property owners if required.

1.04 SUBMITTALS

- A. Comply with provisions of Fairfax County Special Inspections Manual for preparation, review, and approval of construction documents for temporary shoring.
 - 1. Construction documents shall be prepared, signed, and sealed by a Registered Design Professional, licensed by the Commonwealth of Virginia, and experienced in the design of temporary shoring.
 - 2. Construction documents shall be reviewed and approved by Fairfax County DPWES prior to beginning work requiring temporary shoring.

3. Submit three (3) copies of approved construction documents to architect for record and distribution to Owner.

1.05 QUALITY ASSURANCE

- A. Use adequate numbers of workmen, who are trained and experienced in the installation of temporary shoring, and who are familiar with the requirements and methods required by this Section, for proper, safe performance of shoring.
- B. Coordinate shoring design and construction with the following:
 1. The Geotechnical Report
 2. Structural Systems included in the Work
 3. Site Structures included in the Work
 4. Existing adjacent structures affected by work requiring temporary shoring

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Provide all materials necessary to construct the temporary shoring, in accordance with the approved construction documents.

PART 3 - EXECUTION

3.01 CONDITIONS

- A. Examine the areas and conditions under which the work of this Section shall be performed. Correct conditions detrimental to proper installation and safe performance of the temporary shoring. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION

- A. Install the temporary shoring in strict conformance with the approved construction documents.

3.03 CLEANUP

- A. After work requiring temporary shoring is completed, remove all materials and components associated with the shoring, and remove from site. Dispose of excess materials and debris in a legal manner.

END OF SECTION

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SECTION 02364

SHORT AGGREGATE PIER FOUNDATION SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division-1 Specification sections, apply to work of this section.
- B. Fairfax County Special Inspections: "Special Inspections: Implementation in Fairfax County – 2000 Edition" (SIFC-2000).
- C. Earthwork, Section 02200.

1.02 SUMMARY OF WORK

- A. Provide all labor, specialty geotechnical design, materials, equipment, apparatus, tools, transportation, protection and services necessary for, and reasonably incidental to the design and installation of a complete short aggregate pier foundation system. The aggregate piers shall be constructed by compacting aggregate in an excavation hole using special high-energy impact densification equipment. The aggregate piers shall be in a columnar-type configuration and shall be used to produce an intermediate foundation system for the support of the foundation loads as indicated on the drawings and as specified herein.
 - 1. Provide detailed geotechnical calculations and shop drawings prepared by a professional engineer (hereby referred to as the Specialty Engineer) registered in the Commonwealth of Virginia, to design the short aggregate pier foundation system. Support the loads indicated on the drawings to within the settlement limits indicated in this specification. Verify the settlement limits are satisfied by load testing a pier.
 - 2. Special attention is directed to the submittal requirements for final certification of the short aggregate piers foundation system by the Specialty Engineer.
 - 3. Comply with applicable submittal and approval requirements of the Fairfax County Special Inspections Manual (SIFC-2000).
- B. Special attention is directed to the allowable installation times for the aggregate piers. Installation of the piers shall be limited to the following time:
 - 1. After normal school hours of operation and as regulated by the Construction Phasing Plan.
 - 2. As limited by Fairfax County Ordinances.

1.03 WORK EXCLUDED

- A. Excavation and surface compaction for footings supported by short aggregate piers is not part of the work of this Section but is subject to the restrictions listed in 3.02 of the Section.

1.04 DEFINITIONS

- A. Short Aggregate Pier Foundation System: A columnar configuration of aggregate that is produced by compacting aggregate in an excavated cavity using special high energy impact compaction equipment to form a settlement control and foundation support system for column and wall footings.

1.05 REFERENCES

- A. Design Standards:

1. "Control of Settlement and Uplift of Structures Using Short Aggregate Piers," by Evert C. Lawton, Nathaniel S. Fox, and Richard L. Handy
2. Settlement of Structures Supported on Marginal or Inadequate Soils Stiffened with Short Aggregate Piers," by Evert C. Lawton and Nathaniel S. Fox
3. Schmertman method for calculating foundation settlement.

- B. Modulus Load Testing:

1. ASTM D1143 – Pile Load Test Procedures
2. ASTM D1194 – Spread Footing Load Test
3. ASTM D3687 – Uplift Load Test

- C. Materials and Inspection:

1. ASTM D1241 – Aggregate Quality
2. ASTM STP 399 – Dynamic Penetrometer Testing
3. ASTM D422 – Gradation of Soils

1.06 SUBMITTALS

- A. The Aggregate Pier Installer shall submit detailed geotechnical design calculations, construction drawings, and shop drawings. All plans and calculations shall be signed and sealed by a Professional Engineer registered in

the Commonwealth of Virginia. The calculations shall include a detailed explanation of the design properties for settlement calculation and the load testing procedure.

- B. The Aggregate Pier Installer shall submit proof of compliance with 1.07A, below.
- C. The Aggregate Pier Installer shall submit a notarized manufacturer's certification, indicating that the aggregate and other materials proposed for use shall conform to the requirements of this specification.
- D. Insurance: Certificate verifying the Specialty Engineer's professional liability insurance coverage shall be submitted to the Architect, Structural Engineer, and Owner within 10 days of General Contractor's Notice to Proceed.
- E. Observation Reports: Written field reports presenting the Specialty Engineer's field observations shall be submitted to the Architect, Structural Engineer and Owner's Field Representative within 7 days of each field visit.
- F. Final Certification: Upon completion of the construction, the Specialty Engineer shall submit to the Architect, Structural Engineer, and Owner a written certification that the Short Aggregate Pier Foundation System has been constructed in conformance with the specified performance requirements and the construction documents,
- G. Daily Aggregate Pier Progress Reports – The Testing Agency retained by the Owner shall submit progress reports to the General Contractor, Architect, Structural Engineer, and the Owner in accordance with requirements of Section 01410, Testing Laboratory Services. The reports shall indicate the pier location, length, average lift thickness, and final elevations of the base and top of pier. The report shall also indicate the type and size of the densification equipment used. The Aggregate Pier Installer shall immediately report any unusual conditions encountered during installation to the General Contractor, the aggregate pier designer, and the Testing Agency.

1.07 QUALITY ASSURANCE

- A. Aggregate Pier Installer Qualifications: Installers of aggregate pier foundation systems shall have successfully completed not less than three (3) projects with similar soil conditions, depths and type of work contained in this project.
 - 1. Pre-qualified Aggregate pier Installer:
 - a. GeoStructures, Inc. Leesburg, VA (703) 771-9844 Attn: Mike Cowell
 - b. Hayward Baker, Inc., Odenton, MD (410) 551-1980 Attn: Joe Cavey

- c. TerraSystems, Inc., Lovettsville, VA (540) 882-4130 Attn: John Jones
- B. Specialty Engineer Qualifications: The Contractor shall engage the services of a Professional Engineer who shall be responsible for the design, preparation of short aggregate pier foundation system drawings, quality control, periodic field observation, and final certification of the complete short aggregate pier foundation system. The Specialty Engineer shall have the following minimum qualifications:
1. Installer shall have a full time Quality Control Representative on the project site.
 2. Registered in the Commonwealth of Virginia.
 3. Specialization in geotechnical design of Short Aggregate Pier Foundation Systems with a minimum of 3 years experience on projects of a similar size and scope.
 4. Professional liability insurance coverage in the aggregate amount of \$1,000,000.00 to protect the engineer from claims, which may arise in the performance of the engineering services.
- C. Survey Work:
1. General Contractor shall perform surveys, and layouts for pier work. Conduct layout work for each pier to lines and levels required before installation.
 2. General Contractor shall furnish building base line, grade information, and building corners.
 3. Analyze the site conditions and subsurface investigation data prepared by the geotechnical consultant, and make supplemental investigations as deemed necessary by the Specialty Engineer for the proper design of the short aggregate pier foundation system.
 4. Performance Requirements:
 - a. Aggregate piers shall be designed in accordance with generally accepted engineering practice and the method described in "Control of Settlement and Uplift of Structures Using Short Aggregate Piers." The design shall meet the following criteria:

Allowable Bearing Pressure for
Aggregate Pier Improved Soil----- 6000 psf

Minimum Aggregate Pier Area
Coverage (Spread Footings) ----- 30%

Estimated Total Long Term
Settlement for Footings----- ≤ 1 "

Estimated Long Term Differential
Settlement for Adjacent Footings ----- $\leq \frac{1}{2}$ "

- b. The size and spacing of the aggregate piers as described on the foundation drawings are conceptual and based on preliminary geotechnical information derived during the design process. The Aggregate Pier Installer shall modify the proposed pier locations as necessary to deliver a complete aggregate pier foundation system that shall support the structure, while controlling settlement in accordance with these specifications. The installer may add piers as required to deliver a complete foundation system without additional cost to the Owner.
- c. The design shall be verified by a single pier load test. Test pier location to be specified by the aggregate pier specialty engineer and shall be same diameter and length as the production piers.

1.08 JOB CONDITIONS

- A. Site Examination: Contractor shall examine the site to ascertain the state thereof and to understand the complexities of the work. Compare on-site observations with the drawings: The condition of the premises, the actual elevations, existing obstructions, areas of work, and other conditions that would affect the completion of the work.
- B. A Geotechnical Investigation and Report has been prepared for the site and is available for use by the Bidder (see Section 02010, subsurface investigation). The report is not a warranty of the subsurface conditions, and is to be used by the Bidder at his risk. Assume responsibility for the deductions made, or the conclusions drawn from such information.

PART 2 - PRODUCTS

2.01 AGGREGATE PIER MATERIALS

- A. Aggregate above Water Table: Type I Gradation B in accordance with ASTM D1241-68, or other graded aggregate / graded recycled concrete selected by the Aggregate Pier Installer and successfully used in the load test.
- B. Aggregate below Water Table: Type I Gradation B, except particles passing the No. 40 sieve shall be eliminated. Alternatively, No. 57 stone, or other graded

stone / graded recycled concrete selected by the Aggregate Pier installer and successfully used in the load test may be used

2.02 DENSIFICATION EQUIPMENT

- A. Provide densification equipment of type generally used in Aggregate Pier installation and approved by the pier specialty engineer.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Installer shall examine areas and conditions under which aggregate piers are to be installed and shall notify General Contractor, Architect, Structural Engineer, and Owner in writing of conditions detrimental to proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.02 INSTALLING AGGREGATE PIERS

- A. In response to actual site conditions, the Specialty Engineer may direct that the quantity of piers may be increased or decreased from the number of piers shown on the submittals.
- B. Aggregate used for piers constructed above the water table shall be compacted to a densification and strength that provides resistance to the dynamic penetration test ASTM STP 399 of a minimum average of 15 blows per 1.75 inch vertical movement.
- C. Perform dynamic penetration tests on each pier until the pattern of performed tests exceeds 15 blows. Once the pattern of test establishes the 15 blows per pier, confine further tests to questionable or differing conditions.
- D. The Aggregate Piers Installer's full time Quality Control Representative shall verify and report all installation procedures.
- E. Rejected Aggregate Piers: Piers improperly located or installed beyond the maximum allowable tolerances shall be abandoned and replaced with new piers, unless the Engineer approves other remedial measures proposed by the installer. All material and labor required to replace rejected aggregate piers shall be provided at no additional cost to the Owner.
- F. Tolerances: The center of each pier shall be within six (6) inches of the plan locations indicated. The final measurement for the top of aggregate piers shall be the lowest point on the aggregate in the last compacted lift.
- G. Footing Bottom

1. All excavations for footing bottoms supported by aggregate pier foundations shall be prepared in the following manner: Over excavation below the bottom of footing shall be limited to 3 inches. This includes limiting the teeth from excavators from over excavation beyond 3 inches below the footing elevation.
- H. Compaction of surface soil and top of aggregate piers shall be prepared using a standard, hand-operated impact compactor. Compaction shall be performed over the entire footing bottom to compact any loose surface soil and loose surface pier aggregate.

3.03 FIELD QUALITY CONTROL

- A. The Owner will engage the services of an approved independent, Testing Agency to perform field inspection of pier installation, and to monitor the load test. The testing agency will issue copies of all reports as specified herein.
- B. The Contractor shall be responsible for scheduling with the Testing Agency, and shall provide free access to work and cooperate with the Testing Agency.
- C. Pier Installation: The Testing Agency and the quality control personnel for the Aggregate Piers Installer shall be present during pier installation and the load test. The Aggregate Pier Installer shall provide all dial indicators and other measuring devices. The Testing Agency inspector shall make detailed records of the installation of each pile and the results of load tests
- D. Aggregate Pier Load Testing: Provide 1 single test pier. Additional tests shall be performed, if deemed necessary by the Aggregate Pier Designer. Use test piers of same diameter as required for Project and install with same equipment as used in installation of production piers. Install test pier as indicated on drawings for production piers. Load single test piers to twice the required design load as indicated on the drawings. The Testing Agency shall monitor the installation of load test aggregate piers to document procedures and criteria used for constructing the load test pier.
- E. Bottom Stabilization Verification Test: After completion of the bottom pier bulb, or at anytime during the process of constructing the pier, the energy source may be turned off, and a bottom stabilization verification test may be performed. These tests shall be performed when a new soil formation is encountered, and at the beginning of a project to provide quantitative information on pier stabilization. A reference bar is placed over the cavity, and a mark is made on the tamper shaft that has been placed on top of the compacted aggregate. The energy to the tamper is restarted. If the measured vertical movement exceeds 150% of the value achieved during the load test, added energy is applied to redensify the bulb. The procedure for measuring is then repeated. If there is still movement greater than 150% of that achieved during the load test and greater than ½ inch, a lift of loose aggregate may be placed on top of the compacted aggregate, and

the verification test may be performed on this next lift after it is tested. Movement must be limited to below 150% of the values achieved for the load test before completion of 2/3 of the pier depth unless unusually powerful modified hydraulic hammers are being used with tamper heads smaller than 26 inches in diameter.

- F. The Specialty Engineer responsible for the design of the short aggregate pier foundation system shall provide final certification in writing regarding their findings.

END OF SECTION

SECTION 02510

PAVING AND SURFACING

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. Testing Laboratory Services: Section 01410
 - 2. Project Record Information: Section 01720

1.02 RELATED WORK

- A. Subsurface Investigation: Section 02010
- B. Earthwork: Section 02200 (sub-grade preparation)
- C. Cast in Place Concrete: Section 03300

1.03 REFERENCE STANDARDS

- A. Virginia Department of Transportation Standards and Specifications
- B. American Disabilities Act Accessibility Guidelines (ADAAG)

1.04 QUALITY ASSURANCE

- A. Qualifications of Asphalt Concrete Producer: Use only materials which are furnished by a bulk asphalt concrete producer regularly engaged in production of hot-mix, hot-laid asphalt concrete.
- B. Qualification of Testing Agency: The Owner will use a recognized commercial testing laboratory with not less than five years experience in conducting tests and evaluations of asphalt concrete materials and design.
- C. The Owner will provide asphalt concrete testing and inspection service.
- D. The Owner will provide field testing facilities for quality control testing during paving operations.
- E. Qualifications of workmen:
 - 1. Provide at least one person who shall be thoroughly trained and experienced in the skills required, who shall be completely familiar with

the design and application of work described for this Section, and who shall be present at all times during the progress of the work of this Section and shall direct all work.

2. For actual finishing of asphaltic concrete surfaces and operation of the required equipment, use only personnel who are thoroughly trained and experienced.

1.05 REQUIREMENTS OF REGULATORY AGENCIES

- A. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with the referenced portions of Virginia Department of Transportation "Standards and Specifications" and the Virginia Department of Transportation "Road and Bridge Specifications".

1.06 SUBMITTALS

- A. Submit test reports and certificates for asphalt concrete materials and mixes.
- B. Certify that materials comply with specification requirements signed by asphalt concrete producer and Contractor.

1.07 PAVING QUALITY REQUIREMENTS

- A. General: In addition to other specified conditions, comply with the following minimum requirements.
- B. The Owner's Testing Service will:
 1. Test in-place asphalt concrete courses for compliance with requirements for thickness and surface smoothness.
 2. Take not less than 4-inch diameter pavement specimens for each completed course, from locations as directed by Architect.
- C. The Contractor shall repair holes from test specimens as specified for patching defective work.
- D. Thickness: In-place compacted thicknesses will not be acceptable if exceeding following allowable variation from thicknesses shown on Drawings.
 1. Surface Course: 1/2 inch, plus or minus.
- E. Surface Smoothness
 1. The Contractor will test finished surface of each asphalt concrete course for smoothness, using a 10 foot straightedge applied parallel to and at right angles to centerline of paved areas

2. Check surface areas at intervals directed by Architect.
3. Surfaces will not be acceptable if exceeding the following:
 - a. Surface Course: 1/4 inch in 10 feet
4. Provide final surfaces of uniform texture, conforming to required grades and cross sections.

1.08 WEATHER LIMITATIONS

- A. Do not apply asphalt concrete when the surface is wet or contains an excess of moisture which would prevent uniform distribution and the required penetration.
- B. Construct asphalt concrete surface course only when atmospheric temperature is above 40 degrees F, when the underlying base is dry and when weather is not rainy.
- C. Base course may be placed when air temperature is above 30 degrees F and rising, and when acceptable to the Architect and the Owner.
- D. Grade Control: Establish and maintain the required lines and grades, including crown and cross-slope, for each course during construction operations.
- E. Do not place Portland cement concrete when ambient air temperature is below 40 degrees Fahrenheit or air temperature has been below 35 degrees Fahrenheit for 12 or more consecutive hours or between 15 November and 1 March, without written authorization from the Architect with owner.

1.09 TRAFFIC CONTROL

- A. Sequence and schedule paving work in order to maintain vehicular and pedestrian traffic during paving operations, and as required for other construction activities. If working in the state right-of-way, the contractor shall obtain all necessary permits from the Virginia Department of Transportation (VDOT) and prepare traffic control plans for VDOT approval.

1.10 PRODUCT HANDLING AND PROTECTION

- A. Protection: Use all means necessary to protect the materials of this Section before, during and after installation and to protect the work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacement necessary to the approval of the Architect and at no additional cost to the Owner.

- C. Protect asphaltic concrete from traffic for a minimum of 48 hours.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Sub-base Course: VDOT Section 208, Grade 21A
- B. Asphalt Base Course: Superpave: VDOT Special Provision Section 211G, Type BM-25
- C. Surface Course: Superpave: VDOT Special Provision Section 211G, Type SM-9.5A
- D. Prime Coat: VDOT Section 210 and 311 cut-back asphalt, AASHTO M82, Grade MC-30
- E. Tack Coat: VDOT Section 210 and 310 emulsified asphalt, CSS-1H (cationic emulsion)
- F. Overlay Binder Coat: asphalt cement, AASHTO M20, type AC-20
- G. Overlay protective membrane:
 - 1. "Petromat", Phillips Fiber Corp.
 - 2. "Amo Pave", Amoco Fabrics Company.
 - 3. Pre-bid approved manufacturer.
- H. Joint Sealant: AASHTO M81, Grade CSS-1H.
- I. Grade Sealer: VDOT Section 213.
- J. Traffic Marking Paint: Medium oil alkyd paving paint, AASHTO M248, FS-TT-P-115F, Type I.
- K. Expansion Joint Material: Pre-molded asphaltic cork filler strip VDOT Section 212.
- L. Pavement Marking Removal Paint: Black Traffic Paint, as manufactured by Baltimore Paint and Chemical Corporation, Baltimore, Maryland, or approved equal.
- M. Existing Pavement Marking Removal: Existing painted lines shall be removed and existing paving areas prepared for new painted lines by application of two coatings of VDOT Seal Coat, VDOT Section 312.

- N. Concrete: VDOT Class "A-4.5" (4,500 psi) General Use hydraulic cement concrete, Section 217.
- O. Concrete Reinforcement: ASTM A 185 welded wire mesh, size indicated, flat sheets.
- P. Stair Nosing: Cast-in type of abrasive nosing. Size as indicated, and of aluminum, or hot-dip-galvanized steel.
- Q. Stair Hand Rails: Size as indicated, and of aluminum. Hot-dip-galvanized may be substituted with approval of the Owner's Representative.
- R. Stair Hardware: As indicated, and of galvanized steel.
- S. Construction, Expansion and Isolation Joint Filler: ASTM D 994, bituminous preformed joint filler, 1/2 inch thick.
- T. Joint Sealant: Pourable Polyurethane sealant for use between building and concrete walk.
- U. Gravel Base: VDOT Aggregate: Section 208, Grade 21B.
- V. Forms: Steel or wood.
- W. Curing Materials: Burlap Mats: ASSHTO M 182, Class 1.
- X. Miscellaneous Products:
 - 1. Form release compound: Nonstaining and approved by the Architect.
 - 2. Cement Mortar: VDOT Section 218: Hydraulic Cement Mortar.
- Y. Other materials not specifically described but required for proper and complete installation of the work of this section, and subject to the approval of the architect.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine the areas and conditions under which work of this Section will be installed. Correct conditions detrimental to proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 BITUMINOUS CONCRETE

- A. All asphaltic concrete shall be hot plant mixed, and shall be furnished from a commercial asphalt hot mix plant.

- B. The aggregates shall have a temperature between 275 degrees F and 325 degrees F when placed in the mixer. The liquid asphalt shall be heated to a temperature between 275 degrees F and 350 degrees F, and shall be added during mixing.
- C. Mix the combined aggregates and liquid asphalt in a pug mill mixer with a capacity of not less than 3,000 pounds per batch. Continue the mixing for at least 45 seconds after all ingredients have been placed in the mixture, and until the liquid asphalt is distributed uniformly throughout the mixture.
- D. The mixture shall have a temperature between 290 degrees F and 320 degrees F when it leaves the plant.

3.03 PAVING

- A. Sub-grade preparation to achieve compacted sub-base shall be accomplished under the work of Section 02200, Earthwork. Prior to applying prime coat, carefully inspect sub-base surface and remove any loose materials.
- B. Proof roll compacted sub-base surface to identify soft or unstable areas requiring replacement and/or additional compaction. Do not begin paving operations until such areas have been corrected, and testing laboratory results indicate satisfactory compaction. Grade sub-base to profiles indicated on drawings.
- C. Place asphaltic concrete on sub-base; spread, grade and compact in accordance with VDOT standards. Place in strips at least 10' wide, except that small, inaccessible areas shall be placed by hand. Place and roll succeeding strips so as to overlap and blend with joints of previous strips.

3.04 ROLLING

- A. Begin rolling when mixture will bear weight of rolling without excessive displacement. Compact small, inaccessible areas with hand tampers or vibrating plate compactors.
- B. Perform initial rolling immediately after rolling of joints and outside edges. Inspect surface after initial rolling, and repair displaced or loosened areas.
- C. Follow initial rolling immediately after with second rolling while mixture is still hot. Continue until mixture is compacted.
- D. Perform finish rolling while mixture is still warm enough to allow removal of roller marks.
- E. Remove and replace paved areas found to be defective; cut out such areas and fill with fresh, hot mixture, and compact by rolling.

3.05 OVERLAY PAVING

- A. Extent of milling and overlay paving is indicated on the drawings. Provide minimum 2 inches thick VDOT SM 9.5 unless otherwise noted on the Drawings. All debris from milling operations shall be legally disposed of off site.
- B. Apply Tack Coat to surfaces of previously constructed asphaltic or portland cement concrete. Allow to dry prior to receiving overlay paving.
- C. Install protective membrane in accordance with manufacturer's installation instructions.
- D. Avoid smearing and splattering of adjoining curbs and gutters with overlay materials. Clean such surfaces when contaminated by overlay materials.

3.06 FINISH TOLERANCES

- A. Finish all surfaces to the following tolerances.
- B. Asphaltic Concrete Surfacing: Plus or minus 0.05' at any point from line and grade shown on the Drawings.
- C. Apply prime coat to compacted sub-base in accordance with the manufacturer's recommendations.
- D. Variations: Finished surfaces shall be free from birdbaths (sump areas), and shall show no variation from the designed elevations greater than 1/4" when checked with a 10'-0" straight edge.

3.07 FRAME ADJUSTMENTS

- A. Set frames of subsurface structures to final grade as a part of this Work, including adjustments of existing frames, and new frames furnished under other Work of Project.

3.08 PLACING FRAMES

- A. Surround frames set to elevation with a ring of compacted asphalt concrete base prior to paving.
- B. Place asphalt concrete mixture up to 1 inch below top of frame, slope to grade, and compact by hand tamping.
- C. Adjust frames to proper position to meet paving.
- D. If permanent covers are not in place, provide temporary covers over openings until completion of rolling operations.

- E. Set cover frames to grade, flush with surface of adjacent pavement.

3.09 EXISTING WORK DAMAGED BY CONSTRUCTION

- A. Where existing streets, roads, driveways, or other pavements have been cut, removed, or otherwise disturbed by new construction, they shall be repaired as follows.
 1. The areas shall be backfilled and compacted, in accordance with the same standards as backfilling for new work, to secure a compaction of ninety-five percent (95%) of maximum density as determined by the standard proctor density test (ASTM D698) at 2 percent of optimum moisture content.
 2. All existing curbs and gutters, sidewalks, base course, and sod shall be replaced to appropriate line and grade to preclude the ponding of water, with construction similar in design and material as existing, or as otherwise specified.
 3. Wearing surface shall then be replaced with two inches (2") of bituminous concrete, designation SM-2A in accordance with the Virginia Department of Transportation Specifications.
 4. Existing paved areas to be patched shall be repaired using the proposed pavement section, as shown on the Contract drawings. All patching will occur immediately upon completion of the associated excavation activity, regardless of overall construction phasing.
 5. Existing areas to be patched lying within state right-of-ways shall be repaired in strict accordance with the Virginia Department of Transportation Standards and Specifications for such work and shall include a minimum of 25-feet of milling and overlay on each side of the patch.

3.10 MARKING ASPHALT CONCRETE PAVEMENT

- A. Sweep surface with power broom supplemented by hand brooms to remove loose material and dirt.
- B. Do not begin marking asphalt concrete pavement until authorized by the Architect/Owner.
- C. Apply paint with mechanical equipment.
- D. Provide uniform straight edges.
- E. Apply not less than 2 separate coats in accordance with manufacturer's recommended rates.

3.11 CURBS AND GUTTERS

- A. Provide VDOT 21-A stone (6" thick) compacted to 95% proctor density under all curbs and gutters (per AASHTO-T99-61), with minimum 8" sub-base per VDOT Specification 21-A.
- B. Set forms to line and grade.
- C. Install forms over full length of curb, gutter, or sidewalk.
- D. Position integral curb joints at same location as pavement joints.
- E. Form contraction joints using steel templates or division plates.
- F. Remove templates or plates as soon as concrete has hardened sufficiently to retain its shape.
- G. Install expansion joint material behind curb at abutment to sidewalks, curb returns and adjacent structures.
- H. Place top of expansion joint material 1/2 inch below curb surface.
- I. Apply asphalt sealer on top of expansion joint material flush with concrete surface.
- J. Consolidate concrete with mechanical vibrators.
- K. Round face of curbs at top with finishing tool of correct radius.
- L. Finish exposed surfaces with wood float followed by light brushing with broom, brush or burlap.
- M. Apply curing material and cure for 7 days.

3.12 INSTALLATION

- A. After the subgrade has been inspected and approved by the inspector, curb and gutter and transverse curb and gutter shall be constructed where shown on the Drawings.

3.13 SIDEWALKS AND RAMPS

- A. Concrete sidewalks and ramps shall be constructed to the widths and at the locations shown on the Drawings. Include woven wire fabric 6 x 6 - W1.4 X W1.4 in all walks.
- B. Provide one course concrete construction, 4" thick over 6" gravel base and sub-grade compacted to 95% maximum density at optimum moisture.
- C. Expansion joints shall be 1/2 inch wide spaced maximum 16 feet on center in two directions. Provide where walks abut buildings, curbs, platforms, etc. Premolded expansion strips shall extend full width and depth of walk. All joints to be sealed with gray colored self-leveling joint sealant.
- D. Score walks with hand tooled joints at 4'-0" intervals, unless denoted at closer intervals on Drawings, in two directions maximum for their full width and to a depth of at least 1/3 walk thickness (no saw cut joints allowed).
- E. Provide a lightly brushed finish.
- F. See Drawings for areas where reinforcing and gravel fill are required at entrances.
- G. Where existing sidewalks are to be joined or replaced by new sidewalks, saw cut and remove those sections of existing sidewalks indicated on the Drawings to be removed.
- H. Ends of existing sidewalk shall be cleanly saw cut and a 1/2" thick expansion joint filler installed between new and existing work.
- I. Asphalt walks shall be constructed to the widths and at locations indicated on Drawings.
- J. Curb ramps shall comply with Virginia Department of Transportation Standards and Specification for Type CG-12.
- K. Protect completed concrete work from damage. Remove and replace damaged or defective work.
- L. Underdrains in accordance with VDOT's standards shall be provided where the sidewalk is located within area with high ground water or wet soil conditions.

3.14 GENERAL CONCRETE NOTE

- A. Expansion joints in the sidewalk, between sidewalk and curb and gutter, and gaps between the sidewalk and the building wall shall receive urethane based caulking on school property.

3.15 PATCHING

- A. Patch to match material, color, and texture of surrounding area.
- B. Remove and replace defective work.
- C. Uniform smooth surface shall be achieved between the patched area and existing asphalt surface

3.16 PROTECTION

- A. After final rolling, do not permit vehicular traffic on asphalt concrete pavement until it has cooled and hardened. Erect barricades as required.
- B. Provide barricades and warning devices as required to protect pavement and the general public.
- C. Cover openings of structures in the area of paving until permanent coverings are placed.

3.17 AS-BUILT DRAWINGS

- A. Provide electronic as-built drawings in current version of AutoCAD and PDF format, and two full-sized hard copies, prepared by a certified land surveyor practicing in the Commonwealth of Virginia for all new curb and gutter, sidewalks, buildings, parking, and site improvements. Obtain necessary county approvals of as-builts from DPWES, and the supplying water company as required. The Contractor shall be responsible to address and satisfy all review comments to ensure approval of the as-builts and final release. Final owner acceptance of new construction and release of contractor obligations shall not occur until the as-built drawings are approved, and the work is accepted, by Fairfax County DPWES and the Owner.

END OF SECTION

SECTION 02810

FIELD IRRIGATION SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION OF WORK

- A. Design and install field irrigation systems(s) for athletic fields as indicated on the contract documents
- B. Design Parameters:
 - 1. Assume 120 GPM @ 50PSI for all irrigation systems.
 - 2. Individual field designs:
 - a. Soccer Field: Seven (7) zones minimum 28 sprinkler heads (total).
 - b. Softball Field: Three (3) zones minimum 19 sprinkler heads (total).
 - c. Baseball Field: Eight (8) zones minimum 32 sprinkler heads (total).
 - d. Football Field: Nine (9) zones minimum 31 sprinkler heads (total).
 - e. Practice Fields: Seven (7) zones, minimum 28 sprinkler heads (total).
- C. Design Requirements:
 - 1. Prepare design drawings at 1"=50' or larger, indicating system point of connection; major components, such as controllers, backflow preventers, valves, valve boxes, zone layouts, heads and nozzle types. Provide a drawing legend identifying all components.
 - 2. Include pressure loss calculations for each field system design.
 - 3. Include proposed operating schedules based on midsummer, no rain conditions.

4. Sprinkler Head Spacing: based on wind conditions of five (5) mph or less, the maximum allowable spacing shall be 60% of the diameter of throw.
5. Pipe Sizing: Supply pipe shall be sized so that the velocity of flow shall not exceed five (5) feet per second (FPS) at any point in the main line, and six (6) FPS in the lateral lines.
6. Control valves shall be sized so that no more than 5% loss of system static pressure is incurred. Valves shall match the line size, or no more than one (1) pipe size smaller than the pipe in which they are installed.
7. Back flow prevention devices shall be sized to match line size, or no more than one (1) pipe size smaller the pipe in which they are installed.

1.03 RELATED WORK

- A. Water Service: Refer to the Civil Drawings of the Contract documents for location of connection and service size. Service shall be separately metered.
- B. Electric Service: Refer to utility site plan contained in Electrical Drawings of the Contract Documents for service location and characteristics.

1.04 CONTRACTOR QUALIFICATIONS

- A. Contractor shall be licensed, insured and bonded, and shall be a member of the Irrigation Association.
- B. Contractor shall have a minimum of five (5) years successful experience in the design and installation of similar projects.

1.05 REFERENCE STANDARDS

- A. The Irrigation Association standards for certification of irrigation designers and contractors.

1.06 SUBMITTALS

- A. Submit catalog data and materials list indicating manufacturers, model numbers, and performance data for all the components listed in Part 2.
- B. Submit design drawings prepared in accordance with 1.02C.

1.07 PROJECT RECORD INFORMATION

- A. Contractor shall keep an accurate record of all changes and corrections to the layout shown on the Drawings. Submit "As Built" information as part of the requirements of Section 01720.

- B. "As Built" information shall include control valve wiring routing paths, wire splice locations, and controller locations.

1.08 WARRANTIES

- A. Guarantee all workmanship, materials, fixtures and equipment to be free of defects for a period of one (1) year from the effective date of warranty commencement; except that defects due to damage caused by others shall not be covered. Refer to Section 01740 for effective date of warranty commencement.
 - 1. Settlement at trench excavations shall be corrected by the Contractor during the one year warranty period.
 - 2. Winterization of the irrigation systems shall be included in the warranty period.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Materials and equipment specified in this Section shall establish the standard of quality and level of performance for field irrigation systems. Comparable products of other manufacturers shall be considered by the Owner in accordance with Section 01630 (Substitutions and Product Options).

2.02 PIPE AND FITTINGS

- A. PVC pipe (up to and including 2"): White, schedule 40, SDR-21, Class 200, NSF approved; complying with ASTM D241 and ASTM D1784.
- B. PVC pipe (2½" and larger): White, schedule 40, SDR-26, Class 160, NSF approved; complying with ASTM D2241 and ASTM D1784.
- C. Fittings: Schedule 40, ASTM D2466.
- D. Primer for pipe connections: NSF approved, ASTM F656.
- E. PVC pipe solvent: NSF approved, ASTM D2855, or ASTM D2564.
- F. Gaskets: SDR-21; Cresline.

2.03 VALVES AND VALVE BOXES

- A. Valves

1. Approved manufacturer: Rain Bird Sprinkler Mfg. Corp., PGA Series, matched to pipe size.
2. Features:
 - a. PVC construction, globe/angle configuration, solenoid activated.
 - b. Capable of withstanding constant 150 psi pressure and up to 10 gpm flow.
 - c. Normally closed, slow closing.
 - d. Power 24 VAC 50/60 cycle.
 - e. Manual internal bleed.
 - f. Valve construction shall allow removal and replacement of all internal parts without disturbing the installation.
- B. Valve Boxes: Carson Model 1419-12.
- C. Quick Coupling Valves
 1. Hunter or Rainbird 44RC with "DO NOT DRINK" cap, and one key per coupler, two minimum per contract.

2.04 SPRINKLER HEADS

- A. Approved manufacturer: Hunter Industries Model I-25 Plus rotary sprinkler.
- B. Features:
 1. Pop-up height: 3 ½".
 2. Discharge rate: 3.8 to 31.5 gpm.
 3. Radius: 40' to 73'.
 4. Pressure range: 40 psi to 100 psi.
 5. Nozzle trajectory: 250-25 degrees.

2.05 CONTROL WIRE

- A. Approved manufacturer: Paige Electric Company, P7079 D-3.
- B. Characteristics
 1. UL/UF direct burial, 14 AWG
- C. Wire Splice Connectors: Waterproof, direct burial, rated for 30 volts minimum.

2.06 SWING JOINTS

- A. Approved manufacturer: Spears Model 5807

2.07 CONTROLLER

- A. Approved manufacturer:

1. Middle Schools and High Schools: Hunter Industries Model ICC-800-PL (48 zones).
2. Elementary Schools: Hunter Industries Model PROC-800-PL (12 zones).

- B. Features:

1. 8 station controller, plastic cabinet (NEMA 3R), 32 station capacity; UL listed.
2. Transformer input: 120/230VAC, 50/60 Hz; output: 24VAC, 1.5A (40VAC).
3. Seasonal adjustment: 10% to 150%.
4. Self diagnostic circuit breaker.
5. 365 day calendar.
6. Programmable delay between stations up to 10 hours; programmable rain delay up to 7 days.
7. Lithium Battery backup (ten year life).

2.08 BACKFLOW PREVENTER

- A. Approved manufacturer: Wilkins Water Control Products (Division of Zurn Industries) Model 975XLV200.

- B. Features:

1. Reduced pressure principle assembly.
2. 90° union elbows on both inlet and outlet.

2.09 BOOSTER PUMP

- A. Approved manufacturer: Berkeley B1 ½ TPMS

- B. Features: Close coupled, end suction centrifugal pump; cast iron motor bracket, multiple taps.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Prior to beginning work, notify "Miss Utility" in order to establish location(s) of public underground utilities, if any. Verify presence of privately maintained site utilities indicated on project documents, including locations of water supply and electric service for the irrigation system(s).
- B. Verify that size of water supply line and electric service are adequate to serve system design. Notify Owner of any discrepancies or deficiencies that would adversely affect proper system performance. Do not begin work until corrections have been made.

3.02 PIPE ASSEMBLY

- A. Keep pipe free of dirt, rocks, shavings and other debris. Cut pipe square and true, free of shavings.
- B. Use primer and solvent to join pipe and fittings in accordance with solvent manufacturer's written directions. Allow set up time prior to pipe pressurization per solvent manufacturer's recommendations.
- C. Install pipe to allow for expansion and contraction.
- D. Thrust Blocks:
 - 1. Provide concrete thrust blocks where piping changes direction, at dead ends, or at valve locations where thrust may be expected to occur.
 - 2. Install between the fittings and undisturbed soil of the adjacent trench wall.
- E. Trenching and Backfilling:
 - 1. Depth of bury shall be as follows:
 - a. Pipe sizes up to 1.25": 10" minimum cover.
 - b. Pipe sizes over 1.25": 18" minimum cover.
 - 2. Backfill: The first 6" shall be free of rock or other foreign matter 2" in diameter or larger. The remaining backfill shall be laid in 6" maximum lifts and tamped until flush with finished grade.

3. Pipes installed in the same trench shall be separated with a minimum of 2" of soil.

F. Tracer Wire

1. For all pipe install tracer wire in accordance with the IPC 703.6.

3.03 VALVES

- A. Valves shall be installed plumb within valve boxes with all handles, bolts, connection and electrical splices accessible through the box opening.

3.04 CONTROL WIRING

- A. Conform to electrical requirements of the VUSBC for installation of wiring.
- B. Minimize the number of splices. All splices shall be located in valves or splice boxes.
- C. When located in common trench with the main line, install wiring at the same invert as the line.
- D. Provide expansion coils at all valves and at 300' intervals between valves.
- E. Tie wire bundles together before splicing to prevent strain on splice. Tape or conch wire with cable cinches at 50' maximum intervals. Maintain slack in wire to accommodate expansion and contraction.
- F. Above ground wire shall be installed in conduit.
- G. Valve wiring shall be the same color from controller to valves. Neutral wire shall be white.

3.05 SPRINKLER HEADS

- A. Set heads to finished grade in accordance with civil drawings and/or elevations established on the design drawings.

3.06 DRAIN VALVES

- A. Manual: Install at low points on main and lateral lines. Provide valve access boxes with a two (2) cubic foot gravel sump and soil separator.
- B. Automatic (if required): Same requirements as manual, except installed 45° angle down. Do not exceed 10' of head upstream.

3.07 TESTING AND ADJUSTMENT

- A. Pressure test of main line. Design pressure shall be applied for a period of 24 hours. Repair leaks and retest for another period of 24 hours. Continue testing until all leaks have been repaired and system is watertight.
- B. Sprinkler Heads:
 - 1. Disassemble heads for flushing. System shall be flushed under full pressure until clean. Re-install head components and nozzles; adjust radius and arc for optimum coverage and to reduce overspray.
 - 2. Adjust head locations to achieve full coverage of field areas.
- C. System Operation:
 - 1. Test operating sequence to verify proper operation of controller, control wiring, valves and heads.
 - 2. Verify proper performance of drain valves.

3.08 CONTRACT CLOSEOUT

- A. Remove all excess material from work area. Restore field areas damaged by installation operations.
- B. Instruct owner's representative and school staff in the proper operation and maintenance procedures for the field irrigation system(s).
- C. Submit project record information, operating and maintenance manuals, and warranties to the Owner in accordance with Division One requirements.

END OF SECTION

SECTION 02830

CHAIN LINK FENCES - REPAIR

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION OF WORK

- A. Repair existing chain link fencing as indicated on the Drawings. Include the following as required by extent of repair:
 - 1. Fence fabric and posts.
 - 2. Excavation for post bases.
 - 3. Concrete anchorage for posts.

1.03 RELATED WORK

- A. Section 02930: TOPSOILING and SODDING.
- B. Section 03300: CAST-IN-PLACE CONCRETE.

1.04 WORK EXCLUDED

- A. Temporary Construction Fence.

1.05 ERECTOR QUALIFICATIONS

- A. Minimum of two years experience installing similar fencing.

1.06 REFERENCE STANDARDS

- A. Chain Link Fence Manufacturers Institute (CLFMI) - Standard of chain link fence installation.
- B. ASTM A120 - Black and hot dip zinc coated (galvanized) welded and seamless steel pipe.
- C. ASTM A123 - Zinc (hot-galvanized coatings on products fabricated from rolled, pressed and forged steel shapes, bars, and strip).
- D. ASTM C94 - Ready-mixed concrete.

- E. FS RR-F-00191 - Fencing, wire and post, metal (chain-link fence fabric).

1.07 SHOP DRAWINGS AND PRODUCT DATA

- A. Submit shop drawings and product data in accordance with Section 01340.
- B. Clearly indicate plan layout, grid, spacing of components, accessories, fitments, and anchorage.
- C. Submit manufacturer's installation instructions and procedures including standard details of fence and gate installation.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Anchor Fence, Inc.
- B. Sonco Fence, Inc.
- C. Cyclone Fence
- D. Allied Tube and Conduit (Fence Division)
- E. Other domestic manufacturers meeting the requirements of this section.

2.02 MATERIALS

- A. Framework: ASTM A120; Schedule 40, butt weld, standard weight, hot dip galvanized to 2.0 ounce per square foot.
- B. Mesh: ASTM A116-88; FS RR-F-00191, Type 1 - Zinc-coated steel.

2.03 CONCRETE MIX

- A. Concrete: ASTM C94, normal Portland cement, 2000 psi at 28 days, 2 inch to 3 inch slump.

2.04 COMPONENTS

- A. Line Posts: 2.38 inch diameter, steel tubing.
- B. Corner and Terminal Posts: 2.875 inch diameter steel tubing.
- C. Top and Brace Rail: 1.66 inch diameter, plan end, sleeve coupled.
- D. Gate Frame: 1.66 inch diameter, steel tubing.

- E. Caps: Cast steel, hot dip galvanized, sized to post dimension, set screw retained.
- F. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings, steel galvanized.
- G. Fabric: 1-3/4 inches diamond mesh, interwoven, 11 gauge, top and bottom selvage knuckle end closed.
- H. Bottom Tension Wire: 6 gauge steel single strand, galvanized.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install line posts, corner posts, top rails, post caps, fabric and gates, to provide a rigid structure for fence of height to match existing. Use manufacturer's standard fittings, fasteners and hardware.
- B. Maximum Spacing of Posts: CLFMI Standard.
- C. Install line, corner, and terminal posts plumb, set in concrete footings as specified in CLFMI Standard.
- D. Set post to within 6 inches from bottom of concrete footing. Slope top of concrete for water runoff. Set top of footing 2 inches above finished grade.
- E. Position bottom of fabric 2 inches above finished grade with tension wire stretched taut between posts.
- F. Pass top rail through line post tops to form continuous bracing. Install 7-inch long couplings midspan at pipe ends.
- G. Install center and bottom brace rail on corner.
- H. Fasten fabric to top rail, line posts, braces, and bottom tension wire with wire ties maximum 15 inches centers.
- I. Attach fabric to end corner with tension bars and tension bar clips.
- J. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is the least dimension.

3.02 CLEANUP

- A. Remove all trash, debris, and excess materials associated with the work of this Section from the job site and dispose of legally.

END OF SECTION

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SECTION 02831

CHAIN LINK FENCES AND GATES

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. PVC coated Fence fabric posts; rails, tension components and fittings for all fencing including, perimeter and interior site fencing, preschool and kindergarten play areas, and athletic fencing.
- B. Excavation for post bases.
- C. Concrete anchorage for posts.

1.03 RELATED WORK

- A. Section 02930: TOPSOILING and SODDING.
- B. Section 03300: CAST-IN-PLACE CONCRETE.

1.04 WORK EXCLUDED

- A. Temporary Construction Fence.

1.05 ERECTOR QUALIFICATIONS

- A. Minimum of two years of experience installing similar fencing.

1.06 REFERENCES

- A. Chain Link Fence Manufacturers Institute (CLFMI) and ASTM F567 - Standard of chain link fence installation.
- B. ASTM A120 - Black and hot dip zinc coated (galvanized) welded and seamless steel pipe.
- C. ASTM A123 - Hardware (hot-galvanized coatings on products fabricated from rolled, pressed and forged steel shapes, bars, and strip).
- D. ASTM C94 - Ready-mixed concrete.

E. ASTM A491 - Aluminum coating of chain link fabric (steel core wire).

F. ASTM F668 - PVC coated steel chain link fabric, class 2B

1.07 SHOP DRAWINGS AND PRODUCT DATA

A. Submit shop drawings and product data in accordance with Section 01340.

B. Clearly indicate plan layout, grid, spacing of components, accessories, fitments, and anchorage.

C. Submit manufacturer's installation instructions and procedures including standard details of fence and gate installation.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Anchor Fence, Inc.

B. Sonco Fence, Inc.

C. Cyclone Fence

D. Allied Tube and Conduit (Fence Division)

E. Other domestic manufacturers meeting the requirements of this Section.

2.02 MATERIALS

A. All Fencing

1. Framework: Thermally fused PVC coated, sizes as indicated.

2. Mesh: Thermally fused PVC coated chain link fabric "Standard Industrial" or "Tennis Court" type as indicated.

2.03 CONCRETE MIX

A. Concrete: ASTM C94, normal Portland cement, 2000 psi at 28 days, 2 inch to 3 inch slump.

2.04 FENCE COMPONENTS

A. Gate Posts:

1. Posts for swing gates shall be of the following nominal sizes for single swing gates or one leaf each of double gates:
 - a. Gates up to 6' wide shall be 3.00" O. D.
 - b. Gates over 6' to 13' wide shall be 4.0" O. D. @ 9.11 pounds
 - c. Gates over 13' to 18' wide shall be 6.625" O. D. @ 18.97 pounds
 - d. Gates over 18' wide shall be 8.625" O. D. @ 28.55 pounds
- B. Top Rail and Bottom Rail:
 1. Top and bottom rail for 72" and 120" fabric shall be 1.66" O. D.
 2. Top and bottom rail for 48" fabric shall be 1-5/8" O. D.
- C. Braces: Brace material shall be same as top rail.
- D. Fabric: Shall be one or more of the following based upon fence height shown on the Drawings.
 1. 48 inches high: One piece of 9-gauge wire woven in a 2-inch chain link diamond mesh pattern. Top and bottom selvage shall have a knuckled finish.
 2. 72 inches high: One piece of 9-gauge wire woven in a 2-inch chain link diamond mesh pattern. Top and bottom selvage shall have a knuckled finish.
 3. 120 inches high: One piece of 11-gauge wire woven in a 1 3/4-inch chain link diamond mesh pattern. Top and bottom selvage shall have knuckled finish.
- E. Fabric Connections:
 1. Fabric shall be securely fastened to all terminal, corner, and gateposts by 1/4 x 3/4 inch tension bars with 11-gauge pressed steel bands.
 2. Fabric shall be securely fastened to all line posts with .062 by .375 self-locking line post fabric.
 3. Fabric shall be securely fastened to top rail with .062 by .375 self-locking line post fabric.
- F. Line Posts: Shall be one or more of the following:
 1. All intermediate line posts for 72-inch fabric shall be 1.9" O. D.
 2. All intermediate line posts for 120-inch fabric shall be 2.375" O. D.
 3. All intermediate line posts for 48-inch fabric shall be 2.00" O. D.

4. All posts shall be equipped with tops designed to exclude moisture and to hold top rail.
- G. Terminal Posts:
1. All end, corner, and pull posts shall be 3.00" O. D. with tops designed to exclude moisture and to hold top rail.
- H. Pipe and Fittings:
1. All pipes shall be standard weight steel, A.S.A. Schedule 40, of domestic manufacture of sizes and weights specified, or Allied SS-40.
 2. Fittings: All fittings used in the complete fence assembly shall be of malleable cast iron or pressed steel.
- I. Gates:
1. Gates shall be of size and at locations as indicated on the Drawings, complete with latches, stops, keepers and hinges.
 2. Frames shall be 1.9" O. D. pipe per linear foot with heavy malleable iron or pressed steel corner fittings securely fastened to provide a rigid frame of ample strength free from sag and twist. Each frame shall be equipped with 3/8-inch diameter adjustable truss rods.
 3. Fabric, to match the fence, shall be installed in the frame by means of tension bars and hook bolted at intervals not exceeding 14 inches.
 4. Hinges shall be of bearing pattern, of adequate strength for gate, and with large bearing surfaces for fastening in position. The hinges shall not twist or turn under the action of the gate. The gates shall be capable of being opened and closed easily by one person and swing 180 degrees.
 5. Malleable iron latches for single-swing gates shall be guillotine-type designed to prevent the gate from opening in the wrong direction.
 6. Locking device for double-swing gates shall consist of fulcrum-type latch, a center drop rod, a center gate stop, and two semi-automatic holdbacks (set in concrete).

2.05 FINISH

- A. Provide manufacturers standard "Black" PVC coating, thermally fused, ASTM class 2B.

PART 3 - EXECUTION

3.01 GENERAL:

- A. Install line posts, corner posts, top rails, post caps, wire fabric and gates to provide a rigid structure for fence heights of 48", 72" or 120" as indicated on the Drawings. Note: Unless otherwise indicated on the Drawings, all perimeter site fencing shall be 6' high.

3.02 POST SETTINGS:

- A. All posts shall be of sufficient length to provide a minimum 36" setting into concrete footing. Top of footing shall be crowned in order to shed water.
- B. Footing diameters shall be as follows:
 - 1. Line posts: 10" minimum
 - 2. Terminal posts: 12" minimum
 - 3. Gate posts: a minimum of 3 times wider than the post diameter.
- C. Footings shall consist of 1-2-4 concrete mix.

3.03 TOP AND BOTTOM RAILS

- A. Provide top rail couplings approximately every 20 feet.
- B. Top rails shall pass through intermediate line post tops and shall form a continuous brace from end to end of each stretch of fence. Fasten to corner posts using heavy pressed steel connections.
- C. Bottom rails shall connect to line post using Boulevard clamp.

3.04 BRACES

- A. Brace material shall be installed midway between top rail and ground, and shall extend from corner, end, pull and gateposts to the first adjacent line post. Securely fasten to posts using heavy pressed steel connections. Truss from line post back to terminal or gateposts with 3/8" diameter rod and turnbuckle.

3.05 LINE POSTS

- A. All posts shall be evenly spaced, 10 feet on center maximum.

3.06 WIRE FABRIC

- A. Position bottom of fabric approximately 2" above finish grade with tension wire stretched tight between posts.

- B. Fasten fabric to top rail, line posts, braces, and bottom tension wire with ties spaced 14" on center maximum.
- C. Fasten fabric to top rail with ties spaced 24" on center maximum.
- D. Attach fabric to ends and corners with tension bars and bar clips.
- E. Stretch fabric between terminal posts, or at intervals of 100 feet maximum, whichever is the least dimension.

3.07 CLEAN UP

- A. Remove all trash, debris and excess materials associated with the work from the job site and dispose of legally.

END OF SECTION

SECTION 02930

TOPSOILING, SEEDING AND SODDING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 RELATED WORK

- A. Earthwork: Section 02200
- B. Landscaping: Refer to Civil Drawings and Section 02950.
- C. Temporary Seeding for Erosion Control: Refer to Civil Drawings and Section 02100.

1.03 REFERENCE STANDARDS

- A. Fairfax County Public Facilities Manual
- B. Virginia Sediment and Erosion Control Handbook

1.04 AREAS TO BE SODDED

- A. All areas disturbed during construction that are to receive vegetative stabilization.

1.05 QUALITY ASSURANCE

- A. All sod shall be transplanted within 24 hours from the time it is harvested, unless stacked at the project site in a manner approved by the Owner's Representative. Stacked sod shall be kept moist and protected from exposure to wind and sun. Any sod permitted to dry out shall be rejected.
- B. Plant sod only during periods of favorable weather when conditions are suitable. Do not place sod at any time temperature is below freezing. No frozen sod shall be used, and no seed or sod shall be placed on frozen, powder-dry or excessively wet soil.
- C. Certification of Grass Seed: For each grass seed monostand or mixture, provide information from seed Producer stating the botanical and common name,

percentage by weight of each species, percentage of purity, germination, and weed seed content, year of production and date of packaging.

- D. Soil amendments and rate of application shall be determined by laboratory test on soil.
1. Areas to be seeded or sodded shall have a soil pH range of 6.5 - 7.0. Contractor shall be responsible for ensuring correct soil pH.
 2. Test pH level in at least five equidistant locations on the site. Review with the Owner's Representative or Architect who will determine whether the average soil pH value is within acceptable range. If existing soil pH is adequate, no soil amendments are required.
 3. If average pH value is greater than 7.0, add a commercial grade sulfur at rate derived from lab test, over area to be seeded.
 4. If average soil pH value is less than 6.5, then agricultural limestone shall be applied at rate derived from lab test.

1.06 SUBMITTALS

- A. Submit statement of certification from local nursery from which sod shall be obtained.
- B. Upon request, submit square yard of sod to project site for inspection by Architect and owner's representative.
- C. Submit certificates, signed by producer and contractor, stating that soil amendments and sod comply with this specification. Certificates to include the following:
1. Limestone: Type, percentage of calcium magnesium carbonates or oxides, and gradation.
 2. Fertilizer: Type and analysis.
- D. Submit copy of laboratory test results and soil amendment recommendations for review by the Architect and the Owner's Representative.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Sod: Harvest, deliver, store and handle sod in compliance with the requirements of TPI's "Specifications for Turfgrass Sod Materials," and "Specifications for Turfgrass Sod Transplanting and Installation" contained in the "Guidelines Specifications to Turfgrass Sodding".

- B. Seed: Deliver seed in original sealed, labeled and undamaged packaging.

1.08 GUARANTEE, INSPECTION AND FINAL ACCEPTANCE

- A. Guarantee that at end of ninety days after sodding, a healthy first class lawn shall exist.
- B. Upon written request from Contractor, at least ten days before date of inspection, Owner or Architect will perform an inspection of sodded areas.
- C. After inspection, list of deficiencies or omissions requiring correction will be proposed. Items shall be corrected and are subject to same guarantee and final inspection until found acceptable. Be responsible for continued maintenance of that portion of the lawn, which, after ninety days, has not been accepted by Owner.
- D. Notwithstanding punch list items, Owner will certify in writing substantial completion of lawns and acceptance of work. Upon completion, re-inspection of repairs or renewals necessary, Owner will assume responsibility for continued maintenance of lawn.

PART 2 - PRODUCTS

2.01 TOPSOIL

- A. Topsoil shall be a natural, friable, granular soil containing organic matter, uniform composition and texture, and free from clay subsoil, stones, weed plant root, sticks, gravel, trash or harmful chemicals. Obtain topsoil from project site stockpiles established during clearing operations. The project topsoil shall be amended to meet these specifications. Obtain additional topsoil required for landscape development from off-site sources and transport to the project site at no increase to contract sum. Obtain approval from Architect to supply topsoil from more than one site. Do not excavate or haul topsoil when wet or frozen.

2.02 SOIL AMENDMENTS

- A. Limestone: Agricultural grade limestone ground to such fineness that at least 10% passes a 100-mesh sieve, 50% passing a 40-mesh sieve, and at least 90% passes a 20-mesh sieve.
- B. Sulfur: Commercial grade sulfur of equal grade, and quality as specified for limestone.
- C. Gypsum: Agricultural grade gypsum ground to such fineness that at least 10% passes a 100-mesh sieve, 50% passing a 40-mesh sieve, and at least 90% passes a 20-mesh sieve.

2.03 FERTILIZER

- A. Fertilizer: Complete organic or inorganic fertilizer with percentages of nitrogen, phosphoric acid, potash, and trace elements determined by the soil test. Fertilizer shall be delivered to the site in original unopened containers that bear manufacturer's guaranteed statement of analysis. Rate of application shall be determined by the soil test and/or grass product planting recommendations.

2.04 SOD AND SEED

- A. Sod: State certified, nursery grown in nearby area, well rooted, free from disease, defects, insect infestation, or any unhealthy or abnormal condition, and free of weeds.
- B. Grass Seed: Fresh, clean, dry, new crop seed complying with AOSA "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances. Germination: not less than 95%. Seed purity: not less than 85% pure seed and not more than 0.5% weed seed.
- C. Sod and Seed Composition:
 - 1. Tall Fescue (Drought Tolerant, Full Sun Mixture)
 - a. Certified Tall Fescue Cultivars, a mixture of at least two different types - 95%
 - b. Certified Kentucky Bluegrass - 5%
 - 2. Medium Quality Bermuda Grass (if specified on contract Drawings)
 - a. Mohawk Advanced Synthetic Turf-Type
 - b. La Prima Synthetic Turf-Type
- D. Submit statement giving locations of property from which sod is to be obtained and submit square yard sample of sod to site if requested.

PART 3 - EXECUTION**3.01 FINISH GRADE**

- A. After rough grading has been completed and site cleared of construction debris, cover areas disturbed by construction or rough grade with minimum four inches of topsoil over earth to provide finish grade.
- B. Final grades are indicated. Do not allow soil to pond. Firm topsoil by rolling to prevent washing and sinking. Degree of finish shall be that ordinarily obtained

with blade grader or scraper. Finish surface to within 0.10 foot above or below established grade elevations indicated.

- C. Surface soil of final grade shall be hand raked prior to seeding or sodding. All stones larger than ½ inch in size shall be removed from the application area.

3.02 APPLICATION OF SOIL AMENDMENTS

- A. Soil testing shall be made to determine the exact requirements of lime and fertilizer. If soil amendments are required, apply at rates specified. Blend topsoil mix to subgrade and mix soil amendments uniformly into topsoil by tilling, disking or harrowing to five inch depth. Adjacent to existing trees, adjust depth to avoid disturbances of tree roots.

3.03 FERTILIZING:

- A. Incorporate fertilizer with soil in same manner as lime, and apply and incorporate with soil simultaneous with liming operations. Type of fertilizer and rate of application shall be as specified.

3.04 SODDING

- A. Sod shall be laid smooth, edge to edge, with staggered joints and immediately pressed firmly into contact with sod bed by rolling to eliminate air pockets. True and even surface shall be provided to ensure knitting without displacement of sod or deformation of surfaces of sodded areas. In ditches or swales, sod shall be placed with longer dimension perpendicular to flow of water in ditch. On slopes of 1:4 and greater, the sod shall be laid with staggered joints. Sod shall be secured by stapling or other approved method.
- B. Following compaction, screened topsoil of good quality shall be used to fill cracks, and excess soil worked into grass with rakes or other suitable equipment. Grass shall not be smothered with excess fill soil. Exposed edges of sod shall be buried flush with adjacent soil.
- C. Sod shall not be laid on soil surface that are frozen. During High temperature, the soil shall be lightly irrigated immediately prior to laying the sod.

3.05 SEEDING

- A. Sow seed with spreader or seeding machine. Do not use wet seed or seed that exhibits mold or is otherwise damaged. Broadcast seed evenly by sowing in two directions at right angles to each other. Seed only when wind is calm. Sow Tall Fescue seed at the rate of 5 to 8 lb. per 1000 sq. ft. and Bermuda grass seed at the rate of 3 to 5 lb. per 1000 sq. ft.

3.06 HYDROSEEDING

- A. Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until homogeneous slurry is obtained.
- B. Mix slurry with specified tackifier and apply uniformly.
- C. Apply mulch at rate required to obtain specified seed sowing rate.

3.07 MAINTENANCE

- A. Ensure the establishment of a healthy, first class lawn. Be responsible for all maintenance, protection, and repair until Owner accepts planted area. Include watering, rolling, fertilizing and mowing.
- B. Maintenance and protection of all seeded and sodded areas shall continue until Owner accepts lawn. Barriers, sign, and/or flags shall be used on established pedestrian circulation ways as determined by Owner to indicate areas where trespassing is not allowed.
- C. During the maintenance period repair or re-work washouts, dry areas, dead areas or erosion at no additional cost to Owner. Repair damage by vandalism at no additional cost to Owner.

END OF SECTION

INSTRUCTIONS FOR EDITING

SECTION 03100

CONCRETE FORMWORK

1. General: This Section should be used only for projects involving major elements of concrete structure. For projects of limited scope, Section 03300 shall suffice.

SECTION 03100
CONCRETE FORMWORK

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. Codes and Standards: Unless otherwise shown or specified, design, construct, erect, maintain and remove forms and related structures for cast-in-place concrete work in compliance with the American Concrete Institute Standard "Recommended Practice for Concrete Formwork."

1.03 RELATED WORK

- A. Section 03300: Cast in Place Concrete

1.04 DESIGN OF FORMWORK

- A. Design, erect, support, brace and maintain formwork so that it will safely support all vertical and lateral loads that might be applied until such loads can be supported by the concrete structure. Carry vertical and lateral loads to the ground by the formwork system and by the in-place construction that has attained adequate strength for that purpose. Concrete work has been designed to safely support construction loads, including reshoring loads. If the contractor is uncertain about the design live loads, it shall be his responsibility to obtain these from the Architect.
- B. Design forms and falsework to include assumed values of live load, dead load, weight of moving equipment operated of formwork, concrete mix, height of concrete drop, vibrator frequency, ambient temperature, foundation pressures, stresses, lateral stability, and other factors pertinent to safety of the structure during construction.
- C. Provide shores and struts with positive means of adjustment capable of taking up all formwork settlement during concrete placing operations, using wedges or jacks or combination thereof. Provide trussed supports when adequate foundations for shores and struts cannot be secured.
- D. Support form facing materials by structural members spaced sufficiently close to prevent deflection of the form facing material. Fit forms placed in successive

unit for continuous surfaces to accurate alignment to assure a smooth completed surface, free from irregularities and within the allowable tolerances. Provide camber in formwork as required for anticipated deflections in formwork due to weight and pressure of fresh concrete and construction loads for long-span members without intermediate supports. Final position of all structural members to be at elevations shown on drawings.

- E. Design formwork to be readily removable without impact, shock or damage to the cast-in-place concrete surfaces and adjacent materials.
- F. Provide formwork sufficiently tight to prevent leakage of cement past during concrete placement. Solidly butt all joints and provide backup material at joints as may be required to prevent leakage and fins.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

- A. Forms for Exposed Finish Concrete: Unless otherwise shown or specified, construct all formwork for exposed concrete surfaces with plywood, metal-framed plywood-faced, or other panel type materials acceptable to the Architect, to provide continuous, straight smooth exposed surfaces. Furnish in the largest practical sizes to minimize number of joints and to conform to the joint system shown on the drawings. Provide form material with sufficient thickness to withstand the pressure of newly placed concrete without bow or deflections.
- B. Exposed finished concrete shall be defined to mean any vertical surface or soffit concrete exposed to sight; i.e., exterior grade beams, retaining walls, etc. Hand rubbing of concrete surfaces is only required at locations indicated on the drawings.

PART 3 - EXECUTION

3.01 FORM CONSTRUCTION

- A. Construct forms to the exact sizes, shapes, lines and dimensions shown, and as required to obtain accurate alignment, locations, grades, level and plumb work in the finished structures. Provide for openings, offsets, sinkage, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required on the work, and shown in the architectural, structural, and any other pertinent parts of the contract drawings. Use selected materials to obtain the required finishes.
- B. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent

the loss of concrete mortar. Locate consistent with the requirements of the work, and not in any exposed surface.

- C. Chamfer exposed external corners and edges where shown, using chamfer strips accurately fabricated to produce uniform smooth lines and tight edge joints. Provide chamfers of wood, metal, PVC, or rubber, to form the required corner or edge shapes as shown.
- D. Carefully form intersecting planes to provide true, clean-cut corners, with edge grain of plywood not exposed as form for concrete. Back joints with extra studs or girts as required to maintain true and square intersections.
- E. Provide all openings in forms accommodate other work, including mechanical and electrical work. No hole, blockout, or recess shall be allowed in any structural member without the written approval of the Architect-Engineer. Accurately place and securely support all items required to be built into the forms.
- F. Forms for Exposed Concrete: Drill forms to suit ties used and to prevent leakage of concrete mortar around tie holes. Do not splinter forms by driving ties through improperly prepared holes.

Do not use cover plates for patching holes or defects in forms.
- G. Control Joints: Locate where shown or directed.
- H. Provisions for Other Trades: Provide openings in concrete framework to accommodate work of other trades, including those under separate prime contracts. Size and location of openings, recesses and chases are the responsibility of the trade requiring such items. No hole, blockout, or recess shall be allowed in any structural member without the written approval of the Architect. Accurately place and securely support items to be built into forms.
- I. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is to be placed. Retighten forms immediately after concrete placement as required to eliminate mortar leaks.

3.02 PREPARATION OF FORM SURFACES

- A. Coat the contact surfaces of forms with a form-coating compound before reinforcement is placed. Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatment of concrete surfaces requiring bond or adhesion, nor impede the wetting of surfaces to be cured with water or curing compounds.

- B. Thin form-coating compounds only with the thinning agent of the type, and in amount, and under the conditions of the form coating compound manufacturer's directions.
- C. Do not allow excess form coating material to accumulate in the forms or to come into contact with concrete surfaces against which fresh concrete will be placed.
- D. Apply in compliance with the manufacturer's instruction.

3.03 REMOVAL OF FORMS

- A. Formwork not supporting the weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed 24 hours after placing the concrete, providing the concrete is sufficiently hard to not be damaged by the form removal operations, and provided that curing and protection operations are maintained.
- B. Formwork supporting the weight of concrete, such as beam soffits, joists, slabs and other structural elements of work, shall not be removed in less than fourteen (14) days or until the concrete has attained 70% of the design minimum compressive strength for the applicable type of concrete. Determine potential compressive strength of in-place concrete by testing of field-cured specimens representative of the concrete location or members.
- C. Form facing material may be removed four (4) days after placement, only if the shores and other vertical supports have been arranged to permit removal of the form facing material without loosening or disturbing the shores and supports.
- D. Note: These periods indicated above represent the cumulative number of days or fractions thereof, not necessarily consecutive, during which the temperature of the concrete is above 50 degrees F.

3.04 RE-USE OF FORMS

- A. Clean and repair the surfaces of forms that are to be re-used in the work, except that split, frayed, delaminated or otherwise damaged form facing material will not be acceptable. Apply new form coating compound material to all concrete contact form surfaces as specified for new formwork.
- B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close all joints. Align and secure all joints to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to the Architect.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

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

Section 03300: Cast-in place concrete.

1.03 QUALITY ASSURANCE

- A. Comply with the latest adopted edition of the Virginia USBC.
- B. Comply with pertinent recommendations contained in "Manual of Standard Practice for Detail Reinforced Concrete Structures," ACI 315, and "Building Code Requirements for Reinforced Concrete", ACI 318.
- C. Comply with pertinent provisions of the CRSI "Manual of Standard Practice".
- D. Installer Qualifications: A company specializing in placement of concrete reinforcement steel, with a minimum of 3 years experience on projects of similar size and scope.

1.04 REFERENCES STANDARDS

- A. ASTM A615 - Specifications for Deformed Billet Steel Bars for Concrete Reinforcement.
- B. ASTM A82 - Specifications for Cold-Drawn Steel Wire for Concrete Reinforcement.
- C. ASTM A185 - Specifications for Wire Fabric for Concrete Reinforcement.
- D. ASTM A36 - Structural Steel.
- E. ACI 318 - Building Code Requirements for Reinforced Concrete.
- F. CRSI - Manual of Standard Practice.

1.05 SUBMITTALS

- A. Submit Shop Drawings indicating sizes and dimensions for fabrication and placing of reinforcing steel and bar supports.
- B. Provide bar schedules, stirrup spacing, and diagrams of bent bars.
- C. Do not place any reinforcing until Shop Drawings are approved.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver reinforcement to project site in bundles marked with metal tags indicating bar size and length.
- B. Protect concrete reinforcement before, during and after installation and the installed work and materials of other sections.
- C. Store in a manner to prevent excessive rusting and fouling with dirt, grease, and other bond-breaking coatings.
- D. Maintain identification after bundles are broken.
- E. In event of damage, immediately make repairs and replacements necessary.

PART 2 - PRODUCTS**2.01 CONCRETE REINFORCEMENT**

- A. Concrete reinforcement materials: New, free from rust, and complying with the following:
 - 1. Bars for reinforcement: A615, grade 60; stirrups and ties grade 60.
 - 2. Wire fabric: ASTM A185.
 - 3. Bar supports: "Bar Support Specifications," CRSI Manual of Standard Practice, Type: plastic tipped accessories.
 - 4. Tie Wire: Cold drawn steel; ASTM A-82.
 - a. Supports for reinforcement: Provide supports including bolsters, chairs, spacers and other devices for supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI recommendations.

- b. For exposed-to-view concrete surfaces and where support legs are in contact with forms, provide supports with plastic protection (CRSI, Class1) or stainless steel protection (CRSI, Class 2).

2.02 FABRICATION

- A. Fabricate reinforcement in strict accordance with accepted Shop Drawings, and in accordance with ACI 315 and CRSI recommended practice.
- B. Fabricate bars with kinks or bends only as indicated on the drawings.
- C. Do not field-bend or straighten steel. Do not re-bend or straighten reinforcement to correct fabrication errors.
- D. Design:
 1. Bend bars cold.
 2. Make bend for stirrups and ties in accordance with ACI 315.

PART 3 - EXECUTION

3.01 PLACING

- A. Before start of concrete placement, accurately place concrete reinforcement, positively securing and supporting by concrete blocks, metal chairs or spacers, or metal hangers.
- B. Clearance: Clear space between bars and cover for bars shall conform to the Requirements of ACI 318.
- C. Splicing:
 1. Horizontal bars:
 - a. Place bars in horizontal members with laps at splices in accordance with the Contract Documents and the Requirements of ACI-318 (Latest Edition).
 - b. Bars may be wired together at laps.
 - c. Wherever possible, stagger the splices of adjacent bars.
 2. Wire fabric:
 - a. Make splices in wire fabric at least 1-1/2 meshes wide.

3. Other splices:
 - a. Make only those other splices indicated on accepted Shop Drawings or specifically accepted by Architect.
 - b. Place required steel dowels and securely anchor into position before concrete is placed.
 - c. In the event conduits, piping, inserts, sleeves or other items interfere with placing reinforcement as indicated or as otherwise required, immediately consult Architect and Owner's Representative and obtain approval of new procedure before placing concrete.

3.02 CLEANING REINFORCEMENT

Steel reinforcement, at the time concrete is placed around it, shall be free from rust scale, loose mill scale, oil, paint, and other coatings which will destroy bond between steel and concrete.

3.03 PROTECTION DURING CONCRETING

Keep reinforcing steel in proper position during concrete placement.

3.04 INSPECTION BEFORE CONCRETE PLACEMENT

Do not place any concrete until reinforcing steel has been inspected and approved.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 RELATED WORK

- A. Section 03200: Concrete reinforcement.
- B. Section 04200: Masonry accessories cast in concrete.
- C. Section 05500: Metal fabrications cast in concrete.
- D. Section 01400: Testing services.

1.03 QUALITY ASSURANCE

- A. Perform cast-in-place concrete work in accordance with ACI 318 (latest edition), unless specified otherwise in this Section.
 - 1. The Owner will employ a testing laboratory to conduct tests and provide test results.
 - 2. The testing laboratory shall conduct testing in accordance with the requirements of the Fairfax County Special Instructions Manual and other Fairfax County standards, review test results, and submit reports indicating whether test specimens comply with or deviate from applicable requirements.

1.04 TESTING LABORATORY SERVICES

- A. Provide free access to work and cooperate with appointed firm.
- B. Submit proposed mix design to inspection and testing firm for review prior to commencement of work.
- C. Tests of cement and aggregates may be performed to ensure conformance with requirements stated herein.
- D. Cast the following number of test cylinders for each 150 C.Y. or 5,000 S. F. (not less than one set of test cylinders for each days pour):

1. Two (2) Lab Cured for 28 days
 2. Two (2) Lab Cured for 7 days.
 3. All field cured cylinders as directed by local building official.
- E. One additional test cylinder will be taken and held in reserve as required for 56 day testing, and be cured on job site under same conditions as concrete it represents.
- F. One slump test will be taken for each set of test cylinders taken.
- G. At contractor's option, cylinders may be either 6 x 12 inch or 4 x 8 inch.

1.05 SUBMITTALS

- A. Submit pour schedule and diagrams of floor slabs, sidewalks, and footings to Architect for approval.
- B. Submit concrete mix design, including material certificates for cement, aggregate and admixtures. Certificates shall state compliance with the applicable referenced ASTM standards.
- C. Submit catalog data and written application instructions for all concrete compounds.

1.06 REFERENCE STANDARDS

- A. ASTM C33 - Concrete Aggregates.
- B. ASTM C150 - Portland Cement.
- C. ASTM C595 – Blended Hydraulic Cements
- D. ASTM C989 – Blast Furnace Slag
- E. ASTM C618 – Fly Ash
- F. ACI 301 - Specifications for Structural Concrete for Building.
- G. ACI 318 - Building Code Requirements for Reinforced Concrete.
- H. ASTM C260 - Air Entraining Admixtures for Concrete.
- I. ASTM C94 - Ready-Mixed Concrete.
- J. ASTM D994 - Pre-formed Asphalt Expansion Joint Fillers for Concrete Paving and Structural Construction.

- K. ACI 305 - Recommended Practice for Hot Weather Concreting.
- L. ACI 306 - Recommended Practice for Cold Weather Concreting.
- M. ASTM C309/C1315 - Liquid Membrane-Forming Compound for Curing Concrete.
- N. ACI 347 - Recommended Practice for Concrete Formwork.
- O. APA - American Plywood Association.
- P. ACI 315 - Recommended Practice for Detailing Reinforced Concrete Structures.
- Q. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.

1.07 ADJUSTMENT OF CONCRETE QUANTITIES

- A. No payments will be made for extra concrete needed as a result of unauthorized material removed below the required depth found in the field.

PART 2 - PRODUCTS

2.01 CEMENT

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

2.02 AGGREGATE

- A. Coarse aggregate for stone concrete: ASTM C33, with maximum size 3/4 in. for reinforced concrete and 1-1/2 in. for plain (unreinforced) concrete.
- B. Fine aggregate: Clean, durable sand, uncoated, grains free from silt, loam, and clay. Graded from fine to coarse with 95-100 percent by weight passing a No. 4 sieve and 3-8 percent passing a No. 100 sieve. ASTM C33 with following maximum permissible limits for deleterious substances, measured in percentage by weight: clay lumps 1.00; coal and lignite 0.25; materials finer than No. 200 sieve 3.00.

2.03 WATER

- A. Mixing Water: Drinkable in accordance with ACI 318

2.04 ADMIXTURES

- A. Hydration Control: (ASTM C494, Type B and Type D)
 - 1. Pozzolith 100-XR; Master Builders; (Degussa Admixtures, Inc) Cleveland, OH, 1-800-628-9990 (www.degussa.com)

2. Plastiment; Sika Chemical Corporation, Lyndhurst, NJ, 1-800-933-SIKA (www.sikausa.com).
- B. Air-Entraining: ASTM C260.
- C. Water-reducing: ASTM C494, Type A.
- D. Water reducing/retarding: ASTM C494, Type D.
- E. Water reducing/accelerating: ASTM C494, Type E.
- F. Use of calcium chloride as an additive is **not permitted**. (Admixtures for concrete shall contain not more than 0.1 percent chloride ions by weight).

2.05 FORMS

- A. Formwork: Comply with Building Code and ACI 347. Design, erect, support and maintain forms to safely carry all superimposed loads until such time as such loads can be safely supported by the concrete work. Construct formwork to shape, sizes and dimensions as shown on required to ensure accurate alignment and elevation, and level and plumb finished concrete work.
- B. Forms for Unexposed Finish Concrete: Form with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least two (2) edges and one side for tight fit.
- C. Forms for Exposed Finish Concrete Column Wraps: Use two-piece fiberglass forms to provide a smooth exposed surface. Joints shall be placed so as to be parallel with the face of the radiused building.
- D. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces.
- E. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible trademark of an approved inspection agency.
- F. Form Ties: Steel Wire snap ties with positive breakbacks which will leave no metal closer than 1" from formed surface of concrete, leave a cone-shaped recess.
- G. Form Coatings:
 1. Where surfaces are painted
 - a. "Duogard Plus", W. R. Meadows, Inc., Hampshire, IL 1-800-342-5976, (www.wrmeadows.com)

b. "Majic Cote", Symons, DesPlaines, IL 1-800-733-7654 (www.symons.com).

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

2.06 CONCRETE DESIGN MIX

A. Controlled concrete proportioned as outlined in Section 5.3 ACI 318, unless specified otherwise. Allowable design stresses are based on minimum 28-day compressive strength indicated. Submit design mix for each class of concrete for Architect's approval.

B. Proportions of aggregate to cement shall produce non-segregating plastic mixture of consistency required to give specified finish and be worked readily into corners and angles of forms and around reinforcement with method of placement employed. Accomplish variations in consistency by changes in proportioning of mix with changing W/C (water/cement) ratios established.

C. Admixtures:

1. Admixtures used in concrete: of one manufacturer.

2. Use air-entraining admixture in concrete exposed to elements to obtain air content of 5 percent, plus or minus 1.5 percent for 1-inch maximum aggregate and 6 percent plus or minus 2 percent for 3/4 inch maximum aggregate. Do not premix air-entraining admixture with other admixtures.

3. Retarding densifier: in concrete, except concrete for footings and isolated piers.

4. For low temperature conditions, an accelerating densifier may be used in lieu of a retarding densifier in walls.

5. A water-reducing admixture may be used in lieu of a retarding densifier in slabs.

6. Proportion admixtures in accordance with manufacturer's recommendations.

D. Slump Limits: $3" \pm 1"$; 4 inch maximum.

2.07 MIXING CONCRETE

A. Ready-mixed ASTM C94, except addition of water for material with insufficient slump shall not be permitted.

B. Provide a certificate signed by authorized official of supplier, with each load of concrete stating the following:

1. Time truck left plant.
 2. Mix of concrete.
 3. Amount of water and cement in mix.
 4. Time truck is unloaded at project site.
- C. Retain certificates at project site for inspection by testing laboratory.
- D. Not more than one hour shall elapse from time water is introduced into mixer drum until drum is discharged. Do not use concrete that has stood outside the mixer drum for more than 30 minutes. Do not add water to a mix that has stiffened to increase workability. Retempering of partly set concrete is not permitted.

2.08 FORMWORK FABRICATION

- A. Fabricate formwork mortartight, braced to prevent displacement under vibration and sagging between supports. For surfaces exposed to view in finished work, use new, clean, smooth plywood free from blemishes, square-cut and in sizes as large as practical.
- B. Fabricate forms for removal without hammering or prying against concrete.
- C. Provide temporary clean-out openings at base of forms and other locations in formwork to facilitate cleaning and inspection for placing concrete.

2.09 MISCELLANEOUS MATERIALS

- A. Vapor Retarder: "Moistop Ultra 10, Fortifiber Building Systems Group, Reno, NV 1-800-773-4777 (www.fortifiber.com), 10 mil polyolefin film, or Stego Wrap 10 mil Class A Vapor Retarder, San Clemente, CA 1-877-464-7834 (www.stegoindustries.com) or Pre-bid approved equal. Barrier shall resist deterioration when tested in accordance with ASTM E154, and shall meet or exceed ASTM E1745 for Class A.
- B. Porous Fill: Clean, water-worn tailings free from clay, dirt, wood and debris, graded from 2 in. to 3/4 in.
- C. Expansion Joint Material: 1/2 inch (12.7mm) asphalt expansion joint filler complying with the following:
1. ASTM D994
 2. FS HH-F-341F, Type III
 3. AASHTO M33

4. FAA Specification P-610-2.7
- D. Curing and Sealing Compound (for concrete floors scheduled to remain exposed only): Acrylic, water based curing compound, VOC compliant, non-yellowing, ASTM C-309/C1315, Type 1.
1. "Kure-N-Seal W", Sonneborn (Degussa Building Systems), Shakopee, MN, 1-800-443-9517 (www.DegussaBuildingSystems.com)
 2. "VOCOMP-25-1315", W.R. Meadows, Inc.
- E. Cement feathering compound: Ardex "SD-F Feather Finish", Portland cement-based, latex-modified; or comparable.
- F. Perimeter "Zip Strip": Provide a removable bond break "zip strip" capable of producing a clean 1/2" x 1/2" joint to be used for sealing all joints where walls penetrate and abut floor slab. "Sealtight Snap-Cap," W. R. Meadows, 1/2" (12.7mm), or comparable.

PART 3 - EXECUTION

3.01 FORMS

- A. Construct formwork to lines, dimensions, and shapes of concrete indicated, to a tolerance of 1/8 inch in 10 feet. Provide watertight joints in forms. Provide support to maintain tolerance specified during placing of concrete.
- B. Coat forms with form release agent prior to each use of form.
- C. Secure keys in position by continuous wood blocking rigidly secured to forms or reinforcing.
- D. Do not use pinch bars or other metal tools in exposed work to pry forms loose.
- E. Use form ties to prevent form deflection, and to prevent spalling of concrete surfaces upon removal of forms.

3.02 COORDINATION WITH OTHER WORK

- A. Provide in locations indicated slots, chases, recesses or openings not formed by sleeves, frames, boxes or equipment specified in other Sections.
- B. Examine Contract Documents for work specified in other Sections requiring either building in or provisions for later setting. Set items specified in other Sections and provide protection required to prevent damage or displacement during placing of concrete.

- C. Grout and fill with concrete as required throughout the project, except as otherwise specified, and including column base plates, door saddles, frames in concrete walls, and openings after pipes are in place.
- D. Minimum 1-inch concrete cover is required over conduits and pipes embedded in concrete. Do not place pipes or conduits having an outside diameter larger than 1/3 slab thickness in slabs.
- E. Place conduits and pipes as indicated. Place conduits and pipes to avoid changing location of reinforcing steel.
- F. Provide inserts required to bond adjacent construction to concrete.

3.03 PREPARATION

- A. Prior to placing concrete, clean equipment for transporting concrete. Remove debris and ice from spaces to receive concrete. Oil or wet form, as specified, and clean reinforcement of ice or other coatings. Remove water from areas to receive concrete.
- B. Reinforcement, forms and earth in contact with concrete shall be free from frost. Do not place concrete during rainfall without adequate protection. Make preparation to protect newly placed concrete from rainfall until concrete has hardened sufficiently to preclude rainfall damage.
- C. Place expansion joint material as indicated for slab isolation at perimeter walls and columns. Depress joint material 1/2 in. below finish slab for installation of "Zip Strip" specified in this section and sealant specified in Section 07900.

3.04 PLACING CONCRETE

- A. Convey concrete to point of final placement by methods preventing segregation or loss of materials. Place concrete as near as practical in final position to avoid segregation due to handling and flowing. Do not use concrete that has partially hardened, been contaminated by foreign materials or been retempered.
- B. Place concrete in layers not exceeding 18 inches in depth avoiding inclined planes and piling and concrete in forms permitting escape of water or free flow of concrete.
- C. Place concrete for columns and walls through canvas, wood, rubber or metal elephant trunks, 6 inches in diameter minimum, to avoid segregation of concrete in free fall. Do not allow concrete to ricochet against forms for exposed surfaces. Deposit concrete directly to center of forms. Space drop chutes on 10-foot centers, maximum. Do not use drop chutes longer than 12 feet. Provide illumination to permit inspection of the interior of forms.
- D. Vibration:

1. Exposed surfaces shall be finished with a smooth, dense, and concrete without honeycombing. Tamp, space, and vibrate concrete thoroughly during placing.
 2. Quantity, capacity and type of vibrators used is left to discretion of the Contractor. Maintain a reserve of vibrators in event of breakdown.
 3. Exercise care in use of vibrators to prevent scarring or roughening of forms. Vibrators shall not cause separation of free water from mix. Do not vibrate in one spot to extent pools of grout are formed.
 4. Do not vibrate to the extent of causing segregation of aggregate. Insert and withdraw vibrators slowly. Vibrators shall run continuously while being withdrawn. Insert unit in a depth to vibrate lower layer of concrete. Do not insert into concrete that is partly hardened or that will not become plastic under vibrator action. Do not apply vibration to steel reinforcing extending into partially hardened concrete.
 5. Exercise care to prevent formation of water pockets and bubbles against form faces.
- E. Place concrete in continuous operation until panel or section is completed. Locate construction joints at point of minimum shear.

3.05 FORMS REMOVAL

- A. Forms not supporting weight of concrete, such as sides of beams, walls, columns, and similar work, may be removed after cumulatively curing at not less than 50° F. for at least 24 hours after placing concrete, provided that concrete is sufficiently hard so as not to be damaged by form removal, and provided that curing and protection measures are maintained.
- B. Forms supporting the weight of concrete shall not be removed in less than 14 days or until the concrete has attained at least 70% of the design strength.

3.06 CURING AND PROTECTION

- A. Curing:
 1. Spray top surface of slabs with liquid membrane-forming compound in accordance with manufacturer's directions as soon as the newly placed surface has been finished and will not be marred by application.
 2. Respray surfaces subjected to heavy rainfall within three hours of compound application.
 3. Where practicable, keep forms in place for a seven-day curing period. Keep top exposed concrete surface wet and forms moist. Loosen forms to allow curing water to run down between concrete and forms.

4. If forms cannot remain in place for seven days, cover concrete with fabrics that have moisture-retaining properties. Examine fabrics to detect elements that might discolor concrete finish. Keep fabric moist continuously to ensure a film of water on concrete surface.
- B. Cold weather protection:
1. Protection of concrete during cold weather shall comply with ACI 306; heating of concrete shall be in accordance with ASTM C94-78. Cold weather techniques shall be used where the mean daily temperature falls below 40 degrees F for at least two (2) consecutive days.
 2. Temperature of the concrete at time of placement shall not be less than 50 degrees F. Temperature of the soil against which concrete to be placed shall not be less than 40 degrees F.
 3. Concrete temperature shall be maintained at a minimum of 50 degrees F for at least seventy-two (72) hours after placement.
 4. Contractor shall provide to the architect a description of cold weather protection procedures to be used, including the methods for determining the need for the procedures.
- C. Hot Weather Protection:
1. Protection of concrete during hot weather shall comply with ACI 301 and ACI 305. Hot weather protection procedures shall be used when the temperature of the concrete mix exceeds 85 degrees F.
 2. Temperature of the concrete mix may exceed 85 degrees F only if water reducing and retarding compound complying with ASTM C494 is used.
 3. Hot weather precautions shall be instituted by the contractor when the anticipated rate of evaporation, as determined by guidelines in ACI 305, is expected to reach 0.2 pounds per square foot per hour (lb/sq. ft./hr.).
 4. The contractor shall provide to the architect a description of hot weather protection procedures to be used, including the methods for determining when the procedures will need to be implemented. Provide written recommendations from the manufacturer for use of water reducing and retarding compounds.

3.07 CONTRACTION JOINTS FOR GRADE SLABS

- A. Contraction joints shall be located as indicated on Drawings or, if not indicated, so as not to impair the strength and appearance of the structure. Joints shall be spaced at a maximum of 20 feet on center, in either direction and shall coincide with column grids, where present. Install contraction joints in accordance with approved joint location shop drawings.

- B. Sawcut joints in grade slabs immediately after finishing, and after curing compound has been applied so that the slab surface is not damaged by equipment and sawcutting does not dislodge aggregate. In general, sawcutting of joints shall take place within a period of 7 to 14 hours after concrete is placed, depending on actual project conditions. Sawcutting shall be scheduled to occur within this timeframe to minimize the risk of shrinkage cracking. Work shall not be postponed until the following work day.
- C. Contraction joints shall be 1/8 inch wide by a depth equal to 25% of slab thickness.

3.08 FINISHES OTHER THAN FLOORS

- A. After removal of forms, remove fins and forms marks by grinding on exposed interior and exterior surfaces scheduled to receive paint or membrane waterproofing. Patch voids and honeycombs.
- B. Interior and exterior exposed concrete surfaces: "Rubbed Finish." Apply grout, clean-down after the patching, grinding, and cleaning operations are complete. The grout wash shall follow the patching operation as soon as possible and the procedure shall be as follows:
 - 1. Mix one part Portland cement and 1-1/2 parts fine sand with sufficient water to produce a grout having the consistency of thick paint. Use white Portland cement for cement in grout. Wet the surface of the concrete sufficiently to prevent absorption of water from grout and apply grout with a brush or burlap completely filling air bubbles and holes. Immediately after applying grout, float surface with a cork or other suitable float, scouring vigorously. While the grout is still plastic, finish surface with a sponge rubber float, removing excess grout.
 - 2. Finishing shall be done at time when grout will not pull from holes of depressions. Next, allow surface to dry until surface takes on a powdery appearance, then rub vigorously with dry burlap to remove completely dried grout. No visible film or grout shall remain after rubbing. Complete entire cleaning operation for an area the day it is started. Do not leave grout on overnight.
 - 3. After the concrete has been grout-cleaned, if slightly dark spots or streaks remain, wipe off lightly with a fine abrasive hone without using water. Rubbing with the hone shall not be sufficient to change the texture of the concrete. Include final operation as part of grout cleaning where necessary.
- C. In foundation walls below grade and both sides of pit walls, cut back ties and spreaders to a depth of approximately 1-1/2 in. Cut back honeycombed concrete and voids to sound concrete. Cuts shall be to depth of at least 1-1/2 in. with edges perpendicular to surface.

- D. Concrete surfaces not exposed to view may be left "as is." Fill holes resulting from cutting back of scale pockets, honeycomb, surface voids and the removal of form wires or spreaders with cement mortar.

3.09 FLOOR AND SLAB FINISHES

- A. Measure floor finish tolerances in accordance with ASTM E1155. Individual floor sections shall be bounded by construction joints, contraction (control) joints, or column lines that form the smallest sections.
- B. Floor Slab Tolerance: After final troweling operation slab shall have a surface place tolerance not exceeding 1/4 inch in 10 feet when tested with a loft straightedge, but 1/4 inch shall not be cumulative.
- C. Where specified tolerances in surface elevation of slabs are exceeded, grind or patch the surface to obtain specified tolerance. Grind as soon as possible but not before 3 days of cure. Install patching material in accordance with manufacturer's instructions.
- D. Finishes:
 - 1. Scratched finish for surfaces to receive bonded applied cementitious finishes: After the surface has been struck off, consolidated and leveled, roughen surface with stiff brushes or rakes before final set.
 - 2. Troweled finish for surface to receive finish flooring or be exposed: Float finish surfaces first and then apply power-driven trowel and then hand trowel. First troweling after power floating shall be with a power trowel producing a smooth surface relatively free of defects. Additional troweling by hand after surface has hardened sufficiently to produce a ringing sound as the trowel is moved over the surface. Thoroughly consolidate surface by hand trowel operation. Finished surface shall be free of trowel markings and be uniform in texture and appearance. On surfaces receiving floor coverings, remove defects of sufficient magnitude to show through floor covering by grinding.
 - 3. Broom finish: Light/medium broom on ramps and sidewalks, to be approved in field by Architect, finish to be consistent.
- E. Floor Slab Recesses and Slopes:
 - 1. Where floor drains are indicated on Drawings, slope floor slabs to drain.

3.10 QUALITY CONTROL TESTING DURING CONSTRUCTION BY OWNER

- A. Concrete shall be sampled and tested for quality control during the placement of concrete as follows:

1. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C94.
2. Slump: ASTM C143; one test for each concrete load at point of discharge, and one for each set of compressive strength test specimens. The testing laboratory or Owner's Representative shall have the authority to reject any concrete that does not have the specified slump.
3. Air Content: ASTM C231, pressure method; one for each set of compressive strength test specimens.

B. Compression Test Specimens

1. ASTM C31: One set of 5 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
2. Tests shall be made by an independent testing laboratory. Not less than one test for each 150 cubic yards of concrete, or fraction thereof, or each 5,000 sq. ft. of slab, for each class of concrete placed will be required, and in any event not less than one test for each day's pour of each class of concrete. Four specimens will be made for each test: ASTM C39 and C31.
3. Standard age of test shall be 28 days. Seven-day test results shall be reported to Architect for two cylinders of each class of concrete. Test 2 cylinders at 28 days and 2 at 7 days.
4. If strength of laboratory control cylinders for any portion of structure falls below the compressive strength required for the design, Architect shall have the right to order change in proportions of water content of concrete for remaining portions of structure. In addition, where there is question as to quality of concrete in structure, Architect may require tests in accordance with ASTM C42. Should such tests fail to develop minimum strengths specified, faulty concrete shall be replaced.
5. Report test results in writing to the Architect and the Contractor on the same day that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of Contractor, name of concrete supplier and truck number, name of concrete testing service, concrete type and class, location of concrete batch in the structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength and type of break for both 7-day and 28-day tests. Furnish copy of each test to local building inspections office at same time other submittals are made.

6. Contractor must provide a concrete cylinder storage box acceptable to the testing and inspection laboratory.

END OF SECTION

SECTION 03600
NONSHRINK GROUT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION

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

PART 2 - PRODUCTS

2.01 GENERAL

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

2.02 NONSHRINK CEMENT-BASED GROUT

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

- A. Nonshrink: No shrinkage (0.0%) and a maximum 4.0% expansion when tested in accordance with ASTM C-827. No shrinkage (0.0%), and a maximum of 0.2% expansion in the hardened state when tested in accordance with CRD-C-621.
- B. Compressive Strength: A minimum 28-day compressive strength of 5,000 psi when tested in accordance with ASTM C-109.
- C. Setting Time: A minimum set time of 60 minutes when tested in accordance with ASTM C-191.
- D. Technical Service: The manufacturer shall provide technical service upon request.
- E. Composition: For column base plates, grout containing metallic particles such as aluminum powders or iron fillings may be used. For any other applications, the grout shall not contain metallic particles or expansive cement.

2.03 WATER

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

PART 3 - EXECUTION**3.01 GENERAL**

- A. **Placing:** The Contractor shall perform all mixing, grouting, and curing in accordance with the manufacturer's recommendations.
- B. **Temperature:** The temperature of the grouting surfaces and the grout shall be maintained between 50 degrees F and 90 degrees F during grouting and for a minimum of 24 hours thereafter.
- C. **Elimination of Voids:** Grout placement shall proceed in a manner that will assure the filling of all spaces and intimate contact of the grout with contact surfaces. Grout holes shall be used; location to be approved by Architect/Engineer if not otherwise detailed.

3.02 SURFACE PREPARATION

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

3.03 GROUT REMOVAL

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

END OF SECTION

SECTION 16010

ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.01 DESCRIPTION [ENGINEER MUST EDIT]

- 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: electrical service(s); power distribution (both normal and stand-by emergency power); branch circuit wiring; low voltage wiring; wiring devices; grounding; lighting (both interior and exterior); lighting control systems; fire detection and alarm system; security intrusion system; door video access entry system; wireless master clock and program system; sound and intercommunications system and program system; classroom amplification systems; auxiliary sound reinforcement systems; auditorium sound reinforcement system; Black Box Theater sound reinforcement system; gymnasium sound reinforcement systems; band, choral, and orchestra sound reinforcement systems; athletic fields sound reinforcement systems; dance and gymnastics sound reinforcement 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) licensed journeyman electrician (Foreman) to be present at all times while work is being performed. Such certification shall be provided to the Architect/Engineer upon request.
 - F. This Contractor shall: give all necessary notices; obtain all permits (including a low voltage wiring permit); pay all government taxes, fees, and other costs including, but not limited to the Fairfax County Fire Marshals Office shop drawing review fees; file all necessary plans; prepare all documents; and obtain required certificates of inspection for work and deliver same to the Architect/Engineer before any request for acceptance and final payment for the work.
 - G. This Contractor shall be responsible for purchasing equipment and appliances that bear the label of an agency as approved by the Fairfax County Department of Public Works and Environmental Services (DPWES). It shall be the responsibility of the Contractor to pay for any label testing of equipment or appliances that are installed without the label of a DPWES approved agency.

1.05 REVIEWS AND SHOP DRAWINGS

- A. The materials, workmanship, design, and arrangement of all work installed under this contract shall be subject to the review of the Architect/Engineer and Owner.
- B. Where any specified materials, process, or method of construction or manufactured article is specified by name, or by reference to the catalog number of a manufacturer, the specifications are to be used as a guide and are not intended to take precedence over the basic duty and performance specified or noted on the Drawings.
- C. In all cases, the Contractor shall verify the duty and available electric

characteristics with the specific characteristics of the equipment offered for review.

- D. All component parts of each item of equipment or device shall bear the manufacturer's name plate giving name of manufacturer, description, size, type, serial or model number, electrical characteristics, etc., in order to facilitate maintenance or replacement. The nameplate of a Contractor will not be acceptable.
- E. If materials or equipment are installed before they have been reviewed by the Architect/Engineer, the Contractor shall be liable for their removal and replacement at no additional expense to the Owner, if in the opinion of the Architect/ Engineer, material or equipment does not meet the intent of the Drawings and Specifications.
- F. This Contractor shall call to the attention of the Architect/Engineer by letter or on shop drawing submittals, any instance in which the shop drawings differ from the requirements of the Drawings and Specifications.
- G. Data and shop drawings shall be coordinated and included in a single submission in a bound format. Multiple submissions are not acceptable except where prior approval has been obtained from the Architect/Engineer. In such cases, a list of data to be submitted later shall be included with the first submission. No delays in construction occasioned by the Contractor's failure to submit material in accordance with the approval schedule will be excused.
- H. Catalogs, pamphlets, or other documents submitted to describe items on which review is being requested shall be specific and identifications in catalog, pamphlets, etc., of items submitted shall be clearly made in a contrasting ink. Data of a general nature shall not be acceptable.
- I. Submitted samples, drawings, specifications, catalogs, and the like shall be properly labeled and shall indicate: specified service for which the material or equipment is to be used; Section and Article number of Specifications governing; contractor's name; and name of the job.
- J. Data and shop drawings shall be identified in accordance with SECTION 01340. In addition, shop drawings shall be identified by the name of the item and system and the applicable Specification paragraph number. This Contractor shall submit the following components/systems described herein and as specified in other Sections of this Specification.
 - 1. Boxes including device, junction, outlet, and pull types.
 - 2. Conduit and associated fittings.
 - 3. Disconnect /safety switches.

4. Dry type transformers.
 5. Enclosed circuit breakers.
 6. Grounding system, including rods, connectors, and welds.
 7. Panel boards, including distribution and branch circuit.
 8. Sports field lighting systems.
 9. Surge protective devices.
 10. Wires, cables, and connectors.
 11. 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, three (3) 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 VFD's or starters are actuated by automatic controls or other devices specified, all necessary components to actuate VFD's or starters shall be furnished and installed under Division 15.
- E. Wiring for automatic temperature control and boiler emergency shut-off shall be furnished and installed under Division 15. All other line voltage control wiring, including interlock wiring for equipment, shall be furnished and installed under this Division unless otherwise noted.
- F. Power supply wiring for all equipment shall be furnished and installed under this Division of these Specifications.
- G. This Contractor shall coordinate with Division 15 for wiring of approved equipment, and shall coordinate specified control functions.
- H. This Contractor shall install all starters furnished under Division 15, and provide all wiring from the power source, through the starter, to the motor. Starters shall not be located above ceilings or other concealed locations. If locations are not shown on the Drawings, this Contractor shall locate starters in utilitarian locations such as electrical rooms, janitor closets, etc., as approved by the Architect/Engineer.
- I. This Contractor shall provide all power wiring for VFD's from the power source, through the VFD, to the motor.

- J. This Contractor shall make final power connections to all items of equipment and electrical heat furnished under Division 15.

2.05 PLATES AND SLEEVES

- A. All electrical system conduit shall have sleeves for passing through slabs except concrete slabs in contact with grade. All conduit 1-1/2 inch and larger shall have sleeves where the conduit passes through masonry, concrete, tile, and gypsum wall construction. Conduit passing through concrete slabs on grade shall not require sleeves.
- B. This Contractor shall furnish and install sleeves in exterior walls below grade for conduits and, the space between the conduit and the sleeve shall be packed with silicon and made completely watertight.
- C. This Contractor shall fasten sleeves securely in floors and walls so that they will not become displaced when concrete is poured or when other construction is built around them. This Contractor shall take precautions to prevent concrete, plaster, or other materials from being forced into the space between the conduit and sleeve during construction.
 - 1. This Contractor shall terminate sleeves flush with walls, partitions, and ceilings.
 - 2. In areas where conduits are concealed, this Contractor shall terminate sleeves flush with the floor.
 - 3. In finished areas, where conduits are exposed, this Contractor shall terminate sleeves below the floor and cap. In rooms having floor drains, this Contractor shall extend sleeves 3/4 inch above the floor.
- D. Escutcheon plates shall be furnished and installed by this Contractor for all exposed conduits passing through walls, floors, and ceilings. Plates shall be nickel-plated, of the split ring type, and of a size to match the conduit. Where plates are provided for conduits passing through sleeves that extend above the floor surface, this Contractor shall furnish and install deep recessed plates to conceal the sleeves.
- E. Sleeves shall be constructed of galvanized rigid steel conduit unless otherwise indicated on Drawings.

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 either the cast-in-place or precast type 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 its 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. **(ENGINEER MUST EDIT.)**
 - 1. Boxes including device, junction, outlet, and pull types.
 - 2. Conduit and associated fittings.
 - 3. Disconnect /safety switches.
 - 4. Dry type transformers.
 - 5. Enclosed circuit breakers.
 - 6. Grounding system, including rods, connectors, and welds.
 - 7. Panel boards, including distribution and branch circuit.
 - 8. Sports field lighting systems.

9. Surge protective devices.
10. Wires, cables, and connectors.
11. Wiring devices.

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, and 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. Rigid steel and intermediate metal (IMC) conduits shall be full weight threaded and galvanized steel pipe of standard pipe dimensions.
- C. Electrical metallic tubing (EMT) shall be threadless thin wall conduit, galvanized or zinc metallized.
- D. 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.
- E. 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.
- F. 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.
- G. This contractor can use for exterior, underground, pole mounted luminaire branch circuit wiring, schedule 40 high-density polyethylene (HDPE) piping. Where conduit turns out above finished grade, provide a rigid steel conduit elbow and suitable adaptor between plastic and steel conduits. No plastic conduit shall be used exposed outside the building, unless otherwise noted on the Drawings. A HDPE pipe that meets this specification is DURA-LINE Cat. No. EPEC-40/SCH 40 (black) or approved equal.

2.02 FITTINGS

- A. Fittings, couplings, and accessories shall be compatible with the conduit material.

- B. Unions, couplings, and fittings for rigid and IMC conduits shall be of galvanized steel of conventional dimensions and shall be internally threaded at each end to fit the nontapered thread standard for the corresponding size conduit. Couplings and fittings for electrical metallic tubing shall be of steel and shall be of the compression or setscrew type. Cast pot metal and crimp types are not acceptable.
- C. Conduit bodies used with conduits 1 ½ inches and larger shall be galvanized cast iron “mogul conduit bodies” complete with a domed and angled cover, neoprene gasket, stainless steel screws, and rated for “wet locations”.

2.03 BUSHINGS AND LOCKNUTS

- A. Use OZ/GEDNEY type 'B' insulated or type 'BLG' bushing where necessary to bond conduit to ground connection. Bushings shall be as manufactured by OZ/GEDNEY, THOMAS & BETTS, or CROUSE-HINDS.
- B. Locknuts shall be used on both sides of conduit connections to a box or a panelboard in addition to the bushing. Where a larger size opening occurs than the size of the conduit, use reducing locknuts. Do not use reducing washers.

2.04 WIRING TROUGHS

- A. Wiring troughs complete with screwed covers shall be used where indicated and for mounting groups of switches and/or starters. Wiring troughs shall be the standard manufactured product of a company regularly producing wiring troughs and shall not be a local shop assembled unit. Wiring trough shall be UL listed and of sizes indicated or as required by NEC, if not indicated. The interior, including couplings shall be completely open without interference. Finish shall be ASA #49 medium light gray enamel over a rust inhibitor. Wiring troughs shall be UL listed "Suitable For Wet Locations" and so labeled where indicated "WP" on the Drawings.
- B. Wiring connection taps within wiring troughs shall be made using clear self-sealing, self-insulating, multi-tap connectors with transparent flexible insulating covers. The connectors shall be securely fastened. The multi-tap connector shall be manufactured by ILSCO, Series “PCT” ClearTap or approved equal.

2.05 CABLE TRAY

- A. Ladder type cable tray shall be used where indicated on the Drawings, for low voltage cabling systems. Low voltage cabling systems shall be as hereinafter specified in other sections of these specifications. Ladder type cable trays may also be used for Type MC Cable as hereinafter specified in other sections of these specifications.
- B. Cable tray systems shall be made of straight sections, fittings, and accessories as shown on the Drawings, described herein, and as defined in the latest NEMA

standards publication VE-1. Cable tray shall be UL classified as an equipment-grounding conductor.

- C. Ladder type cable tray shall be metal (aluminum or pre-galvanized steel) of the types, classes and sizes indicated; with splice plates bolts, nuts and washers for connecting units. Construct units with rounded edges and smooth surfaces; in compliance with applicable standards and these specifications.
- D. Cable tray materials and finish shall be as follows:
1. Aluminum: Straight section and fitting side rails and rungs shall be extruded from Aluminum Association Alloy 6063. All fabricated parts shall be made from Aluminum Association Alloy 5052.
 2. Pre-Galvanized Steel: Straight sections, fitting side rails, and rungs shall be made from structural quality steel meeting the minimum mechanical properties and mill galvanized in accordance with ASTM A653 SS, Grade 33, Coating Designation G90.
- E. Ladder type cable tray shall consist of two (2) longitudinal members (side rails) with transverse members (rungs) welded to the side rails. Rungs shall be spaced six (6) inches on center. Rung spacing in radiused fittings shall be nine (9) inches and measured at the center of the tray's width. Rungs shall have a minimum cable bearing surface of 7/8 inches with radiused edges. No portion of the rungs shall protrude below the bottom plane of the side rails. Each rung must be capable of supporting the cable load, with a safety factor of 1.5, and a 200 lb. concentrated load when tested with NEMA VE 1, section 5.4.
- F. Ladder type cable tray shall have an overall side rail height of four (4) inches with a minimum loading depth of three (3) inches. Cable tray width shall be twelve (12) inches, eighteen (18) inches, or twenty-four (24) inches as shown on the Drawings. Straight section side rails shall be of "I-beam" design with a rung retaining weld bead. All straight sections shall be supplied in standard lengths of twelve (12) feet, except where shorter lengths are permitted to facilitate tray assembly lengths as shown on the Drawings. Fittings radius shall be twenty-four (24) inches. Side rails of straight sections and fittings shall be compatible so that standard splice plates can be used to join straight sections and fittings. Fittings shall have three (3) inch tangents beyond the curved section to accommodate the standard splice plates.
- G. Splice plates shall be the bolted type made as indicated below for each tray type. The resistance to fixed splice connections between an adjacent section of tray shall not exceed .00033 ohm. Splice plate construction shall be such that a splice may be located anywhere within the support span without diminishing rated loading capacity of the cable tray.
1. Aluminum Tray: Splice plates shall be made of 6063-T6 aluminum, using four square neck bolts and serrated flange locknuts. Hardware shall be

zinc plated in accordance with ASTM B633, SC1.

2. Pre-Galvanized Steel Tray: Splice plates shall be manufactured of high strength steel, meeting the minimum mechanical properties of ASTM A1011 HSLAS, Grade 50, Class 1. Each splice plate shall be attached with ribbed neck carriage bolts and serrated flange locknuts. Hardware shall be zinc plated in accordance with ASTM B633 SC1.

Splice plates shall be furnished with straight sections and fittings.

H. Cable Tray Supports

1. Supports shall be constructed from 12 gauge steel formed shape channel members 1 5/8 inch by 1 5/8 inch with necessary hardware such as trapeze support kits furnished by manufacturer of cable tray (or engineer approved equal). Cable trays installed adjacent to walls shall be supported on wall-mounted brackets furnished by manufacturer of cable tray (or engineer approved equal).
 2. Trapeze hanger supports shall be supported by ½ inch (minimum) diameter rods.
 3. Cable tray fitting supports shall be located such that they meet the strength requirements of straight sections. Install fitting supports per NEMA VE-2 guidelines, and in accordance with manufacturer's instructions.
- I. Accessories shall be furnished as required to protect, support, and install a cable tray system. Accessories shall consist of but not be limited to: section splice plates, expansion plates, blind-end plates, specially designed ladder dropouts, etc.
- J. Cable tray shall be capable of carrying a uniformly distributed load of 126 lbs./ft. for aluminum on a 12 ft. support span or 103 lbs./ft for pre-galvanized steel on a 12 ft. support span (NEMA Class 12C) with a safety factor of 1.5 when supported as a simple span and tested per NEMA VE 1, section 5.2. In addition to the uniformly distributed load, the cable tray shall support 200 lbs. concentrated load at mid-point of span. Load and safety factors specified are applicable to both the side rails and rung capacities. Cable tray shall be made to manufacturing tolerances as specified by NEMA.
- K. Cable tray manufacturers shall be B-LINE SYSTEMS, INC. Series 24A for aluminum and 248 for pre-galvanized steel or equal as manufactured by CABLOFIL, CHALFANT CABLE TRAY, COPE CABLE TRAY, SQUARE D, or THOMAS & BETTS CORPORATION.

2.06 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.

2.07 PULL-LINES (CORDAGE)

- A. Pull-lines (rope and cordage) types and strengths must be selected and calculated by the Contractor. The selection must be based on the intended use and expected pulling load applications. Design Factor (DF) selections and Working Load Limits (WLL) must be calculated with consideration of exposures to risk and actual conditions of use for each application. Pull-lines shall be in compliance with the latest Cordage Institute Standards and Guidelines.
- B. The minimum pull-line tensile strength for insertion into conduits shall be 500

pounds and of the low-friction type.

- C. Each utility service entrance conduit (raceway) for power company, telephone company and/or cable television (CATV) company shall have a MULETAPE® pulling tape with numerical values having sequential footage (feet and inches) markings, without splices. The MULETAPE® shall have a minimum tensile strength of 2500 pounds and shall be of the low-friction type with prelubrication, high abrasion resistant yarns.
- D. Where minimum pull-line strengths are given, they do not negate the Contractor's responsibility for proper selections and calculations for higher strength pull-lines to suit the application.

2.08 ROOFTOP CONDUIT SUPPORT STRUT SYSTEM

- A. Provide rooftop conduit support strut systems that will absorb thermal expansion and contraction of conduits, thus preventing damage to the roof membrane. This Contractor must select the support strut system's load capacity necessary to carry the weights and sizes of conduits.
- B. The conduit support base shall have gently rounded edges to prevent damage to the roof and shall be UV resistant polycarbonate resin or 100% recycled rubber and polyurethane prepolymer, and all other metal parts made of hot-dip galvanized or stainless steel.
- C. Conduits shall rest on the strut system made of hot-dip galvanized or stainless steel. Provide fasteners sized for the conduit.
- D. Rooftop conduit support system manufacturers shall be MIRO INDUSTRIES, INC. or equal as manufactured by CABLOFIL (CABLO-PORT), COOPER B-LINE (DURA-BLOK™) or approved equal.

PART 3 - EXECUTION

3.01 CONDUITS

- A. Panelboard feeders shall be run in electrical metallic tubing (EMT), galvanized rigid steel conduit, intermediate grade metal conduit, or plastic conduit as described herein.
- B. Branch circuit raceways for motors twenty (20) horsepower (or tons) and larger, or a combination of motors totaling twenty (20) horsepower and larger requiring a single point connection shall be EMT, galvanized rigid steel conduit, intermediate grade metal conduit, or plastic conduit as described herein.
- C. Branch circuit raceways for motors served by variable frequency drives (VFD) shall be electrical metallic tubing (EMT), galvanized rigid steel conduit, or intermediate grade metal conduit from the load side of the VFD to the line side of

the motor. Do not use plastic conduit.

- D. Feeders, branch circuits, fire alarm system wiring, and other low voltage systems wiring (required to be in conduit) installed indoors in dry locations shall be run in electrical metallic tubing (EMT), galvanized rigid steel conduit, or intermediate grade metal conduit above hung ceilings (accessible and non-accessible), in hollow block walls, in furred spaces, in vertical and horizontal pipe chases, and in exposed dry locations as describe herein and other sections of these specifications.
- E. Feeders, branch circuits, fire alarm system wiring, and other low voltage systems wiring installed underground, under slab on grade, in concrete, in crawl spaces, or in wet locations shall be run in galvanized rigid steel conduit, intermediate grade metal conduit, or plastic conduit as described herein.
- F. Low voltage systems plenum rated wiring or cables run indoors in dry locations shall be in electrical metallic tubing (EMT), galvanized rigid steel conduit, or intermediate grade metal conduit when run above non-accessible ceilings, in hollow block walls, and in exposed dry locations other than communications rooms or in a cable tray. Refer to the respective low voltage systems sections of the specifications for other conduit requirements.
- G. Conduits run exposed in boiler rooms, elevator machine rooms, mechanical rooms, pump rooms, fire sprinkler service room, and all other similar spaces, located between the floor and a height of 10'-0" above the finished floor, shall be galvanized rigid steel conduit, or intermediate grade metal conduit as described herein. Conduits above 10'-0" may be EMT, unless otherwise indicated on the Drawings, or required by codes.

3.02 RACEWAY SYSTEM

- A. Raceways shall be continuous from outlet to outlet; from outlet to cabinets, junction boxes, or pullboxes; and secured to all boxes so that each system is electrically continuous from service to outlets. Provide termination of raceways with double lock nuts and bushings.
- B. Raceways shall be securely and rigidly supported to the building structure in a neat and workmanlike manner, and wherever possible, parallel runs or horizontal conduit shall be grouped together on adjustable trapeze hangers. Raceways shall be supported independently from other disciplines (i.e. mechanical, sprinkler, etc). Support shall be provided at appropriate intervals not exceeding ten (10) feet with straps, hangers, and brackets specifically designed for the application. Channels shall be 1 inch for 24-inch wide trapeze and 1-1/2 inch for larger than 24 inch. Perforated steel straphangers or tie-wire supports are not acceptable. Conduits installed along wall surfaces shall be supported with galvanized steel brackets specifically designed for conduits and sized for the conduit used. Conduit brackets shall be fastened to the wall using appropriate anchors and screws, the use of drive pins and/or other methods using

compressed air or gases are not acceptable. Raceways and supports shall not terminate or be fastened directly to the roof decking. Raceways under roof decking shall not be less than 1½ inches from the nearest surface of the roof decking. Supports attached to structural steel joists shall only be attached within 3" of the top of the joist panel points. Supports attached at the bottom or beyond 3" of the joist panel points must be approved, in writing, by the Structural Engineer of record and the Owner before attaching.

- C. Run exposed raceways parallel with or at right angles to walls. In mechanical rooms and similar utilitarian spaces where exposed conduits are used, provide "condulets", and similar fittings in lieu of junction boxes. Exposed outlet boxes of adequate size, however, shall be used to contain wire junctions.
- D. No raceway shall be installed within three (3) inches of hot water pipes, or appliances, except at crossings where raceway shall be at least one (1) inch from pipe cover.
- E. Install raceway to prevent collection of trapped condensation and be devoid of traps. Slope underground raceways away from the building or provide weep holes when sloping away from the building is not possible.
- F. Do not terminate in, or fasten raceways to, motor foundations.
- G. Raceways installed outside underground shall have a minimum of twenty-four (24) inches top cover. Separate electric raceways from telephone (and other low voltage systems) raceways with a minimum of twelve (12) inches of well-tamped earth, or six (6) inches of concrete.
- H. Joints in raceways in concrete or underground shall be watertight. Steel conduits shall have ends cut square. Ream smooth and paint male threads with graphite-base pipe compound and draw up tight with conduit couplings. Do not paint female threads; where required, use Erickson, or equal, conduit fittings. Running threads shall not be permitted. Place caps in ends of conduits as soon as located to prevent entry of foreign material. Screwed on caps shall be used for threaded conduits. Unused (abandoned) conduits shall be capped. The use of tape, paper or rag wads is not acceptable for conduit caps.
- I. After conduit installation, clean and paint marred surfaces affecting galvanizing with asphaltum, galvanized-iron primer.
- J. Run conduit above suspended ceilings for outlets in suspended ceilings. Keep clear of planned ductwork where turning down from slab into suspended ceiling.
- K. Horizontal or cross runs in solid partitions and walls shall not be permitted.
- L. Conduits designated on the Drawings as empty conduits (EC) shall have a properly sized pull-line.

- M. Flexible metal conduit used for connection of luminaires (lighting fixtures), receptacles outlets, telepower poles, and as otherwise shown on the Drawings, shall be supported and bonded in accordance with NEC Article 348.
- N. Conduit runs in under concrete slabs shall be installed only where shown on the Drawings or approved by the owner and shall be limited to 3/4-inch conduit. Conduit shall be run in the gravel under the slab not in the slab.
- O. Where embedded conduits cross building expansion joints, the Contractor shall furnish and install an offset expansion joint or a sliding expansion joint. Sliding expansion joints shall be provided with bonding strap and clamp. Where conduits are exposed, provide expansion fittings or flexible conduit as required.
- P. In all wet and damp locations, boiler rooms, elevator machine rooms, kitchens, mechanical rooms, pump rooms, fire sprinkler service room, and all other similar spaces, all final electrical connections to any and all equipment, regardless of the type, shall consist of conductors run in polyvinyl sheathed flexible metal conduit ("Sealtite") with maximum lengths as hereinbefore specified.
- Q. Conduits/raceways shall not be permitted to be run exposed on top of finished floors or grade, unless specifically shown on the drawings or approved by the Owner in advance.
- R. Raceways or sleeves known to be subjected to different temperatures and where condensation is known to be a problem, as in cold storage areas of (or in) the building or where passing from the interior to the exterior of the building, the raceway or sleeve shall be filled with an approved material to prevent the circulation of warm air to a cold section of the raceway or sleeve, per NEC 300.7.

3.03 CABLE TRAY

- A. Installation shall be in accordance with equipment manufacturer's instructions and with recognized industry practices (NEMA VE 2), to ensure that cable tray equipment complies with requirements of the NEC and applicable portions of NFPA 70B.
- B. Cable tray shall be supported from the building structure. Supports attached to structural steel joists shall only be attached within 3" of the joist panel points, top or bottom. Supports attached beyond 3" of the joist panel points must be approved, in writing, by the Structural Engineer of record and the Owner before attaching.
- C. Coordinate cable tray with other electrical work and other trades' work as necessary to properly integrate installation of cable tray work with other work.
- D. Provide sufficient space encompassing cable trays to permit access for installing and maintaining cables.

- E. Test cable trays to ensure electrical continuity of bonding and grounding connections and to demonstrate compliance with specified minimum grounding resistance. Refer to NFPA 70B, Chapter 18, for testing requirements and test methods.

3.04 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.

3.05 CUTTING AND HOLES

- A. Locate holes in advance where they are proposed in structural sections such as ribs or beams. Prior to drilling through any structural section or member, obtain the written approval of the Architect/Structural Engineer of Record and the Owner.
- B. Cut holes through concrete and masonry structures with a diamond core drill or concrete saw. Pneumatic hammer, impact electric, hand or manual hammer type drills are not allowed, except where permitted in advance by the Architect/Engineer and Owner, do to limited working space.

- C. Openings in floor slabs or fire-rated walls or partitions for raceways and other electrical equipment shall, after installation of the raceway, be fire stopped using a product similar to THOMAS & BETTS "Flame-Safe" fire retardant.

3.06 ROOFTOP CONDUIT SUPPORT STRUT SYSTEM

- A. Rooftop conduit support struts shall be installed in accordance with manufacturer's instructions and recommendations.
- B. Determine that the structure, roof insulation, and roof membrane are structurally adequate to support weight of conduits (with conductors), supports and hangers.
- C. Install supports at maximum spacing of 10 feet, unless closer spacing is required due to weight of conduits or as shown on the Drawings. Do not exceed manufacturer's recommended load limits.
- D. Support pads: Remove rock or gravel from area to be covered by pad, apply on clean area, and center bases on top of support pads.
- E. Set conduit in support without dropping or causing undue impact. Install properly sized clamps to suit conduit sizes.
- F. Always consult roofing manufacturer for roof membrane compression capacities. If necessary, a compatible sheet of roofing material (rubber pad) may be installed under rooftop support to disperse concentrated loads and add further membrane protection.
- G. Contractor shall adjust conductor sizes in raceways in accordance with the National Electrical Code section 310.15(B)(2)(c) based on an average ambient temperature of 84°F.

END OF SECTION

SECTION 16120

WIRE, CABLE, AND CONNECTORS

PART 1 - GENERAL

1.01 REQUIREMENTS

- A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.02 SCOPE

- A. The work covered under this Section shall include furnishing and installing wire, metal-clad cable, two hour fire rated conduit cable, and connectors for all power wiring systems as shown on the Drawings and herein specified.
- B. Wiring for data, communication, electronic, fire alarm, or other low voltage and special systems shall be provided as specified in the appropriate specialty Section of these Specifications.

1.03 QUALITY ASSURANCE

- A. All equipment, materials, and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements, and these Specifications.
- B. All equipment and materials shall be listed by Underwriters Laboratories, Inc. (UL) for their intended use and shall bear the UL label.
- C. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.
- D. Submittals are required in accordance with SECTION 16010 of these Specifications.
 - 1. Submittals shall include a preliminary schedule to perform the infrared scans described in Part 3 of this specification. The schedule shall be based on the contractual substantial completion date for this project.

PART 2 - PRODUCTS

2.01 MATERIALS AND COMPONENTS

- A. All conductors shall be new soft drawn high conductivity copper and shall be delivered to the site in their original unbroken packages plainly marked as follows:

1. UL Label.
 2. Size, type and insulation rating of the wire marked every four (4) feet along the length.
 3. Name of the manufacturing company and the trade name of the wire.
- B. All conductors shall have 600 volt insulation, unless specified otherwise. The minimum operating temperature of the conductor's insulation shall be 75° C.
 - C. Where conductors are installed in a raceway, in dry and damp locations, conductor insulation shall be rated 75° C. Type THWN or dual rated THWN/THHN.
 - D. Where conductors are installed in a raceway, exposed to excessive temperatures, conductor insulation shall be rated 90° C. Type THHN, THWN/THHN (dual rated), XHHW or XHHW-2.
 - E. Where conductors are installed in a raceway, in wet locations, conductor insulation shall be rated 75° C. Type XHHW (wet locations), or XHHW-2 rated 90° C. (dry and wet locations) as appropriate.
 - F. Conductors on the secondary side of variable frequency drives (VFD) shall be Type XHHW or XHHW-2 as appropriate.
 - G. The minimum conductor size shall be No. 12 AWG, except for control wiring (minimum size shall be No. 14 AWG), and as stated in other Sections of these Specifications, or as shown on the Drawings. Conductors for 120/277 volt control signals shall not be considered as control wiring.
 - H. Branch circuits for emergency lighting, including illuminated exit signs, shall be a minimum of No. 10 AWG.
 - I. Conductors smaller than No. 8 shall be solid; No. 8 and larger shall be stranded.
 - J. All conductors throughout the project shall be color coded to identify phases, neutral, and ground. Color-coding shall be as follows:

<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 prevents removal of panels, including suspended ceiling panels.
- I. Flattened, dented, deformed, or open armor is not permitted. If damaged during installation, damaged cables shall be replaced with new undamaged material.
- J. Horizontal or cross runs in solid masonry partitions or walls shall not be permitted.
- K. All horizontal penetrations through new or existing walls shall be sleeved. No other type of wiring systems shall occupy the same penetration sleeve with the MC cable. Sleeve penetrations through fire-rated walls, after installation of MC cables, shall be fire stopped using a product similar to THOMAS & BETTS "Flame-Safe" fire retardant.

3.04 FIELD QUALITY CONTROL

- A. After installing conductors and cables and before electrical circuitry has been energized, perform the following visual and mechanical inspections:
1. Verify cables and conductors comply with the contract documents.
 2. Verify cables and conductors are braced for short circuit stresses where specified.
 3. Verify cables and conductors are correctly identified at each termination, splice and tap where applicable.
 4. Verify correct phase rotation is maintained throughout project.
 5. Verify color coding and identification complies with specifications and the National Electrical Code.
 6. Inspect all exposed sections of cables and conductors for physical damage and correct connection.
 7. Inspect all bolted and compression connections.
- B. Verify phase identification is A, B, C, left to right, front to back and top to bottom. If corrections are required change feeder and branch circuit identification at each end of circuit so that correct phase identification is maintained throughout the project. If incorrect identification is noted on existing systems notify the Architect/Engineer and Owner for action to be taken.
- C. Infrared Scanning: After Substantial Completion, but not more than sixty (60) days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger and a complete infrared scan of each panel board, switchboard, and lug terminations of each chiller and motor terminations 20 HP and larger. Remove box and equipment covers so splices and lugs are accessible to portable scanner.
1. Perform a follow-up infrared scan for all splices and terminations previously described approximately eleven (11) months after date of Substantial Completion, but must be during normal school (business) operating hours.
 2. Contractor shall submit to the Architect/Engineer and Owner, at time of final inspection, a schedule to perform the infrared scans during normal school (business) operating hours while the building is in full operation, under load. Re-terminations requiring any power shut-downs must be coordinated with the Owner and performed during non-school (business) hours.

3. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 4. Record of Infrared Scanning: Prepare a certified report that identifies equipment and splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken and observations after remedial action.
- D. Remove and replace malfunctioning units then verify, inspect and retest as specified above.

END OF SECTION

SECTION 16130

WIRING DEVICES

PART 1 - GENERAL

1.01 REQUIREMENTS

- A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.02 SCOPE

- A. The work covered under this Section shall include furnishing and installing wiring devices, for all electrical systems as shown on the Drawings and herein specified.

1.03 QUALITY ASSURANCE

- A. All equipment, materials, and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements and these Specifications.
- B. All equipment and materials shall be listed by Underwriters Laboratories, Inc. (UL) for their intended use and shall bear the UL Label.
- C. All 125 volt and 250 volt, 15 amp and 20 amp receptacles (NEMA 5-15R, 5-20R, 6-15R, 6-20R, L5-15R, and L5-20R) shall be FSUL WC-596-G compliant and bear the FSUL label.
- D. All non-locking 125 volt and 250 volt, 15 amp and 20 amp receptacles (NEMA 5-15R, 5-20R, 6-15R and 6-20R) located in damp or wet locations shall be UL Listed as "weather resistant".
- E. All lighting switches shall be FSUL WS-896 compliant and bear the FSUL label.
- F. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.
- G. Submittals are required in accordance with SECTION 16010 of these Specifications.
 - 1. Certain wiring devices and other equipment listed hereinafter may not be part of this project. This Contractor shall select from the listed devices the equipment necessary to be compliant with the Contract Documents and include in the submittals only the devices and equipment specific for this project.

PART 2 - PRODUCTS

2.01 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-
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,
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 16505 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 LUTRON “Nova” Type or PASS & SEYMOUR Cat. No. CD4FBL3PI.
ENGINEER TO EDIT.
- B. Wall dimmer switches for Tubular Daylighting Device shall be 0 to 10 Volt, of the voltage indicated; LUTRON “Diva” Cat. No. DVSTV-453PH-WH or equal by PASS & SEYMOUR.

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. **[Engineer delete this if not an elementary school]**
- 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, 20A, 125V, NEMA 5-20R:
P&S Cat. No. 5362-AI
 2. Duplex (PlugTail Type), 2P, 3W, 20A, 125V, NEMA 5-20R:
P&S Cat. No. PT5362-AI
 3. Controlled Receptacle, Duplex 2P, 3W, 20A, 125V, NEMA 5-20R:
P&S Cat. No. 5362-AGRY
 4. Controlled Receptacle (PlugTail Type), Duplex 2P, 3W, 20A, 125V, NEMA 5-20R: P&S Cat. No. PT5362-AGRY
 5. 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. 2095TRI
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:
P&S Cat. No. 3871
 32. Single 3P, 4W, 20A, 250V, NEMA 15-20R:
P&S Cat. No. 3821
 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
- D. Outdoor Charging Station shall be LEGRAND Part No. XCSP3GRUU-BZ. Complete with one (1) 20A weather resistant GCFI receptacle and two (2) 4-port, 4.2A USB receptacles.
- 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. 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. Locations/rooms requiring labels shall be as follows: **[Engineer: edit to suit project]**

1. Elementary schools:
 - a. All classrooms and instructional spaces.
 - b. Media Centers/Libraries, excluding offices, conference rooms and other ancillary spaces associated with the Media Center.
 2. Middle and High Schools:
 - a. Lecture Halls.
 - b. Media Centers/Libraries, excluding offices, conference rooms and other ancillary spaces associated with the Media Center.
 - c. Multi-Purpose Classrooms.
- 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.

2.06 POWER OUTLET PANELS

- A. Power Outlet Panels shall have one duplex 2P, 3W, 20A, 125V, NEMA 5-20R weather-resistant and tamper-resistant, Ground Fault Circuit Interrupter (GFCI) type receptacle; P&S Cat. No. 2095TRWR or equal.
- B. Enclosure shall be rainproof NEMA 3R and fabricated from G90 galvanized steel with welded flange construction and a gray powder coat finish. The door cover shall swing up and able to be held in the open position and closed with plugs and cords inserted into the receptacle while maintaining the NEMA 3R rating. The door shall have rolled edges to protect cords from damage and with padlock provisions. The deadfront cover shall be angled with the receptacle to facilitate easier plug and cord attachments and shall be removable without interfering with factory wiring.
- C. All components shall be factory wired and have field termination lugs, including ground lug.
- D. Power Outlet Panels shall be MIDWEST ELECTRIC PRODUCTS, INC. Catalog No. U010SEP or approved equal.

2.07 CORD REELS

- A. Cord reels designated on the Drawings as 'CR' shall be WOODHEAD Cat. No. 990-3000, having an open housing, a minimum 18 inch primary power cord and a

NEMA 5-15P plug cap, a shock-absorbing ball stop, adjustable tension, built in ratchet locks, a swivel/pivot base (Cat. No, 9507), and a forty-five (45) foot secondary power cord (rated 11 amps, minimum) with an attached non-conductive rubber and plastic power outlet box having two (2) 2P, 3W, 15A duplex receptacles (NEMA 5-15R). The power cords shall be 'SJTOW' type with three (3) conductor, No. 14 AWG.

1. This Contractor shall furnish and install a NEMA 5-15R single receptacle in/on the ceiling as shown on the Drawings for plugging in the cord reels primary cord.
 2. Contractor shall activate ratchet if not set by the factory.
- B. Cord reels designated on the Drawings, as 'CRL' shall be WOODHEAD Cat. No. 980A-83, having an open housing with an automatic 'on/off' power switch located inside the reel, a minimum 18 inch primary power cord and a NEMA 5-15P plug cap, a shock-absorbing ball stop, adjustable tension, built in ratchet locks, a swivel/pivot base (Cat. No, 9507), and a fifty (50) foot secondary power cord with an attached 13 watt fluorescent hand lamp having vinyl coated guard and rubber handle without a receptacle in the handle suitable for use in minor repair garages classified as a non-hazardous location per NEC Article 511.3(D)(1). The power cords shall be 'SJTOW' type with three (3) conductor, No. 16 AWG.
1. This Contractor shall furnish and install a NEMA 5-15R single receptacle in/on the ceiling as shown on the Drawings for plugging in the cord reels primary cord.
 2. Contractor shall activate ratchet if not set by the factory.

2.08 DOORBELL SYSTEM

- A. This Contractor shall furnish and install where shown on the Drawings, a complete doorbell signaling system as specified herein:
1. Bell: Edwards Signaling Cat. No. 340-6G5 Adaptable. Bell shall be six (6) inches in diameter, 24 volts AC, having a sound level of 92 dB measured at 10 feet.
 2. Class 2 Signaling Transformer: Edwards Signaling Cat. No. 592. Transformer shall have primary voltage of 120 volts AC and secondary voltage of 24 volts AC and 20 VA.
 3. Pushbutton Station: Trine Access Technology Cat. No. 65P. Pushbutton shall be weatherproof, surface mount, and solid brass construction. The pushbutton shall have normally open momentary contacts, rated at 24 volts, 4 amps AC, 2 amps DC, a neoprene diaphragm to protect the internal phosphor bronze contact springs, and a bakelite back plate

threaded for ½ inch conduit.

2.09 FIRE EVACUATION STAGING AREA (FESA) VISUAL NOTIFICATION SYSTEM

- A. This Contractor shall furnish and install where shown on the Drawings, a complete FESA visual notification system as specified herein:
1. Signal Beacon: Federal Signal Corporation Model No. FB2PST-120R exterior red strobe light rated at 120VAC, 0.25 amps, flash rate/minute of 90, candela ratings of 1,000,000 (peak) and 300 ECP (effective candela) suitable for mounting on ½" NPT pipe.
 2. Wall Mounting Bracket Kit: Federal Signal Corporation Model No. LWMB2 wall mounting bracket for mounting the FESA exterior strobe light signal beacon. The wall bracket shall be wall mounted on a suitable outlet box and shall allow wiring to be run concealed within the wall bracket to the strobe light.
 3. Activation Station (on/off): STI Model No. SS-2231 with custom two (2) line label to read "FESA" (line 1), "SIGNAL BEACON" (line 2) and a STI Model No. SUB-102722 Spacer (color to match shell). Mount over flush outlet box or surface mounted on Wiremold V5744S outlet box where indicated on the Drawings or required to be surface mounted.
 4. Transformer: Provide a transformer, when required to step down the voltage from 277 volts to 120 volts. Transformer shall be equal to ACME ELECTRIC Catalog No. TB81301 rated at 50 VA, 277 volts primary to 120 volts secondary complete with a primary fuse block, Part No, PL112700 and 0.6 amp time delay class CC fuses. Mount transformer and fuse block in a metal NEMA 1 vented enclosure with a latching hinged cover, HOFFMAN Catalog No. A8N66/A8N6P with HOFFMAN Catalog No. AVK23 louver vents field installed on two (2) side walls of enclosure. Mount enclosure above the ceiling or as shown on the Drawings.

2.10 S.O.L TESTING PORTABLE POWER DISTRIBUTION BOX **[middle and high schools only]**

- A. S.O.L. testing portable power distribution boxes shall contain a minimum of six (6) NEMA 5-20R duplex receptacles, one (1) NEMA L5-30R single receptacle, one (1) 50A 125/250V locking inlet (CS6375) and one (1) 50A 125/250V locking outlet (CS6369). A circuit breaker panel box with a hinged door cover shall be provided. Each NEMA 5-20R duplex receptacle shall be protected by one (1) single pole, 20A circuit breaker and each NEMA L5-30R single receptacle shall be protected by one (1) 2 pole, 30A circuit breaker. The power distribution box shall have individual GFCI modules to protect the duplex receptacles against ground faults with manual GFCI reset configuration.

1. The power distribution box shall be suitable for indoor or outdoor environments. Box shall have a reinforced steel housing and support legs and finished with a powder coat paint inside and out to prevent corrosion.
- B. Each portable power distribution box shall have one (1) factory assembled 50A, 125/250V, 50 ft. min. length cordset for connecting the unit from a CS6369 wall receptacle to the inlet (CS6375) of the power distribution box.
- C. An S.O.L. testing portable power distribution box that meets this specification is a COOPER (ARROW HART) Cat. No. RB300M with PC50A cordset or as equal by ERICSON, or HUBBELL. This contractor shall furnish one (1) unit for each S.O.L. 50A receptacle shown on the Drawings.

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 POWER OUTLET PANELS

- A. This Contractor shall furnish and install power outlet panels, material, and hardware as indicated on the Drawings, as specified, and as required for a complete installation. Power outlet panels generally will be mounted on the roof

with the free standing safety switch assembly as detailed on the Drawings or other locations shown on the Drawings.

- B. All mounting openings not used must be permanently sealed to keep rain, moisture, insects, etc. from entering the box housing. The use of stainless steel screws/nuts with rubber washers and silicone sealant may be used, or another approved method for a completely sealed box housing.

3.03 S.O.L 50A POWER RECEPTACLES

- A. S.O.L. 50A receptacles shown on the Drawings shall be complete with a spring loaded self-closing die-cast flip cover. Label each receptacle cover to read "S.O.L. TESTING". A flip cover that meets this specification shall be HUBBELL Cat. No. HBL7382 or equal.

3.04 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.

3.05 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, flush floor outlets (boxes) and Science Room multiplex service fittings complete for all electrical systems as shown on the Drawings and herein specified.

1.03 QUALITY ASSURANCE

- A. All equipment, materials, and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements, and these Specifications.
- B. All equipment and materials shall be listed by Underwriters Laboratories, Inc. (UL) for their intended use and shall bear the UL label.
- C. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.
- D. 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.

2.02 FLUSH FLOOR OUTLETS

- A. Flush floor outlets designated on the Drawings as "Type 1" shall consist of a WIREMOLD Model No. EFB6S-OG floor box manufactured from stamp steel approved for use with on-grade concrete floor applications. Boxes shall have the ability to accept a component (EFB610-CTR) that will allow the box to be installed flush in polished concrete or terrazzo floors. Boxes shall be painted with a fusion-bonded epoxy designed for use on metal reinforcement bar and related accessories before encapsulation in concrete, and be approved for use on-grade and above grade floors. Boxes shall be 15- $\frac{1}{8}$ " L x 13- $\frac{3}{16}$ " W x 4- $\frac{1}{16}$ " H [384mm x 284mm x 103mm]. Provide boxes with six (6) independent wiring compartments that allow for up to six (6) duplex receptacles, communication and/or audio/video services. Boxes shall have removable and relocatable dividers to permit custom configuration of compartments as well as

permit feed to adjacent compartments. Boxes shall permit feed to compartments on the opposite side of the box through a tunnel. Each of the four (4) outer compartments shall have a minimum wiring capacity of 32-in³ [524ml]. Each of the two (2) center compartments shall have a minimum wiring capacity of 38.5-in³ [630ml]. Each of the six (6) compartments shall have a minimum depth of 3-7/8" [98mm] behind the plate. Provide boxes with removable compartments to facilitate installation. The compartments shall be removable from the top of the floor box. Provide boxes with two (2) cable guides to organize and maintain the cables egress out of the box. The box shall contain the following number of knockouts: 10 1" trade size, six (6) 1-1/4" trade size, and six (6) 3/4" trade size. Boxes shall be fully adjustable, accommodating a maximum 2-inch [51mm] pre-concrete pour and a maximum 1/2" [12.7mm] post-concrete pour adjustment. The box shall be able to accept 2-3/4" x 4-1/2" standard size wall plates. Include mounting brackets with the boxes that will accommodate 15 amp, 20 amp straight blade, 20 amp turn loc, 30 amp straight blade and 30 amp turn loc receptacles, Ortronics® workstation connectivity and modular adapters, a variety of audio/video devices from most manufacturers, and other open system devices.

1. This floor box shall contain three (3) two pole, three wire, 20 amp, 125 volt, NEMA 5-20R duplex receptacles as hereinbefore specified complete with coverplates; one (1) two (2) port modular jack kit complete with one (1) RJ-45 (568A) voice port and one (1) RJ-45 (568A) data port; and two (2) blank single gang coverplates.
 2. Floor boxes shall be complete with die-cast aluminum Activation Covers. Activation covers in carpeted floor areas shall be surface mount (EFB610BTC) type and in tile floor areas shall be flush mount (EFB610BT) type. Provide covers with two (2) gaskets (one (1) for carpet and one (1) for tile) to go under the trim flange to maintain scrub watertightness. Covers shall be 16-15/16" x 12-1/2" x 3/16" [430mm x 318mm x 4mm]. Covers shall be provided with a carpet recess area in carpeted and tiled areas or a solid lid in non-carpeted/tiled areas. Secure the cover to the flange and enable cover to rotate greater than 180 degrees to reduce trip hazards and provide maximum amount of working space. Provide covers with spring-loaded self-closing slide egress doors to reduce egress opening when cables are exiting and reduce trip hazards. Each of the two (2) egress openings shall have a minimum of 4-in² [102mm²], or a minimum of 8-in² [203mm²] per cover assembly. Covers shall have a powder coat finish with one of the following colors to be selected by the architect: [black] [gray] [brass] [nickel] [bronze].
- B. Flush floor outlets designated on the Drawings as "Type 2" shall consist of a WIREMOLD Model No. EFB6S-OG floor box manufactured from stamp steel approved for use with on-grade concrete floor applications. Boxes shall have the ability to accept a component (EFB610-CTR) that will allow the box to be

installed flush in polished concrete or terrazzo floors. Boxes shall be painted with a fusion-bonded epoxy designed for use on metal reinforcement bar and related accessories before encapsulation in concrete, and be approved for use on-grade and above grade floors. Boxes shall be 15- $\frac{1}{8}$ " L x 13- $\frac{3}{16}$ " W x 4- $\frac{1}{16}$ " H [384mm x 284mm x 103mm]. Provide boxes with six (6) independent wiring compartments that allow for up to six (6) duplex receptacles, communication and/or audio/video services. Boxes shall have removable and relocatable dividers to permit custom configuration of compartments as well as permit feed to adjacent compartments. Boxes shall permit feed to compartments on the opposite side of the box through a tunnel. Each of the four (4) outer compartments shall have a minimum wiring capacity of 32-in³ [524ml]. Each of the two (2) center compartments shall have a minimum wiring capacity of 38.5-in³ [630ml]. Each of the six (6) compartments shall have a minimum depth of 3- $\frac{7}{8}$ " [98mm] behind the plate. Provide boxes with removable compartments to facilitate installation. The compartments shall be removable from the top of the floor box. Provide boxes with two (2) cable guides to organize and maintain the cables egress out of the box. The box shall contain the following number of knockouts: 10 1" trade size, six (6) 1- $\frac{1}{4}$ " trade size, and six (6) $\frac{3}{4}$ " trade size. Boxes shall be fully adjustable, accommodating a maximum 2-inch [51mm] pre-concrete pour and a maximum $\frac{1}{2}$ " [12.7mm] post-concrete pour adjustment. The box shall be able to accept 2- $\frac{3}{4}$ " x 4- $\frac{1}{2}$ " standard size wall plates. Include mounting brackets with the boxes that will accommodate 15 amp, 20 amp straight blade, 20 amp turn loc, 30 amp straight blade and 30 amp turn loc receptacles, Ortronics® workstation connectivity and modular adapters, a variety of audio/video devices from most manufacturers, and other open system devices.

1. This floor box shall contain three (3) two pole, three wire, 20 amp, 125 volt, NEMA 5-20R duplex receptacles as hereinbefore specified complete with coverplates; and four (4) two port modular jack kits complete with two (2) RJ-45 (568A) ports in each, for a total of eight (8) ports.
2. Floor boxes shall be complete with die-cast aluminum Activation Covers. Activation covers in carpeted floor areas shall be **available in** surface mount **(EFB610BTC) type and in tile floor areas shall be flush mount (EFB610BT) type flush versions**. Provide covers with two (2) gaskets (one (1) for carpet and one (1) for tile) to go under the trim flange to maintain scrub watertightness. Covers shall be 16- $\frac{15}{16}$ " x 12- $\frac{1}{2}$ " x $\frac{3}{16}$ " [430mm x 318mm x 4mm]. Covers shall be provided with a carpet recess area in carpeted and tiled areas or a solid lid in non-carpeted/tiled areas. Secure the cover to the flange and enable cover to rotate greater than 180 degrees to reduce trip hazards and provide maximum amount of working space. Provide covers with spring-loaded self-closing slide egress doors to reduce egress opening when cables are exiting and reduce trip hazards. Each of the two (2) egress openings shall have a minimum of 4-in² [102mm²], or a minimum of 8-in² [203mm²] per cover assembly. Covers shall have a powder coat

finish with one of the following colors to be selected by the architect:
[black] [gray] [brass] [nickel] [bronze].

- C. Flush floor outlets designated on the Drawings as "Type 3" shall consist of a WIREMOLD Model No. EFB8S-OG floor box manufactured from stamp steel approved for use with on-grade concrete floor applications. Boxes shall have the ability to accept a component (EFB610-CTR) that will allow the box to be installed in polished concrete or terrazzo floors. Boxes shall be painted with a fusion-bonded epoxy designed for use on metal reinforcement bar and related accessories before encapsulation in concrete, and be approved for use on-grade and above grade floors. Boxes shall be 15- $\frac{1}{8}$ " L x 13- $\frac{3}{16}$ " W x 6" H [384mm x 284mm x 152mm]. Provide boxes with six (6) independent wiring compartments that allow for up to six (6) duplex receptacles, communication and/or audio/video services. Boxes shall have removable and relocatable dividers to permit custom configuration of compartments as well as permit feed to adjacent compartments. Boxes shall permit feed to compartments on the opposite side of the box through a tunnel. Each of the four (4) outer compartments shall have a minimum wiring capacity of 32-in³ [524ml]. Each of the two (2) center compartments shall have a minimum wiring capacity of 38.5-in³ [630ml]. Each of the six (6) compartments shall have a minimum depth of 3- $\frac{7}{8}$ " [98mm] behind the plate. Provide boxes with removable compartments to facilitate installation. The compartments shall be removable from the top of the floor box. Provide boxes with two (2) cable guides to organize and maintain the cables egress out of the box. The box shall contain the following number of knockouts: 10 1" trade size, six (6) 1- $\frac{1}{4}$ " trade size, and six (6) $\frac{3}{4}$ " trade size. Boxes shall be fully adjustable, accommodating a maximum 2-inch [51mm] pre-concrete pour and a maximum $\frac{1}{2}$ " [12.7mm] post-concrete pour adjustment. The box shall be able to accept 2- $\frac{3}{4}$ " x 4- $\frac{1}{2}$ " standard size wall plates and 2 gang multimedia devices. Include mounting brackets with the boxes that will accommodate 15 amp, 20 amp straight blade, 20 amp turn loc, 30 amp straight blade and 30 amp turn loc receptacles, Ortronics® workstation connectivity and modular adapters, a variety of audio/video devices from most manufacturers, and other open system devices.
1. This floor box shall contain three (3) two pole, three wire, 20 amp, 125 volt, NEMA 5-20R duplex receptacles as hereinbefore specified complete with coverplates; one (1) three port modular jack kit complete with two (2) RJ-45 (568A) ports and one (1) F-Connector; and one (1) EXTRON RAPIDRUN Part No. XTP-T-UWP-202 2212-43036317-001 coverplate multi-media presentation system outlet consisting of a double brushed aluminum faceplate with female HD15, 3.5mm audio, HDMI connectors, and USB connector; and one (1) blank single gang coverplate.
 1. Floor boxes shall be complete with die-cast aluminum Activation Covers. Activation covers in carpeted floor areas shall be available in surface mount (EFB610BTC) type and in tile floor areas shall be flush mount

(EFB610BT) type flush versions. Provide covers with two (2) gaskets (one (1) for carpet and one (1) for tile) to go under the trim flange to maintain scrub watertightness. Covers shall be 16-15/16" x 12-1/2" x 3/16" [430mm x 318mm x 4mm]. Covers shall be provided with a carpet recess area in carpeted and tiled areas or a solid lid in non-carpeted/tiled areas. Secure the cover to the flange and enable cover to rotate greater than 180 degrees to reduce trip hazards and provide maximum amount of working space. Provide covers with spring-loaded self-closing slide egress doors to reduce egress opening when cables are exiting and reduce trip hazards. Each of the two (2) egress openings shall have a minimum of 4-in² [102mm²], or a minimum of 8-in² [203mm²] per cover assembly. Covers shall have a powder coat finish with one of the following colors to be selected by the architect: [black] [gray] [brass] [nickel] [bronze].

- D. Flush floor outlets designated on the Drawings as Type "4" shall be THOMAS & BETTS (STEEL CITY) Cat. No. 643, 3-gang case iron floor box complete with: three (3) separate wiring compartments; cast iron watertight body; one (1) P64DS duplex brass mop tight coverplate; two (2) P64-GFCI brass mop tight coverplates; one (1) OPODEC-XLRF-WH rectangular microphone jack adaptor; one (1) OPODEC 3-WH device plate with three (3) keystone ports; one (1) ORTRONICS Cat. No. OR-KS35STST 3.5mm keystone adaptor insert and two (2) ORTRONICS Cat. No. OR-KS6A RJ-45, Cat. 6, 568A track jack adaptor inserts. The body shall be divided having one (1) NEMA 5-20R duplex receptacle as previously specified, one (1) microphone jack, one (1) 3.5mm jack for MP3 and two (2) RJ-45, Cat 6 data jacks. The trim, shall be completely flush with the finished floor.
- E. Flush floor outlets designated on the Drawings as "Type 5" shall be THOMAS & BETTS (STEEL CITY) Cat. No. 642, 2-gang cast iron floor box complete two (2) P64DS duplex brass mop tight coverplates, two (2) NEMA 5-20R duplex receptacles as previously specified. The trim, shall be completely flush with the finished floor. Each floor outlet shall be complete with carpet flange assembly in carpeted areas; and non-skid top in non-carpeted areas.
- F. Flush floor outlets designated on the Drawings as "Type 6" shall be WIREMOLD Cat. No. 8ATCP fire-rated Poke-Thru Assembly Unit, for use in existing or new concrete floors, or approved equal. This assembly consists of an insert and an activation cover. Overall poke-thru assembly length shall be 16 3/4". The insert body shall recess the devices a minimum of 3-1/4" and have a polyester based backing enamel finished interior (ivory). There shall be necessary channels to provide complete separation of power and communication services. There shall be five (5) compartments that allow for up to three (3) duplex receptacles and/or twelve (12) communications ports and/or ten (10) of Extron® Electronics MAAP™ and/or two (2) AAP™ devices. The body shall consist of an intumescent fire stop material to maintain the fire rating of the floor slab. The intumescent material will be held securely in place in the insert body and shall

not have to be adjusted to maintain fire rating of the unit and the floor slab. The insert shall have retaining feature that will hold the poke-thru device in the floor slab without additional fasteners. The poke-thru insert shall also consist of a 3/4" trade size conduit stub that is connected to the insert body and a 24.5 cubic inch stamped steel junction box for wire splices and connections. The stamped steel junction box shall also contain the necessary means to electrically ground the poke-thru device to the system ground. **Communication Modules Mounting Accessories:** The poke-thru manufacturer shall have available open modular inserts to facilitate mounting UTP (including Category 5, 5e, and 6), STP, fiber optic, coaxial, and data/communications devices. The activation shall have three (3) locations to mount communication connectors. Connectors shall be mounted using a mounting bracket. Where indicated, provide connectivity outlets and modular inserts by Ortronics or approved equal.

1. This floor box shall contain two (2) proprietary two pole, three wire, 20 amp, 125 volt, NEMA 5-20R duplex receptacles with mounting plates; one (1) '8TRAC' device mounting plate for use in the center compartment only, complete with one (1) RJ-45 (568A) TracJack voice device and one (1) RJ-45 (568A) TracJack data device; three (3) blank TracJack inserts; and two (2) 8B single gang blank device plates.
 2. Flush Floor Poke-Thru shall be complete with die-cast aluminum Activation Cover. Two gaskets (one for carpet and one for tile) shall be provided to go under the trim flange to maintain scrub water tightness. The activation cover shall be 9 1/4" in diameter. The activation covers shall be available in carpet and tile versions. The carpet covers shall be surface mounted (8CTC) and the tile covers shall be flush (8CT) with the finished floor coverings. The cover shall have spring loaded slides to allow cables to egress out of the unit and maintain as small an egress opening as possible. Covers shall have a powder coat finish with one of the following colors to be selected by the architect: [black] [gray] [brass] [nickel] [bronze].
- G. Flush floor outlets designated on the Drawings as "Type 7" shall be WIREMOLD Cat. No. 8ATCP fire-rated Poke-Thru Assembly Unit, for use in existing or new concrete floors, or approved equal. This assembly consists of an insert and an activation cover. Overall poke-thru assembly length shall be 16 3/4". The **INSERT** body shall recess the devices a minimum of 3-1/4" and have a polyester based backing enamel finished interior (ivory). There shall be necessary channels to provide complete separation of power and communication services. There shall be five (5) compartments that allow for up to five (5) duplex receptacles and/or twenty-two (22) communications ports and/or sixteen (16) of Extron® Electronics MAAP™ and/or four (4) AAP™ devices. The body shall consist of an intumescent fire stop material to maintain the fire rating of the floor slab. The intumescent material will be held securely in place in the insert body and shall not have to be adjusted to maintain fire rating of the unit and the floor slab. The insert shall have retaining feature that will hold the poke-thru device in

the floor slab without additional fasteners. The poke-thru insert shall also consist of a 3/4" trade size conduit stub that is connected to the insert body and a 24.5 cubic inch stamped steel junction box for wire splices and connections. The stamped steel junction box shall also contain the necessary means to electrically ground the poke-thru device to the system ground. **Communication Modules Mounting Accessories:** The poke-thru manufacturer shall have available open modular inserts to facilitate mounting UTP (including Category 5, 5e, and 6), STP, fiber optic, coaxial, and data/communications devices. Where indicated, provide connectivity outlets and modular inserts by Ortronics or approved equal.

H.

1. This floor box shall contain two (2) proprietary two pole, three wire, 20 amp, 125 volt, NEMA 5-20R duplex receptacles with mounting plates; one (1) duplex mounting plate (8DP) with one (1) two pole, three wire, 20 amp, 125 volt, NEMA 5-20R duplex receptacle to be used in the center compartment; two '8TRAC' device mounting plates for use in the center compartment only, complete with eight (8) RJ-45 (568A) TracJack devices; and four (4) blank TracJack inserts.
2. Flush Floor Poke-Thru shall be complete with die-cast aluminum Activation Covers. Two gaskets (one for carpet and one for tile) shall be provided to go under the trim flange to maintain scrub water tightness. The activation cover shall be 9 1/4" in diameter. The activation covers shall be available in carpet and tile versions. The carpet covers shall be surface mounted (8CTC) and the tile covers shall be flush (8CT) with the finished floor coverings. The cover shall have spring loaded slides to allow cables to egress out of the unit and maintain as small an egress opening as possible. Covers shall have a powder coat finish with one of the following colors to be selected by the architect: [black] [gray] [brass] [nickel] [bronze].

- I. Flush floor outlets designated on the Drawings as "Type 8" shall be WIREMOLD Cat. No. 8ATCP fire-rated Poke-Thru Assembly Unit, for use in existing or new concrete floors, or approved equal. This assembly consists of an insert and an activation cover. Overall poke-thru assembly length shall be 16 3/4". The INSERT body shall recess the devices a minimum of 3-1/4" and have a polyester based backing enamel finished interior (ivory). There shall be necessary channels to provide complete separation of power and communication services. There shall be five (5) compartments that allow for up to five (5) duplex receptacles and/or twenty-two (22) communications ports and/or sixteen (16) of Extron® Electronics MAAP™ and/or four (4) AAP™ devices. The body shall consist of an intumescent fire stop material to maintain the fire rating of the floor slab. The intumescent material will be held securely in place in the insert body and shall not have to be adjusted to maintain fire rating of the unit and the floor slab. The insert shall have retaining feature that will hold the poke-thru device in the floor slab without additional fasteners. The poke-thru insert shall also consist of a 3/4" trade size conduit stub that is connected to the insert body and a 24.5 cubic inch stamped steel junction box for wire splices and connections. The

stamped steel junction box shall also contain the necessary means to electrically ground the poke-thru device to the system ground. **Communication Modules Mounting Accessories:** The poke-thru manufacturer shall have available open modular inserts to facilitate mounting UTP (including Category 5, 5e, and 6), STP, fiber optic, coaxial, and data/communications devices. Where indicated, provide connectivity outlets and modular inserts by Ortronics or approved equal.

1. This floor box shall contain two (2) proprietary two pole, three wire, 20 amp, 125 volt, NEMA 5-20R duplex receptacles with mounting plates; one '8TRAC' device mounting plate for use in the center compartment only, complete with two (2) RJ-45 (568A) TracJack devices, one (1) "F" Connector TracJack device, and three (3) blank TracJack devices; and one (1) EXTRON Part No. ~~XTP-T-UWP-202~~ multi-media presentation system 'decorator style' outlet consisting of a HD-15, 3.5mm audio and HDMI connectors.
2. Flush Floor Poke-Thru shall be complete with die-cast aluminum Activation Covers. Two gaskets (one for carpet and one for tile) shall be provided to go under the trim flange to maintain scrub water tightness. The activation cover shall be 9 1/4" in diameter. The activation covers shall be available in carpet and tile versions. The carpet covers shall be surface mounted (8CTC) and the tile covers shall be flush (8CT) with the finished floor coverings. The cover shall have spring loaded slides to allow cables to egress out of the unit and maintain as small an egress opening as possible. Covers shall have a powder coat finish with one of the following colors to be selected by the architect: [black] [gray] [brass] [nickel] [bronze].

2.03 MULTIPLEX SERVICE FITTINGS

- A. Multiplex service fittings designated on the Drawings as Type "1" shall consist of the following field assembled by this Contractor as detailed on the Drawings: one (1) WIREMOLD Cat. No. MP8 dual service fitting including housing, base, mounting frames, integral divider, and mounting hardware; one (1) WIREMOLD Cat. No. M-2DR dual duplex opening faceplate; two (2) NEMA 5-20R duplex receptacles as previously specified; one (1) WIREMOLD Cat. No. LTF48-ACT communications face plate; one (1) WIREMOLD Cat. No. 2A245-C5E dual-port, RJ-45 (568A) workstation insert; two (2) WIREMOLD Cat. No. 2A-BL blank inserts; and two (2) WIREMOLD Cat. No. LTF48-B blank face plates.
- B. Multiplex service fittings designated on the Drawings as Type "2" shall consist of the following field assembled by this Contractor as detailed on the Drawings: one (1) WIREMOLD Cat. No. MP4 single service fitting including housing, base, mounting frames, integral divider, and mounting hardware; one (1) WIREMOLD Cat. No. M-2DR dual duplex opening face plate; two (2) NEMA 5-20R duplex receptacles as previously specified; and one (1) WIREMOLD Cat. No. LTF48-B blank face plate.

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.

3.02 FLUSH FLOOR OUTLET BOXES INSTALLATION

- A. Examine conditions under which boxes and fittings are to be installed. Notify the Architect/Engineer in writing of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Strictly comply with manufacturer's installation instructions and recommendations. Coordinate installation with adjacent work to ensure proper clearances and to prevent electrical hazards.
- C. Floor boxes shall permit all wiring to be completed at floor level. The "FC" models, when used, shall be used as defined by the UL Fire Resistance Directory at a minimum spacing of 24 inches (610 mm) on center.

3.03 FLUSH FLOOR POKE-THRU ASSEMBLY UNITS

- A. Examine conditions under which boxes and fittings are to be installed. Notify the Architect/Engineer in writing of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected. Flush floor poke-thru assemblies require the floor to be core drilled. Coordinate exact locations with the building structure and other trades before core drilling and **obtain written approval from the Structural Engineer and Architect before core drilling.**
- B. Strictly comply with manufacturer's installation instructions and recommendations. Coordinate installation with adjacent work to ensure proper clearances and to prevent electrical hazards.
- C. Units shall permit all wiring to be completed at floor level. Use is defined by the UL Fire Resistance Directory as a minimum spacing of "2 ft. on center and not more than one device per each 65 sq. ft. of floor area in each span."
- D. Poke-thru assemblies installation shall be completed by pushing unit down into the cored hole. The unit shall contain a retainer for securing the device in the slab, as well as the necessary intumescent material to seal the cored hole under fire conditions.

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.

2.02 UNDERGROUND BOXES AND ENCLOSURES

- A. Underground boxes, enclosures and covers shall conform to all test provisions of the most current ANSI/SCTE 77 "Specifications For Underground Enclosure Integrity" for Tier 15 applications. When multiple tiers are specified the boxes must physically accommodate and structurally support compatible covers while possessing the highest Tier rating. In no assembly can the cover design load exceed the design load of the box. All components in an assembly (box and cover) shall be manufactured using matched surface tooling. All covers are required to have a minimum coefficient of friction of 0.05 in accordance with ASTM C1028 and the corresponding Tier level embossed on the top surface. Assemblies not U.L. Listed shall have independent third party verification or test reports stamped by a registered Professional Engineer certifying that all test provisions of this specification have been met are required with each submittal.
- B. Underground boxes, enclosures and covers shall be as manufactured by QUAZITE or approved equal.
 - 1. Telephone Service inground enclosure box and cover shall be QUAZITE Cat. No. PG3048BA36 box with Cat. No. PG3048HS0043 cover.
 - 2. CATV Service inground enclosure box and cover shall be QUAZITE Cat. No. PG3048BA36 box with Cat. No. PG3048HS0010 cover.
 - 3. Sports Field Lighting Pole ground rod hand hole enclosure box and cover shall be QUAZITE Cat. No. PG1118BA18 box with Cat. No. PG1118CA0024 cover.
 - 4. Other applications requiring the use of exterior underground boxes or enclosures shall use QUATIZE "PG" Series enclosure boxes appropriately sized complete with the proper cover with logo designating the use of the box or enclosure.

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 UNDERGROUND BOXES AND ENCLOSURES

- A. Exterior underground boxes and enclosures shall be installed per manufacturer's recommendations and the following minimum requirements:
1. After the proper location of the underground enclosure has been established and the conduits, underground cables or ground rods, etc. are installed or located, the hole for the enclosure shall be excavated and shall be at least six (6) to eight (8) inches deeper than the depth of the enclosure and shall have a minimum of six (6) inches of gravel in the bottom of the hole or as shown on the Drawings. The gravel base shall extend past the side walls of the enclosure by at least four (4) to six (6) inches. Once the enclosure is positioned on top of the gravel base and the elevation check, the enclosure shall be back-filled.
 2. Back-filling shall have 95% compaction or greater.
 3. Provide internal bracing during back-filling to ensure minimal box sidewall deflections. Bracing supports shall be 2x4's or similar material sized to hold the box at mid-depth.
 4. Top of the box and cover shall be flush with the finished grade.

3.03 CONDUCTORS

- A. All conductors entering junction and pull boxes shall be of the same voltage. Do not mix voltages regardless of the conductors' voltage rating, unless specifically shown on the Drawings.
- B. Branch circuit conductors and feeder conductors shall not occupy the same junction or pull box. Maintain separate boxes for branch circuits and separate boxes for feeders, unless specifically shown otherwise on the drawings.

3.04 ARC-PROOFING

- A. All feeders entering a pull box containing more than one (1) feeder, or more than one (1) parallel feeder, shall be arc-proofed as follows. Conductors of the same feeder, including each set of a parallel feeder, shall be tightly grouped together and held in place with random wrapped 3M No. 33 Tape. Grouped cables shall be arc proofed using spirally wound one half-lapped layer of 3M No. 77 Fire and Arc-Proofed Tape which shall be held in place with random wrapped 3M No. 69 Glass Cloth Electrical Tape.

END OF SECTION

SECTION 16410

UNDERGROUND ELECTRICAL SERVICE

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 underground electrical service complete as shown on Drawings and herein specified.
- B. The existing underground and/or overhead electrical service(s) shall remain in operation and shall continue to serve the building during the construction period until the new service has been installed and tested, ready for operation. After the new service has assumed the building's entire power load, the existing service(s) shall be removed as shown on the Drawings.

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.
- D. All electrical work specified under this Section of these Specifications shall conform to the requirements of the electric utility company.
- E. The grounding systems shall comply with the National Electrical Code (NEC) and as hereinafter specified.

PART 2 - PRODUCTS

2.01 ELECTRICAL SERVICE

- A. Primary service shall be three phase with pad or pole mounted transformer(s) as shown on the Drawings and shall be furnished by **[ENGINEER TO EDIT]** (DOMINION VIRGINIA POWER) (NORTHERN VIRGINIA ELECTRIC

COOPERATIVE).

- B. This Contractor shall furnish and install primary underground service conduits, electric utility company manhole(s) as shown on the Drawings. Electric utility company shall install all primary service conductors.
- C. This Contractor shall furnish and install secondary underground service conduits from the electrical utility company's transformer(s) into the building and extend the service to the metering equipment as shown on the Drawings. Secondary voltage, phase, and number of conduits shall be as shown on the Drawings. Electric utility company shall furnish and install all secondary service conductors, unless otherwise shown on the Drawings to be furnished and installed by this Contractor.
- D. All necessary devices, such as meter sockets, meter connection boxes, meter enclosures, current and/or potential transformers, manhole enclosure lid(s), and instrument transformer hangers shall be furnished to this Contractor by the electric utility company.
- E. This Contractor shall furnish and install the concrete transformer pad(s), unless other arrangements are made with the electric utility company to have the pads provided by the electric utility company. Contractor provided pads must meet all of the requirements of the electric utility company.
- F. This Contractor shall provide pull-lines in all primary and secondary service conduits, including spare raceways. Refer to Specification Section 16110.

2.02 MATERIALS AND COMPONENTS

- A. Primary and secondary electrical service entrance conduits shall be heavywall (Schedule 40) polyvinyl chloride (PVC) plastic as hereinbefore specified. Secondary electrical service entrance conduits shall be encased in concrete as detailed on the Drawings and specified herein.
- B. Concrete for the secondary electrical service entrance ductbank(s) shall be 3,000 psi, air entrained with 3/4 inch maximum aggregate size.
- C. Duct spacers shall be fabricated plastic, UL listed.
- D. Electrical service entrance conductors, where shown on the Drawings, shall be as hereinbefore specified.
- E. Cable lugs for termination of electrical service entrance conductors shall be suitable for the application and as approved by the electrical utility company.

- F. Electric utility company manhole enclosures shall be installed, by this contractor, and sized per the electric utility company requirements. Coordinate with the electric utility company.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. This Contractor shall furnish and install a metering system as shown on the Drawings and as required by the electric utility company serving the project.
- B. Conduits for the primary and secondary electrical service shall be installed a minimum thirty-six (36) inches below grade, or as required by the electrical utility company.
- C. This Contractor shall make all necessary final arrangements with the electric utility company for the installation of the permanent underground electrical service.
- D. This Contractor shall coordinate all scheduling of the installation with the electric utility company.
- E. Slope installation of electrical service to drain away from the building.
- F. Terminate primary and secondary service entrance raceways at transformer location(s) as directed by the electric utility company.
- G. This Contractor shall make all necessary final arrangements with the electric utility company for the phased removal of the existing electrical service(s) and associated equipment.

3.02 DUCTBANK

- A. Place concrete so that all voids around ducts are filled.
- B. Furnish and install a three (3) inch minimum concrete envelope around ducts with two (2) inch minimum concrete thickness between ducts.
- C. Adjust final slopes on site to coordinate with existing and new utilities.
- D. Install on undisturbed soil.
- E. After installation, clean and swab ducts.
- F. Cap spare ducts.
- G. Install a minimum thirty-six (36) inches below grade to top of ductbank or as

indicated on the Drawing.

3.03 SERVICE INSTALLATION

- A. Furnish and install ductbank and/or conduits as indicated on Drawings complete from service location in building to transformer location(s). Seal raceways watertight at inside face of outside wall or where raceways pierce slab.

END OF SECTION

SECTION 16418

SURGE PROTECTIVE 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 under this Section shall include furnishing and installing Surge Protective Devices (SPDs), formerly TVSS, for the protection of AC electrical circuits 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. SPD units and all components shall be designed, manufactured and tested in accordance with the most recent editions of ANSI/UL 1449 and UL 1283.
- C. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards (NEMA LS-1).
- D. Submittals are required in accordance with SECTION 16010 of these Specifications. The submittals shall contain, at a minimum, the following:
 - 1. Provide verification that the SPD complies with the required ANSI/UL 1449 3rd Edition listing by Underwriters Laboratories (UL) or other Nationally Recognized Testing Laboratory (NRTL) acceptable to Fairfax County Department of Public Works and Environmental Services. Compliance may be in the form of a file number that can be verified on UL's website or on any other NRTL's website, as long as the website contains the following information at a minimum: model number, SPD Type, system voltage, phases, modes of protection, Short Circuit Current Rating (SCCR), Voltage Protection Ratings (VPRs) for all modes, Maximum Continuous Operating Voltage rating (MCOV) and Nominal Discharge Current (I_n). UL data and visual inspection takes precedence over manufacturer's published documentation.

2. For SPD external mounting applications include electrical/mechanical drawings showing unit dimensions, weights, installation instruction details, and wiring configuration.
3. Where applicable the following additional information shall be included in the submittals:
 - a. Descriptive bulletins.
 - b. Product sheets.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance, the following SPD manufacturers are acceptable: ADVANCED PROTECTION TECHNOLOGIES (APT) as listed herein or TOTAL PROTECTION SOLUTIONS (TPS) or SURGE SUPPRESSION INC or the switchboard manufacturers SPD's for internal or external mounting in or on switchboards shall also be acceptable. Panelboard manufacturers SPD's for external mounting only shall also be acceptable.
- B. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features, and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety.

2.02 VOLTAGE SURGE SUPPRESSION – GENERAL

- A. Electrical Requirements:
 1. Refer to Drawings for operating voltages and unit configurations.
 2. SPD's shall be UL labeled with 200kA Short Circuit Current Rating (SCCR). Fuse ratings shall not be considered in lieu of demonstrated withstand testing SPDs.
 3. Maximum Continuous Operating Voltage (MCOV):

<u>System Voltage</u>	<u>Allowable System Voltage Fluctuation (%)</u>	<u>MCOV</u>
208Y/120	25%	150V
480Y/277	15%	320V
 4. The suppression system shall incorporate thermally protected metal-oxide varistors (MOVs) as the core surge suppression component for the service entrance and all other distribution levels. The system shall not utilize silicon avalanche diodes, selenium cells, air gaps, or other

components that may crowbar the system voltage leading to system upset or create any environmental hazards.

5. The SPD shall provide surge current path for all modes of protection: L-N, L-G, and N-G for Wye systems; L-L, L-G in Delta and impedance grounded Wye systems.
6. All SPD's applied to the distribution system shall have a 20kA Nominal Discharge Current (I_n) rating regardless of their SPD Type (includes Types 1 and 2) or operating voltage. SPDs having an I_n less than 20kA shall not be acceptable.
7. ANSI/UL 1449 Listed Voltage Protection Ratings (VPRs) shall not exceed the following:

<u>System Voltage</u>	<u>L-N</u>	<u>L-G</u>	<u>L-L</u>	<u>N-G</u>
208Y/120	800V	800V	1200V	800V
480Y/277	1200V	1200V	2000V	1200V

(Numerically lower is allowed/preferred; old-style Suppressed Voltage Ratings (SVRs) shall not be submitted, nor evaluated due to outdated less-strenuous testing).

B. SPD Design:

1. SPD shall be UL listed Type 1 or Type 2, intended for use without need for external or supplemental overcurrent controls. Every suppression component of every mode, including N-G, shall be protected by internal overcurrent and thermal over temperature controls. SPD's relying upon external or supplementary installed safety disconnects do not meet the intent of this specification.
2. The SPD shall be maintenance free and shall not require any user intervention throughout its life. SPDs containing items such as replaceable modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.
3. The surge current shall be equally distributed to all MOV components to ensure equal stressing and maximum performance. The surge suppression platform must provide equal impedance paths to each matched MOV. Designs incorporating replaceable SPD modules shall not be accepted.

4. SPD shall have UL 1283 EMI/RFI filtering with minimum attenuation of 50dB at 100kHz.
 5. SPD shall include visual LED diagnostics including a minimum of one green LED indicator per phase, and one red service LED. SPD shall include an audible alarm with on/off silence function and diagnostic test function. SPDs for branch circuit panels not employing an on/off silence function will be acceptable.
 6. The SPD must include Form C dry contacts (one NO and one NC) for remote monitoring of its status. Both the NO and NC contacts shall change state under any fault condition or if power is removed from the SPD. Service entrance locations shall have two sets of NO and NC contacts for building power monitoring.
 7. SPDs at service entrance locations shall be provided with a surge event counter with a reset button allowing the surge counter to be zeroed. The surge event count shall have a lithium battery backup or be stored in non-volatile memory and displayed after power is restored.
 8. Internally mounted SPDs in switchboards shall be designed to interface with the electrical assembly via factory installed conductors only and not mounted directly to bus bars.
 9. Sidemount SPDs shall be factory sealed in order to prevent access to the inside of the unit. Sidemount SPDs shall have factory installed phase, neutral, ground and remote status contact conductors factory installed and shall have a pigtail of conductors protruding outside of the enclosure for field installation. Top mount SPDs for switchboards where sidemount is not feasible due to space constrictions or space allowed for future expansion.
- C. SPDs shall have NEMA 1 general purpose enclosures, unless otherwise noted or required for the environment. SPDs located in kitchens or other areas subject to possible water exposure shall be NEMA 4X.

2.03 SYSTEM APPLICATION

- A. The SPD applications covered under this section include switchboard assemblies, motor control centers (if present), distribution and branch circuit panelboards. All SPDs shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category C, B, and A environments.
- B. The minimum current capability (single pulse rated) per phase shall be:

Service Entrance or Automatic Transfer Switch:	250kA
Distribution Panelboards & MCC:	150kA
Branch Circuit Panelboards:	100kA

- C. SPDs installed on the load side of the service entrance disconnect shall be Type 1. Other SPD locations beyond the service entrance shall be Type 1 or Type 2.

2.04 SERVICE ENTRANCE SWITCHBOARD/PANELBOARD LOCATIONS **[Engineer to edit. Delete SE Distribution Panels if not using. These are used mostly for ball fields]**

- A. The SPD application covered under this section is for service entrance switchboard(s) and service entrance distribution panelboard(s). Service entrance located SPDs shall be tested and demonstrated suitability for application within ANSI/IEEE C62.41 Category C environments.
- B. The SPD shall be from the same manufacturer as the switchboard. The SPD shall be internal and panel mounted in the front face of the switchboard at the assembly point by the original equipment manufacturer. Alternatively, the SPD from the same or different manufacturer may be mounted external to the switchboard.
- C. The SPD for service entrance distribution panelboards shall be mounted external and adjacent to the panelboard.
- D. Locate the SPD (Type 1) on the load side of the main disconnect device, as close as possible to the phase conductors and the ground neutral bar.
- E. The SPD shall be connected through a three pole, 60A circuit breaker to serve as the disconnecting means for the SPD. This disconnect shall be located in immediate proximity to the SPD. Connections shall be made via conductors originating in the SPD and shall be kept as short as possible.
1. As an option, internal mounted SPD's in switchboards may be provided with an integral disconnect switch in lieu of using a 60A circuit breaker to serve as the SPD disconnecting means. Connections shall be made via conductors originating in the SPD and connected to the bus bars with suitably sized tap lugs, factor installed. Conductors shall be kept as short as possible.
- F. All monitoring and diagnostic features shall be visible from the front of the equipment.
- G. The service entrance distribution panelboard external SPD shall be ADVANCED PROTECTION TECHNOLOGIES (APT) Model No.: **[Engineer to edit]**

- TE02XAS25E1X for 120/208V SE distribution panelboards
- TE04XAS25E1X for 277/480V SE distribution panelboards

2.05 POWER DISTRIBUTION AND BRANCH CIRCUIT PANELBOARD LOCATIONS

- A. The SPD application covered under this section includes distribution and branch circuit panelboards. The SPD units shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category B environments.
- B. The SPD shall be mounted externally and adjacent to the panelboard. The SPD shall be connected through a three pole, 30A circuit breaker to serve as the disconnecting means for the SPD. Connections shall be made via conductors originating in the SPD and shall be kept as short as possible.
- C. SPDs shall be flush mounted adjacent flush mounted panelboards and surface mounted adjacent to or attached to surface mounted panelboards.
- D. The external SPD shall be ADVANCED PROTECTION TECHNOLOGIES (APT) Model No.: **[Engineer to edit]**
- TE02XDS154XA for 120/208V distribution panelboards
 - TE04XDS154XA for 277/480V distribution panelboards
 - TE02XDS104XA for 120/208V branch circuit panelboards
 - TE04XDS104XA for 277/480V branch circuit panelboards
- E. SPDs for motor control centers (MCC) shall be from the same manufacturer as the MCC. The SPD shall be internal and panel mounted in the front face of the MCC at the assembly point by the original equipment manufacturer. Alternatively, the SPD from the same or different manufacturer may be mounted external to the MCC. All monitoring and diagnostic features shall be visible from the front of the equipment. **[Engineer edit out if not using MCCs]**

PART 3 - EXECUTION

3.01 INSTALLATION

- A. SPD shall be installed per manufacturer's installation instructions with lead lengths as short (less than 24") and straight as possible. Gently twist conductors together.
- B. This Contractor may reasonably rearrange the circuit breaker locations to ensure the shortest and straightest possible leads for the SPD connections.
- C. Before energizing, this Contractor shall verify service and separately derived

system neutral to ground bonding jumpers per the National Electrical Code.

- D. Repaint marred and scratched surfaces with touch-up paint to match original finish.

3.02 TRAINING

- A. This Contractor shall provide four (4) hours of technical service training to the Owner's technical and maintenance staff.
- B. The training session shall be conducted by a manufacturer's qualified representative. The training program shall consist of instruction on operation of the assembly.

3.03 WARRANTY

- A. SPDs and supporting components and accessories shall be guaranteed by the manufacturer to be free of defects in material and workmanship for a period of ten (10) years from the date of substantial completion of service and activation of the system to which the suppressor is attached. Additionally, during the applicable warranty period, and SPD which fails due to any electrical anomaly, including lightning, shall be replaced by the manufacturer without charge. Special or optional warranties in excess of the warranty period for purposes of this bid are not acceptable. Standard unit warranties in excess of the warranty period stated herein are acceptable. Refer to SECTION 01740 for the start of the warranty period.
- B. Since "Acts of Nature" or similar statements typically include the threat of lightning to which the SPDs shall be exposed, any such clause limiting warranty responsibility in the general conditions of this specification shall not apply to this particular section. The warranty must specifically provide for unlimited free replacements of the SPD in the event of failure caused by the effects of lightning and all other electrical anomalies. The warranty shall cover the entire device, not just various components, such as modules only.

END OF SECTION

SECTION 16430

DISTRIBUTION PANELBOARDS

PART 1 - GENERAL

1.01 REQUIREMENTS

- A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.02 SCOPE

- A. The work covered under this Section shall include furnishing and installing distribution panelboards complete for all systems as shown on the Drawings and herein specified.

1.03 QUALITY ASSURANCE

- A. All equipment, materials, and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements, and these Specifications.
- B. All equipment and materials shall be listed by Underwriter's Laboratories, Inc. (UL) for their intended use and shall bear the UL label.
- C. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.
- D. Submittals are required in accordance with SECTION 16010 of these Specifications. The manufacturer shall furnish, but not be limited to the following:
 - 1. Circuit breaker and/or fusible switch layout with dimensions and nameplate designation. **[Engineer, edit out fusible switch if not using]**
 - 2. Circuit breaker trip ratings and frame sizes.
 - 3. Fusible switch units size, interrupting rating, and fuse rating. **[Engineer, edit out fusible switch if not using]**
 - 4. Component list.
 - 5. Conduit entry/exit locations.

6. Assembly ratings, including short-circuit rating, voltage, and continuous current rating.
7. Bus material, including ground bar.
8. Cable terminal sizes.
9. Product data for each type of panelboard.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver material and products in factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations.
- B. Each distribution panelboard section shall be delivered in individual shipping splits and individually wrapped for protection and mounted on shipping skids.
- C. Store in a clean, dry space. Maintain factory protection and /or provide an additional heavy canvas or heavy plastic cover to protect structure from dirt, water, construction debris, and traffic. Where applicable, provide adequate heating within enclosures to prevent condensation.
- D. Handle in accordance with NEMA PB1.1 and manufacturer's written instructions. Handle carefully to avoid damage to panelboard internal components, enclosure and finish.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. The distribution switchboard(s) shall be as manufactured by CUTLER-HAMMER, GENERAL ELECTRIC or SIEMENS.

2.02 PANELBOARDS

- A. This Contractor shall furnish and install where indicated on the Drawings, deadfront distribution panelboards incorporating switching and branch circuit protective devices of the number, ratings, and type noted herein or as shown on the Drawings. Panelboards shall have NEMA 1 general purpose enclosures and shall be surface mounted. All distribution panelboards shall be rated for the intended voltage and shall be in accordance with UL's "Standard for Panelboards" and "Standard for Cabinets and Boxes" and shall be so labeled. Distribution panelboards shall also comply with NEMA "Standard PB1 For Panelboards" and the NEC. (Circuit breakers) (Switch and fuse units) shall conform to the paragraph, which follows in these Specifications.

- B. Ratings: **[ENGINEER, EDIT OUT SHORT-CKT STUDY IF NOT IN PROJECT]**
1. Distribution panelboards rated 240 Vac or less shall have short-circuit ratings as shown on the Drawings **or as determined by the Short-Circuit Coordination Study whichever is higher**, but not less than 10,000-amperes RMS symmetrical.
 2. Distribution panelboards rated 480 Vac shall have short-circuit ratings as shown on the Drawings **or as determined by the Short-Circuit Coordination Study whichever is higher**, but not less than 14,000-amperes RMS symmetrical.
 3. Distribution panelboards used for service entrance shall have short-circuit ratings as shown on the Drawings **or as determined by the Short-Circuit Coordination Study whichever is higher**, but not less than 65,000 amperes RMS symmetrical at system voltage and be labeled as service entrance equipment in accordance with UL requirements.
 4. **(ENGINEER, DELETE THIS PARAGRAPH IF NOT USING SERIES CONNECTED RATINGS)** Distribution panelboards shall have fully rated or series connected short-circuit rated interrupting ratings as indicated on the drawings and shall be labeled with a UL short-circuit rating. When series connected ratings are applied with integral or remote upstream devices, a label shall be provided. It shall state the conditions of the UL series connected ratings including:
 1. Size and type of upstream device.
 2. Branch devices that can be used.
 3. UL series short-circuit rating.
- C. Interiors:
1. All interiors shall be completely factory assembled with switching and protective devices, wire connectors, etc. All conductor connectors, except screw terminals, shall be of the anti-turn solderless type and all shall be suitable for copper conductors of the sizes indicated on the Drawings.
 2. Interiors shall be designed so that switching and protective devices can be replaced without disturbing adjacent units and without removing the main bus connectors and shall be so designed that circuits may be changed without matching, drilling, or tapping.
- D. All distribution panelboards shall be surface mounted on twelve (12) gauge formed steel channel having a cross section dimension at least 1-1/2 inches x 1-1/2 inches. The channel and fittings shall have a hot dipped galvanized finish to

resist rust formation. Channels shall be installed vertically and as detailed on the Drawings.

E. Bus Bars:

1. Bus bars for the mains shall be of copper sized in accordance with UL 67 Standards for temperature rise to limit temperature rise on any current carrying part to a maximum of 65 degrees C above an ambient of 40 degrees C maximum. The bus bars shall be standard density rated for 1000 amperes per square inch copper. Bus bar taps for distribution panelboards with single pole branches shall be arranged for sequence phasing of the branch circuit devices. Busing shall be braced throughout to conform to industry standard practice governing short circuit stresses in panelboards. Phase busing shall be full height without reduction. Cross connectors shall be copper.
2. Phase busing shall be manufactured to accept bolt-on circuit protective devices only.
3. The distribution panelboard shall have fully equipped provision spaces for future protective devices as shown on the Drawings. Remaining space not identified on the Drawings shall be fully bused and pre-drilled for future protective devices that do not have established frame sizes. This is in addition to the scheduled space or spare branches specified or shown on the Drawings.
4. A non-insulated copper ground bus shall be provided for each distribution panelboard.
5. Full size (100% rated) insulated neutral busing shall be included for panelboards shown with a neutral. Neutral busing shall have a suitable lug for each outgoing feeder or branch circuit requiring a neutral connection.
6. Lugs shall be rated for 75 degrees C terminations and shall bolt in place.

F. Backboxes:

1. Backboxes shall be made from unpainted galvanized code gauge steel having no knockouts.
2. Boxes shall have gutter and wiring space sized as required per NEC but not less than four (4) inches on all sides.
3. Backboxes shall also have sufficient space to safely attach clamp-on or split-core current transformers to the feeders for future portable or

permanent check metering.

4. Backboxes for multiple (two or more) sections shall be of the same dimensions.
5. Each backbox shall include at least four (4) interior mounting studs.
6. The distribution panelboard identification number shall be on the backbox.

G. Trim:

1. **(ENGINEER TO EDIT THIS PARAGRAPH)** Hinged door fronts shall be provided with a door-in-door type, covering all circuit breaker handles and all live parts in all distribution panelboard trims. - **OR** - Distribution panelboards having individual switch and fuse units shall have hinged door trims which cover all live parts. Switching device handles shall be accessible. The use of door in a hinged cover type panelboard is prohibited.
2. Doors in distribution panelboard trims shall conform to the following:
 - a. In making device handles accessible, inboard doors shall not uncover any live parts. Outboard doors shall allow hinged access to the interior panel wiring without removal of the panel door assembly.
 - b. Doors shall have a semi-flush type cylinder lock and catch. Door hinges shall be concealed. Two (2) keys shall be furnished for each distribution panelboard door and all locks shall be keyed as requested by the Owner to match current standard. The outer door shall be keyed separately. Directory frame and card, having a transparent cover, shall be furnished on the inside of each door.
 - c. Directory cards shall be neatly typewritten indicating each branch circuit number and assignment. The assignment designation shall include the final room number(s) assigned by the Owner. Do not use the architectural room numbers shown on the Drawings. The directory cards shall also include the source (switchboard, panelboard, etc., with circuit number) feeding the panel.
3. The trims shall be fabricated from code gauge sheet steel.
4. All of the distribution panelboard's steel surfaces, exterior and interior shall be properly cleaned and finished with the manufacturer's standard paint over a rust-inhibiting phosphatized coating. The finish paint shall be

of a type to which field applied paint will adhere.

5. Trims shall be mountable by a screwdriver without the need for special tools.

2.03 CIRCUIT BREAKERS

- A. Electrical circuits shall be protected by molded case circuit breakers as indicated on the Drawings.
- B. The circuit breakers shall be operated by a toggle type handle and shall have a quick-make, quick-break over-center switching mechanism that shall be mechanically trip free from the handle so that the contacts cannot be held closed against short circuits and abnormal currents. Tripping due to overload or short circuit shall be clearly indicated by the handle automatically assuming a position midway between the manual "ON" and "OFF" positions. All latch surfaces shall be ground and polished. All poles of a multi-pole breaker shall be so constructed that they open, close, and trip simultaneously.
- C. The circuit breakers shall be completely enclosed in a molded case. Non-interchangeable trip breakers shall have their covers sealed; interchangeable trip breakers shall have the trip unit sealed to prevent tampering. Ampere ratings shall be clearly visible. Contacts shall be non-welding silver alloy. Arc extinction shall be accomplished by means of arc chutes consisting of metal grids mounted in an insulating support. Breakers shall be of the bolt-on type; plug-in, plug-on, blow-on, and clamp-on circuit breakers shall not be acceptable.
- D. Circuit breakers shall be 80% rated unless indicated on the Drawings to be 100% rated.
- E. Circuit breakers shall have a minimum symmetrical interrupting capacity as indicated on the Drawings. The interrupting ratings of the circuit breakers shall be at least equal to, or greater than, the available short circuit at the line terminals and not less than those values shown on the Drawings and specified in this specification section **or as determined by the Short-Circuit Coordination Study whichever is higher. [ENGINEER, EDIT OUT SHORT-CKT STUDY IF NOT IN PROJECT]**
- F. Circuit breakers shall be listed with UL, conform to the applicable requirements of the latest issue of NEMA Standards Publication No. AB1.
- G. Circuit breakers shall have thermal-magnetic trip units, with inverse time-current characteristics, unless otherwise noted on the Drawings and/or specified herein.
 1. Automatic operation of all circuit breakers shall be obtained by means of thermal-magnetic tripping devices located in each pole providing inverse

- time delay and instantaneous circuit protection. Instantaneous pick-up settings for each phase shall be adjustable on all frames 250A and above.
2. Circuit breakers shall be ambient compensating in that, as the ambient temperature increases over 40° C, the circuit breaker automatically derates itself to better protect its associated conductor.
 3. Circuit breakers 250A and above shall have thermal magnetic interchangeable trip units.
- H. Circuit breaker frames 400 ampere and above shall have microprocessor-based RMS sensing trip units on 480 volt systems and on 208 volt systems where indicated on the Drawings.
1. Solid State sensing shall measure true RMS current with capability to measure through to the 21st harmonic. Automatic operation of all circuit breakers shall be obtained by means of solid state tripping elements providing inverse time delay and instantaneous and short-time circuit protection. Continuous current rating shall be adjustable from 20% to 100% of trip unit rating. Long-time delay and instantaneous trip ratings shall also be adjustable. The short time pick-up trip shall have adjustable pick-up settings at definite times and with I_{2t} delay.
 2. Long time current adjustment shall be possible without the need for a rating plug.
 3. Main and feeder circuit breakers shall be provided with integral ground fault protection in 480 volt distribution panels. Ground fault pick-up shall be adjustable from 20% to 70% of the breakers maximum continuous current rating, but in no case be greater than 1200A. Ground fault time delay shall be adjustable with three (3) I_{2t} delay settings.
 4. Solid State circuit breakers shall have built-in test ports for testing the long-time delay, instantaneous, and ground fault functions (if equipped) of the breaker by means of a test set.
 5. Provide one (1) test set capable of testing all circuit breakers with a built-in test port.
- I. Service entrance panelboards shall utilize a molded case main circuit breaker (MCB) equipped with individual insulated, braced and protected connectors, and single phase protection. The circuit breaker shall use a solid state trip furnished with a plug-in or panel mounted metering device. This device shall simultaneously display all three phase currents, as well as average current, ground current, and phase unbalance. In addition it shall display date, time and

type (overload, short circuit or ground fault) of trip for the most recent five (5) events. **(ENGINEER TO EDIT OUT THIS PARAGRAPH IF NOT USING THE PANEL FOR SERVICE ENTRANCE.)**

- J. Circuit breaker accessories: Provide shunt trips, bell alarms and auxiliary switches, etc. as may be shown on the Drawings. All accessories shall be UL Listed for field installation.
- K. Circuit breakers shall be manufactured by the same manufacturer as the panelboard and factory installed.
- L. Where indicated, circuit breakers shall be UL listed for series application. **(ENGINEER TO EDIT OUT THIS PARAGRAPH IF NOT USING SERIES CONNECTED BREAKERS.)**

2.04 SWITCH AND FUSE UNITS **[ENGINEER, EDIT OUT FUSIBLE SWITCH SECTION IF NOT USING]**

- A. The switch and fuse units shall be quick-make, quick-break type. The units shall be listed by UL for service entrance use where applicable. Each unit shall be enclosed in a separate steel enclosure. The enclosure shall employ a hinged cover for access to the fuses which shall be interlocked with the operating handle to prevent opening the cover when the switch is in the ON position. This interlock shall be constructed so that it can be released with a standard electrician's tool for testing fuses without interrupting service. The units shall have padlocking provisions in the OFF position and the operating handle position shall give switch position indication, i.e., horizontal OFF, diagonal ON. Units 30 ampere through 600 ampere shall be rated not less than 100 kAIC with rejection type clips for Class R type fuses. Fuses shall be furnished and installed by this Contractor.
- B. Switch and fuse units shall be manufactured by the same manufacturer as the panelboard and factory installed.

2.05 MULTIPLE SECTION PANELBOARDS

- A. Panelboards with two (2) or more sections shall have sub-feed lugs or thru-feed lugs in all but one (1) section of the panelboard, unless otherwise shown on the Drawings. Lugs shall have same capacity as incoming mains. Cable interconnections shall be field installed.

2.06 NAMEPLATES

- A. Panelboards shall have nameplates of 1/16-inch thick laminated plastic with 3/16 inch high white letters on a black background. Nameplates shall identify the panelboard and shall be mounted on the front top of the enclosure.

- B. Circuit protective devices shall each have nameplates of 1/16 inch thick laminated plastic with 1/8 inch high white letters on a black background. Nameplates shall be mounted in a manner to that above.

2.07 SURGE PROTECTIVE DEVICE (SPD)

- A. Provide surge protective devices (SPD) as specified in Section 16418.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Before installing panelboards, check all of the Drawings for possible conflict of space and adjust the location of the panelboard to prevent such conflict with other items. Panelboard locations in electrical rooms and other spaces shall closely follow the layouts shown on the Drawings, leaving sufficient space on walls for future installations of panelboards and/or other electrical equipment.
- B. Panelboards shall be securely mounted to steel framing channel at locations shown on Drawings. Construction shall be such that additional conduits can be added for future requirements.
- C. The cabinets and enclosures shall be mounted in accordance with the NEC. This Contractor shall furnish all materials necessary for mounting the panelboards.
- D. Install units plumb, level and rigid without distortion to the distribution panelboard.
- E. Panelboard interiors shall be factory assembled with circuit breakers, wire connectors, etc. Circuit breakers shall be sequence numbered to correspond with the panelboard directory.
- F. Connect the SPD to the appropriate circuit breaker.
- G. Contractor shall install required safety labels.

3.02 START-UP SERVICE AND PERFORMANCE TEST FOR SERVICE ENTRANCE DISTRIBUTION PANELBOARDS **[ENGINEER, EDIT OUT THE SECTION IF NOT USED FOR SERVICE ENTRANCE]**

- A. The manufacturer shall provide factory personnel to completely inspect and test the service entrance panelboard(s) for proper installation and operation of all

equipment, at the time of system start-up. Testing shall include, but not be limited to, performance testing of the circuit breakers, fused switches (if equipped), SPDs, metering, single phase protection, and ground fault protection systems and equipment.

- B. All testing and start-up services shall be in the presence of the Engineer and the Contract Owners Technical Representative (COTR). The tests shall be as stated in the manufacturer's literature. One (1) copy of the tests results shall be submitted to the Engineer and Owner for review.
- C. The completed equipment grounding system shall be subjected to a metered test at the service entrance panelboard ground bar to ensure that the ground resistance, without chemical treatment or other artificial means, does not exceed five (5) ohms. One (1) copy of the test results shall be submitted to the Engineer and Owner for review.

3.03 FIELD TESTS

- A. Check tightness of all accessible mechanical and electrical connections to assure they are torqued to the minimum acceptable manufacturer's recommendations.
- B. Check all panelboards for proper grounding, fastening and alignment.

3.04 FIELD ADJUSTMENTS

- A. This Contractor shall perform field adjustments of the protective devices as required to place the equipment in final operating condition. Necessary field settings of devices and adjustments and minor modifications to equipment shall be carried out by this Contractor at no additional cost to the Owner.
- B. **(ENGINEER, DELETE THIS PARAGRAPH WHEN SECTION 16015 "SHORT-CIRCUIT/COORDINATION STUDY" IS NOT USED)** The settings shall be in accordance with the approved protective device coordination study or as directed by the Engineer.

3.05 TRAINING **[ENGINEER, DELETE THIS SECTION IF PANEL IS NOT USED FOR SERVICE ENTRANCE]**

- A. This Contractor shall provide eight (8) hours of technical service training to the Owner's technical and maintenance staff.
- B. The training session shall be conducted by a manufacturer's qualified representative. The training program shall consist of instruction on operation of the assembly, circuit breakers, fused switches (if equipped), metering, and major components within the assembly.

3.06 CLEANING

- A. Remove debris from panelboards and wipe dust and dirt from all components.
- B. Repaint marred and scratched surfaces with touch-up paint to match original finish.

3.07 EXISTING DISTRIBUTION PANELBOARDS

- A. This Contractor shall clean, adjust, and tighten all feeder and branch circuit connections (new and existing) and provide new typewritten directories (as described above) in all existing distribution panelboards that is associated with work on this project. Distribution panelboards not associated with work on this project are not subject to the requirement.

END OF SECTION

SECTION 16435

BRANCH CIRCUIT PANELBOARDS

PART 1 - GENERAL

1.01 REQUIREMENTS

- A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.02 SCOPE

- A. The work covered under this Section shall include furnishing and installing circuit breaker type branch circuit panelboards complete for all systems as shown on the Drawings and herein specified.

1.03 QUALITY ASSURANCE

- A. All equipment, materials, and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements, and these Specifications.
- B. All equipment and materials shall be listed by Underwriter's Laboratories, Inc. (UL) for their intended use and shall bear the UL label.
- C. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.
- D. Submittals are required in accordance with SECTION 16010 of these Specifications. The manufacturer shall furnish, but not be limited to the following:
 - 1. Circuit breaker layout with dimensions and nameplate designation.
 - 2. Circuit breaker trip ratings and frame sizes.
 - 3. Component list.
 - 4. Conduit entry/exit locations.
 - 5. Assembly ratings, including short-circuit rating, voltage, and continuous current rating.
 - 6. Bus material, including ground bar.

7. Cable terminal sizes.
8. Product data for each type of panelboard.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver material and products in factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations.
- B. Each panelboard section shall be delivered in individual shipping cases and individually wrapped for protection.
- C. Store in a clean, dry space. Maintain factory protection and /or provide an additional heavy canvas or heavy plastic cover to protect panelboards from dirt, water, construction debris, and traffic. Where applicable, provide adequate heating within enclosures to prevent condensation.
- D. Handle in accordance with NEMA PB1.1 and manufacturer's written instructions. Handle carefully to avoid damage to panelboards internal components, enclosure and finish.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. The branch circuit panelboards shall be as manufactured by CUTLER-HAMMER, GENERAL ELECTRIC or SIEMENS.

2.02 PANELBOARDS

- A. This Contractor shall furnish and install where indicated on the Drawings, deadfront branch circuit panelboards incorporating switching and branch circuit protective devices of the number, ratings, and type noted herein or as shown on the Drawings. Branch circuit panelboards shall have NEMA 1 general purpose enclosures and shall be surface or flush mounted as noted. All branch circuit panelboards shall be rated for the intended voltage and shall be in accordance with UL's "Standard for Panelboards" and "Standard for Cabinets and Boxes" and shall be so labeled. Branch circuit panelboards shall also comply with NEMA "Standard PB1 for Panelboards" and the NEC.
- B. Ratings: **[ENGINEER, EDIT OUT SHORT-CKT STUDY IF NOT IN PROJECT]**
 1. Panelboards rated 240 Vac or less shall have short-circuit ratings as shown on the drawings **or as determined by the Short-Circuit Coordination Study whichever is higher**, but not less than 10,000-amperes RMS symmetrical.

2. Panelboards rated 480 Vac shall have short-circuit ratings as shown on the drawings **or as determined by the Short-Circuit Coordination Study whichever is higher**, but not less than 14,000-amperes RMS symmetrical.
 3. **(ENGINEER, DELETE THIS PARAGRAPH IF NOT USING SERIES CONNECTED RATINGS)** Panelboards shall have a fully rated or series connected short-circuit rated interrupting ratings as indicated on the drawings and shall be labeled with a UL short-circuit rating. When series connected ratings are applied with integral or remote upstream devices, a label shall be provided. It shall state the conditions of the UL series connected ratings including:
 - a. Size and type of upstream device.
 - b. Branch devices that can be used.
 - c. UL series short-circuit rating.
- C. Interiors:
1. All interiors shall be completely factory assembled with switching and protective devices, wire connectors, etc. All conductor connectors, except screw terminals, shall be of the anti-turn solderless type and all shall be suitable for copper conductors of the sizes indicated on the Drawings.
 2. Interiors shall be designed so that switching and protective devices can be replaced without disturbing adjacent units and without removing the main bus connectors and shall be so designed that circuits may be changed without matching, drilling, or tapping.
- D. Branch circuits shall be arranged using double row construction except where a narrow column width panelboard is required or noted on the Drawings. Branch circuits shall be numbered by the manufacturer.
- E. Furnish and install three (3), 3/4 inch and two (2), one inch empty conduits up through the wall and turned out above the ceiling; and three (3), 3/4 inch and two (2), one inch empty conduits down into the ceiling space below the floor for all flush mounted branch circuits panelboards. Where floor slab is on grade, provide only empty conduits to the ceiling.
- F. All surface mounted branch circuit panelboards shall be mounted on twelve (12) gauge formed steel channel having a cross section dimension at least 1-1/2 inches x 1-1/2 inches on walls. The channel and fittings shall have a hot dipped galvanized finish to resist rust formation. Channels shall be installed vertically and as detailed on the Drawings.

G. Bus Bars:

1. Bus bars for the mains shall be of copper sized in accordance with UL 67 Standards for temperature rise to limit temperature rise on any current carrying part to a maximum of 65 degrees C above an ambient of 40 degrees C maximum. The bus bars shall be standard density rated for 1000 amperes per square inch copper. Bus bar taps for branch circuit panelboards with single pole branches shall be arranged for sequence phasing of the branch circuit devices. Busing shall be braced throughout to conform to industry standard practice governing short circuit stresses in panelboards. Phase busing shall be full height without reduction. Cross connectors shall be copper. A non-insulated copper ground bus shall be provided for each panelboard.
2. Phase busing shall be manufactured to accept bolt-on circuit breakers only.
3. Spaces for the addition of future switching and protective devices in branch circuit panelboards shall be bussed for the maximum number of devices possible complete with pre-drilled mounting holes and knockouts in the front cover.
4. A non-insulated copper ground bus shall be provided for each branch circuit panelboard.
5. Full size (100% rated) insulated neutral busing shall be included for panelboards shown with a neutral. Neutral busing shall have a suitable lug for each outgoing feeder or branch circuit requiring a neutral connection.
6. Lugs shall be rated for 75 degrees C terminations and shall bolt in place.

H. Backboxes:

1. Backboxes shall be made from unpainted galvanized code gauge steel having no knockouts.
2. Boxes shall have gutter and wiring space sized as required per NEC but not less than four (4) inches on all sides. Where feeder cables supplying the mains of a panelboard are carried through the box to supply other electrical equipment, the box shall be so sized as to include this wiring space. This wiring space shall be in addition to the minimum gutter space specified above and the limiting width may be increased accordingly.
3. Backboxes shall also have sufficient space to safely attach clamp-on or split-core current transformers to the feeders for future portable or

permanent check metering.

4. Backboxes for multiple (two or more) sections shall be of the same dimensions.
 5. Each backbox shall include at least four (4) interior mounting studs.
 6. The branch circuit panelboard identification number shall be on the backbox.
 7. Branch circuit panelboard backboxes shall be of one (1) piece construction.
- I. Trim:
1. Hinged doors shall be the door-in-door type covering all switching device handles and all live parts and shall be included in all branch circuit panelboard trims. The use of door in a hinged cover type panelboard is prohibited.
 2. Doors in branch circuit panelboard trims shall conform to the following:
 - a. In making device handles accessible, inboard doors shall not uncover any live parts. Outboard doors shall allow hinged access to the interior panel wiring without removal of the panel door assembly.
 - b. Doors shall have a semi-flush type cylinder lock and catch. Door hinges shall be concealed. Two (2) keys shall be furnished for each panelboard door and all locks shall be keyed as requested by the Owner to match current standard. The outer door shall be keyed separately. Directory frame and card, having a transparent cover, shall be furnished on the inside of each door.
 - c. Directory cards shall be neatly typewritten indicating each branch circuit number and assignment. The assignment designation shall include the final room number(s) assigned by the Owner. Do not use the architectural room numbers shown on the Drawings. The director cards shall also include the source (switchboard, panelboard, etc. with circuit number) feeding the panel.
 3. The trims shall be fabricated from code gauge sheet steel.
 4. All of the panelboard's steel surfaces, exterior and interior shall be properly cleaned and finished with the manufacturer's standard paint over a rust-inhibiting phosphatized coating. The finish paint shall be of a type

to which field applied paint will adhere.

5. Trims for flush mounted branch circuit panelboards shall overlap the box by at least 3/4 inches on all sides. Surface trims shall be mountable by a screwdriver without the need for special tools.
- J. Conduit skirts shall be provided on surface mounted branch circuit panelboards, where shown on the drawings. Skirts shall be the same width and depth as the panelboard backbox. Screw on skirt covers shall be the same code gauge sheet steel as the panelboard trim and painted with the same finish and color as the panelboard. Skirts shall be from the top of the panelboard to the underside of the finished ceiling and/or from the bottom of the panelboard to the finished floor concealing all conduits.

2.03 CIRCUIT BREAKERS

- A. Electrical circuits shall be protected by molded case circuit breakers as indicated on the Drawings.
- B. The circuit breakers shall be operated by a toggle type handle and shall have a quick-make, quick-break over-center switching mechanism that shall be mechanically trip free from the handle so that the contacts cannot be held closed against short circuits and abnormal currents. Tripping due to overload or short circuit shall be clearly indicated by the handle automatically assuming a position midway between the manual "ON" and "OFF" positions. All latch surfaces shall be ground and polished. All poles of a multi-pole breaker shall be so constructed that they open, close, and trip simultaneously.
- C. The circuit breakers shall be completely enclosed in a molded case. Non-interchangeable trip breakers shall have their covers sealed; interchangeable trip breakers shall have the trip unit sealed to prevent tampering. Ampere ratings shall be clearly visible. Contacts shall be non-welding silver alloy. Arc extinction shall be accomplished by means of arc chutes consisting of metal grids mounted in an insulating support. Breakers shall be of the bolt-on type; plug-in, plug-on, blow-on, and clamp-on circuit breakers shall not be acceptable.
- D. Circuit breakers shall be 80% rated unless indicated on the Drawings to be 100% rated.
- E. Circuit breakers shall have a minimum symmetrical interrupting capacity as indicated on the Drawings. The interrupting ratings of the circuit breakers shall be at least equal to, or greater than, the available short circuit at the line terminals and not less than those values shown on the Drawings and specified in this specification section **or as determined by the Short-Circuit Coordination Study whichever is higher. [ENGINEER, EDIT OUT SHORT-CKT STUDY IF NOT IN PROJECT]**

- F. Circuit breakers shall be listed with UL, conform to the applicable requirements of the latest issue of NEMA Standards Publication No. AB1.
- G. Circuit breakers shall have thermal-magnetic trip units, with inverse time-current characteristics, unless otherwise noted on the Drawings and/or specified herein.
1. Automatic operation of all circuit breakers shall be obtained by means of thermal-magnetic tripping devices located in each pole providing inverse time delay and instantaneous circuit protection. Instantaneous pick-up settings for each phase shall be adjustable on all frames 250A and above.
 2. Circuit breakers shall be ambient compensating in that, as the ambient temperature increases over 40° C, the circuit breaker automatically derates itself to better protect its associated conductor.
 3. Circuit breakers 250A and above shall have thermal magnetic interchangeable trip units,
- H. Circuit breaker frames 400 ampere and above shall have microprocessor-based RMS sensing trip units on 480 volt systems and on 208 volt systems where indicated on the Drawings.
1. Solid State sensing shall measure true RMS current with capability to measure through to the 21st harmonic. Automatic operation of all circuit breakers shall be obtained by means of solid state tripping elements providing inverse time delay and instantaneous and short-time circuit protection. Continuous current rating shall be adjustable from 20% to 100% of trip unit rating. Long-time delay and instantaneous trip ratings shall also be adjustable. The short time pick-up trip shall have adjustable pick-up settings at definite times and with I²t delay.
 2. Long time current adjustment shall be possible without the need for a rating plug.
 3. Main and feeder circuit breakers shall be provided with integral ground fault protection in 480 volt panels. Ground fault pick-up shall be adjustable from 20% to 70% of the breakers maximum continuous current rating, but in no case be greater than 1200A. Ground fault time delay shall be adjustable with three (3) I²t delay settings.
 4. Solid State circuit breakers shall have built-in test ports for testing the long-time delay, instantaneous, and ground fault functions (if equipped) of the breaker by means of a test set.

5. Provide one test set capable of testing all circuit breakers with a built-in test port, unless previously provided under another section of these specifications.
 - I. Where a circuit breaker is the disconnecting means for fire alarm equipment, a listed breaker locking device shall be installed.
 - J. Circuit breaker accessories: Provide shunt trips, bell alarms and auxiliary switches, etc. as may be shown on the drawings. All accessories shall be UL Listed for field installation.
 - K. Circuit breakers shall be manufactured by the same manufacturer as the panelboard and factory installed.
 - L. Where indicated, circuit breakers shall be UL listed for series application.
(ENGINEER TO EDIT OUT THIS PARAGRAPH IF NOT USING SERIES CONNECTED BREAKERS.)

2.04 MULTIPLE SECTION PANELBOARDS

- A. Panelboards with two (2) or more panelboard sections, sub-feed lugs or thru-feed lugs shall be used in all but one (1) section of each panelboard, unless otherwise shown on the Drawings. Lugs shall have same capacity as incoming mains. Cable interconnections shall be field installed.

2.05 NAMEPLATES

- A. Branch circuit panelboards shall have nameplates of 1/16 inch thick laminated plastic with 3/16 inch high white letters on a black background. Nameplates shall identify the branch circuit panelboard and shall be mounted on the front top of the enclosure.

2.06 SURGE PROTECTIVE DEVICE (SPD)

- A. Provide surge protective devices (SPD) as specified in Section 16418.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Before installing branch circuit panelboards, this Contractor shall check all of the Drawings for possible conflict of space and adjust the location of the branch circuit panelboard to prevent such conflict with other items. Panelboard locations in electrical rooms and other spaces shall closely follow the layouts shown on the Drawings, leaving sufficient space on walls for future installations of panelboards and/or other electrical equipment.

- B. Surface mounted branch circuit panelboards shall be securely mounted to steel framing channel at locations shown on Drawings. Construction shall be such that additional conduits can be added for future requirements.
- C. The cabinets and enclosures shall be mounted in accordance with the NEC. This Contractor shall furnish all materials necessary for mounting the branch circuit panelboards.
- D. Install units plumb, level and rigid without distortion to the branch circuit panelboard.
- E. Branch circuit panelboard interiors shall be factory assembled with circuit breakers, wire connectors, etc. Circuit breakers shall be sequence numbered to correspond with the panelboard directory.
- F. Connect the SPD to the appropriate circuit breaker.
- G. Contractor shall install required safety labels.
- H. The mounting of junction boxes, wire troughs, and auxiliary gutters to the top, bottom or sides of a branch circuit panelboard is prohibited unless approved by the FCPS technical inspection staff on a case by case basis.

3.02 FIELD TESTS

- A. Check tightness of all accessible mechanical and electrical connections to assure they are torqued to the minimum acceptable manufacturer's recommendations.
- B. Check all panelboards for proper grounding, fastening and alignment.

3.03 FIELD ADJUSTMENTS

- A. This Contractor shall perform field adjustments of the protective devices as required to place the equipment in final operating condition. Necessary field settings of devices and adjustments and minor modifications to equipment shall be carried out by this Contractor at no additional cost to the Owner.
- B. **(ENGINEER, DELETE THIS PARAGRAPH WHEN SECTION 16015 "SHORT-CIRCUIT/COORDINATION STUDY" IS NOT USED)** The settings shall be in accordance with the approved protective device coordination study or as directed by the Engineer.

3.04 CLEANING

- A. Remove debris from panelboards and wipe dust and dirt from all components.
- B. Repaint marred and scratched surfaces with touch-up paint to match original finish.

3.05 EXISTING BRANCH CIRCUIT PANELBOARDS

- A. This Contractor shall clean, adjust, and tighten all feeder and branch circuit connections (new and existing) and provide new typewritten directories (as described above) in all existing branch circuit panelboards that are associated with work on this project. Panelboards not associated with work on this project are not subject to this requirement.

END OF SECTION

SECTION 16440

DISCONNECT SWITCHES

PART 1 - GENERAL

1.01 REQUIREMENTS

- A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.02 SCOPE

- A. The work under this Section shall include furnishing and installing safety switches and/or bolted pressure switches as shown on the Drawings and herein specified.

1.03 QUALITY ASSURANCE

- A. All equipment, materials, and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements, and these Specifications.
- B. All equipment and materials shall be listed by Underwriter's Laboratories, Inc. (UL) for their intended use and shall bear the UL label.
- C. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.
- D. Submittals are required in accordance with SECTION 16010 of these Specifications.

PART 2 - PRODUCTS

2.01 SAFETY SWITCHES

- A. This Contractor shall furnish and install where shown on the Drawings, heavy-duty type safety switches. Safety switches shall be NEMA heavy-duty type HD only and shall be UL listed. The heavy-duty safety switches shall be manufactured by CUTLER-HAMMER, GENERAL ELECTRIC or SIEMENS.
- B. Switches shall have a quick-make and quick-break operating handle and mechanism that shall be an integral part of the enclosure. Switches shall be horsepower rated 250 volt for 120/208 volt systems or 600 volt for 277/480 volt system. The lugs shall be UL listed for copper conductors and be front removable. Ampere ratings shall be as indicated on the Drawings.

- C. Safety switches required and/or noted on the Drawings to be "four wire" shall be furnished by the manufacturer complete with a solid neutral assembly.
- D. Safety switches shall have defectable door interlocks that prevent the door from opening when the handle is in the "ON" position. Defeater mechanism shall be front accessible.
- E. Enclosures for the switches shall generally be NEMA 1 or NEMA 3R (rainproof) for exterior locations, or where noted "WP" on the Drawings.

2.02 BOLTED PRESSURE SWITCHES

- A. This Contractor shall furnish and install where shown on the Drawings, true bolted contact load-break type switches with provisions for NEMA Class L fuses (fuses shall be furnished and installed by this Contractor). The stored energy deadfront operating mechanism shall include disk springs, compressed and released by the operating handle, to provide quick-positive switching action independent of the speed with which it is operated. The mechanism shall be designed so that the switch can be closed only after the opening spring has been charged, ready for manual opening by mechanical pushbutton.
- B. The switch operating handle shall be mechanically interlocked with the fuse access door and have provisions for padlocking in OPEN position.
- C. The switch shall have an interrupting rating of twelve (12) times the continuous rating and capable of carrying 100% of rated current and shall have been tested in accordance with UL Subject 977. The switch shall be suitable for use on circuits having available fault currents of 65,000 RMS symmetrical amperes rated (250) (600) VAC and of the ampacity shown on the Drawings. High-pressure contact switches do not meet the intent of these specifications.
- D. The switch shall be complete with single phase protection to open the main device upon loss of any single phase but not upon simultaneous loss of all three (3) phases.
- E. The switch shall be complete with separate blown fuse protection to open the bolted pressure switch if one or more of the Class L fuses operate. Indicating lights mounted on the front of the switch shall be included as a means of showing that the fuses have operated. Operating lights shall operate only when a fuse has blown.
- F. The switch shall have two (2) sets of auxillary contacts (2 normally open and 2 normally closed) for switch position monitoring.
- G. A ground fault protection system shall be included for the bolted pressure switch

as shown on the Drawings or as required by NEC.

1. The system shall consist of a current sensor enclosing all phase and neutral conductors of the circuit to be monitored, and appropriate relaying equipment to provide the desired ground fault current sensitivity and time-current response characteristics. The switch shall be equipped to function in conjunction with the other elements of the ground fault protection system. Installation of the equipment shall be in all respects in accordance with the manufacturer's recommendations.
 2. A current sensor shall be provided of the size necessary to encircle the phase conductors and the neutral conductor of the circuit to be monitored. Current sensor output shall be coordinated with the required input to the relay. A test winding shall be included to simulate the flow of ground fault current through the current sensor in order to test the operation of the ground fault protection system including sensor pick-up relay, and circuit protective device operation. The frame of the current sensor shall be so constructed that one leg can be opened to allow removal of installation around cable or bus without disturbing the cable or requiring drop-links in the bus.
 3. The ground fault relay shall be of solid state construction, except that a coil operated output relay shall be provided to control 120 volt power to operate the associated fusible bolted pressure switch ground fault trip mechanism. The relay shall require 120 volt power to operate the associated main device. Adjustable pickup current sensitivity for ground currents from 200 amperes to 1200 amperes shall be provided. A calibrated dial shall be provided for setting the current pickup point in the field. Settings for individual relays shall be 1200 amperes **or as determined by the Short-Circuit Coordination Study whichever is lower**. Time delay provided by the relay circuitry shall be nominally 0.2 seconds **or as determined by the Short-Circuit Coordination Study** and shall be permanently calibrated. A self-contained test circuit utilizing the test coil provided in the current sensor shall be incorporated in the system. The test circuit shall be part of the monitor panel that shall be mounted on the front cover of the switch. **[ENGINEER, EDIT OUT SHORT-CIRCUIT STUDY PORTIONS IF NOT IN PROJECT]**
- H. The switch enclosure shall be NEMA 1, floor or wall mounted as shown on the Drawings.
- I. The switch shall be manufactured by PRINGLE and shall be type CBC or approved equal.

2.03 NAMEPLATE

- A. Disconnect switches, including exterior locations, shall have nameplates of 1/16 inch thick laminated plastic with 3/16 inch high white letters on a black background. Nameplates shall identify each piece of equipment and shall be mounted on the front top of the enclosure. Nameplates shall be screw fastened using stainless steel screws.
- B. Disconnect switches for elevator equipment shall also provide nameplates and signage to identify the location of the supply side overcurrent protective device, including circuit numbers, per NEC Article 620. Nameplates and signage shall be laminated plastic as hereinbefore described.

PART 3 - EXECUTION**3.01 INSTALLATION**

- A. The disconnect switches shall be securely mounted in accordance with the NEC, approximately forty eight (48) inches but no less than twelve (12) inches above the finished floor to the bottom unless otherwise noted.
- B. Mounting brackets and hardware exposed to weather shall be galvanized or otherwise suitably protected from corrosion.
 - 1. All NEMA 3R disconnect safety switches mounting openings not used must be permanently sealed to keep rain, moisture, insects, etc. from entering the switch housing. The use of stainless steel screws/nuts with rubber washers and silicone sealant may be used, or another approved method for a completely sealed switch housing.
- C. The fuses (type and size as noted on the Drawings) as specified shall be installed in disconnect switches requiring fuses. Rejection fuse clips shall be installed where called for on the Drawings or in these Specifications.
- D. Contractor shall install required safety labels.

END OF SECTION

SECTION 16445

ELECTRIC EQUIPMENT ENCLOSURES

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 OF WORK

- A. The work covered under this Section shall apply to the design and supply of pad mounted, weatherproof, electric equipment enclosures that are used to house electric equipment in outdoor environments.
- B. The electric equipment enclosures shall be as noted on the Contract Drawings.

1.03 QUALITY ASSURANCE

- A. All equipment, materials, and their installation shall conform to the requirements of the Virginia Uniform Statewide Building Code (VUSBC), 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. The supplier shall design and produce the electric equipment enclosures to meet the criteria noted in these specifications and as shown on the Drawings. The supplier shall be capable of producing a premium grade product, which meets the quality, fit and finish noted herein.
- E. The cabinet shall be designed to meet the approval of the local electrical utility (if applicable) and shall be designed for ease of maintenance.
- F. Submittals are required in accordance with SECTION 16010 of these specifications. Submittals shall include but not be limited to the following:
 - 1. Detailed cabinet and door shop drawings showing all fabrication and the layout of all internal components and equipment.
 - 2. List of all components (by manufacturer and model number) and product sheets for each item.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturers of Electric Equipment Enclosures are: HOFFMAN ENCLOSURES, INC., NJ SULLIVAN CO. or approved equal.
- B. The listing of the above manufacturers does not constitute automatic approval or final acceptance. It is the Contractor's responsibility to verify and document that any product selected from the above list does meet the requirements of the Contract Documents.

2.02 GENERAL MATERIAL REQUIREMENTS

- A. All materials shall be new.
- B. Unless otherwise noted, the cabinet shall be fabricated from 12 gauge galvanized post-fabrication, electrostatically primed and painted steel; or unpainted 12 gauge Type 304 or 316L stainless steel.
- C. All materials shall be corrosion resistant for extended life.
- D. Enclosures shall be rated NEMA 3R or 4X.

2.03 FABRICATION PROCESS

- A. The cabinet and doors shall be fabricated to plus or minus 10-thousandths of an inch tolerance for proper fit.
- B. All bending shall be done using a suitable break press.

2.04 CONNECTING HARDWARE

- A. All screws, bolts, washers, nuts, etc. shall be stainless steel.
- B. All screws shall be stainless steel pan-head machine screw type.
- C. No sheet metal or self tapping screws shall be used.

2.05 WELDING

- A. All exterior seams shall be of continuously welded construction. All welds shall be free of slag and spatter. All exterior welds shall be ground smooth.
- B. The supplier shall have suitable credentials to weld steel and shall adhere to all applicable ANSI standards.
- C. The supplier shall use a suitable welding process and materials.

2.06 DOORS AND HINGES

- A. Doors shall be designed for maximum strength and snug fit. It is the supplier's responsibility to design and fabricate the doors to the fit and finish required in this specification.
- B. Doors shall be fabricated out of a single sheet of steel and have wrap-around return for strength and fit.
- C. Doors shall have a one-piece gasket to provide a tight seal against contaminants entering the cabinet.
- D. Door handles shall be 3-point contact steel construction. The lever handles shall latch to the cabinet with 16-gauge stainless steel rails and rollers which shall be fabricated to provide a secure and well sealed attachment to the cabinet. Door handles shall be designed to accept a padlock. Bolted door closures or dogs are not allowed.
- E. The exterior of the doors shall have continuous welds.
- F. All exterior corners shall be rounded to a minimum radius of 1/8 of an inch. All sharp edges shall be de-burred to a minimum radius of 1/64 inch in order to reduce hazards to service personnel.
- G. Hinges shall be both corrosion resistant and vandal proof.

2.07 CABINET

- A. The cabinet and door shall be constructed to meet NEMA 3R or 4X standards. The cabinet shall be made up of the main body, roof section and inner wall. These components shall be welded together. The cabinet shall be designed for maximum strength and proper fit to the door.
- B. It is the supplier's responsibility to design and fabricate the cabinet to the fit and finish required in this specification.
- C. The cabinet shall be designed to attach to a concrete pad via suitable drop-in anchors, which shall be supplied with the cabinet.
- D. The exterior of the cabinet shall have continuous welds.
- E. The cabinet main body shall have a wrap-around return to accept the door.
- F. The cabinet shall have 120V weather-resistant ground fault duplex receptacle.
- G. The cabinet shall be equipped with lifting brackets, which shall be removable after installation.

- H. All exterior corners shall be rounded to a minimum radius of 1/8 of an inch. All sharp edges shall be de-burred to a minimum radius of 1/64 inch in order to reduce hazards to service personnel.

2.08 EQUIPMENT MOUNTING INNER WALL

- A. Equipment shall be mounted on the interior using mounts and fittings supplied with the enclosure. No penetrations of the outer enclosure shall be used to mount equipment.
- B. Equipment mounting panels shall be constructed from minimum 12 gauge sheet steel with a conductive, corrosion-resistant coating. Panels shall have edge flanges on two or four sides and lifting holes.

2.09 FINISH

- A. Upon completion of fabrication the cabinet, door and inner wall shall be finished as follows:
 - 1. Surfaces shall be thoroughly cleaned and degreased.
 - 2. Painted surfaces shall receive a prime coat electrostatically applied. After the prime coat has set, the top coat shall be electrostatically applied. Color shall be ANSI Dark Green or as shown on the Drawings.
 - 3. Stainless steel surfaces are unpainted. Front, sides, top and back shall have a smooth #4 brushed finish.
 - 4. The final product shall be free of dents, scratches, weld burns and abrasions harmful to its strength and general appearance.

2.10 GENERAL ELECTRICAL

- A. All equipment shall be mounted on stand-off back panels.
- B. All equipment shall be labeled using Lamicoid or vinyl adhesive labels with ½-inch high black characters on a white background.

2.11 METERING (WHEN REQUIRED)

- A. Metering location shall meet the approval of the local utility company. The metering shall be located for easy reading by the local utility.
- B. CT's and metering cabinets shall be sized and laid out to meet the local utility company's standards.

2.12 GROUNDING

- A. The grounding system shall be designed to meet all NEC standards and any codes and local utility standards.
- B. The grounding system shall be designed as part of the power distribution system.

2.13 EXTERNAL LIGHTING CONTROLS – SPORTS FIELDS [ENGINEER: EDIT OUT IF NOT USING]

- A. A weatherproof NEMA 3R pad-lockable box shall be provided and located as shown on the Drawings, for an On/Off pushbutton control station furnished as part of the Sports Field Lighting Control System. This control station switch will allow users to turn the lights on or off whenever the system is enabled by the remote system, on-site digital key pad, or time clock, see Specification Section 16545. The control station enclosure box shall be suitably located on the exterior of the Electrical Equipment Enclosure.

2.14 LABELING

- A. All products shall be labeled (inside) with the supplier's company name, model number, panel rating and the date of manufacture.
- B. The Contractor or supplier shall also provide adhesive Lamicoid or vinyl labels on the inside of each cabinet for each component. Each incoming feeder and output circuit shall also be labeled per the electrical design Drawings.
- C. All ID labels shall have ¼" to ½" high black characters on a white background.

2.15 PACKAGING

- A. Any product damaged in shipping shall be repaired or replaced at no cost to the Owner.

PART 3 – EXECUTION**3.01 FOUNDATIONS**

- A. The Contractor shall provide and install concrete pads for electrical equipment enclosures and utility transformers (if applicable) as shown on the Drawings.
 - 1. Concrete foundations for electrical equipment enclosures shall be as follows:
 - a) Minimum compressive strength at 28 days – 3500PSI
 - b) Maximum nominal aggregate size – 1 inch
 - c) Maximum W/C ratio by mass - 0.45

- d) Air content - $5 \pm 1\%$
 - e) Slump - $2'' \pm 0.75''$
- 2. Top of concrete bases shall be trowel finished smooth and level with beveled edges. Top surface shall not vary by more than 1/8 inch in depth as measured across the widest surface.
 - 3. All concrete shall be fully vibrated.
 - 4. Reinforcing Steel – Reinforcing to meet ASTM requirements. Spacing of bars shall be adjusted to suit conduit spacing.
- B. Excavated material may be used as backfill. All excess excavated material shall be disposed of off-site.

3.02 GROUNDING

- A. Install all grounding and bonding in accordance with NEC and the Contract Documents.

3.03 FIELD QUALITY CONTROL

- A. Inspect each installed unit for damage. Replace damaged components.
- B. Any paint damage shall be repaired by spray applied or other application that matches the factory finish to the maximum extent possible. Brush or roller applied repair painting is not allowed.

END OF SECTION

SECTION 16450

DRY-TYPE TRANSFORMERS

PART 1 - GENERAL

1.01 REQUIREMENTS

- A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.02 SCOPE

- A. The work under this Section shall include furnishing and installing TP-1 dry-type energy efficient transformers complete as shown on the Drawings and herein specified. Provide all lugs, accessories and mounting hardware necessary for proper installation and operation.

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. Transformers shall meet the requirements of Federal Law 10 CFR Part 431 "Energy Efficiency Program for Certain Commercial and Industrial Equipment" and bear the Energy Star® label.
- C. The transformer manufacturer shall be ISO 9001 or 9002 certified.
- D. All equipment and material shall be listed by Underwriter's Laboratories, Inc. (UL) for their intended use and shall bear the UL label.
- E. Equipment shall be constructed and tested in accordance with National Electrical Manufacturer's Association (NEMA) standards including TP-1, TP-2 and TP-3.
- F. Submittals are required in accordance with SECTION 16010 of these Specifications. The following minimum information shall be submitted:
 - 1. Outline dimensions and weights.
 - 2. Technical certification sheet.
 - 3. Transformer ratings including:
 - a. kVA

- b. Primary and secondary voltage.
- c. Taps.
- d. Design impedance.
- e. Insulation class and temperature rise.
- f. Sound level.

- 4. Product data sheets.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Handle transformers in accordance with manufacturer’s recommendations. Utilize factory provisions for all lifting, rigging, or hoisting.
- B. Store transformers prior to installation in a temperature and humidity controlled space. If such a space is not available, apply temporary heat in accordance with the manufacturer’s instructions within each ventilated type transformer case to exclude moisture and condensation.

PART 2 - PRODUCTS

2.01 MATERIALS AND COMPONENTS

- A. Dry-type energy efficient transformers shall be indoor, dry, ventilated, quiet type and shall be constructed and tested in accordance with the latest applicable standards of ANSI, NEMA and UL.

- B. Ratings:

- 1. KVA and voltage ratings shall be as shown on the drawings.
- 2. Transformers shall be designed for continuous operation at rated kVA, for 24 hours a day, 365 days a year operation, with normal life expectancy as defined in ANSI C57.96.
- 3. Transformer sound levels shall not exceed the following ANSI and NEMA levels for self-cooled ratings:

0	to	9 kVA	40 dB
10	to	50 kVA	45 dB
51	to	150 kVA	50 dB
151	to	300 kVA	55 dB
301	to	500 kVA	60 dB

- 4. Transformers shall be low loss type with minimum efficiencies as listed in NEMA TP-1 when operated at 35% of full load capacity. Efficiency shall be tested in accordance with NEMA TP-2.

- C. Insulation Systems:
1. Transformer insulation system shall be Class 220 degrees C insulation system with 150 degree C rise, ventilated design.
 2. Required performance shall be obtained without exceeding the above indicated temperature rise in a 40 degrees C maximum ambient, and a 24 hour average ambient of 30 degrees C.
 3. All insulation materials shall be flame-retardant and shall not support combustion as defined in ASTM Standard Test Method D635.
- D. Core and Coil Assemblies:
1. Transformer core shall be constructed with high-grade, nonaging, silicon steel with high magnetic permeability, and low hysteresis and eddy current losses. Maximum magnetic flux densities shall be substantially below the saturation point. The transformer core volume shall allow efficient transformer operation at 10% above the nominal tap voltage. The core laminations shall be tightly clamped and compressed. Coils shall be wound of high quality electrical grade aluminum with continuous wound construction.
 2. On three-phase units rated 15 kVA and above the core and coil assembly shall be impregnated with non-hygroscopic, thermosetting varnish and cured to reduce hot spots and provide a flame retardant seal and seal out moisture. The assembly shall be installed on vibration-absorbing pads. There shall not be any metal-to-metal contact between the core and coil assembly and the enclosure except for a flexible safety ground strap.
- E. Three-phase transformers rated 15 through 500 kVA shall be provided with six 2-1/2% taps, two above and four below rated primary voltage.
- F. Enclosure:
1. The enclosure shall be made of heavy-gauge steel. All transformers shall be equipped with a wiring compartment suitable for conduit entry and large enough to allow convenient wiring. The maximum temperature of the enclosure shall not exceed 90 degrees C. The core of the transformer shall be visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable UL and NEC standards.
 2. On three-phase transformers rated 15 kVA and above the enclosure construction shall be ventilated, NEMA 2, drip-proof, with lifting holes. All

ventilation openings shall be protected against falling dirt. Enclosures shall be finished with ANSI gray color, weather-resistant enamel.

3. On ventilated outdoor units provide suitable weathershields over ventilation opening, conforming to the requirements of NEMA 250, Type 3R. Suitable screens shall be provided to prevent insertion of foreign debris and animals in the ventilation openings.
- G. Dry-type transformers shall be as manufactured by EATON/CUTLER-HAMMER, GENERAL ELECTRIC or SIEMENS.

2.02 NAMEPLATE

- A. Transformers shall have nameplates of 1/16 inch thick laminated plastic with 3/16 inch high white letters on a black background. Nameplates shall identify the transformer and shall be mounted on the top front edge of the enclosure. Nameplates shall be screw fastened using stainless steel screws. Nameplates for transformers on emergency power shall have a red background.

PART 3 – EXECUTION

3.01 FACTORY TESTING

- A. The following standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with latest version of ANSI and NEMA standards.
1. Ratio tests at the rated voltage connection and at all tap connections.
 2. Polarity and phase relation tests on the rated voltage connection.
 3. Applied voltage tests.
 4. Induced potential test.
 5. No-load and excitation current at rated voltage on the rated voltage connection.

3.02 INSTALLATION

- A. Transformers, shown on the Drawings to be floor mounted shall have a four (4) inch high by four (4) inch greater all sides concrete base. Connections shall be made with flexible metal conduit.
- B. Transformer manufacturer's nameplates, marked in accordance with NEMA Specifications, shall be permanently attached to the transformer in a readily accessible position.

- C. Transformer secondary neutral shall be grounded as per NEC requirements, and/or hereinafter specified.
- D. This Contractor shall install the transformer to insure that the minimum clearances required by the transformer manufacturer are provided. These clearances shall be clearly labeled on the transformer by the manufacturer.
- E. Install units plumb, level and rigid without distortion.

3.03 ADJUSTMENTS AND CLEANING

- A. On completion of installation, inspect components. Remove paint splatters and other spots, dirt and debris. Repair scratches and mars on finish to match original finish. Clean components internally using methods and materials recommended by the manufacturer.
- B. Adjust transformer taps to provide optimum voltage conditions at utilization equipment throughout normal operating cycle of the facility. Measure and record primary and secondary voltages and tap settings and submit with test results.

3.04 FIELD TESTING

- A. Include the following minimum inspections and tests according to manufacturer's written instructions. Comply with IEEE C57.12.91 for test methods and data correction factors.
- B. Inspect accessible components for cleanliness, mechanical and electrical integrity and damage or deterioration. Verify that temporary shipping bracing has been removed. Include internal inspection through access panels and covers.
- C. Inspect bolted electrical connections for tightness according to manufacturer's published torque values or, if not available, those specified in UL 486A and UL 468B.

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. MAIN GROUNDING SYSTEM:

- 1. The ground bus in the main distribution switchboard shall be connected to at least three (3) copper-clad ground rods, not less than 3/4 inches in

diameter, ten (10) feet long, and driven full length into the ground outside in unpaved earth. Where required to meet the requirements of herein specified tests, extra rods shall be installed at no additional cost to the Owner. The rods shall be located a minimum of ten (10) feet from each other, or any other electrode, and shall be loop interconnected with each other by a minimum No. 4/0 AWG bare copper conductor thermal welded, using the proper style mold, to each rod below grade.

2. Provide a minimum No. 4/0 AWG green insulated copper ground conductor from the main distribution switchboard ground bus to the main metallic water service entrance (before the first pipe joint inside the building) and connect to same by means of adequate ground clamps. Where a dielectric main water fitting is installed, this ground conductor shall be connected to the street side of the dielectric water fitting. The conduit shall be bonded to the ground conductor at each end. Furnish and install with ground clamps, a minimum No. 4/0 AWG jumper around the water meter.
3. Provide a secondary building ground bar to serve as part of the building grounding electrode system in each electric room and other utilitarian areas of the building where dry-type transformers will be located, and in each communication room and/or where telecommunications main distribution frames (MDF) and sub-distribution frames (SDF) will be located. A ground bar(s) shall also be located at the telephone and CATV service entrance demarcation point(s). The ground bar(s) shall be electro-tin plated copper, minimum size of 1/4" x 6" x 12" or larger sizes as shown on the Drawings or required, with 3/8" plastic standoff insulators bolted to the wall. These ground bars shall be connected with a continuous No. 4/0 AWG bare copper ground conductor using high compression two (2) hole lugs. The No. 4/0 AWG ground conductor shall originate at the main switchboard ground bus and route through the building corridor ceilings unspliced to each of the ground bars. Provide "low smoke" type exothermic welds in an accessible ceiling using the proper style mold. Where impractical to use an exothermic weld due to space constraints, the Contractor may use an irreversible compression type connection listed for the purpose but only at locations approved by the Owner.
4. **(ENGINEER, USE THIS PARAGRAPH FOR AN ALL STEEL FRAMED BUILDING IN LIEU OF #3 ABOVE.)** Provide a secondary building ground bar to serve as part of the building grounding electrode system in each electric room and other utilitarian areas of the building where dry-type transformers will be located, and in each communication room and/or where telecommunications main distribution frames (MDF) and sub-distribution frames (SDF) will be located. A ground bar(s) shall also be located at the telephone and CATV service entrance demarcation

point(s). The ground bar(s) shall be electro-tin plated copper, minimum size of ¼" x 6" x 12" or larger sizes as shown on the Drawings or required, with 3/8" plastic standoff insulators bolted to the wall. These ground bars shall be connected with a continuous No. 4/0 AWG bare copper ground conductor using high compression two (2) hole lugs. The No. 4/0 AWG ground conductor shall originate at the nearest accessible building steel beam or column using a "low smoke" type exothermic weld with the proper style mold. Remove the building steel paint completely prior to making grounding connections and repaint with proper galvanized paint when complete.

5. **(ENGINEER, USE THIS PARAGRAPH FOR AN ALL STEEL FRAMED BUILDING.)** Bond the building steel at each building expansion joint with No. 4/0 AWG bare copper using a "low smoke" type exothermic weld using the proper style mold at accessible locations. Remove the building steel paint completely prior to making grounding/bonding connections and repaint with proper galvanized paint when complete.
6. New Buildings, Building Additions and Exterior Electrical Equipment Enclosures:
(ENGINEER TO EDIT PARAGRAPHS BELOW TO SUIT PROJECT)
 - a. Buildings with new concrete foundations and/or footings shall be provided with a minimum No. 4 AWG bare copper ground conductor from the main distribution switchboard ground bus to the foundations and/or footings concrete-encased electrode rebar meeting the requirements of NEC 250.52(A)(3). The conductor shall be thermal welded to the concrete-encased electrode (rebar), using the proper style mold. Refer to the detail on the Drawings. **(ENGINEER EDIT OUT THIS PORTION IF NOT USING)** Building additions foundations and/or footings not within a reasonable distance from the switchboard may have the concrete-encased electrode bonded to the buildings secondary building electrode system ground bar.
 - b. Exterior electrical equipment enclosures with new concrete foundations and/or footings shall be provided with a bare copper ground conductor from the ground rods (if provided) and/or from the ground bus of the main panel within the enclosure to the concrete-encased electrode, meeting the requirements of NEC 250.52(A)(3), as shown on the Drawings. The conductor shall be thermal welded to the concrete-encased electrode (rebar), using the proper style mold. The enclosure, if metal, shall be bonded to the grounded electrode.
 - c. **(ENGINEER, USE THIS PARAGRAPH FOR A STEEL FRAMED**

BUILDING.) Steel frame buildings shall also have the steel columns anchor bolt connected to the concrete-encased electrode (rebar) with a No. 4/0 AWG bare copper ground conductor having an exothermic weld at both ends, using the proper style molds. Coordinate the installation of the anchor bolts to the base plate to scrape away paint/rust prior to the installation of the washer and nut to the steel columns anchor bolts. Refer to the detail on the Drawings.

- B. Secondary services shall be grounded on the "line" side in accordance with the NEC. The neutral disconnecting link, or links, shall be located so that the main distribution switchboard neutral bus with all interior secondary neutrals can be isolated from the common ground bus and the service entrance conductors.
- C. The equipment grounding conductors and straps shall be sized in compliance with the NEC. All equipment grounding conductors shall be provided with green insulation equivalent to the insulation on the associated phase conductors. The related feeder and branch circuit grounding conductors shall be connected to the ground bus with pressure connectors. A feeder serving several panelboards shall have a continuous grounding conductor which shall be connected to each related cabinet ground bus.
- D. 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.
- E. This Contractor shall furnish and install in the same raceway with the associated phase and/or neutral conductors, a green colored equipment ground conductor having the same type insulation and connected as described below:
 - 1. Where electrical devices, such as heaters, are installed in air ducts, provide a green insulated equipment ground conductor sized in accordance with the NEC based on the rating of the overcurrent device supplying the unit. This conductor shall be bonded to the ground bus in the associated panelboard.

2. From the equipment ground bus in panelboards through raceways and flexible metallic conduit to ground terminal in a connection box mounted on three-phase motors, furnish and install a ground conductor sized as herein specified. Where the motor has a separate starter and disconnecting device, the ground conductor shall originate at the ground bus in the panelboard. Motors shall be bonded to each starter and disconnecting device enclosure.

PART 3 - EXECUTION

3.01 POWER SYSTEM GROUNDING

- A. This Contractor shall furnish and install green insulated ground conductor(s) in a raceway to the main ground and domestic metallic water main with ground clamps designed specifically for that purpose.
- B. Main distribution system: From the ground electrodes, this Contractor shall furnish and install an insulated ground conductor to the ground bus within the switchgear, to the neutral of the switchgear, and to all non-current carrying parts.
- C. Secondary building grounding: Furnish and install secondary building ground bars where indicated and as detailed on the drawings. Connect the ground bars with No. 4/0 AWG bare copper ground conductors originating from the (switchgear ground bus) (building steel). Provide green tags on the ground conductors every fifty (50) feet or less. The tags shall identify the ground conductor as the building secondary grounding electrode system. Laminate tags and secure with tie wraps.
- D. 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 jumpers: This Contractor shall furnish and install a green insulated bonding conductor (size shall correlated with the over-current device protecting the conductor) attached to grounding bushings on the raceway, to lugs on boxes, and other enclosures.
- F. Bonding conductors: This Contractor shall furnish and install a bonding conductor in all flexible conduits connected at each end to a grounding bushing.
- G. Pole mounting luminaire (lighting fixture) grounding: This Contractor shall furnish and install a ground conductor with green insulation to the lighting standard (pole). Connect to a corrosion-resistant ground stud or ground clamp furnished as part of the standard. The ground conductor shall originate and be run with the branch circuit wiring.

- H. All electrical outlets shall be connected from the device grounding terminal to the outlet box with No. 12 AWG green insulated conductor. This Contractor shall furnish and install a green screw terminal in the outlet box and a continuous green ground conductor from the green terminal screw to the grounding systems as indicated on the Drawings.

3.02 COMMUNICATION GROUNDING

- A. Telephone
 - 1. This Contractor shall furnish and install one (1) No. 2 AWG green ground conductor in a $\frac{3}{4}$ inch raceway from the telephone equipment demarcation space to the main service ground or building secondary grounding electrode system.
 - 2. This Contractor shall furnish and install one (1) No. 2 AWG type green ground loop between each raceway terminating at the telephone equipment demarcation backboard by means of a grounding bushing.
- B. Fire detection and alarm systems: This Contractor shall furnish and install one (1) No. 8 AWG green ground conductor in a $\frac{3}{4}$ inch raceway from system equipment enclosures to the main service ground or building secondary grounding electrode system.
- C. Ancillary communication systems: Provide additional grounding of other building systems as described elsewhere in these specifications.

3.03 TESTS

- A. The completed grounding system shall be subjected to a ground resistance test with an earth test megger to ensure that the ground resistance, without chemical treatment or other artificial means, does not exceed five (5) ohms at the service entrance equipment's ground bus. The Contractor shall furnish and install additional ground rods and conductors from the exterior ground grid to achieve the required resistance to ground. Testing equipment must be calibrated to the manufacturer's requirements. Upon request, the Contractor shall provide documentation of the testing equipment's most recent calibration.
- B. **(ENGINEER, USE THIS PARAGRAPH FOR AN ALL STEEL FRAMED BUILDING.)** In addition to the above, steel framed buildings shall be subjected to a ground resistance test with an earth test megger for the adequacy of the steel framing of the building as a grounding electrode system for five (5) ohms or less. Testing shall be at all of the secondary building ground bar connection points. If testing results do not meet the required resistance, the engineer must be notified.

END OF SECTION

SECTION 16470

ENCLOSED CIRCUIT BREAKERS

PART 1 - GENERAL

1.01 REQUIREMENTS

- A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.02 SCOPE

- A. The work under this Section shall include furnishing and installing enclosed circuit breakers and/or molded case switches as shown on the Drawings and herein specified.

1.03 QUALITY ASSURANCE

- A. All equipment, materials, and their installation shall conform to the requirements of the National Electrical Code (NEC), local code requirements, and these Specifications.
- B. All equipment and materials shall be listed by Underwriter's Laboratories, Inc. (UL) for their intended use and shall bear the UL label.
- C. Equipment shall be constructed in accordance with National Electrical Manufacturer's Association (NEMA) standards.
- D. Submittals are required in accordance with SECTION 16010 of these Specifications. The manufacturer shall furnish, but not be limited to the following:
 - 1. Circuit breaker enclosure with dimensions and nameplate designation.
 - 2. Circuit breaker trip ratings and frame sizes.
 - 3. Conduit entry/exit locations.
 - 4. Assembly ratings, including short-circuit rating, voltage, and continuous current rating.
 - 5. Cable terminal sizes.
 - 6. Product data.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver material and products in factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations.
- B. Each unit shall be delivered in individual shipping cases and individually wrapped for protection.
- C. Store in a clean, dry space. Maintain factory protection and /or provide an additional heavy canvas or heavy plastic cover to protect equipment from dirt, water, construction debris, and traffic. Where applicable, provide adequate heating within enclosures to prevent condensation.
- D. Handle carefully to avoid damage to panelboards internal components, enclosure and finish.

PART 2 - PRODUCTS**2.01 MANUFACTURERS**

- A. The enclosed circuit breaker(s) shall be as manufactured by CUTLER-HAMMER, GENERAL ELECTRIC or SIEMENS.

2.02 MATERIALS AND COMPONENTS

- A. Enclosed circuit breakers shall be furnished and installed by this Contractor as shown on the Drawings. Enclosed circuit breakers shall be UL listed.
- B. Enclosed circuit breakers required and/or noted on the Drawings to be "four wire" shall be furnished by the manufacturer complete with a solid neutral assembly.
- C. Enclosed circuit breaker enclosures shall generally be NEMA 1 or NEMA 3R (rainproof) for exterior locations, or where noted "WP" on the Drawings.

2.03 CIRCUIT BREAKERS

- A. Electrical circuits shall be protected by molded case circuit breakers as indicated on the Drawings.
- B. The circuit breakers shall be operated by a toggle type handle and shall have a quick-make, quick-break over-center switching mechanism that shall be mechanically trip free from the handle so that the contacts cannot be held closed against short circuits and abnormal currents. Tripping due to overload or short circuit shall be clearly indicated by the handle automatically assuming a position midway between the manual "ON" and "OFF" positions. All latch surfaces shall

be ground and polished. All poles of a multi-pole breaker shall be so constructed that they open, close, and trip simultaneously.

- C. The circuit breakers shall be completely enclosed in a molded case. Non-interchangeable trip breakers shall have their covers sealed; interchangeable trip breakers shall have the trip unit sealed to prevent tampering. Ampere ratings shall be clearly visible. Contacts shall be non-welding silver alloy. Arc extinction shall be accomplished by means of arc chutes consisting of metal grids mounted in an insulating support. Breakers shall be of the bolt-on type; plug-in, plug-on, blow-on, and clamp-on circuit breakers shall not be acceptable.
- D. Circuit breakers shall be 80% rated unless indicated on the Drawings to be 100% rated.
- E. Circuit breakers shall have a minimum symmetrical interrupting capacity as indicated on the Drawings. The interrupting ratings of the circuit breakers shall be at least equal to, or greater than, the available short circuit at the line terminals and not less than those values shown on the Drawings and specified in this specification section **or as determined by the Short-Circuit Coordination Study whichever is higher. [ENGINEER, EDIT OUT SHORT-CKT STUDY IF NOT IN PROJECT]**
- F. Circuit breakers shall be listed with UL, conform to the applicable requirements of the latest issue of NEMA Standards Publication No. AB1.
- G. Circuit breakers shall have thermal-magnetic trip units, with inverse time-current characteristics, unless otherwise noted on the Drawings.
 - 1. Automatic operation of all circuit breakers shall be obtained by means of thermal-magnetic tripping devices located in each pole providing inverse time delay and instantaneous circuit protection. Instantaneous pick-up settings for each phase shall be adjustable on all frames 250A and above.
 - 2. Circuit breakers shall be ambient compensating in that, as the ambient temperature increases over 40° C, the circuit breaker automatically derates itself to better protect its associated conductor.
 - 3. Circuit breakers 250A and above shall have thermal magnetic interchangeable trip units.
- H. Circuit breaker frames 400 ampere and above shall have microprocessor-based RMS sensing trip units on 480 volt systems and on 208 volt systems where indicated on the Drawings.

1. Solid State sensing shall measure true RMS current with capability to measure through to the 21st harmonic. Automatic operation of all circuit breakers shall be obtained by means of solid state tripping elements providing inverse time delay and instantaneous and short-time circuit protection. Continuous current rating shall be adjustable from 20% to 100% of trip unit rating. Long-time delay and instantaneous trip ratings shall also be adjustable. The short time pick-up trip shall have adjustable pick-up settings at definite times and with I2t delay.
 2. Long time current adjustment shall be possible without the need for a rating plug.
 3. Where specifically indicated on the Drawings, enclosed circuit breakers shall be provided with integral ground fault protection. Ground fault pick-up shall be adjustable from 20% to 70% of the breakers maximum continuous current rating, but in no case be greater than 1200A. Ground fault time delay shall be adjustable with three (3) I2t delay settings.
 4. Solid State circuit breakers shall have built-in test ports for testing the long-time delay, instantaneous, and ground fault functions (if equipped) of the breaker by means of a test set.
 5. Provide one test set capable of testing all circuit breakers with a built-in test port, unless previously provided under another section of these specifications.
- I. Circuit breaker accessories:
1. Provide shunt-trips, bell alarms and auxiliary switches, etc. as may be shown on the drawings. All accessories shall be UL Listed for field installation.
 2. Coils for the shunt-trip circuit breakers associated with the elevator shut-down system, activated by the Fire Alarm and Detection System shall be coordinated with the Fire Alarm and Detection System for the proper coil voltage of the shunt-trip device.
- J. Circuit breakers shall be manufactured by the same manufacturer as the panelboards and the circuit breaker enclosure and be factory installed.
- K. Lugs shall be rated for 75 degrees C terminations and shall bolt in place.
- L. Where indicated, circuit breakers shall be UL listed for series application. **(ENGINEER TO EDIT OUT THIS PARAGRAPH IF NOT USING SERIES CONNECTED BREAKERS.)**

2.04 MOLDED CASE SWITCHES

- A. Where indicated on the Drawings provide enclosed molded case switches. Molded case switches shall employ the same operating mechanism as the thermal magnetic and magnetic only circuit breaker units described above. The molded case switch shall have a factory preset instantaneous function to allow the switch to trip and protect itself at a high fault current, without thermal overload protection.

2.05 NAMEPLATES

- A. Enclosed circuit breakers and or molded case switches, including exterior locations, shall have nameplates of 1/16 inch thick laminated plastic with 3/16 inch high white letters on a black background. Nameplates shall identify each piece of equipment and shall be mounted on the front top of the enclosure. Nameplates shall be screw fastened using stainless steel screws.

PART 3 - EXECUTION**3.01 INSTALLATION**

- A. The enclosed circuit breakers shall be securely mounted in accordance with the NEC, approximately forty eight (48) inches but no less than twelve (12) inches above the finished floor to the bottom unless otherwise noted.
- B. Mounting brackets and hardware exposed to weather shall be galvanized or otherwise suitably protected from corrosion.
- C. Install units plumb, level and rigid without distortion to the units.
- D. Contractor shall install required safety labels.

3.02 FIELD TESTS

- A. Check tightness of all accessible mechanical and electrical connections to assure they are torqued to the minimum acceptable manufacturer's recommendations.
- B. Check all enclosed circuit breakers and enclosures for proper grounding, fastening and alignment.

3.03 FIELD ADJUSTMENTS

- A. This Contractor shall perform field adjustments of the protective devices as required to place the equipment in final operating condition. Necessary field settings of devices and adjustments and minor modifications to equipment shall

be carried out by this Contractor at no additional cost to the Owner.

- B. **(ENGINEER, DELETE THIS PARAGRAPH WHEN SECTION 16015 “SHORT-CIRCUIT/COORDINATION STUDY” IS NOT USED)** The settings shall be in accordance with the approved protective device coordination study or as directed by the Engineer.

3.04 CLEANING

- A. Remove debris from enclosed circuit breaker enclosures and wipe dust and dirt from all components.
- B. Repaint marred and scratched surfaces with touch-up paint to match original finish.

END OF SECTION

SECTION 16545

SPORTS FIELD LIGHTING SYSTEM AND LIGHTING 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 Sports Field Lighting System(s), and Sports Field Lighting Control and Monitoring System(s) complete as shown on Drawings and as herein specified.
- B. The Sports Field Lighting Systems shall include field lighting luminaires, egress/entry luminaires, and support structures to include: poles; foundations; crossarms; and other appurtenances, complete as shown on Drawings and as herein specified.
- C. The Sports Field Lighting Control and Monitoring System shall be for the control of Sports Field Lighting System(s) and other equipment as shown or 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.
 - 1. The systems shall include but not be limited to microprocessor controlled relay panels controlled via wireless communication based equipment, switches, and Digital Time Clock (DTC), and other devices to provide the required functionality of the system. The system shall also include contactors, cabinets, interface cards, and other devices or equipment as shown on the Drawings. 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. 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.

1.03 DEFINITIONS

- A. Coefficient of Utilization (CU):
 - a. A measurement of the efficiency of a luminaire in transferring luminous

energy to the field surface.

- B. Coefficient of Variation (CV):
 - 1. A measure of the weighted average of all relevant illuminance values. Defined by IESNA Lighting Handbook, Ninth Edition, Chapter 20.
- C. Design Documents:
 - 1. Documents, including drawings, calculations, and material and product specifications prepared to obtain acceptance by Owner and authorities having jurisdiction.
- D. Horizontal Illuminance:
 - 1. Illuminance measured in footcandles (FC), on a horizontal surface three (3) feet above the playing surface (ground), unless otherwise indicated.
- E. Illuminance:
 - 1. Concentration of incident light falling on a surface.
- F. LLD:
 - 1. Lamp lumen depreciation. The fractional loss of lamp lumens at rated operating conditions that progressively occurs during lamp operation.
- G. LLF:
 - 1. Light loss factor. Factor used to adjust lighting calculations from initial values obtained in a controlled laboratory environment to maintained values in actual field conditions.
- H. Support Assembly:
 - 1. Includes poles or other support structures, brackets, arms, appurtenances, base, anchorage, and foundation.
- I. Target Illuminance:
 - 1. Illuminance level used for calculations during system design to determine if the system meets a desired performance standard.
- J. Vertical Illuminance:
 - 1. Illuminance, measured in footcandles, in two (2) directions on a vertical surface, at an elevation coinciding with plane height of horizontal measurements, unless otherwise indicated.

1.04 LIGHTING PERFORMANCE

A. Illumination Criteria:

1. BASEBALL/SOFTBALL

- a. Minimum Average Target Illumination: 50 FC infield and 30 FC outfield.
- b. Maximum-to-minimum Uniformity Ratio: 2:1 infield or less and 2.5:1 outfield or less.
- c. CV: 0.17 or less infield and 0.21 or less outfield.

2. FOOTBALL/STADIUM*

- a. Minimum Average Target Illumination: 30 FC
- b. Maximum-to-minimum Uniformity Ratio: 3:1 or less.
- c. CV: 0.25 or less.

3. TRACK AND FIELD*

- a. Minimum Average Target Illumination: 20 FC track (at surface of track) and 30 FC for field event areas and all areas inside the track.
- b. Maximum-to-minimum Uniformity Ratio: 4:1 or less.
- c. CV: 0.3 or less.

*The football/stadium includes the track and field playing surfaces as well as other sports such as soccer and lacrosse. Stadiums shall have the entire area inside the track lighted to a minimum average target illumination of 30 FC and the track lit to a minimum average target illumination of 20 FC. FIELD EVENT areas (such as pole vaults, broad jumps, etc.) located outside of the track shall have these areas lit to a minimum average target illumination of 30 FC. This criterion is the same for standalone TRACK and FIELDS.

B. Illumination Levels and Design Factors: Playing surfaces shall be lit to an average target illumination level and uniformity as specified in the chart below. Lighting calculations shall be developed and field measurements taken on the grid spacing with the minimum number of grid points specified below. Appropriate light loss factors shall be applied and submitted for the basis of design. Average illumination level shall be measured in accordance with the IESNA LM-5-04

SPORTS FIELD LIGHTING SYSTEM AND LIGHTING CONTROL SYSTEM SECTION 16545

(IESNA Guide for Photometric Measurements of Area and Sports Lighting Installations). Illumination levels shall not to drop below desired target values in accordance to IES RP-6-15, Page 2, Maintained Average Illuminance and shall be guaranteed for the full warranty period.

- C. Computer-analyzed illumination calculations shall include, but not limited to, the following:
1. Grid Pattern Dimensions: For playing areas of each sport and areas of concern for spill-light control, correlate and reference calculated parameters to the grid areas. Each grid point represents the center of the grid area defined by the length and width of the grid spacing. The grid pattern dimensions shall generally be 30 feet by 30 feet, unless indicated otherwise. Each grid point shall be considered a field test station for purposes of field testing described later in these specifications.
 2. Spill-Light Control: Minimize spill light for each playing area on adjacent and nearby areas. These levels shall be initial footcandles and shall be measured at a maximum distance of 150 feet from the boundary of the playing field(s).
 - a. Prevent light trespass on properties near the playing field(s) as defined by Fairfax County Lighting Ordinance 14-904, Fairfax County's Outdoor Lighting Standards and these specifications.
 - b. For areas indicated on the Drawings as "Spill-Light Critical", limit the level of luminance directed into the area from any luminaire or group of luminaires, and measured 36 inches above finished grade to the following:
 - 1) Maximum Horizontal Illuminance: 0.5 FC.
 - 2) Maximum Vertical Illuminance from the direction of the greatest contribution of light: 0.3 FC.
 - c. Calculate the horizontal and vertical illuminance due to spill light for points spaced 20 feet apart in areas indicated on the Drawings as "spill-light critical" and 30 feet apart in other "non-critical" areas, to ensure that design meets above limits. Each spill-light point shall be considered a field test station for purposes of field testing described later in these specifications.
 3. Glare Control: Minimize direct glare in adjacent and nearby areas and properties. These levels shall be measured at a maximum distance of 200 feet from the boundary of the playing field(s).
 - a. The intensity of luminaires that may be observed at an elevation of 60 inches above finished grade from nearby areas

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and properties shall be less than 7,000 candela when so observed.

b. The intensity of luminaires that may be observed at an elevation of 60 inches above finished grade from designated "spill-light critical" areas at nearby properties shall be less than 4,000 candelas when so observed.

c. Calculate and measure the glare points spaced 20 feet apart in areas indicated on the Drawings as "spill-light critical" and 30 feet apart in other "non-critical" areas, to ensure that design meets above limits. Each glare point shall be considered a field test station for purposes of field testing described later in these specifications.

4. Luminaire Mounting Height: Comply with IESNA RP-6-15 with consideration for requirements to minimize spill light and glare. Luminaire mounting heights are to the lowest sports lighting luminaire measured above the playing field elevation.
5. Luminaire clusters shall be located outside of the playing field glare zones defined by IESNA RP-6-15.
6. Egress/Entry Lighting: Provide LED luminaires to provide an average of 1.0 FC illumination measured at grade in spectator and spectator egress/entry areas. These luminaires shall operate upon initial activation of the sports field lights and upon deactivation of the sports field lights. Momentary power interruptions shall activate the egress/entry lighting immediately following restoration of power to the lighting circuits. The duration of these lights illumination shall not be less than 15 minutes, for each occurrence stated above, and then automatically extinguished.

1.05 QUALITY ASSURANCE

- A. Sports field lighting systems and the control systems shall meet the requirements of the National Electrical Code (NEC), state and local codes, including Fairfax County's Outdoor Lighting Standards, and these Specifications.
- B. The entire sports field lighting system, which includes the support assemblies, shall be listed by Underwriters Laboratories, Inc. (UL) as a system as well as each individual component having its own UL listing or classification.
- C. The Sports Field Lighting Controls and Monitoring System lighting control panels (LCP) shall be UL 916 Listed. LCP's controlling emergency operation by a relay panel shall fully comply with NEC 700.9(B). This Contractor is responsible for verifying compliance.

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1. Control wiring shall be in accordance with the NEC requirements for Class 2 remote control systems, Article 725 and manufacturer's specification and requirements.
- D. All materials used shall be new and of good quality conforming to these specifications and the successfully reviewed submittals. Any material not successfully reviewed by the Architect/Engineer that is incorporated in the work, used or delivered to the site, shall be immediately removed upon the order of the Owner or Architect/Engineer and replaced to the satisfaction of the Owner and Architect/Engineer at this Contractor's expense.

1.06 SUBMITTALS

- A. This Contractor shall furnish submittals for the **Sports Field Lighting System(s)** in accordance with SECTION 16010 of these Specifications. Submittals for review shall include but not be limited to the following:
 1. Design Calculations for the following:
 - a. Target Illuminance(s).
 - b. Complete computer-generated point-by-point photometric calculations of horizontal and vertical illuminance, at minimum grid size and area for each sports field(s).
 - 1) The exact quantities of luminaires may differ from the original design, but the required footcandle levels, CV, CU, uniformity ratios, spill-light and glare control must be maintained using the same design criterion shown on the drawings and/or specified herein. Should the luminaire manufacturer require additional luminaires to achieve the stated footcandle levels, uniformity and/or require additional branch circuit wiring, supports, support assembly, etc., in conjunction with these additional luminaires, shall not cause additional expense to the Owner.
 - c. Computer-generated spill/glare analysis in accordance with the lighting performance specifications.
 - d. Total electrical load, in kilowatts, of lighting system and for each individual pole.
 2. Provide an aiming plan for each sports luminaire.
 3. Manufacturers must provide the first page of a photometric report for all luminaire types proposed showing horizontal and vertical axial candle power shall be provided to demonstrate the capability of achieving the

specified performance. Reports shall be certified by a qualified independent testing laboratory with a minimum of five years experience or by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products. A summary of the horizontal and vertical aiming angles for each luminaire shall be included with the photometric report.

4. Provide pole and foundation design drawings signed and sealed by a Professional Engineer registered in the Commonwealth of Virginia. Pole drawings shall indicate the design criteria, assumptions, codes, standards, and all foundation reaction forces and moments. Foundation drawings shall indicate the design criteria allowable soils bearing pressures, codes, standards, all foundation reaction forces and moments, construction specifications, materials, and specific installation requirements such as shoring or de-watering. For the purpose of this bid, the Contractor shall assume the following type of sub-grade material specified in the current adopted edition of the International Building Code, Section 1804, Table 1804-2 – Allowable Foundation and Lateral Pressure:
 1. Soils – Class 5 (clay and sandy clay)
 5. Provide data and drawings for all lighting system equipment, service platforms, crossarms and other accessories specified herein and as shown on the Drawings.
- B. This Contractor shall furnish submittals for all components of the **Sports Field Lighting Control and Monitoring System(s)** in accordance with SECTION 16010 of these Specifications. Submittals for review shall include but not be limited to the following:
1. Shop Drawings: Submit dimensioned drawings of complete lighting control systems and accessories including, but not necessarily limited to, relay panels, switches, DTC, contactors, cabinets, and other interfaces. Shop drawings shall indicate exact location of each device. Plans shall be diagrammatical. "Cut Sheet" submittals not acceptable.
 2. Product Data: Submit for approval manufacturer's data on the specific lighting control and monitoring 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 a project specific one-line diagram of the system configuration indicating the type, size and number of conductors

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between each component. Submittals that show typical one-line or riser diagrams are not acceptable.

4. Schematics: Submit wiring schematics for switches and remote control system including all relays and contactors.
5. 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.

1.09 DESCRIPTION – SPORTS FIELD LIGHTING SYSTEM

- A. This Contractor shall furnish and install sports field luminaires complete with diffusers, louvers, glassware, gaskets, shims, wiring, control, conduit, hardware, driver, and other appropriate devices and parts for a complete exterior weatherproof sports field lighting system installation. Adjustable fixtures shall be aimed in accordance with the luminaire manufacturer's recommendations. Each luminaire shall be installed by this Contractor complete with the proper type of new lamp(s).
- B. Poles and support assemblies shall be designed and constructed so that all wiring and grounding facilities are concealed. All handholes, wire inlets/outlets, inserts for pole steps, thru-bolt holes and ground wire shall be cast or fitted into the pole during the manufacturing process.

1.10 DESCRIPTION – SPORTS FIELD LIGHTING CONTROL AND MONITORING SYSTEM

- A. The Sports Field Lighting Control and Monitoring System shall be a microprocessor controlled wireless control system that controls and monitors the operation of sports field lighting. The system shall be comprised of Lighting Control Panel(s), suitable cabinet enclosures, contactors, relays, TCP/IP communication link and control software to provide the required functionality.
 1. The system shall monitor lighting performance and notify the manufacturer if individual luminaire outage is detected so that appropriate maintenance can be scheduled. The manufacturer shall notify the Owner of outages within 24 hours, or the next business day. The controller shall determine switch position (Manual or Auto) and contactor status (open or closed).
 2. The system shall allow the Owner and users with a security code to schedule on/off system operation via a web site, telephone, fax or email up to ten (10) years in advance. Manufacturer shall provide and maintain a two-way TCP/IP communication link. Trained staff shall be available 24/7 to provide scheduling support and assist with reporting needs. The Owner may assign various security levels to schedulers by function

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and/or fields. This function must be flexible to allow a range of privileges such as full scheduling and capabilities for sports fields, to only having permission to execute "early off" commands by telephone. The controller shall accept and store 7-day schedules, be protected against memory loss during power outages, and shall reboot once power is restored and execute any commands that would have occurred during said power outage.

3. Manufacturer of the systems shall include communications costs for the operation of the controls and monitoring systems for the length of the warranty and maintenance period.
4. Manufacturer shall provide a web-based database of actual field usage and provide reports by facility and user group.

1.11 ALTERNATIVE SYSTEMS

- A. Compliance to Specifications: Acceptance of alternative (substitution) systems or equipment does not negate the Contractor and the lighting and control manufacturer's responsibility to comply fully with the requirements of these specifications. Any exceptions to the specifications must be clearly stated in the 10-day Prior Approval submittal documents. Refer to specification sections 16010 and 01630.
- B. Lighting Performance Requirements: Manufacturer shall provide computer models guaranteeing the lighting performance, hereinbefore described under LIGHTING PERFORMANCE, for a period of 25 years. For alternative systems, scans for both initial and maintained light levels shall be submitted. All computer generated models shall also include the spill-light control and glare control criterion.
- C. Revised Electrical Distribution: Manufacturer shall provide revised electrical distribution plans to include any changes to the electrical service entrance, panelboards, branch circuits, wire sizing, etc. associated with an alternative system or equipment.
- D. Associated Costs: Contractor and the lighting system and controls manufacturer shall be responsible for any additional costs associated with an alternative system or equipment, including engineering costs from the engineer of record.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. It is the intent of these specifications that the Sports Field Lighting System and the Sports Field Lighting Control and Monitoring System manufacturer be the same manufacturer in order to have a complete sports field lighting system and

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control system from a single manufacturer. Such firms shall be regularly engaged in the manufacture of sports lighting equipment and lighting control equipment and ancillary equipment, of types and capacities necessary to provide the required functionality, whose products have been in satisfactory use in similar service for not less than 5 years.

- B. Acceptable Sports Field Lighting System Manufacturers shall be: MUSCO LIGHTING, LLC (Light-Structure with TLC for LED) or approved equal.
- C. Acceptable Egress/Entry Luminaire Manufacturers shall be MUSCO LIGHTING, LLC (Light-Structure with TLC for LED) or approved equal or as shown on the Drawings.
- D. Acceptable Hybrid Steel Pole with Pre-stressed concrete foundation base manufacturers shall be MUSCO LIGHTING, LLC, or approved equal.
- E. Acceptable Service Platforms and Crossarm Brackets manufacturers shall be MUSCO LIGHTING, LLC or approved equal (If Required).
- F. Acceptable Sports Field Lighting Controls and Monitoring System manufacturers shall be MUSCO LIGHTING, LLC [Basis of Design] or approved equal.
- G. The listing of the above products and manufacturers does not constitute automatic approval or final acceptance. Products must meet the lighting performance and control requirements. It is the Contractor's responsibility to verify and document that any product selected from the above list does meet the requirements of these specifications.

2.02 LUMINAIRES

A. SPORTS LUMINAIRES

1. Light Control Luminaires: All LED luminaires shall utilize spill light and glare control devices including, but not limited to, internal shields, louvers and external shields. No symmetrical beam patterns are accepted. Color: The lighting system shall have a minimum color temperature of <5700K and a CRI of 75.
2. Manufacturer will supply all drivers and supporting electrical equipment
 - Remote drivers and supporting electrical equipment shall be mounted approximately 10 feet above grade in aluminum enclosures. The enclosures shall be touch-safe and include drivers and fusing with indicator lights on fuses to notify when a fuse is to be replaced for each luminaire. Disconnect per circuit for each pole structure will be located in the enclosure.

- Alternate: Integral drivers mounted at the top of the pole will require a pole mounted enclosure approximately 10 feet above grade. The enclosure shall include a disconnect per circuit and surge protection.

3. The mounting hardware shall be heavy-gauge steel protected by a weather-resistant coating. The mounting hardware shall be capable of allowing the floodlight to be moveable in all directions, containing degree markers and a repositioning stop. Each luminaire shall be pre-aimed. Each luminaire aiming location shall be verified in order to comply with IESNA recommendations. Each luminaire shall have a memory positioning device for automatic repositioning after re-lamping. To ensure added durability, luminaire visors/glare shields and platform/crossarm shall withstand 150 mph winds and maintain luminaire aiming alignment.

B. EGRESS/ENTRY WALK-WAY LUMINAIRES

1. Walkway luminaires shall be a heavy-duty, weather-resistant floodlight for operation of one (1) 400-1150 watt LED. The floodlight shall contain a complete optical assembly with NEMA type beam spread (horizontal X vertical), prewired with leads for connection to the power source. The floodlight shall have a NEMA lamp identification decal. The floodlight shall be UL 1572 listed and labeled SUITABLE FOR WET LOCATIONS. Standard construction shall be IP55.
2. The floodlight shall include die-cast aluminum housing with an electrocoat paint finish, hinged front door frame, built-in aiming sight and ½-inch standard tapered pipe tread swivel mount. All external hardware shall be of a corrosion-resistant material or protected by a corrosion-resistant finish.
3. The optical assembly shall include a tempered, clear, heat and shock resistant door glass, a one-piece aluminum reflector and twin compressible sockets.

2.03 POLES

A. POLE STRUCTURES

1. Pole structures shall be multi-sectional and shall consist of one of two types, but only one type may be selected for use on this project. The types of pole structures are as follows:
 - a. Hybrid Steel and prestressed concrete multi-section pole with the prestressed concrete base foundation designed for direct embedment.

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- b. Steel multi-section pole with a cast-in-place concrete anchor bolt foundation.
- 2. Steel poles direct embedded and **precast concrete poles** are not acceptable.
- 3. Poles shall be designed considering the application of both dead load and wind load. The moment at any point along the length of the pole is to be the sum of moments resulting from dead loads and forces from wind loads. The wind force is to be computed by multiplying the specified wind pressure by the effective projected area (EPA) of the individual components.
- 4. The P-Delta secondary moments due to the deflected unbalance of the structure must be accounted for in the design and shown in the calculations submitted.
- 5. Poles shall be designed to meet AASHTO requirements for wind loading and shall be designed such that the deflection does not exceed 1.1% of the free height of the pole at its maximum EPA under a wind loading equivalent to ½ the designated ultimate wind speed, including a 1.3 gust factor.
- 6. The natural frequency of the pole shall be limited to 0.8 cycles/sec. The manufacturer shall provide calculations verifying the above requirements.
- 7. Pole heights shall be determined to provide a mounting height above the playing field sufficient to meet the specified lighting requirements. Luminaire mounting heights are to the lowest mounted sports lighting luminaire(s) measured above the playing field, not the grade location of the pole(s).

Mounting Heights: To ensure proper aiming angles for reduced glare and to provide better playability, minimum mounting heights shall be as described below. Higher mounting heights may be required based on photometric report and ability to ensure the top of the field angle is a minimum of 10 degrees below horizontal.

# of Poles	Pole Designation	Pole Height
# of Poles	Pole Designation(s)	Pole Height
# of Poles	Pole Designation(s)	Pole Height

B. POLE MATERIALS for PRESTRESSED CONCRETE POLE BASES

- 1. The specification contained herein shall be for the prestressed concrete

foundation portion of hybrid steel and concrete multi-sectional pole.

2. The concrete mix shall be designed to achieve a minimum 28-day compressive strength of 9,500 psi. Concrete test reports shall be kept per ASTM C-39. Cement shall conform to the latest requirements of Type I or III Portland Cement in accordance with ASTM-C150. Maximum size aggregate may be $\frac{3}{4}$ inch or 75% of the clear spacing between main reinforcing steel and surface of pole. Any water reducers, retarders, or accelerating admixtures shall conform to ASTM-C494. Water shall be free from foreign materials in amounts harmful to concrete and embedded steel.
3. Reinforcing Steel – Deformed steel reinforcement shall conform to requirements of ASTM A615 for Grade 60 Rebar.
4. Pre-stressing Steel – Pre-stressing steel reinforcement shall conform to uncoated 7-wire, stress relieved strand (including low relaxation) per ASTM-A416.
5. Spiral Reinforcement – Steel spiral reinforcement shall conform to the requirements of ASTM-A82 and shall not be less than .150 inch diameter. The pitch of the spiral steel shall not be greater than 4 inches or the radius of the pole, whichever is less.
6. Hardware – All structural steel shall conform to ASTM-A36 and be hot-dipped galvanized in accordance with ASTM-A123 or ASTM-A153 as applicable. Zinc alloy AC41A for inserts, handhole frames and covers, shall conform to ASTM-B240. All bolts, nuts, washers and other fasteners must be either stainless steel or hot-dipped galvanized to resist corrosion.
7. Manufacture of Pre-stressed Concrete Pole Bases:
 - a. All manufacturing tolerances, details of reinforcement and finishes shall be in accordance with “Guide Specification for Prestressed Concrete Poles”, as published in the May-June, 1982 issue of the Journal of the Prestressed Concrete Institute.
 - b. Pole **bases** shall be prestressed concrete, manufactured by the centrifugal spinning process. Pole **bases** shall be round in cross section with a hollow center.
 - c. Forms shall be designed to provide a continuous taper of +/- 0.16 inches per foot of length and provide a minimum of $\frac{3}{4}$ ” of concrete coverage over the longitudinal steel.
 - d. Pole **bases** shall have a smooth natural form finish, soft gray in

color.

- e. The manufacturer shall have 10 years experience in the design and production of centrifugally spun concrete poles and be a "PCI-Certified Facility."
- f. All cable entry holes shall be free from sharp edges for passage of electrical wiring. All handhole frames shall be composed of rugged high density cast zinc.

8. Pole Accessories:

- a. A nameplate shall be cast into the wall of the pole approximately 5 feet above the ground line identifying the name of the manufacturer, overall length, weight, manufacturer date, class and fabrication number.
- b. A 3" x 12" or 4" x 10" conduit entrance opening shall be centered 18" below grade (depending on pole size).
- c. A 3.5" x 10.5" handhole frame with flush cover shall be centered approximately 36" above grade.
- d. A 2.5" x 8.5" handhole frame with flush cover shall be located 180 degrees from disconnect switches and/or electrical equipment cabinets that are pole mounted.
- e. All pole bases shall be provided with pull cordage to facilitate cable installation.
- f. Provisions shall be made for attaching and wiring any disconnect switches or other electrical components not covered herein but required to complete the project.

C. POLE MATERIALS for MULTI-SECTION STEEL POLES

- 1. The specification contained herein shall be for full length multi-sectional steel poles or for the steel portion(s) of the hybrid steel and prestressed concrete foundation multi-sectional pole.
- 2. The pole shaft shall be constructed of low carbon, tapered tubular steel conforming to ASTM A595 Grade A or ASTM A572 Grade 65. A non-tapered section of pole conforming to ASTM A513 may be used at the top of the pole for luminaire crossarms and/or platforms. The overlap telescoping joint of pole sections shall be by slip fitting the top section over the lower section by a length that is the larger of 2 feet or 1.5 times the diameter of the inside of the female tube. All sections shall maintain a

uniform taper from top to bottom.

3. There shall be at least one longitudinal seam weld in the tapered section of the shaft. The longitudinal seam weld shall have at least 60% penetration, except in the areas where the shaft section telescopes over another. In overlapping areas, the weld penetration shall be 100%. No circumferential weld splices may be used in fabricating the shafts.
4. The pole shaft shall be hot dip galvanized after fabrication to conform to ASTM A123. To ensure a high quality galvanized coating with good adherence, all steel components used for the pole shaft, luminaire crossarm, and other attachments must be of a steel content that conforms to ASTM A385.
5. All exposed steel components of the pole shall be at least 18 inches above the surface of the ground to avoid exposure of the steel to the heavily moisture and oxygen laden air, both above and below the surface. There shall be a cap to cover the top of the pole and covers for all access openings in the pole wall so that rain will not enter the interior of the pole. To avoid stress corrosion of the pole, there shall be no critical stress points of the steel portion of the pole within 18 inches of the ground.
6. All fasteners and attaching hardware shall either be stainless steel or be hot dip galvanized to conform to ASTM A153.
7. Hand Holes shall be peripherally reinforced with flat bar which shall be integrally welded to the plate shaft. Hand holes shall be minimum 4" x 6" and located at each platform/crossarm level for use during installation and maintenance of electrical wiring. Hand holes shall also be located 180 degrees from each disconnect switch and/or electrical equipment cabinet that are mounted to the pole. One 4" x 10.5" hand hole shall be located two to six feet above finished grade with a ground lug welded inside the pole opposite this hand hole. Cover plates shall be included with each hand hole and attached to the pole with a black bar and screw.
8. Top wiring shall be through a threaded coupling suitable for the diameter of the pole, with access by the way of a hand hole. A suitable wire hanger(s) shall be provided at top coupling locations for use with a wire mesh grip.
9. Pole assemblies which exceed 50 feet in height shall have an internal cable guide and strain relief mechanism, which is typically attached at the mid-height of the pole assembly. The cable guide assembly shall consist of an offset bar, steel pipe sleeve with internal PVC sheathing to reduce wear, and a handhole opposite the offset bar access.
10. Steel poles using a cast-in-place concrete anchor bolt foundation design shall have a base plate. The base plate shall be a structural quality hot

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rolled carbon steel plate that meets or exceeds ASTM A36 with a minimum yield of strength of 42,000 psi. The base plate shall telescope the pole shaft and have a circumferential weld on the top and bottom or shall have a full penetration butt weld with a back up bar. The anchor bolt holes shall be slotted and be a minimum ¼" larger than the diameter of the anchor bolts used on the pole.

11. Anchor bolts shall be fabricated from a commercial quality hot rolled carbon steel bar that meets or exceeds minimum yield strength of 55,000 psi. Anchor bolts shall be sized according to each pole design and furnished with two (2) galvanized flat washers. Anchor bolts shall be galvanized a minimum of 6" on the threaded end in accordance with ASTM A153. Typically, the anchor bolts will ship with the poles.

C. POLE FIELD APPLIED LABELS

1. Labels shall be attached to each sports field lighting pole identifying each poles designation, as shown on the Drawings. Labels shall be pressure-sensitive type, suitable for exterior use. Labels shall have bright contrasting colors with letters minimum 2" high or greater. Locate labels at 10'-0" above finished grade on two sides of the poles, with one side visible from the field side. Poles located behind stadium bleachers or other structures shall have the labels located at a height visible from the field.
2. Labels shall be UV sunlight resistant.

2.04 FOUNDATIONS

- A. The sports field lighting system manufacturer shall provide foundation designs to suit their lighting system. Geotechnical information (Boring Logs) have been provided on the Boring Location Plan to assist in foundation design.
- B. For purposes of this Bid, or in the absence of geotechnical information, the Contractor shall assume the following type of sub-grade material specified in the current adopted edition of the International Building Code, Section 1804, Table 1804.2 "Allowable Foundation and Lateral Pressure":
 1. Soils – Class 5 (Clay and Sandy Clay).
- C. Foundation size, shape, depth of embedment, and backfill material shall be determined by the manufacturer's structural engineer. Manufacturer shall provide suitable concrete foundations to support anticipated pole loading based on load carrying capacity of existing soil conditions as hereinbefore described. The design of the support structure and foundation shall be signed and sealed by a licensed Professional Engineer registered in the Commonwealth of Virginia. The design shall include the following minimum requirements:

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1. Use Broms safety factor of three (or IBC) in the foundation design.
 2. Foundation strength shall allow the concrete to harden on any concrete portions of the pole in which steel components that provide tension strength are contained, for a minimum of 28 days before design loads of pole attachment are applied.
 3. Concrete material:
 - a. Cast-in-place concrete foundations shall be constructed of not less than 3,000 psi.
 - b. Pre-stressed concrete poles as hereinbefore described.
 - c. The steel reinforcement within the concrete shall be protected from slippage and exposure to oxidation through voids in the concrete or exposure of the steel through porous concrete material. Provide cover as specified in ACI-318.
- D. Excavation is unclassified soil and includes excavation to sub-grade elevations indicated regardless of character of materials and obstructions.

2.05 SERVICE PLATFORM CAGE ASSEMBLY (If Required)

- A. Platform cages shall be provided on all sports field lighting poles, unless specifically shown on the Drawings as not requiring a platform cage. Poles that may be shown as not requiring a platform cage are based on a maximum of twelve (12) sports luminaires on stacked crossarms as described under CROSSARM ASSEMBLY below.
- B. Platform cages shall be OSHA APPROVED and shall be constructed from either tubing or angle iron members, which meets the minimum requirements of ASTM A53 Grade B and ASTM A36 respectively. Tubular members shall have silicone gasketed end caps.
- C. Top mounted platform cages shall be mechanically attached to the pole with plates meeting the requirements of ASTM A36 and connecting hardware meeting the requirements of ASTM A325.
- D. Side mounted platform cages shall be mechanically fastened to the pole with plates conforming to ASTM A36 and U-bolts fabricated from round stock conforming to ASTM A36. Additional side mounted assemblies may be permitted to establish correct quantity of luminaires.
- E. The platform floor shall consist of expanded aluminum grating and shall incorporate a hinged door for access to the platform. The hinged door shall be

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capable of closing prior to unlatching any safety climbing devices. Cage railings shall be constructed of flat bar stock or angle iron. Railings constructed of cable or steel rope materials will not be accepted. Cages shall also incorporate a bottom "kick-plate."

- F. The platform cage sections shall be powder coated aluminum in accordance with the requirements of ASTM A123 specifications. Each cage assembly must be completely coated, inside and out, in a single dip. Double dipping will not be permitted to prevent acid entrapment in compliance with USGA recommended practices. All miscellaneous connecting hardware shall be galvanized in accordance with ASTM A153 specifications.
- G. All wiring shall be factory pre-wired enclosed within the system assembly when required by the luminaire manufacturer's lighting system.
- H. For ease of maintenance, the system must be capable of re-lamping the luminaires from the front or rear of the assembly.

2.06 CROSSARM ASSEMBLY

- A. The crossarm assembly shall be designed as a U-bolted, side mount connection. The assembly shall include a four bolt plate, allowing two U-bolts per arm assembly. The crossarm shall be made of minimum 4" x 4" x 3/8" angle iron. At each luminaire or speaker location drilled holes shall be provided to accommodate the attachment of the luminaire or speaker assemblies. Near each crossarm attachment point a threaded coupling and handhole shall be provided at 90 degrees to allow for electrical wiring and access respectively.
- B. The crossarm assembly shall be hot dip galvanized in accordance with the requirements of ASTM A123 specifications. Each assembly must be completely coated, inside and out, in a single dip. Double dipping will not be permitted to prevent acid entrapment in compliance with USGA recommended practices. All miscellaneous connecting hardware shall be galvanized in accordance with ASTM A153 specifications.
- C. Luminaires requiring tubular type crossarms shall meet the requirements above and shall be 4" x 2" x 1/8" tubular steel (FTY-46 KSI, ASTM A500 GRADE B) and welded to a 6" C-channel support structure. Crossarms using steel less than 1/8" are unacceptable and length shall not exceed 155". Crossarms shall be hot dip galvanized after fabrication.
- D. All wiring shall be factory pre-wired enclosed within the system assembly when required by the luminaire manufacturer's lighting system.

2.07 WELDING

- A. Welding shall be in accordance with AWS (American Welding Society) Structural

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Welding Code's most recent edition. Welders certified in accordance with the AWS Code shall perform welding. Welds shall be free of cracks and undercutting, and shall be 100% visually inspected with questionable areas inspected by the magnetic particle non-destructive process.

2.08 CLIMBING SYSTEM

- A. Each pole shall have a Climbing System, whether or not the pole includes a platform cage assembly. The climbing system shall incorporate pole steps, safety climbing cable, and harness.
 - 1. Pole step bolts shall be field installed. Each step shall utilize a minimum 5/8 inch diameter x 6.5 inch long carriage bolt. Each bolt shall attach by means of a "nut-holder" cast or welded into the pole. Steps shall start 12 feet from the finished grade and continue to within 18 inches of the platform/crossarm. The steps shall be alternately spaced staggered on 15 inch intervals, 90-120 degrees apart. The first set of steps and last two sets of steps shall be "doubled" without staggering.
 - 2. Safety climbing cable shall be 5/16 inch diameter, galvanized steel or stainless steel cable. The cable system shall incorporate a tension spring and intermediate cable guides(s) to insure the cable remains "tight" and offset from the pole shaft. Poles with a platform cage assembly shall have the cable transition into the caged platform assembly in a manner that does not require the climber to disengage the safety belt from the cable prior to entering the caged platform and closing the door.
 - 3. The safety harness assembly shall be OSHA approved for climbing sports lighting support structures. The belt, lanyard, and respective attachment hardware shall be appropriate for the safety cable and step system. One (1) safety harness assembly shall be provided for each sports field lighted system.

2.09 WIRING HARNESS

- A. Strain Relief – The wiring harness shall be supported at the top of the pole by a stainless steel wire mesh grip matched to the size of the harness. There shall be not more than 13 conductors supported by a single wire mesh grip. An interim wire mesh grip support shall be located approximately halfway down the pole.
- B. Strain Relief Slippage – There shall be protection around the conductors, in addition to the insulation, to protect from damage from the wire mesh grip and also to avoid slippage of the grip on the wire harness. The wire mesh grip shall also be clamped to the harness with a cable tie at the bottom of the grip to avoid loosening.
- C. Pole Attachment – The wire mesh grip shall be mechanically attached to the pole

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with an enclosed mounting loop so that it cannot be accidentally removed in any direction.

- D. Spiral Winding – The harness being supported by the wire mesh grip shall consist of multiple #14 A.W.G. (minimum) conductors rated at 600V with 90°C insulation and shall be continuously spiral wound and bound with Mylar wrap to prevent slippage of individual conductors within the wiring harness. Additionally, a cable tie shall be tightly wrapped around the harness at not more than 10-foot increments.
- E. Abrasion Bumper – There shall be provided at 2 feet below the wire mesh grip and then at not more than 10-foot intervals along the entire length of the wire harness an abrasion protective bumper device of soft, durable abrasive resistant material not less than 2 inches in diameter attached around the wiring harness to protect the harness from striking and being abraded by the interior surface of the pole.
- F. Labeling – All wiring harness conductors shall be color-coded and clearly labeled.
- G. Plug-ins – Each end of the wire harness shall be terminated into a plug-in device with conductors sequenced consistent with the pattern of the wiring schematic provided by the Manufacturer.
- H. Testing – All conductors and plug-in devices shall be tested for resistance under load for continuity, schematic sequence, and for insulation integrity. Manufacturer shall ship a copy of the test results with the wire harness.
- I. Grounding – There shall be included, within the wiring harness, one conductor for use as a grounding conductor. The grounding conductor shall be equal in size to the load carrying conductors.

2.10 ELECTRICAL COMPONENT ENCLOSURE (ECE)

- A. The ECE shall be a NEMA 3R rated, gasketed enclosure to house the drivers, fuses, terminal strips, disconnect switch and distribution lugs.
- B. The ECE shall be divided into two (2) compartments. The upper compartment shall house the drivers and fuses. The lower compartment shall provide for the thermal magnetic circuit breaker, distribution lugs, and connection of all circuits coming into and out of the ECE.
- C. NEMA 3R rated aluminum enclosure powder coated.
- D. All latches, hinges and non-current carrying fasteners, outside or inside the enclosure, shall be stainless steel and shall further be coated with a clear thermoset polymer coating such as Empigard to prevent galvanic interaction.

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- E. The access door of the ECE shall be attached by a full-length stainless steel hinge and shall be secured, when closed, by lockable stainless steel latches.
- F. The ECE shall attach to the pole by means of a device, which is sufficient to align the ECE and support its weight. There shall be a sealed joint with a non-threaded connection to provide wiring access from the pole to the ECE for both the primary and secondary circuits. The connection shall be gasketed for watertight protection. All wire passages shall be protected to prevent wire abrasion or damage.
- G. There shall be provided, within the ECE, a UL listed **disconnect switch** such that electrical power to all equipment on the pole served by the three-phase feeder circuit shall be disengaged by the operation of one switch. The **disconnect switch** shall be located in a compartment separated from any capacitors or **drivers**.
- H. The circuit breaker shall provide landing lugs for the conductors that provide power to the pole.
- I. There shall be provided by the Manufacturer a set of distribution terminal blocks, which shall be factory wired from the breaker to the blocks. These blocks shall provide for termination of all **driver** connection wiring.
- J. There shall be provided an individual fuse for each **driver** conductor except neutral conductors which shall not be fused or switched. Fusing must be UL listed. In-line fusing will NOT be acceptable.
- K. All **luminaire** supply circuits in the ECE shall be color-coded and labeled and shall be terminated into a UL recognized plug-in device in the lower compartment of the ECE in a manner suitable for plug-in to the wiring harness.
- L. The wiring harness circuits from the **luminaires** shall be attached to the ECE circuits by UL recognized plug-in connectors.
- M. There shall be provided, in the ECE located in the lower compartment of the enclosure, one equipment-grounding lug rigidly fastened to the enclosure, sized to accept up to a 1/0 conductor. There shall also be provision in the upper compartment for a ground terminal of sufficient size to permit connection of the grounding conductors from the capacitors and the ground wire from the wiring harness.
- N. There shall be an individual **driver** for each luminaire. The **drivers** shall be located remote from the luminaire cross arm and shall be placed approximately 10 feet above ground level. The **driver** box must be a NEMA 3R enclosure and must be manufactured by the luminaire assembly manufacturer and all hardware shall be included with the **driver** box assembly. The remote **driver** system described

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above shall be located on the same pole as the luminaire assembly in the NEMA 3R enclosure. The assembly design shall be adaptable to various standard ballasts and must retain its U.L. listing.

- O. The manufacturer shall provide an electrical schematic of the ECE circuits, which schematic shall be of a durable material and affixed to the inside of the ECE door for use by maintenance personnel.
- P. The ECE shall be attached to the pole with the lower end approximately 10 feet above grade.
- Q. The ECE shall be listed by UL both for use with 90°C-rated supply conductors and as suitable for use in wet locations.
- R. Comply with ANSI C82.4 and be capable of starting at a temperature of minus 30 degrees Celsius.

2.11 IN-GROUND CAST HANDHOLES

- A. Provide open bottom in-ground cast handhole at each pole location and at location(s) shown on the drawings.
- B. Each in-ground cast handhole shall be approximately 18 inches (length) x 11 inches (width) x 18 inches (depth) with a skid resistant cover.
- C. The bases and covers for the handholes shall have a load of 22,568 lbs. minimum over a 10 inch square with a minimum test load of 33,852 lbs. The top of the box shall fit flush with the finished grade.
- D. The base and covers shall be as manufactured by QUAZITE series "PG" or approved equal.

2.12 LIGHTING CONTROL SYSTEM – MATERIALS and COMPONENTS

- A. The Sports Field Lighting Control and Monitoring equipment shall include cabinets to house all lighting control panels (LCP), contactors, switches, terminals, digital cellular communications equipment and lighting controls required to control the Sports Field Lighting System(s) as shown on the Drawings and as specified herein.
- B. Off-On-Auto switches shall be utilized to manually over-ride the lighting control system. One switch shall be required for each lighting zone or system. Switches shall be supplied with on, off, and auto nameplates and labels clearly identifying the zone by field or location.
- C. The lighting system shall be controlled via remote system. In addition to the remote system, On/Off pushbutton control stations (user switch) shall be

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provided to allow users to turn the Sports Field Lighting System(s) on and off from the field. These on/off controls shall be provided in a weatherproof NEMA 3R pad-lockable box and located as shown on the Drawings. This user switch will allow the users to turn the lights on or off whenever the system is enabled by the remote system, on-site digital keypad, or time clock. The digital keypad enabling switch shall be located within the same weatherproof box as the On/Off control station, unless otherwise noted.

- D. The remote lighting system shall include Digital Cellular Communication equipment using wireless technology avoiding both the ongoing and installation costs of utilizing telephone land lines at remote sites. The system shall utilize publicly available wireless communication infrastructure avoiding the cost associated with installing and maintaining a private wireless infrastructure.
1. Digital Cellular Communication Equipment shall have a main power switch for servicing convenience and safety.
- E. The remote lighting control system shall also meet the following:
1. A security-code based, 24-hour, remote control system that enables Owner and/or authorized user to remotely enable the system on or off, control the sports field lighting schedule, and monitor the system, using telephone and web based or software driven computer.
 2. The remote control system shall be protected against power outages and memory loss, shall reboot to real-time once power is restored, and execute any commands issued prior to the power outage.
 3. The remote control system shall monitor and provide reports of actual lighting system luminaire usage.
 4. On-site equipment shall include manual Off-On-Auto switches to allow for maintenance and manual operation.
 5. System shall be capable of operating any given field from multiple computers via the Internet.
 6. Zones shall have one or more outputs assigned to them, with the ability to have any outputs assigned to any zone. Outputs shall have the ability to be assigned to multiple zones.
 7. System shall have delay-off capability on a per zone basis whereby some of the lighting for a given zone is turned off at the end of the lighting schedule time or the local user switch is turned to the off position, and the balance of the lights are turned off a number of minutes later (user definable), for safety and convenience.

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8. LCP's shall allow for user settable overrides on an independent basis for each zone whereby the override is set for either duration of time or set to be cancelled at a specific time decided by the user. If the override is canceled for any reason, the underlying schedule shall run as normal. The override capabilities shall be available to the user remotely or manually at the field.
- F. Manual Off-On-Auto Selector Switches
1. For on-site manual control, three position selector switches (Off-On-Auto) shall be factory-mounted in the Lighting Contactor Cabinet.
 2. The OFF-ON-AUTO switches shall operate as follows: The three position switch shall control each lighting zone. In the OFF position all contactors are open and the local user switch is locked out. In the ON position all contactors are closed independent of or in conjunction with the position of the local user switch. In the AUTO position, the system is under control of the remote control signal or the time clock and the local user switch is active. The contacts on the OFF-ON-AUTO switch shall be make-before-break so that the switch may be moved between ON and AUTO without de-energizing the circuit.
- G. An adequate number of Lighting Control Panels (LCP) shall be supplied to control the required number of zones of control for this project.
- H. LCP's shall utilize dry-contact type outputs for switching the control voltage to the lighting contactors.
- I. LCP's shall incorporate the appropriate control mechanism to control the type of lighting contactors; regardless of whether the lighting contactors are continuous electrically held, mechanically held latching and unlatching (continuous power OK), mechanically held latching and unlatching (requiring momentary power), etc; all combined within the same LCP if required.
- J. LCP's shall permit the downloading of all data within the unit for analysis via laptop computer or PDA.
- K. Override control may be achieved either via the remote manual control switches at the LCP's, or computer; none of which shall be mutually exclusive of the other (e.g., the user may set an override via Web Access, then cancel later at the keypad at the LCP's); all available 24 hours per day, 7 days per week, and all without the user having to contact manufacturer.
- L. In *addition* to utilizing Web Access for scheduling, the user shall be able to contact Manufacturer support team 24/7 to enter schedules and request last minute changes.

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- M. The lighting control system shall automatically adjust for changes in Daylight Savings Time and changes in sunset and sunrise times, on a stand-alone basis not reliant upon a computer or some other system transmitting the information to the units.
- N. UL listed Power supply shall be non-linear switching-type power supply.

2.13 LIGHTING CONTROL SYSTEM CABINETS

- A. The Lighting Control and Monitor Systems equipment shall be housed in suitable cabinets, including lighting contactors. The manufacturer shall determine the quantity of cabinets needed for this project.
 - 1. Lighting contactors shall be housed in a separate cabinet. The contactor cabinet shall contain custom configured contactor modules for 20, 30, 60, and 100 amps, labeled to match field diagrams and electrical design. Manual On-Off-Auto selector switches shall be provided as hereinbefore described. Refer to the Drawings for specific contactor sizes.
 - 2. As an option, the contactors may be located within the Lighting Control and Monitoring Cabinet provided there is adequate space. However, all the contactors per system must be located in a single cabinet.
- B. The final complete cabinet(s) with all electrical components shall bear the UL label.
- C. The cabinet(s) shall be designed and produced to meet the criteria noted in this document. The supplier shall be capable of producing a premium grade product, which meets the quality, fit and finish noted in this document. The use of CNC (Computer Numerical Control) equipment is preferred. The supplier's shop shall be approved to produce UL listed products.
- D. The cabinet(s) and doors shall be constructed to meet NEMA 1 standards. The cabinets shall have ventilation as required for the lighting controls and monitoring equipment and contactors.
- E. All materials shall be new.
- F. Unless otherwise noted, cabinet(s) shall be fabricated from 5052-H32 sheet aluminum of at least 1/8-inch thick. Alternate materials may be considered.
- G. All materials shall be corrosion resistant for extended life.
- H. The cabinet(s) and doors shall be fabricated to plus or minus 10-thousandths of an inch tolerance for proper fit. All bending shall be done using a suitable break press.

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- I. Connecting hardware screws, bolts, washers, nuts, etc. shall be stainless steel. The screws shall be stainless steel pan-head machine screw type. No sheet metal or self tapping screws shall be permitted.
- J. Welding:
 - 1. All exterior seams shall be of continuously welded construction. All welds shall be free of slag and spatter. All exterior welds shall be ground smooth.
 - 2. The supplier shall have suitable credentials to weld aluminum and shall adhere to all applicable ANSI standards.
 - 3. The supplier shall use a suitable welding process and materials.
- K. Doors shall be designed for maximum strength and snug fit. It is the supplier's responsibility to design and fabricate the doors to the fit and finish required in this specification. Doors shall be fabricated out of a single sheet of aluminum and have wrap-around return for strength and fit.
- L. All equipment mounted in the cabinet shall be mounted on an inner wall.

2.14 LIGHTING CONTROL SYSTEM EQUIPMENT LABELING

- A. All products shall be labeled (inside) with the supplier's company name, model number, panel rating and the date of manufacture.
- B. The supplier shall also provide adhesive Lamicoid or vinyl labels on the inside of each cabinet for each component. Each contactor and output circuit shall also be labeled in accordance with the lighting design.
- C. All ID labels shall have ¼" to ½" high black characters on a white background.
- D. All wiring shall be labeled with computer generated sleeve type wire markers.

PART 3 - EXECUTION

3.01 LAYOUT

- A. This Contractor shall layout all equipment and review locations with the Architect/Engineer and/or Owner prior to construction. Poles shall be laid out based on pole locations on the suppliers lighting layout drawing. Pole locations shall be set by using a metal tape to the exact locations shown on the drawings (+/- 2 feet).

3.02 POLE HANDLING AND ERECTION

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- A. Transportation, site handling and erection shall be performed by qualified personnel with equipment and methods that are in accordance with standard industry practices.
- B. Prior to unloading the pole, shop drawings shall be reviewed to identify proper pick-up points for unloading, storage and erection procedures. A thru-hole shall be provided at the proper pick-up point for the purpose of inserting a steel bar to act as a stop to the cable choker when erecting the pole.
- C. Web fabric slings (not chain or cable) shall be used to raise and set structural members. Protect equipment during installation to prevent corrosion.
- D. Step bolts, safety cable and internal wiring may be installed while the pole is in a horizontal position on the ground. If the service platform/crossarms are to be attached prior to erection, the pole tip must be supported to prevent undesirable deflection.
- E. Install poles and other structural units level, plumb and square. Orientation of the prestressed concrete pole base or the cast-in-place foundation anchor bolts in relation to the direction of the lighting must be checked carefully using the Manufacturer's drawings, contract drawings and specifications.
- F. For base plate style poles, the steel shall not be installed until concrete has reached the specified 28 day strength. For direct bury prestressed concrete foundations the steel pole portion shall not be installed until backfill has reached 98% of the specified compaction all around the prestressed foundation as per ASTM D698.
- G. After installation is complete, the Contractor shall plug with suitable semi-permanent material any alignment or installation aid or other unused holes or cavities in the poles to prevent them serving as harboring for insects and to prevent tampering. Material used shall be the same color as the pole.

3.03 SITE PROTECTION AND RESTORATION

- A. Protect existing site, plantings, trees, pavements, facilities, structures, grounds, playing fields, and all other site amenities designated or intended to remain, temporarily or permanently, from damage during demolition or construction activities, including delivery of poles and equipment. Repair items damaged during demolition or construction activities to their original condition, or replace with new, by qualified personnel and technicians, at no additional cost to the Owner. Repairs, reinforcement or structural replacement shall be approved by the Architect and/or Owner.
- B. Refer to Specification Section 02100 for additional requirements.

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3.04 STORAGE

- A. Poles and foundations may be stored on-site (for a short time period) if they do not impact the day-to-day operations of the facility. Poles and bases shall be placed on suitable supports.
- B. Luminaires, platforms, crossarms, wiring, electrical enclosures and control equipment shall be stored off-site until they are ready for assembly and erection. On-site storage is permitted provided all items are stored in secure and DRY locations.
- C. This Contractor is responsible for any damage or theft to any materials left on-site.

3.05 FOUNDATIONS

- A. Foundations shall be the directly embedded pre-stressed concrete or cast-in-place concrete (directly embedded steel in ground is not acceptable). The foundation shall have suitable conduit entrance holes and wiring access hand holes and shall have a suitable wire way into the pole.
- B. Top of cast-in-place concrete bases shall be trowel finished smooth and level with beveled edges. Top surface shall not vary by more than 1/8 inch in depth as measured across the widest surface.
- C. All concrete shall be fully vibrated.
- D. Reinforcing steel shall meet ASTM A615 and Grade 60.
- E. Cast-in-place foundations anchor bolt projections must allow for the thickness of the base plate, nuts (including leveling nuts), and raking if required. Adjust leveling nuts before installing the pole. They should be in a horizontal plane.
- F. Reinforcing steel in cast-in-place foundations must not be welded to the anchor bolts. Care must be taken not to disturb the position of the anchor bolts while pouring concrete.
- G. Steel poles shall have grout in the void between pole base and foundation. Use approved non-shrinking or expanding concrete grout firmly packed in entire void space. Use a short piece of ½ inch diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

3.06 POLE/FOUNDATION EXCAVATION

- A. The Contractor may excavate by any means he prefers, insofar as these methods conform to these specifications. Holes shall be excavated with diameters not less than 8 inches greater than the largest dimension of the pole foundations being installed. Required depth of pole holes shall be as

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recommended by the pole manufacturer and the support assemblies Professional Engineer.

- B. The bottom of the pole holes shall be on undisturbed earth. If a pole hole is excavated to a depth greater than required, it shall be backfilled with specified crushed stone, placed in 6 inch layers, and thoroughly machine tamped to an approximate compaction of 95%.
- C. All excavations must be free of loose soil and debris prior to foundation installation and concrete pour and backfill placement.
- D. Backfill:
 - 1. Prestressed concrete foundations shall include poured concrete backfill. Temporary casings or drillers slurry may be used to stabilize the excavation during installation. Casings must be removed during concrete backfill placement. Concrete backfill must be placed with a tremie when slurry or water is present within the excavation or when the free drop exceeds 6'-0".
 - 2. Cast-in-place foundations backfill shall be Virginia Department of Transportation (VDOT) specification 21-A bluestone placed from the bottom of the pole hole to a distance of 18 inches below the top of the hole and topped with excavated soil. All backfill shall be placed in 6 inch layers and each layer shall be thoroughly tamped to an approximate compaction of 95%. The soil backfill shall be banked and tamped around the poles/foundations to a height of 12 inches above the finished grade.
- E. Subject to the Owner's approval, excavated surplus material shall be uniformly spread at the site or removed and disposed of at this Contractor's expense. Care shall be taken that the spreading of surplus material does not result in the channeling of run-off water past pole locations.

3.07 LIGHTNING PROTECTION/GROUNDING

- A. Manufacturer shall provide lighting grounding as defined by NFPA 780 and be UL listed per UL 96 and YL96A.
 - a. Integrated grounding via concrete encased electrode grounding system.
 - b. If grounding is not integrated into the structure, the manufacturer shall supply grounding electrodes, copper down conductors, and exothermic weld kits. Electrodes and conductors shall be sized as required by NFPA 780. The grounding electrode shall be minimum size of 5/8 inch diameter and 8 feet long, with a minimum of 10 feet embedment. Grounding electrode shall be connected to the structure by a grounding electrode conductor with a minimum size of 2 AWG for poles with 75 feet mounting height or less, and 2/0 AWG for poles with more than 75 feet mounting height.

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3.08 IN-GROUND HANDHOLES

A. Excavation

1. Excavation for the handhole shall be approximately eight inches deeper than the depth of the handhole box. The bottom of the hole shall be on undisturbed earth. Provide eight to ten inches of gravel for drainage.
2. Box shall be placed in the excavated hole with the top level with the finished grade.

B. Backfill

1. Backfill around the box shall be with excavated soil placed in six-inch layers and each layer thoroughly tamped to approximate compaction of 95%.

3.09 LIGHTING CONTROL SYSTEMS EQUIPMENT INSTALLATION

A. Lighting Control Panels

1. Before installing the Sports Field Lighting Control and Monitoring Systems equipment check all of the Drawings for possible conflict of space and adjust the location of the system's equipment to prevent such conflict with other items. Equipment locations shall closely follow the layouts shown on the Drawings, leaving sufficient space for installations of panelboards and/or other electrical equipment.
2. Equipment shall be securely mounted at locations shown on the Drawings. Construction shall be such that additional conduits can be added for future requirements.
3. The cabinets and enclosures shall be mounted and grounded in accordance with the NEC. This Contractor shall furnish all materials necessary for mounting the cabinets.
4. Lighting control equipment will generally be located adjacent to respective lighting panelboards. During the construction process, protect all interior components of each relay panel and each digital switch from dust and debris. Any damage done to electronic components due to non-protection shall be the sole responsibility of this Contractor.

B. Pull boxes and wireways may be used for ease of field wiring and trouble shooting. All wireways shall have removable covers.

C. Switches: Provide outlet boxes, single or multi-gang, as shown on the Drawings for the control switches. Provide coverplates for all switches.

D. 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 this Contractor in minimum ½ inch conduit.
3. All horizontal wiring for the lighting control systems shall be run at right angles to the building structure.
4. 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.
5. All low voltage wiring connections shall be made by this Contractor accordance to manufacturer recommendations. Cables shall be run free of splices from the equipment enclosures to the outlets.
6. All wiring shall be checked and tested by this Contractor to insure the system is free from grounds, opens, and shorts.
7. Do not mix low voltage and high voltage conductors; power limited and non-power limited in the same conduit.
8. Ensure low voltage conductors, conduits or control wires do not run parallel to current carrying conduits.
9. All control wiring shall be labeled in accordance with the schematic diagram.

E. Terminal Blocks:

1. Terminal blocks, fuses, relays, etc. shall be din-rail mounted.
2. Output wiring shall be connected via terminal blocks to accept field wiring.
3. Terminals for bonding conductors shall also be provided.

F. Installation and Set-up

1. Verify that conduit for line voltage wires enters the panel in line voltage areas and conduit for low voltage control wires enters the panel on low-voltage areas. Refer to manufacturer's plans and approved shop

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drawings for location of line and low-voltage areas. It is the responsibility of this Contractor to verify with the lighting control manufacturer all catalog information and specific product acceptability.

2. Unused openings in cabinets shall be effectively closed.
3. Lugs shall be suitable and listed for installation with the conductor being connected.
4. Neatly group, lace and rack wiring in cabinets. Conductor lengths shall be maintained to a minimum within the wiring gutter space, but long enough to allow for future changes within the cabinet without splicing. Conductors shall be arranged in a manner that avoids strain on the connecting lugs and maintain the required bending radius of conductors inside cabinets.
5. Follow the manufacturer's torque values to tighten lugs.
6. Follow manufacturer's instructions for installation and for all low voltage wiring.

G. Service and Support

1. Start Up: This Contractor shall contact the manufacturer at least 7 days before activation of the system. Manufacturer shall remotely connect into the lighting control system, run diagnostics and confirm system programming. This Contractor shall be available at the time to perform any corrections required by the manufacturer.
2. Telephone factory support shall be available at no additional cost to the Contractor or Owner both during and after the warranty period. Factory shall pre-program the lighting control system per plans and approved submittal, to the extent data is available. The specified manufacturer, at no added cost, shall provide additional remote programming via Web Access as required by the Contractor or Owner for the operational life of the system.

3.10 FIELD QUALITY CONTROL

- A. Inspect each installation for damage. Replace damaged luminaires and components. All luminaires shall be cleaned and completely lamped and wired.
- B. Before energizing the system, the following steps shall be taken:
 1. Retighten connections to the manufacturer's torque specifications. Verify that required connections have been furnished.

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2. Remove shipping blocks from component devices and panel interiors.
 3. Inspect each installed unit for damage. Replace damaged components.
 4. Remove debris from the panels and cabinets, wipe dust and dirt from all components, and repaint marred surfaces with touch-up paint to match the original finish.
- C. After installation and connection of sports field lights to their permanent power supply, the Contractor shall verify supply voltages and currents at the disconnecting device in the electrical enclosure and at the main circuit breaker. Branch circuit and feeder voltage drop shall not exceed three (3) percent. Ensure that the three phases are balanced between phases at each support structure to minimize flicker. Measurements shall be taken phase to phase.
- D. Prior to the Architect/Engineer's and/or Owner'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 system shall test free from grounds, shorts, and other faults. All connections shall be thoroughly checked for mechanical and electrical connections. Replace or repair damaged and malfunctioning units, make necessary adjustments, and retest. Repeat procedure until all units operate properly.
- E. This Contractor shall perform all tests in the presence of the Architect/Engineer and/or Owner. This Contractor shall furnish all personnel and test instruments for use in the tests. Give advance notice of dates and times for field tests to the Architect/Engineer and Owner and coordinate a mutually agreed time and date. All equipment shall be demonstrated to operate in accordance with the requirements set forth in these Specifications and as shown on the Drawings.
- F. Testing and Measuring of Field Illuminance
1. Contractor shall perform proof-of-performance field measurements and analysis for compliance with lighting requirements hereinbefore described in Part 1.04 LIGHTING PERFORMANCE. Initial footcandle readings for the sports lighting luminaires shall be taken after 100 hours of operation.
 2. Field measurements shall be taken on appropriate grid spacing test stations and at the appropriate spill-light and glare points test stations. Test stations shall be the points hereinbefore specified in the "Lighting Performance" section.
 3. Ambient light levels shall be measured at the specified test stations with the facility luminaires turned off. Once the maximum spill-light readings have been recorded, subtract the ambient light readings from the respective footcandle readings at each test station to determine spill-light due to facility luminaires only.

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4. Testing equipment for measuring footcandle levels shall be a Gossen Panlux meter or equal. Meter must show proof of calibration as required by its manufacturer.
5. After all photometric testing has been completed, a final report shall be provided to the Architect/Engineer and the Owner. This report should indicate footcandle levels taken on the playing field, spill-light locations (including and deducting ambient light levels at spill-light locations), candela levels for glare measurements at the spill-light locations, total number of hours on the system, average initial illumination as tested, CV and uniformity ratios. Report shall also include computer-generated values. Computer-generated values shall use Manufacturer's lamp lumens that are adjusted to lamp age at time of field testing.
6. Correcting Non-Conformance – If, in the opinion of the Architect/Engineer and/or Owner, the actual performance levels and uniformity do not meet the requirements of the performance specifications and submitted information, the Contractor shall be liable to any of the following:
 - a. Contractor shall, at his expense, provide and install any necessary additional luminaires and/or re-aim luminaires so that specified levels are achieved. If additional luminaires are installed the Contractor shall also either replace the existing poles to meet the new wind load (EPA) requirements or verify by certification by a licensed Professional Engineer registered in the Commonwealth of Virginia that the existing poles will withstand the additional wind loading.
 - b. Contractor shall remove the entire unacceptable lighting system and install a new lighting system to meet the specifications.

3.11 WARRANTY AND MAINTENANCE REQUIREMENTS

- A. This Contractor shall deliver the work in a first-class operating condition in every respect.
- B. The Contractor/lighting system and controls system manufacturer shall warrant that the material, equipment, and workmanship furnished shall be entirely free from defects for a minimum 25-year Warranty Period. Any material, equipment, or workmanship in which defects may develop before or during the warranty period shall be repaired or replaced at the Contractor/Manufacturer's own expense. Refer to SECTION 01740 for the start of the warranty period.
- C. In addition to the Warranty Provisions, the sports field lighting and controls system manufacturer shall provide a signed maintenance agreement covering the entire lighting and control systems for a minimum period of 25 years. The maintenance agreement shall guarantee light levels; luminaire replacements;

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monitoring; communications; maintenance and control services; spill-light control, and structural integrity. During the maintenance period the manufacturer shall:

1. Maintain lighting levels for the entire field(s) being lit.
 2. All repairs shall be completed within seventy-two (72) hours of notification, unless otherwise approved by the Owner.
- D. Manufacturer shall maintain specifically-funded financial reserves for this project to assure fulfillment of the warranty and maintenance for the full term. Warranty may exclude fuses, storm damage, vandalism, abuse and unauthorized repairs or alterations. Warranty may not exclude means and methods to access any part of the lighting and controls systems.

3.12 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. At the completion of the installation, this Contractor shall furnish four (4) final sets of "as-built" drawings as well as manuals of instruction as to the proper operation and maintenance of the sports field lighting system and control system.
- B. The "As-Built" documentation shall include wiring diagrams for the lighting control and monitoring 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 contactor and the identification number for that relay and contactor, and placement of switches. Original shall be given to Owner, copies placed inside the door of each lighting control cabinet.
- C. This Contractor shall also furnish the Architect/Engineer four (4) bound copies of complete operating and maintenance instruction manuals of the complete sports field lighting system and the sports field lighting control and monitoring system. 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 proper operation, service, and maintenance of the systems.

3.13 TRAINING

- A. This Contractor shall furnish the Owner's officially designed representative(s) with a minimum of four (4) hours of on-the-job instructions in the operation, maintenance, and testing of the systems, using the factory operation manuals previously specified, for proper operation, maintenance and testing of the systems. The lighting controls supplier shall undertake all required set-up, programming, testing, commissioning and training of the Owner's Representative as required for the proper operation of the lighting control and monitoring system.
- 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

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during the warranty period.

C. All training specified herein shall be performed by a factory certified technician.

END OF SECTION