

PROJECT MANUAL

**VOLUME 1
Technical Specifications**

WOODBIDGE SCHOOL DISTRICT

New Woodbridge High School

Woodbridge Road
Greenwood, Delaware

PROJECT NO. 11109

CONSTRUCTION MANAGERS
EDIS
110 South Poplar Street
Suite 400
Wilmington, Delaware 19801
(302) 421-5700



Bid Package C

April 15, 2013

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Bid Pac A – available for reference and coordination on the FTP site.

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END OF SECTION

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Bid Pac A – Available for reference and coordination on the FTP site.

Bid Pac B – Available for reference and coordination on the FTP site.

END OF SECTION

SECTION 001113 ADVERTISEMENT FOR BID

Public notice is hereby given that sealed bids for the following prime contracts will be received for the construction of a new high school in Greenwood, Delaware for Woodbridge School District. Bids will be received at the field office of the Construction Manager, EDiS Company, at 14714 Woodbridge Road, Greenwood, Delaware 19950 until 2:00 PM local time on Thursday, 6 June 2013 at which time they will be publicly opened and read aloud. ***Bidder bears the risk of late delivery. Any bids received after the stated time will be returned unopened.*** The time and location of the bid opening may be extended with a minimum of 2 calendar days' notice to the Bidders.

Contract C-29: Voice and Data
Contract C-30: Audio/Video

Documents may be viewed and downloaded at EDiS' FTP site after 9 May 2013.

Bidders requesting the log on information may obtain user name and password permission by contacting Diana Patille with EDiS Company at dpatille@ediscompany.com or 302-421-2985.

It is the responsibility of each bidder to review and coordinate all project documents. This includes plans, specifications and addenda. Documents may be examined at the office of the Construction Manager EDiS Company, 110 South Poplar Street, Suite 400, Wilmington, Delaware 19801 and the Architect, Fearn Clendaniel, 6 Larch Avenue, Suite 398, Wilmington, Delaware 19804.

A bid security in the amount of 10% of the bid, plus a consent of surety must accompany each bid. Bid Security shall specify the Owner as the obligee. Owner: Woodbridge School District, 16359 Sussex Highway, Bridgeville, DE 19933.

A pre-bid meeting will be held at field office of the Construction Manager, EDiS Company, at 14714 Woodbridge Road, Greenwood, Delaware 19950 on Thursday, 16 May 2013 at 10:00 AM local time. Attendance is highly suggested but not mandatory.

Please contact EDiS Company, Diana Patille at 302-421-2985, dpatille@ediscompany.com with questions.

Conformance to the Delaware Architectural Accessibility Act and the standards of the Architectural Accessibility Board is required on the Project.

END OF SECTION

SECTION 002113 - INSTRUCTIONS TO BIDDERS

1. DEFINITIONS

- 1.1 Bidding Documents include the Contract Documents, Invitation to Bid, Instructions to Bidders, the Proposal Forms, Contract, General Conditions of the Contract, Supplementary Conditions, Specifications, Plans, and any Addenda issued prior to receipt of bids.
- 1.2 All definitions set forth in the General Conditions and the other Contract Documents are applicable to the Bidding Documents.
- 1.3 "Addenda" are written or graphic instruments issued by the Architect/Engineer prior to the receipt of bids which modify or interpret the Bidding Documents, by additions, deletions, clarifications or corrections. Addenda become part of the contract documents upon execution of the agreement.
- 1.4 The term Work is defined in 1.1.3 of the General Conditions.
- 1.5 A "Unit of Work" includes all Work covered by the one or more Sections of the specifications listed under that particular Unit of Work in Section 011100 - SUMMARY OF WORK. A Unit of Work is the smallest portion of the Project for which a separate Bid will be accepted by the Construction Manager. The word "Unit" means "Unit of Work" whenever the context clearly implies "Unit of Work".
- 1.6 A "Bid" is a complete and properly signed proposal to do one or more Units of Work for the sum stipulated therein.
- 1.7 A "Bidder" is one who submits a Bid to the Bidding Agency for the Unit or Units of Work indicated therein.
- 1.8 A substantial amount of specification language constitutes definitions for terms found in other Contract Documents, including drawings, which must be recognized as diagrammatic in nature and not completely descriptive of requirements indicated thereon. Certain terms used in Contract Documents are defined generally in this article. Definitions and explanations to this section are not necessarily either complete or exclusive, but are general for the work to the extent not stated more explicitly in another provision of Contract Documents.
- 1.9 General Requirements (or Conditions) apply to entire work of Contract and, where so indicated, to other elements which are included in the project.
- 1.10 The term "indicated" is a cross reference to details, notes or schedules on the Drawings, to other similar means of recording requirements in the Contract Documents. Where terms such as "shown", "noted", "schedule" and "specified" are used in lieu of "indicate," it is for purpose of helping to locate cross reference and no

limitation of location is intended, except as specifically noted.

- 1.11 Where not otherwise explained, terms such as “directed”, “requested”, “authorized”, “selected”, “approved”, “required”, “accepted” and “permitted” mean “directed by Construction Manager or Architect”, “requested by Construction Manager or Architect”, etc.
- 1.12 Where used in conjunction with Construction Manager’s or Architect’s response to submittals, requests, applications, inquiries, reports and claims by Contractor, the meaning of the term “approved” will be held to limitations of Construction Manager’s and Architect’s responsibilities and duties as specified in General and Supplementary Conditions. In no case will “approval” by Construction Manager or Architect be interpreted as a release of Contractor from responsibilities to fulfill requirements of the Contract Documents.
- 1.13 The “Project Site” is the space available to Contractor for performance of the Work, either exclusively or in conjunction with others performing other work as part of the Project. The extent of project site is shown on the Drawings and may or may not be identical with description of the land upon which project is to be built. The Contractor shall visit the site to verify contract or construction limits.
- 1.14 Except as otherwise defined in greater detail, term “furnish” is used to mean supply and deliver to project site, ready for unloading, unpacking, assembly, installation, etc., as applicable in each instance.
- 1.15 Except as otherwise defined in greater detail, term “install” is used to describe operations at project site including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations as applicable in each instance.
- 1.16 Except as otherwise defined in greater detail, term “provide” means furnish and install, complete and ready for intended use, as applicable in each instance.
- 1.17 An “Installer” is the entity, person or firm, engaged by the Contractor or his subcontractor or sub-subcontractor for the performance of a particular unit of work at the project site, including installation, erection, application and similar required operation. It is a general requirement that such installers be expert in operations they are engaged to perform.
- 1.18 The duties and obligations of the Contract apply to this Contractor (as defined herein) regardless of similar or identical duties or obligations of other Prime Contractors related to the Project. Therefore, even though other Prime Contractors may have similar, identical or overlapping duties and obligations, each and every duty and obligation set forth in this Contract is enforceable against this Contractor.

2. BIDDER’S REPRESENTATION

2.1 Each Bidder in submitting its bid represents that:

1. It has read and understands the Bidding Documents and its Bid is made in accordance therewith.
2. Contractor has visited the site; familiarized himself with the local conditions under which the work is to be performed; compared the site with drawings and specifications; satisfied himself of the conditions of delivery, handling and storage of materials and all other matters that may be incidental to the Work before submitting his Bid.
3. Its Bid is based upon the materials and equipment described within the Bidding Documents without exceptions.

2.2 EVIDENCE OF REPRESENTATION

1. Submission of a Bid will be considered as evidence of the bidder's representation. No allowance will subsequently be made to the successful contractor by reason of any error omission on his part, due to his neglect in complying with the requirements of this article.

3. BIDDING DOCUMENTS

3.1 ISSUANCE

1. Bidding documents will be available from the EDiS FTP site **bids.ediscompany.com**. It is the responsibility of the bidders to be aware and familiar with all contract documents including previously issued Bid Packages.
2. Bidding Documents will not be issued to subcontractors or other individuals or organizations that will not be contracting directly with the Owner.
3. The complete set of Bidding Documents shall be used in preparing bids; neither the Owner, the Architect nor the Construction Manager assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
4. The Owner, Architect, and the Construction Manager, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining bids on the Work and do not confer a license or grant for any other use.

3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

1. Bidders shall examine the Bidding Documents carefully and shall promptly

notify the Construction Manager of any ambiguity, inconsistency or error which they may discover. No request for adjustment of Contract Time or Sum shall be permitted with regard to any purported ambiguity, inconsistency or error not promptly noticed to the Construction Manager.

2. Bidders requiring clarification or interpretation of the Bidding Documents shall make a written request to the Construction Manager to reach him at least seven days prior to the date of receipt of bids.
3. Any interpretation, correction or change of the Bidding Documents will be made by Addendum. Interpretations, corrections, or changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon such interpretations, corrections, and changes.

3.3 SUBSTITUTIONS

1. Refer to Specification Section 016200 - MATERIAL AND EQUIPMENT.
2. Substitution requests must be made at least ten (10) days prior to the receipt of bids.

3.4 ADDENDA

1. Addenda will be available at the EDiS FTP site. Email will be used to notify each bidder of the Addenda issued.
2. Sub-Bidders, Suppliers, Manufacturers and others wishing to have Addenda mailed free of charge directly to them should address a letter to the Construction Manager requesting a listing on the Addenda mailing list for this Project. Such letter must include no other subject matter, must clearly identify this Project by name, and must indicate, line for line, exactly how the name and address is to be typed on the envelope. Phone requests will not be accepted. The Construction Manager will endeavor, but expressly does not promise, to mail Addenda directly to those who have properly requested. Such mailing list is for this one Project only.
3. Addenda issued during the time of bidding shall be listed on Bid form in the space provided. Failure of a Bidder to receive any Addendum shall not release the Bidder from any obligations under his Bid, provided said addendum was sent by email to the address furnished by the bidder for transmittal of mail.
4. No Addenda will be issued later than three (3) days prior to the date for receipt of Bids, except an Addendum withdrawing the request for Bids or one which extends the time or changes the location for the opening of Bids.

4. BIDDING PROCEDURE

4.1 FORM AND STYLE OF BIDS

1. Bids shall be submitted in triplicate upon the proposal form included in these specifications, or upon an exact copy of it.
2. The Bidder shall complete all blank spaces on the Bid form.
3. Where indicated on the Bid form, sums shall be expressed in both words and figures. In case of discrepancy between the two, the written amount shall govern.
4. Any interlineation, alteration or erasure of an entry made in a blank space of the form must be initialed by the signer of the Bid. However, no interlineation, alteration or erasure shall be made in the wording printed on the bid form unless the Bidder is instructed by the Bidding Documents to do so. The Bidders shall add no stipulations or qualifications on the Bid form or accompanying the bid form unless permitted by or instructed by the Bidding Documents to do so.
5. All requested quantities, unit prices and alternates shall be included as part of the bid.
6. All signatures shall be in long hand.
7. The Bidder shall include on the Bid Form, within the Base Bid total costs associated with providing both the Labor and Material Payment and Performance Bonds.
8. The Bidder shall affix his seal to the bid form, if organized as a corporation.

4.2 SUBMISSION OF BIDS

1. Bids shall be deposited at the designated location prior to the time and date for receipt of Bids indicated in the Invitation to Bid, or any extension thereof made by Addendum. The time and location of the bid opening may be extended with a minimum of two (2) calendar days notice to the Bidders. Bids received after the time and date for receipt of Bids will be marked "LATE BID" and returned.
2. The Bid Proposal (3 copies) shall be enclosed in a sealed envelope. The envelope shall be addressed to the Owner, and shall be identified with the Project name, the Bidder's name and address and the Unit of Work included in the Bid.
3. If the Bidder submits his Bid by mail, he shall enclose the above described sealed envelope in a separate mailing envelope with the notation "BID

ENCLOSED' on the face thereof.

4. Bids shall include a fully executed Bid Bond, Power of Attorney, Non-collusion Statement, Consent of Surety and Subcontractor listing.

4.3 MODIFICATION OR WITHDRAWAL OF BID

1. A Bidder may modify his Bid in writing at any time prior to the time scheduled for receiving Bids, provided such written modification is received by the Construction Manager prior to said time.
2. Unless specifically authorized, faxed bids will not be considered.
3. No Bidder shall modify, withdraw or cancel his Bid or any part thereof for SIXTY (60) days after the time designed for the receipt of Bids, in the Invitation to Bid. Any further extension of the time will be by mutual consent of the Owner and the Contractor.
4. A Bid may be withdrawn up until the time scheduled for receiving the Bids. Such withdrawal shall be in writing.

5. CONSIDERATIONS OF BIDS

5.1 OPENING OF BIDS

1. Bid shall be publicly opened and read aloud.

5.2 REJECTION OF BIDS

1. The Owner, in its sole discretion, shall have the right to reject any or all bids for any reason or for no reason whatsoever.

5.3 ACCEPTANCE OF BIDS

1. The Owner, in its sole discretion, shall have the right to waive any informality or irregularity in any Bid received.
2. The Owner shall have the right to accept Alternates in any order or combination.

6. SUBCONTRACT INFORMATION

6.1 SUBMISSION OF SUBCONTRACTOR LIST

1. Should the Contractor fail to utilize any or all of the Subcontractors in the Contractor's Bid statement in the performance of the Work on the public

bidding, the Contractor shall be penalized in the amount of (project specific amount *). The Agency may determine to deduct payment of the penalty from the Contractor or have the amount paid directly to the Agency. Any penalty amount assessed against the Contractor may be remitted or refunded, in whole or in part, by the Agency awarding the Contract, only if it is established to the satisfaction of the Agency that the Subcontractor in question has defaulted or is no longer engaged in such business. No claim for the remission or refund of any penalty shall be granted unless an application is filed within one year after the liability of the successful Bidder accrues. All penalty amounts assessed and not refunded or remitted to the Contractor shall be reverted to the State.

* one (1) percent of the contract amount not to exceed \$10,000.

2. Upon request of the Construction Manager, the Bidder shall within seven (7) days of the request submit a list of the other subcontractors or other persons or organizations (including those who are to furnish materials or equipment fabricated to a special design) if any, proposed for the various portions of the Work not included in the subcontractors list submitted with the bid.
3. The Bidder will be required to establish to the satisfaction of the Construction Manager the capability and experience of all proposed subcontractors to furnish and perform the work described in the sections of the specifications pertaining to such proposed subcontractor's respective trades.
4. Subcontractors and other persons and organizations proposed by the Bidder and accepted by the Owner must be used on the work for which they were proposed and accepted, and shall not be changed except with the written approval of the Construction Manager.

7. EQUALITY OF EMPLOYMENT OPPORTUNITY ON PUBLIC WORKS

During the performance of this Contract, the Contractor agrees as follows:

- 7.1 The Contractor will not discriminate against any employee or applicant for employment because of race, creed, color, sex or national origin. The Contractor will take affirmative action to ensure the applicants are employed, and that employees are treated during employment, without regard to their race, creed, color, sex or national origin. Such action shall include, but not be limited to, the following: Employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training including apprenticeship. The Contractor agrees to post in conspicuous places available to employees and applicants for employment notices to be provided by the contracting agency setting forth this nondiscrimination clause.

- 7.2 The Contractor will, in all solicitants or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, creed, color sex, or national origin.
- 7.3 The term "Contract for public works" means construction, reconstruction, demolition, alteration and repair work and maintenance work paid for, in whole or in part, with public funds.
- 7.4 The Secretary of the Department of Labor shall be responsible for the administration of this section and shall adopt such rules and regulations and issue such orders as he deems necessary to achieve the purpose thereof, provided that no requirement established hereby shall be in conflict with subchapter 6904 of this title.

8. PREVAILING WAGE REQUIREMENT

- 8.1 Wage Provisions: In accordance with Delaware Code, Title 29, Section 6960, renovation projects whose total cost shall exceed \$15,000 and \$100,000 for new construction, the minimum wage rates for various classes of laborers and mechanics shall be as determined by the Department of Labor, Division of Industrial Affairs of the State of Delaware.
- 8.2 The prevailing wage shall be the wage paid to a majority of employees performing similar work as reported in the Department's annual prevailing wage survey or in the absence of a majority, the average paid to all employees reported.
- 8.3 The Contractor shall pay all mechanics and labors employed directly upon the site of work, unconditionally and not less often than once a week and without subsequent deduction or rebate on any account the full amounts accrued at time of payment, computed at wage rates not less than those stated in the specifications, regardless of any contractual relationship which may be alleged to exist between the employer and such laborers and mechanics.
- 8.4 The scale of the wages to be paid shall be posted by the employer in a prominent and easily accessible place at the site of the work.
- 8.5 Every contract based upon these specifications shall contain a stipulation that certified sworn payroll reports be maintained by every Contractor and Subcontractor performing work upon the site of construction. The Contractor and Subcontractor shall keep and maintain the sworn payroll information for a period of 2 years from the last day of the work week covered by the payroll. A certified copy of these payroll reports shall be made available: 1) Effective June 30, 2007, all Contractors performing work on public work projects are required to furnish sworn payroll records on a weekly basis to the Department of Labor. Specifically, 29 Del. C. § 6960(c) states that "(e)very contract... shall contain a stipulation that

sworn payroll information, as required by the Department of Labor, be furnished weekly." Further, that "(t)he Department of Labor shall keep and maintain the sworn payroll information for a period of 6 months from the last day of the work week covered by the payroll." Lastly, the failure to submit payroll reports shall be subject to a civil penalty of not less than \$1,000 nor more than \$5,000 for each violation. 29 Del. C. § 6960(e). Sworn payroll information shall consist of a fully completed and notarized report on a form provided upon request by the Department of Labor. See Delaware Prevailing Wage Regulations VII A.2(c)"; 2) upon request by the public or for copies thereof. However, a request by the public must be made through the Department of Labor. The requesting party shall, prior to being provided the records, reimburse the costs of preparation by the Department of Labor in accordance with the Department's copying fee policy. The public shall not be given access to the records at the principal office of the Contractor or Subcontractor; and 3) the certified payroll records shall be on a form provided by the Department of Labor or shall contain the same information as the form provided by the Department and shall be provided within 10 days from receipt of notice requesting the records from the Department of Labor.

9. PERFORMANCE AND PAYMENT BONDS

- 9.1 The Contractor shall be required to furnish bonds covering the faithful performance of the contract and the payment of all obligations arising thereunder with such sureties secured through the Bidder's usual sources as may be agreeable to the parties. The Owner shall be noted as the obligee. The Owner is the Woodbridge School District.
- 9.2 The performance and payment bonds shall each be in an amount equal to 100% of the Contract Sum as adjusted from time to time. The Owner shall be noted as the obligee. The Owner is Woodbridge School District.

9.3 TIME OF DELIVERY AND FORM OF BONDS

1. The Bidder shall deliver the required bonds within seven (7) days from receipt of request from the Construction Manager.
2. The performance and payment bonds shall be written in the form found in Section 006113 Performance and Payment Bond Forms.
3. The required bonds shall be by an authorized agent of the bonding company and shall be accompanied by a certified and current copy of the bonding agent's Power of Attorney, indicating the monetary limit of such power. The bonding company shall be licensed to operate in the state which the work is to be performed.

10. EXECUTION OF AGREEMENT

- 10.1 The Agreement will be written on a contract form, stipulated by the Owner, a copy of

which is included in the Specifications.

- 10.2 The Bidder shall, within seven (7) days following its presentation, execute the Agreement and return it to the Construction Manager.
- 10.3 The Bidder agrees to commence work within seven (7) days of 1) execution of the Agreement, or 2) receipt of a Letter of Intent to execute the Agreement, or other authorization to proceed, if furnished at an earlier date.
- 10.4 If the successful Bidder fails to execute the required Contract and Bond, as aforesaid, within twenty (20) days after the date of official Notice of the Award of the Contract, their Bid guaranty shall immediately be taken and become the property of the State for the benefit of the Agency as liquidated damages, and not as a forfeiture or as a penalty. Award will then be made to the next lowest qualified Bidder of the Work or readvertised, as the Agency may decide.

11. GENERAL COMMENTS

11.1 JOINT VENTURE AGREEMENTS

In the event of a mandatory pre-bid meeting, representatives of both Joint Ventures must attend the pre-bid meeting and must be an officer and co-joint venture of the corporations involved.

Each Joint Venture shall be qualified and capable to complete the project with their own forces.

Included with the bid submission, and as a requirement to bid, a copy of the executed Joint Venture Agreement shall be submitted and signed by all Joint Ventures involved.

All required bid bonds, performance bonds, material and labor payment bonds must be executed by both Joint Ventures and be placed in both of their names.

All required insurance certificates shall name both Joint Ventures.

Both Joint Ventures shall sign the bid form and shall submit a valid Delaware Business License Number with their bid or shall state that the process of application for a Delaware Business License has been initiated.

Both Joint Ventures shall include their Federal E. I. Number with the bid.

Due to exceptional circumstances and for good cause shown, one or more of these provisions may be waived at the discretion of the Owner.

11.2 LICENSE APPLICATION REQUIRED TO BID

A business license application must be initiated prior to or in conjunction with the submission of a bid on competitively bid contracts exceeding \$50,000; or in the case of a subcontractor, prior to the submission of a bid by the general contractor. The license application procedure may be initiated by visiting or calling the Division of Revenue.

11.3 BONDING REQUIREMENTS FOR NON-RESIDENT CONTRACTORS

All non-resident contractors are reminded that they must supply a surety or cash bond to the Division of Revenue equal to six percent (6%) of the total of all contracts exceeding \$20,000 for construction within this state. For Division of Revenue purposes, cash bonds and bank letters of credit issued by financial institutions will be accepted on all contracts.

11.4 CONTRACT AWARD TO NON-RESIDENT CONTRACTORS

Every architect, or professional engineer or contractor or construction manager engaging in the practice of such profession shall furnish the Department of Finance within 10 days after entering into any contract with a contractor or subcontractor not a resident of this State, a statement of the total value of such contract or contracts together with the names and addresses of the contracting parties.

11.5 STATE LICENSE AND TAX REQUIREMENTS

The Contractor and Subcontractor shall be licensed to do business in the State of Delaware and shall pay all fees and taxes due under State laws. In conformance with Section 2503, Chapter 25, Title 30, Delaware Code, "the Contractor shall furnish the State Tax Department within ten (10) days after award of the Contract, a statement of the total values of each contract and subcontract, together with the names and addresses of the contracting parties . . ."

11.6 RIGHT TO AUDIT RECORDS

The Owner (contracting agency) shall have the right to audit the books and records of a Contractor or any Subcontractor under any Contract or Subcontract to the extent that the books and records relate to the performance of the Contract or Subcontract.

Said books and records shall be maintained by the Contractor for a period of three (3) years from the date of final payment under the Prime Contract and by the Subcontractor for a period of three (3) years from the date of final payment under the Subcontract.

11.7 PREFERENCE FOR DELAWARE LABOR

In the construction of all public works for the State or any political subdivision

thereof or by firms contracting with the State or any political subdivision thereof, preference in employment of laborers, workers or mechanics shall be given to bona fide legal citizens of the State who have established citizenship by residence of at least 90 days in the State. Each public works contract for the construction of public works for the State or any political subdivision thereof shall contain a stipulation that any persons, company or corporation who violates this section shall pay a penalty to the Secretary of Finance equal to the amount of compensation paid to any person in violation of this section.

END OF SECTION

SECTION 003132 – GEOTECHNICAL DATA

1. GENERAL

1.1 Owner's Disclaimer

- A. Site Information: Data on subsurface conditions are made available in the Bidding Documents as a convenience to Bidders and the Contractor. They are not intended as representations or warrants of continuity of such conditions between soil borings. It shall be expressly understood that the Owner will not be responsible for interpretations or conclusions drawn there from by the Contractor. Additional test borings and other exploratory operations may be made by the Contractor at no additional cost to the Owner, provided such operations are acceptable to the Architect and Construction Manager.

1.2 SOIL BORING DATA

- A. Report of Geotechnical Exploration dated 3-13-12 has been prepared by GTA and is included in this section.



REPORT OF GEOTECHNICAL EXPLORATION

Woodbridge High School Sussex County, Delaware

March 13, 2012

Prepared For:

Fearn Clendaniel Architects, Inc.
6 Larch Avenue, Suite 398
Wilmington, Delaware 19804

Attn: Mr. Wayde B. Clendaniel, A.I.A.

Prepared By:

GEO-TECHNOLOGY ASSOCIATES, INC.
Geotechnical and Environmental Consultants
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GTA Job No: 120007

GEO-TECHNOLOGY ASSOCIATES, INC.

GEOTECHNICAL AND
ENVIRONMENTAL CONSULTANTS

A Practicing ASFE Member Firm

March 13, 2012



Fearn Clendaniel Architects, Inc.
6 Larch Avenue, Suite 398
Wilmington, Delaware 19804

Attn: Mr. Wayde B. Clendaniel, A.I.A.

Re: Report of Geotechnical Exploration
Woodbridge High School
Sussex County, Delaware

Gentlemen:

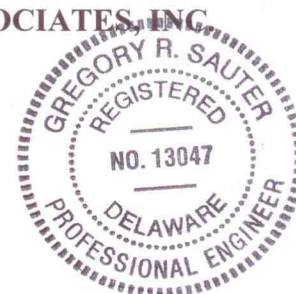
In accordance with our agreement dated September 7, 2011, Geo-Technology Associates, Incorporated (GTA) has performed geotechnical exploration for the Woodbridge High School project in Sussex County, Delaware. The exploration consisted of performing 13 test borings at the proposed Woodbridge High School site, visually classifying the soils, and performing limited laboratory testing. The results of field and laboratory testing and recommendations regarding design and construction of foundations, slabs, earthwork, and below grade utilities are included in this report.

Unless Fearn Clendaniel Architects, Inc. specifies otherwise, the samples collected as a part of the subsurface exploration will be disposed of after a period of 60 days from the date of this report. Thank you for the opportunity to be of assistance. If you have any questions or require additional information, please do not hesitate to contact our office.

Sincerely,

GEO-TECHNOLOGY ASSOCIATES, INC.


Gregory R. Sauter, P.E.
Vice President



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REPORT OF GEOTECHNICAL EXPLORATION

WOODBRIIDGE HIGH SCHOOL SUSSEX COUNTY, DELAWARE MARCH 2012

INTRODUCTION

Woodbridge School District is proposing a new high school building and campus on the grounds of the existing Woodbridge Athletic Complex situated along Woodbridge Road between Bridgeville and Greenwood in Sussex County, Delaware. The project entails the construction of a partial 2-story school building with an approximate 150,000 square foot footprint; including a gymnasium, several outbuildings, drive lanes and parking areas, and stormwater management (SWM) systems.

Geo-Technology Associates, Inc. (GTA) was retained by Fearn Clendaniel Architects, Inc. to perform a geotechnical exploration of the site. The scope of this study included field exploration, review of a site plan, limited laboratory testing, and engineering analysis. The field exploration consisted of ten Standard Penetration Test (SPT) borings and three auger borings with Dynamic Cone Penetrometer (DCP) tests located within the area of the proposed Woodbridge High School building, Athletic and concession Facility, Camp Raider buildings, drive lanes and parking lot. Conclusions and recommendations regarding site development were derived from:

- Engineering analyses of field and laboratory data;
- Preliminary building construction information provided by Fearn Clendaniel Architects, Inc.;
- Preliminary structural load information provided by Baker, Ingram & Associates in their letter dated February 15, 2012; and a
- Preliminary site plan titled “WOODBRIIDGE SCHOOL DISTRICT, NEW HIGH SCHOOL,” prepared by CDA Engineering, dated February 19, 2011.

SITE CONDITIONS

Referring to the Site Location Plan and the Exploration Location Plan included as Figures 1 and 2, respectively, in Appendix A, the project site is located at 14714 Woodbridge Road along the

southwest side of Woodbridge Road west of Adams Road between Bridgeville and Greenwood, Delaware. The project site is situated within an irregularly shaped parcel with mostly open grass fields with an existing agricultural-use building along the southeast side of the proposed high school, a SWM pond along south west side; athletic fields and pathways along the northwest side and Woodbridge Road along the northeast side. With the exception of an approximate 13-foot high stockpile and a 3 to 5-foot deep swale within portions of the proposed high school building footprint, the site is relatively level with the ground surface ranging from Elevation 46 to 50 Mean Sea Level (MSL). The SWM pond has a permanent pool indicated at Elevation 43.3 MSL.

PROPOSED CONSTRUCTION

The proposed construction will consist of a new high school of approximately 150,000 square feet with classrooms, laboratories, administration, shops, a gymnasium, and an auditorium. The classrooms are two-story with the remaining sections typically one-story. The building will generally consist of structural steel framing, elevated concrete floors on steel framing, and open web steel roof joists and metal roof deck. A shallow spread foundation system and ground supported slabs are anticipated. Exterior walls will have a masonry veneer with a combination of cold-formed steel studs and masonry back-up. Preliminary foundation loads of 240 kips (DL of 110 kips and LL of 130 kips) for columns and 5 kips per linear foot (DL of 4 k/ft. and LL of 1 k/ft.) are anticipated for the high school building. The proposed Greenhouse, Athletic and Concession Facility and the three Camp Raider buildings will consist of low-rise, primarily masonry wall bearing or pole-type supported structures.

Parking and access drives are proposed for the northern portion of the campus, as well as new athletic fields in the southern portion of the campus. An existing Stormwater management pond is located on the site; however, other areas of the site may be reserved for additional Stormwater management features. The buildings will be served by public sewer and a proposed on-site well. Final grades for the proposed buildings and paved areas were not available at the time of this report, but are assumed to closely match existing grades with cuts to fills limited to on the order of 1 to 2 feet to achieve final grades.

SITE GEOLOGY

According to the Report of Investigations No. 76; Stratigraphy, Correlation, and Depositional Environments of the Middle to Late Pleistocene Interglacial Deposits of Southern Delaware (2010) published by the Delaware Geological Survey, the site is within the Coastal Plain Province. Coastal Plain sediments below the surficial deposits exposed in the site area were generally deposited in estuarine environments of Tertiary geologic age. The sediment deposits are designated as the Beaverdam Formation. Sediments of this formation typically consist of "...silty to clayey, fine to coarse sand. Laminae and beds of very coarse sand with pebbles to gravel are common. Laminae and beds of...silty clay are also common." Please refer to the referenced publication for additional information. Also, man-made fill is present at the site considering the existing stockpile and other development.

SUBSURFACE EXPLORATION

The field exploration consisted of drilling Standard Penetration Test (SPT) borings at ten locations, designated as B-1 through B-8, P-1 and P-2, in the areas of the proposed school building footprint and pavement areas. In addition, three auger borings with Dynamic Cone Penetrometer (DCP) tests, designated as C-1, C-2 and CR-1, were performed within the proposed Athletic and Concession Facility and the Camp Raider Building areas. The SPT borings were drilled on January 24 and 25, 2012 to depths of 5.5 to 25 feet below the existing ground surface using an ATV-mounted CME 55 drill rig. The auger borings were drilled on January 30, 2012 to depths of 10 feet below the existing ground surface.

The borings were performed at the approximate locations shown on the Exploration Location Plan, presented as Figure 2 in Appendix A. GTA selected the locations and field located the exploration locations measuring from existing site features in conjunction with the use of Garmin 60C global positioning system (GPS) equipment with 20 foot accuracy. The exploration locations indicated on the plan should be considered approximate. The ground surface elevation at the explorations was estimated from plan topography. Actual ground surface elevations were not determined.

Standard Penetration Testing was performed in the SPT boreholes, with soil samples obtained at 2 ½-foot intervals in the upper 10 feet and then at 5-foot intervals thereafter. Standard Penetration Testing involves driving a 2-inch O.D., 1 ¾ -inch I.D. split-spoon sampler with a 140-pound hammer free-falling 30 inches. The SPT N-value, given as blows per foot (bpf), is defined as the total number of blows required to drive the sampler from the 6 to 18 inches below the sampling depth. At borings C-1, C-2 and CR-1, in-situ soil strength was evaluated using Dynamic Cone Penetration (DCP) testing (ASTM STP 399). This test is conducted by driving a 1.5-inch diameter cone into the subsoil using a 15-pound hammer, free-falling a vertical distance of 20 inches. The number of hammer-blows required to drive the cone 1¾ inches is an indication of the soil strength and density. The DCP penetration resistance value can be correlated to the Standard Penetration Testing (SPT) N-value, referencing ASTM Special Technical Paper 399.

Samples obtained from the borings were returned to GTA's office for visual classification by GTA personnel. Selected samples recovered from the field exploration were submitted for limited laboratory analysis. The soil layers were classified in accordance with the Unified Soil Classification System (USCS) and the American Association of State Highway and Transportation Officials (AASHTO) classification system. Classifications provided on the logs are visual descriptions, supplemented by available laboratory data. The exploration logs are presented in Appendix B. The logs represent our interpretation of the field data based on observation and limited soil classification tests. The interfaces indicated on the logs may be gradual.

SUBSURFACE CONDITIONS

The explorations generally confirm the description of subsurface conditions provided in the *SITE GEOLOGY* section of this report. The explorations encountered fill materials extending to a depth of 10 feet at B-4. The fill was visually classified as consisting of Silty SANDs (USCS classification SM). The relative density of the fill was loose to medium dense based upon SPT N-values of 9 to 16 blows per foot (bpf).

Below the fill at boring B-4 and a 6- to 12-inch thick layer of topsoil at the remaining borings, the explorations encountered native soils visually classified as primarily consisting of Poorly graded SANDs (SP), Silty SANDs (SP-SM, SM), and Clayey SANDs (SC). The relative densities of the granular soils were very loose to medium dense based on SPT N-values of 3 to 27 bpf. Most granular soils were medium dense.

At borings B-8 from 17 to the boring termination depth of 25 feet and at C-2 from 8 to 9 feet, fine-grained soils were encountered consisting of Sandy Lean CLAY (CL) at B-8 and SILT (ML) at C-2. The relative consistency of the fine-grained soil was stiff based on SPT N-values of 12 to 14 bpf.

With the exception of shallow borings P-1 and P-2, water was encountered at completion of the borings at depths of 5.3 to 17.4 feet below the ground surface. P-1 and P-2 were dry and caved to depths of 3 to 4 feet. Longer term water levels recorded one day after completion ranged between 4 and 7.3 feet below the existing ground surface outside of the stockpile boring B-4. The longer term water levels varied between Elevation 42 and 44 MSL.

The groundwater levels can be expected to fluctuate with seasonal changes, precipitation, and other factors such as development activity. Additionally, perched water conditions develop in granular soils overlying fine-grained soils during the “wet season” and during heavy periods of precipitation. Please refer to the exploration logs and Table 1, Exploration Data Summary provided in Appendix B for further information.

LABORATORY TESTING

Selected samples obtained from the borings were tested for grain-size analysis, Atterberg Limits, moisture density relationships, and natural moisture contents. The grain-size analysis and Atterberg Limits testing were performed to identify the Unified Soil Classification System (USCS), and the American Association of State Highway and Transportation Officials (AASHTO) designations for the soil. The results of testing are:

SUMMARY OF LABORATORY TESTING

EXPLORATION NO.	DEPTH (FT.)	USCS CLASSIFICATION	AASHTO CLASSIFICATION	LL (%)	PI (%)
B - 4	0 - 5	Silty SAND (SM)	A-2-4	NP	NP
B - 4	5 - 9	Silty SAND (SM)	A-2-4	NP	NP
B - 4	9 - 10.5	Silty SAND (SM)	A-2-4	NP	NP
B - 5	14 - 15.5	Silty SAND (SM)	A-1-b	NP	NP
B - 8	19 - 20.5	Sandy Lean CLAY (CL)	A-7-6	42	23
P - 1	0 - 3	Silty SAND (SM)	A-2-4	NP	NP

Note: LL=Liquid Limit PI=Plastic Index NP=Non-plastic

Three bulk samples, obtained from borings B-4 and P-1 were tested for moisture-density relationships in accordance with the Standard Proctor (ASTM D-698, AASHTO T-99) for use in evaluating the suitability of these soils for reuse as fill. Results of these tests are summarized in the following table:

**SUMMARY OF COMPACTION DATA
 (ASTM D-698/AASHTO T-99, the Standard Proctor)**

EXPLORATION NO.	DEPTH (FT.)	MAXIMUM DRY DENSITY (PCF)	OPTIMUM MOISTURE (%)	NATURAL MOISTURE (%)
B - 4	0 - 5	122.8	10.2	10.1
B - 4	5 - 9	123.9	9.9	12.5
P - 1	0 - 3	117.2	9.7	12.1

Please refer to the laboratory test results included within Appendix C for additional information.

CONCLUSIONS AND RECOMMENDATIONS

Based upon the results of this study, it is our opinion that construction of the proposed improvements is feasible, given that the geotechnical recommendations are followed and that the standard level of care is maintained during construction. GTA’s preliminary recommendations are provided in the following paragraphs.

Earthwork

Before the placement of compacted fill, areas below proposed foundations, slabs, and pavements should be stripped and grubbed to remove all topsoil, organic matter, soft materials and existing fill including the referenced stockpile. GTA recommends that for earthwork estimates, a stripping thickness of 1 to 1 ½ feet be used. The actual stripping thickness will be dependant on localized topsoil development, historic plow depth and tree growth, precipitation, soil moisture, construction traffic disturbance, and contractor care.

After stripping, subgrade areas should be proof-rolled with a loaded tandem-axle dump truck, performed as recommended by GTA. No fill should be placed until the geotechnical engineer approves the subgrade. Wet soils near surface grade will result in poor trafficability. Positive drainage should be maintained during construction.

Most near surface on-site soils beneath the topsoil and stockpiled materials similar to the materials tested are considered suitable for reuse as structural fill material. Excavated site materials conforming to SP-SM, SM, or SC classifications will be suitable for reuse as structural utility backfill and in structural areas of mass earthwork construction. The moisture of the bulk samples tested ranged from near optimum to approximately 3 percent above the optimum moisture content. At these indicated moisture levels, granular site materials similar to the samples tested will require limited, if any, drying by aeration after spreading and prior to compaction to achieve the project compaction specifications. During wet weather or when excavating below or near groundwater, delays and expense will likely be associated with reducing soil moistures to acceptable levels.

For utility and site earthwork construction, the success of these operations will be largely dependent upon the weather conditions at the time of the earthwork construction. Summer construction season is recommended to reduce the premium cost for drying. A contingency should be established for moisture adjustments and importing suitable materials. If the work is performed during wet weather, offsite borrow may be required to complete the earthwork construction.

Off-site borrow, if required, should meet Unified Soil Classification System (USCS) designation SM, SP, SW, GP, GM, or GW and be approved by GTA.

All fills should be constructed in maximum 8-inch thick loose lifts and be compacted to the following specifications:

COMPACTION SPECIFICATIONS

Structure / Fill Location	Compaction / Moisture Specification
Below foundations, retaining walls, below top 12 inches of pavement and floor slab subgrades and within wall backfill	95% of ASTM D-698/AASHTO T-99 Moisture: optimum to \pm 3% of optimum
Top 12 inches of pavement and floor slab subgrades	100% of ASTM D-698/AASHTO T-99 Moisture: optimum to \pm 3% of optimum
Lawn or unimproved areas	92% of ASTM D-698/AASHTO T-99 Moisture: optimum to \pm 3% of optimum

A full time soils-technician under guidance of GTA should observe fill construction. Compactive effort should be verified by in-place density testing.

Retaining Wall / Loading Dock Wall Construction

Unless designated otherwise, all structural fill should meet Unified Soil Classification System (USCS) designation SP-SM, SP, SW, GP, GM, or GW and should be approved by the geotechnical engineer. Unless specified otherwise, all fills should be constructed in 8-inch loose lifts and compacted to 95 percent of the maximum dry density as determined by ASTM D-698 (AASHTO T-99), the Standard Proctor. The reinforced earth retaining wall construction and the retained fill construction should be observed by GTA and verified by in-place density testing.

Retaining walls should be designed to resist lateral earth pressures and be provided with a properly outletted drain system in an effort to minimize the buildup of hydrostatic pressure from natural or unnatural sources following construction. An appropriate surface surcharge should be

considered in the design to reflect the uses of the areas adjacent to the walls following construction. GTA recommends that the following soil design parameters be used for the design of the retaining walls:

Friction Angle	$\phi = 30$ degrees
Active Pressure Coefficient*	$K_a = 0.33$
At Rest Pressure Coefficient*	$K_o = 0.5$
Passive Pressure Coefficient*	$K_p = 3.0$
Moist Unit Weight of Soil	125 pcf
Saturated Unit Weight of Soil	130 pcf
Submerged Unit Weight of Soil	68 pcf
*Level backfill condition	

Soil used for backfill against retaining walls should be non-plastic and have less than 20 percent passing the No. 200 sieve. Select borrow material meeting these requirements may need to be borrowed from other areas of the site or imported from an approved borrow source. Select borrow material used for the loading dock and retaining walls should be approved by GTA for the intended usage.

Foundations

Based upon the exploration data, it is GTA's opinion that the proposed buildings may be supported on structural fill or firm native soils using shallow spread footings designed for a maximum net allowable bearing pressure of 3,000 pounds per square foot (psf) for the high school building and 2,000 psf for the Athletic and Concession Facility, Camp Raider buildings and the Greenhouse. Minimum widths for wall footings of 16 inches and column footings of 24 inches are recommended. Settlement of 1-inch total and ½-inch differential over a 50 foot horizontal span is estimated considering preliminary wall loads of 5 kips per foot and column loads of 240 kips. Exterior footings should be founded a minimum of 24 inches below the final exterior grades to provide protection from frost action.

Detailed foundation evaluations should be performed in each footing excavation prior to the placement of reinforcing steel or concrete. These evaluations should be performed by a

representative of GTA to confirm that the allowable soil bearing capacity is available. The foundation bearing surface evaluations should be performed using a combination of visual observation, comparison with the borings, hand-rod probing, and Dynamic Cone Penetrometer (DCP) testing. Footings should be concreted on the day they are excavated.

Seismic Information

It is GTA's opinion that the soil conditions at this site can be categorized as Site Class E per the 2003 International Building Code. This categorization is based on the near surface test boring results, general geologic information for the region, and the information contained in the IBC 2003 codes.

While the class determined for this site was based on SPT values obtained from the borings, a more accurate method, shear wave velocity, is available to evaluate the potential for improving the Site Class designation. Shear wave velocity testing was not included in our scope of work, but GTA regularly performs this service on selected projects and can be provided, if requested.

Floor Slabs

The ground floor should be designed as concrete slab-on-grade. GTA recommends that the concrete floor slabs supported on grade be founded on a four-inch thick open-graded stone layer covered with a polyethylene vapor retarder to interrupt the rise of moisture through the slab. Natural and compacted fill subgrades for support of the floor slabs should be tested to verify stability and compaction in accordance with GTA's earthwork recommendations prior to placement of concrete. Control joints should be provided to control shrinkage cracking of the concrete floor system. Isolation joints should be present at the location of walls, columns, and footings to allow for differential movement. A modulus of subgrade reaction value of 100 psi per inch is recommended for the design of the building slabs.

Subsurface Utilities

The natural soils are considered suitable for support of below grade utilities; however, GTA recommends a minimum 6-inch granular bedding to provide uniform support where wet or plastic

soils are encountered at the subgrade and as dictated by site conditions. Where HDPE or PVC pipe is used, GTA recommends that the stone bedding materials and stone backfill, at least to haunch elevations, be used. GTA should be consulted for additional recommendations where HDPE or PVC pipes are used. GTA recommends evaluation and testing of utility backfill during installation.

Based upon the results of the borings, GTA anticipates that standard excavating techniques should be suitable for utility installation to depths of 5 feet. Firm natural soil and controlled compacted fill are considered suitable for support of the proposed pipe systems. Due to the potential for collapse of unsupported excavation in granular soils, the utility contractor should be prepared to provide adequate earth support systems during utility construction. Dewatering through the use of well point techniques will be required in areas where utility installation occurs more than two feet below the groundwater level. During prevailing wet weather, perched water will likely be encountered at depths shallower than 5 feet. Consideration must be given to supplementing dewatering using well points with “sump and pump” techniques, especially in areas where clay or silt layers are present and well points will not be particularly effective.

Compaction of the soils to the degree specified in the *Earthwork* section of this report may require that the soils be moisture conditioned prior to placement and compaction within the trench. If the excavated materials are wet of the optimum moisture content, they should be spread in thin layers and aerated by discing to within 2 or 3 percentage points of the optimum moisture, as applicable. If soils are not dried, suitable borrow material will need to be imported from other areas of the site for utility trench backfill. Settlement and instability are likely if the on-site soils are used as backfill at moisture levels more than 4 percentage points above optimum.

Surface and Subsurface Drainage

Final grades should be carefully established to provide adequate surface drainage away from the foundations. Groundwater levels referenced in the *SUBSURFACE CONDITIONS* section of the report are expected to fluctuate several feet due to seasonal changes in precipitation and development activity. Furthermore, soil layers containing appreciable amounts of silt or clay tend to perch groundwater at higher levels during wetter periods.

Depending upon final grades, field underdrains may be needed in the portion of the site in the areas where the groundwater level was at a depth less than 5 feet during the exploration program. The need for underdrain construction can be reduced by minimizing the degree of cut required to achieve grade. If saturated footing and slab subgrades are encountered, the subgrade should be stabilized and the subgrade elevation may have to be raised as recommended by GTA.

ADDITIONAL SERVICES

We recommended that during construction of the subject project, GTA be retained to provide observation and testing services for the following items.

- Provide infiltration testing in proposed supplemental stormwater management areas, if required.
- Perform subsurface exploration for athletic fields.
- Review of final grades, structural loads and construction plans when established to evaluate if they conform with the intent of this report.
- Provide testing observation and services during fill placement to evaluate if the work is being performed in accordance with the project specifications and intent of this report.
- Observe the proof-rolling of pad and pavement subgrades prior to placing fill or base course to evaluate stability.
- Review excavated footings for compliance with the project drawings and the intent of this geotechnical report.

LIMITATIONS

This report, including all supporting exploration logs, field data, field notes, laboratory test data, calculations, estimates, and other documents prepared by GTA in connection with this project, has been prepared for the exclusive use of Fearn Clendaniel Architects, Inc. pursuant to the agreement between GTA and Fearn Clendaniel Architects, Inc. dated September 7, 2011 and in accordance with generally accepted engineering practice. All terms and conditions set forth in the Agreement and the General Provisions attached thereto are incorporated herein by reference. No warranty, express or implied, is given herein. Use and reproduction of this report by any other

person without the expressed written permission of GTA and Fearn Clendaniel Architects, Inc. is unauthorized and such use is at the sole risk of the user.

The analysis and recommendations contained in this report are based on the data obtained from limited observation and testing of the encountered materials. Explorations indicate soil conditions only at specific locations and times and only to the depths penetrated. They do not necessarily reflect strata variations that may exist between the exploration locations. Consequently, the analysis and recommendations must be considered preliminary until the subsurface conditions can be verified by direct observation at the time of construction. If variations in subsurface conditions from those described are noted during construction, recommendations in this report may need to be re-evaluated.

In the event that any changes in the nature, design, or location of the facilities are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report are verified in writing. Geo-Technology Associates, Inc. is not responsible for any claims, damages, or liability associated with interpretation of subsurface data or reuse of the subsurface data or engineering analysis without the expressed written authorization of Geo-Technology Associates, Inc.

The scope of our services for this geotechnical exploration did not include any environmental assessment or investigation for the presence or absence of wetlands, or hazardous or toxic materials in the soil, surface water, groundwater or air, on or below or around this site. Any statements in this report or on the logs regarding odors or unusual or suspicious items or conditions observed are strictly for the information of our Client.

The subject matter of this report is limited to the facts and matters stated herein. Absence of a reference to any other conditions or subject matter should not be construed by the reader to imply approval by the writer.

Important Information About Your Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you — should apply the report for any purpose or project except the one originally contemplated.*

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,

- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that

have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely on Your ASFE-Member Geotechnical Engineer for Additional Assistance

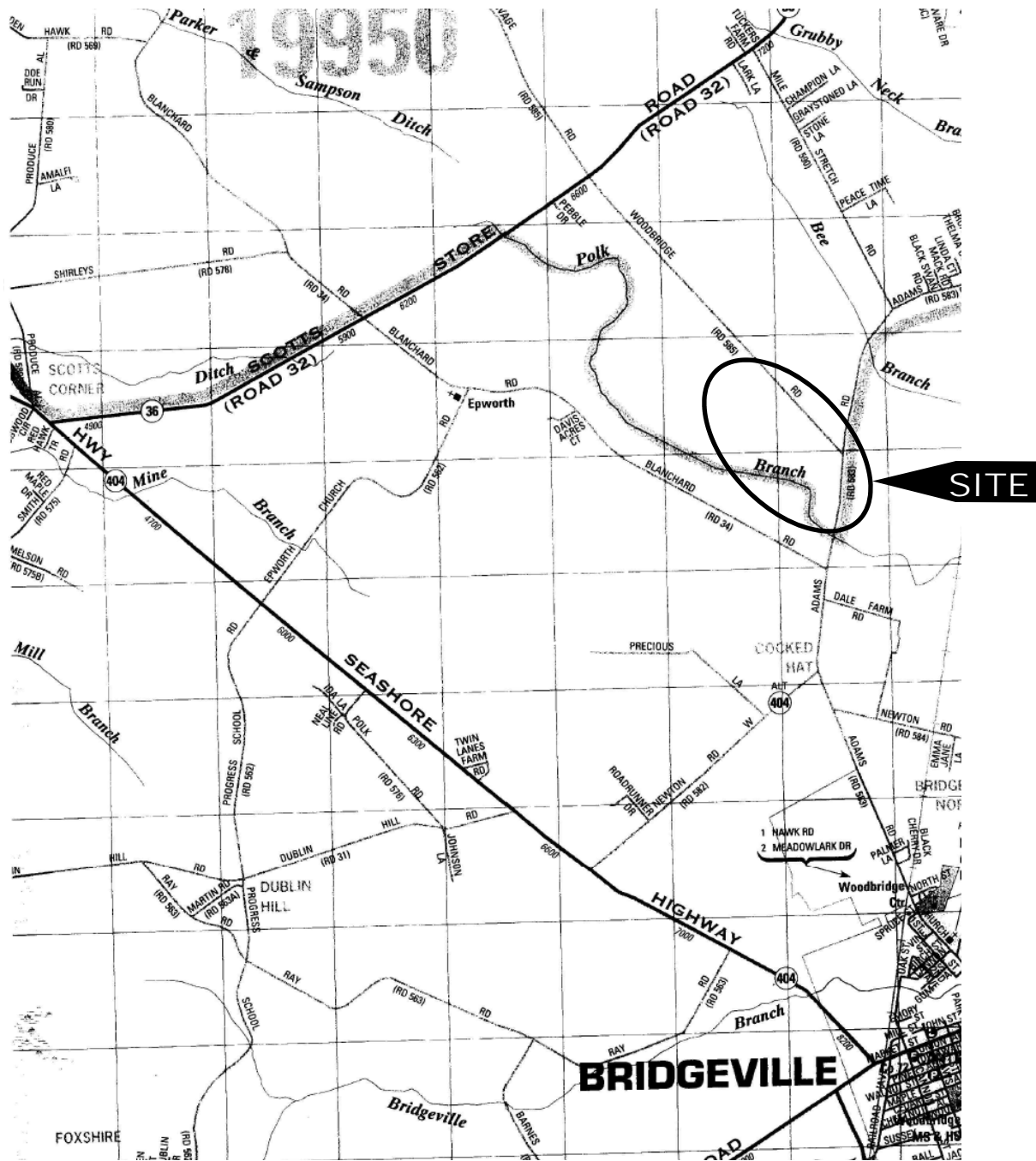
Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.



8811 Colesville Road/Suite G106, Silver Spring, MD 20910
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e-mail: info@asfe.org www.asfe.org

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APPENDIX A
FIGURES



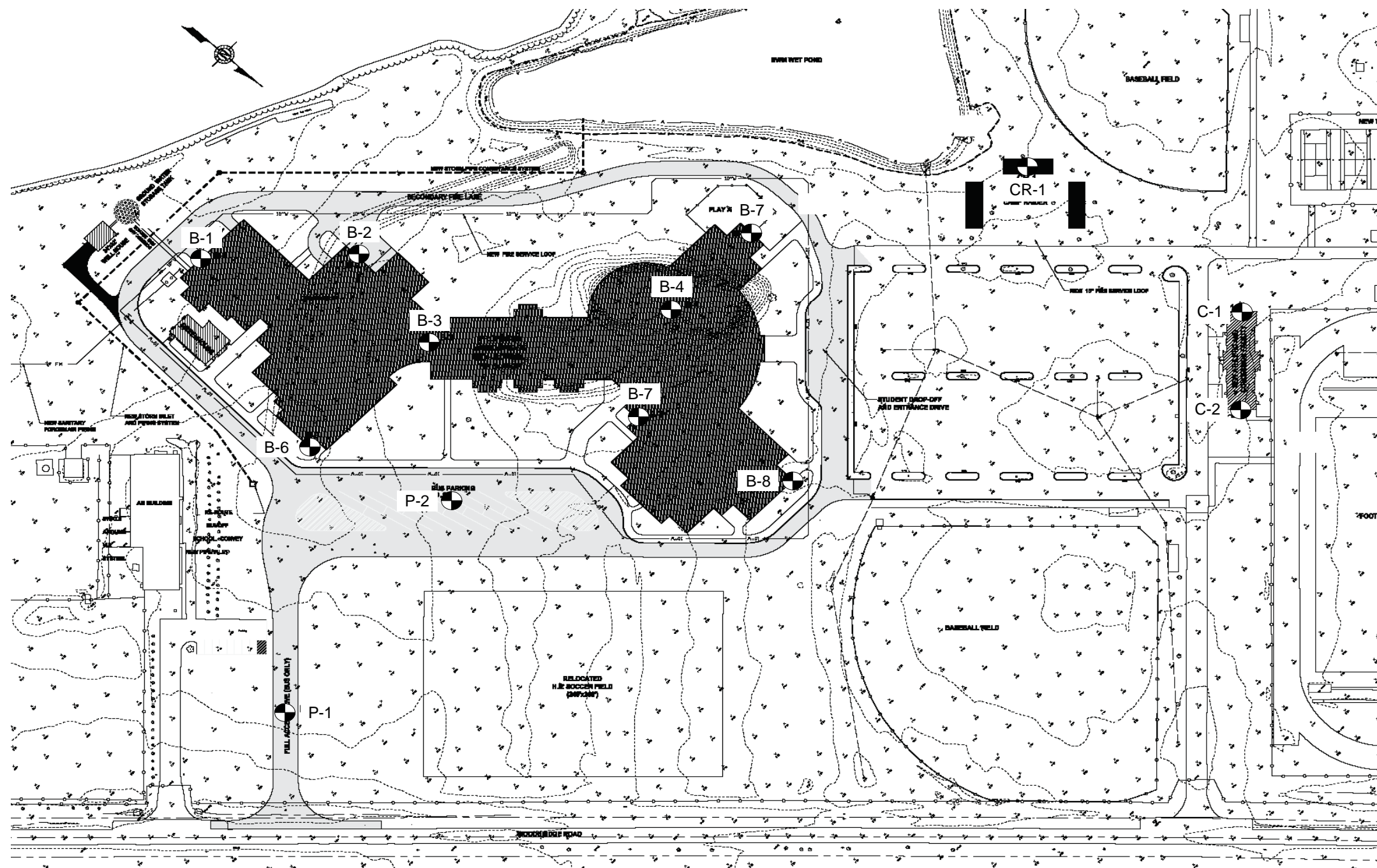
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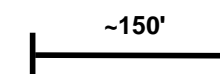
GEO-TECHNOLOGY ASSOCIATES, INC.
Geotechnical and Environmental Consultants
21133 Sterling Square, Unit 7
Georgetown, Delaware 19947
Phone: 302-855-9761
Fax: 302-856-3388

Site Location Plan
Woodbridge High School
Sussex County, Delaware

SCALE	DATE	DRAWN BY	REVIEW BY	FIGURE	JOB NO.
1" ~ 3519'	January 12, 2012	SS	GRS	1	120007



Exploration Location Plan was taken from a plan titled Woodridge School District - New High School - Woodridge Road, prepared by Fearn-Clendaniel Architects, Inc. and dated February, 19, 2011. Exploration locations were selected and staked by GTA measuring from site features. Exploration locations indicated on the plan should be considered approximate.



GEO-TECHNOLOGY ASSOCIATES, INC.
 GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
 21133 Sterling Avenue, Unit 7
 Georgetown, Delaware
 (302) 855-9761 Fax (302) 856-3388

Woodbridge High School
Exploration Location Plan
Sussex County, Delaware

SCALE	DATE	DRAWN BY	DESIGN BY	REVIEW BY	JOB NO.
As shown	February 2012	DW	Fearn - Clendaniel	GRS	120007

APPENDIX B
EXPLORATION DATA

GEO-TECHNOLOGY ASSOCIATES, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

21133 Sterling Avenue, Suite 7 Georgetown, Delaware 19947
 302-855-9761 302-856-3388 FAX



Re: Woodbridge High School
 Sussex County, Delaware
 GTA Project No.: 120007

TABLE 1
Exploration Data Summary

Exploration No.	Existing Ground Surface Elevation (ft.)	Total Depth of Exploration (ft.)	Topsoil Thickness (in.)	Extent of Fill From – To (ft.)	Extent of USCS CL or ML Soils From - To (ft.)	Extent of USCS SP, SP-SM, SM or SC Soils From - To (ft.)	Depth to Groundwater at Completion (ft.)	Depth to Groundwater/ Groundwater El. at One Day After Completion of Exploration (ft./MSL)
B-1	46	25	10	*NE	NE	0.8 - 25	5.3	4 / 42
B-2	48	20	8	NE	NE	0.7 - 20	11.3	6 / 42
B-3	49	20	8	NE	NE	0.7 - 20	7.6	6.5 / 42.5
B-4	60	25	NE	0 – 10	NE	10 - 25	17.4	17.2 / 42.8
B-5	48	20.5	6	NE	NE	0.5 – 20.5	6.9	5.4 / 42.6
B-6	47	20.5	8	NE	NE	0.7 – 20.5	5.0	4.8 / 42.2
B-7	50	20.5	8	NE	NE	0.7 – 20.5	11.4	7.3 / 42.7
B-8	49	25	12	NE	17 - 25	1 - 17	6.8	Dry to 5.7 / Dry to 43.3
C-1	49	10	12	NE	NE	1 - 10	6.3	5.2 / 43.8
C-2	49	10	12	NE	8 - 9	1 – 8; 9 - 10	6.3	5.2 / 43.8
CR-1	48	10	12	NE	NE	1 - 10	6.5	5.3 / 42.7
P-1	48	5.5	8	NE	NE	0.7 – 5.5	Dry to 4	Dry to 1.2 / Dry to 46.8
P-2	48	5.5	8	NE	NE	0.7 – 5.5	Dry to 3	Dry to 2.7 / Dry to 45.3

*NE – Not Encountered.

NOTES FOR EXPLORATION LOGS

KEY TO USCS TERMINOLOGY AND GRAPHIC SYMBOLS

MAJOR DIVISIONS (BASED UPON ASTM D 2488)			SYMBOLS		
			GRAPHIC	LETTER	
COARSE-GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LESS THAN 15% PASSING THE NO. 200 SIEVE)		GW	
		GRAVELS WITH FINES (MORE THAN 15% PASSING THE NO. 200 SIEVE)		GP	
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LESS THAN 15% PASSING THE NO. 200 SIEVE)		GM	
				GC	
		SANDS WITH FINES (MORE THAN 15% PASSING THE NO. 200 SIEVE)		SW	
				SP	
FINE-GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILT OR CLAY (<15% RETAINED ON THE NO. 200 SIEVE) SILT OR CLAY WITH SAND OR GRAVEL (15% TO 30% RETAINED ON THE NO. 200 SIEVE)	SILTS AND LEAN CLAYS LIQUID LIMIT LESS THAN 50		SM	
				SC	
		SANDY OR GRAVELLY SILT OR CLAY (>30% RETAINED ON THE NO. 200 SIEVE)	ELASTIC SILTS AND FAT CLAYS LIQUID LIMIT GREATER THAN 50		ML
					CL
			OL		
			MH		
		CH			
		OH			
HIGHLY ORGANIC SOILS				PT	

NOTE: DUAL SYMBOLS ARE USED TO INDICATE COARSE-GRAINED SOILS WHICH CONTAIN AN ESTIMATED 5 TO 15% FINES BASED ON VISUAL CLASSIFICATION OR BETWEEN 5 AND 12% FINES BASED ON LABORATORY TESTING; AND FINE-GRAINED SOILS WHEN THE PLOT OF LIQUID LIMIT & PLASTICITY INDEX VALUES FALLS IN THE PLASTICITY CHART'S CROSS-HATCHED AREA. FINE-GRAINED SOILS ARE CLASSIFIED AS ORGANIC (OL OR OH) WHEN ENOUGH ORGANIC PARTICLES ARE PRESENT TO INFLUENCE ITS PROPERTIES. LABORATORY TEST RESULTS ARE USED TO SUPPLEMENT SOIL CLASSIFICATION BY THE VISUAL-MANUAL PROCEDURES OF ASTM D 2488.

ADDITIONAL TERMINOLOGY AND GRAPHIC SYMBOLS

ADDITIONAL DESIGNATIONS	DESCRIPTION		GRAPHIC SYMBOLS
	DESCRIPTION	"N" VALUE	
ADDITIONAL DESIGNATIONS	TOPSOIL		
	MAN MADE FILL		
	GLACIAL TILL		
	COBBLES AND BOULDERS		
RESIDUAL SOIL DESIGNATIONS	HIGHLY WEATHERED ROCK	50 TO 50/1"	
	PARTIALLY WEATHERED ROCK	MORE THAN 50 BLOWS FOR 1" OF PENETRATION OR LESS, AUGER PENETRABLE	

COARSE-GRAINED SOILS (GRAVEL AND SAND)

DESIGNATION	BLOWS PER FOOT (BPF) "N"
VERY LOOSE	0 - 4
LOOSE	5 - 10
MEDIUM DENSE	11 - 30
DENSE	31 - 50
VERY DENSE	>50

NOTE: "N" VALUE DETERMINED AS PER ASTM D 1586

FINE-GRAINED SOILS (SILT AND CLAY)

CONSISTENCY	BPF "N"
VERY SOFT	<2
SOFT	2 - 4
MEDIUM STIFF	5 - 8
STIFF	9 - 15
VERY STIFF	16 - 30
HARD	>30

NOTE: ADDITIONAL DESIGNATIONS TO ADVANCE SAMPLER INDICATED IN BLOW COUNT COLUMN:
 WOH = WEIGHT OF HAMMER
 WOR = WEIGHT OF ROD(S)

SAMPLE TYPE

DESIGNATION	SYMBOL
SOIL SAMPLE	S-
SHELBY TUBE	U-
ROCK CORE	R-

WATER DESIGNATION

DESCRIPTION	SYMBOL
ENCOUNTERED DURING DRILLING	
UPON COMPLETION OF DRILLING	
24 HOURS AFTER COMPLETION	

NOTE: WATER OBSERVATIONS WERE MADE AT THE TIME INDICATED. POROSITY OF SOIL STRATA, WEATHER CONDITIONS, SITE TOPOGRAPHY, ETC. MAY CAUSE WATER LEVEL CHANGES.

LOG OF BORING NO. B-1

PROJECT: **Woodbridge High School**
 PROJECT NO: **120007**
 PROJECT LOCATION: **Sussex County, Delaware**

GROUND SURFACE ELEVATION: **46.0**
 DATUM: **Topo**
 EQUIPMENT: **CME 55 ATV**
 LOGGED BY: **DRW**
 CHECKED BY: **G. Sauter**

DATE STARTED: **January 25, 2012**
 DATE COMPLETED: **January 25, 2012**
 DRILLING CONTRACTOR: **Walton**
 DRILLER: **BillHolden**
 DRILLING METHOD: **HSA**
 SAMPLING METHOD: **Split Spoon**

WATER ENCOUNTERED DURING DRILLING: ∇ **10**
 WATER LEVEL: ∇ **5.3** ∇ **4.0** ∇ _____
 DATE: **1/25/12** **1/26/12** _____
 CAVED (ft): **16.8** **4.3** _____

SAMPLE NUMBER	SAMPLE DEPTH (ft)	SAMPLE RECOVERY (in)	BLOWS/ 6 inches	N (blows/ft)	ELEVATION (ft)	DEPTH (ft)	USCS	GRAPHIC SYMBOL	DESCRIPTION		REMARKS
					-46.0	0			TOPSOIL		Topsoil: 6 in.
1	1.0	18	2-6-8	14	45.2		SM		Brown-orange, moist, medium dense, Silty SAND		
2	4.0	18	8-13-11	24	42.8		SP SM		Brown-orange-tan, moist to wet, medium dense, Poorly-graded SAND with SILT		∇ ∇
3	6.5	16	3-8-9	17							
4	9.0	18	2-1-2	3	37.5		SM		Tan, wet, very loose to loose, Silty SAND		∇
5	14.0	18	3-3-4	7							
6	19.0	12	2-2-3	5	28.8		SP SM		Orange, wet, loose to medium dense, Poorly-graded SAND, with Silt and Gravel		
7	23.5	12	9-10-10	20							
					21.0	25			Bottom of hole at 25 ft.		

STANDARD LOG OF BORING - 25 FEET WOODBRIDGE HIGH SCHOOL.GPJ 3/12/12

Note: Automatic Hammer used; NE = Not Encountered.



GEO-TECHNOLOGY ASSOCIATES, INC.
 21133 Sterling Avenue, Unit 7
 Georgetown, Delaware 19947

LOG OF BORING NO. B-1

LOG OF BORING NO. B-2

PROJECT: **Woodbridge High School**
 PROJECT NO: **120007**
 PROJECT LOCATION: **Sussex County, Delaware**

GROUND SURFACE ELEVATION: **48.0**
 DATUM: **Topo**
 EQUIPMENT: **CME 55 ATV**
 LOGGED BY: **DRW**
 CHECKED BY: **G. Sauter**

DATE STARTED: **January 25, 2012**
 DATE COMPLETED: **January 25, 2012**
 DRILLING CONTRACTOR: **Walton**
 DRILLER: **Bill Holden**
 DRILLING METHOD: **HSA**
 SAMPLING METHOD: **Split Spoon**

WATER ENCOUNTERED DURING DRILLING: ∇ **10.5**
 WATER LEVEL: ∇ **11.3** ∇ **6.0** ∇ _____
 DATE: **1/25/12** **1/26/12** _____
 CAVED (ft): **6.8** **6.5** _____

SAMPLE NUMBER	SAMPLE DEPTH (ft)	SAMPLE RECOVERY (in)	BLOWS/ 6 inches	N (blows/ft)	ELEVATION (ft)	DEPTH (ft)	USCS	GRAPHIC SYMBOL	DESCRIPTION		REMARKS
									DESCRIPTION		
					-48.0	0			TOPSOIL		Topsoil: 8 in.
1	1.0	18	4-4-3	7	47.3		SM		Brown, moist, loose, Silty SAND		
					44.8						
2	4.0	18	4-6-8	14			SM		Brown-orange, moist, medium dense, Silty SAND		
					42.0	5					
3	6.5	14	4-7-15	22			SP SM		Brown-orange, moist to wet, medium dense, Poorly-graded SAND, with Silt and Gravel		
4	9.0	16	5-9-10	19		10					
					36.0						
5	13.5	18	4-2-5	7			SP SM		Gray-orange, wet, loose, Poorly-graded SAND with SILT		
					31.3						
6	18.5	18	5-8-12	20			SP		Gray-orange, wet, medium dense, Poorly-graded SAND, with Gravel		
					28.0	20					
									Bottom of hole at 20 ft.		

STANDARD LOG OF BORING - 25 FEET WOODBRIDGE HIGH SCHOOL.GPJ 3/12/12

Note: Automatic Hammer used; NE = Not Encountered.



GEO-TECHNOLOGY ASSOCIATES, INC.
 21133 Sterling Avenue, Unit 7
 Georgetown, Delaware 19947

LOG OF BORING NO. B-3

PROJECT: **Woodbridge High School**
 PROJECT NO: **120007**
 PROJECT LOCATION: **Sussex County, Delaware**

GROUND SURFACE ELEVATION: **49.0**
 DATUM: **Topo**
 EQUIPMENT: **CME 55 ATV**
 LOGGED BY: **DRW**
 CHECKED BY: **G. Sauter**

DATE STARTED: **January 25, 2012**
 DATE COMPLETED: **January 25, 2012**
 DRILLING CONTRACTOR: **Walton**
 DRILLER: **Bill Holden**
 DRILLING METHOD: **HSA**
 SAMPLING METHOD: **Split Spoon**

WATER ENCOUNTERED DURING DRILLING: ∇ **9.0**
 WATER LEVEL: ∇ **7.6** ∇ **6.5** ∇ _____
 DATE: **1/25/12** **1/26/12** _____
 CAVED (ft): **9.3** **6.8** _____

SAMPLE NUMBER	SAMPLE DEPTH (ft)	SAMPLE RECOVERY (in)	BLOWS/ 6 inches	N (blows/ft)	ELEVATION (ft)	DEPTH (ft)	USCS	GRAPHIC SYMBOL	DESCRIPTION		REMARKS
									DESCRIPTION		
					-49.0	0			TOPSOIL		Topsoil: 8 in.
1	1.0	18	6-9-14	23	48.3		SM		Dark brown, moist, medium dense, Silty SAND		
					45.8				Brown-orange, moist to wet, medium dense to loose, Silty SAND		
2	4.0	18	3-9-11	20		5	SM				
					40.5				Brown, moist to wet, medium dense, Poorly-graded SAND with SILT		∇
3	6.5	14	2-3-4	7							∇
					37.0				Tan - gray, wet, very loose, Silty SAND		
4	9.0	18	5-6-7	13		10	SP SM				∇
					32.3				Tan, wet, medium dense Poorly-graded SAND, with Gravel		
5	13.5	18	2-2-2	4		15	SM				
					29.0				Bottom of hole at 20 ft.		
6	18.5	6	12-10-6	16		20	SP				

Note: Automatic Hammer used; NE = Not Encountered.

STANDARD LOG OF BORING - 25 FEET WOODBRIDGE HIGH SCHOOL.GPJ 3/12/12



GEO-TECHNOLOGY ASSOCIATES, INC.
 21133 Sterling Avenue, Unit 7
 Georgetown, Delaware 19947

LOG OF BORING NO. B-3

LOG OF BORING NO. B-4

PROJECT: **Woodbridge High School**
 PROJECT NO: **120007**
 PROJECT LOCATION: **Sussex County, Delaware**

GROUND SURFACE ELEVATION: **60.0**
 DATUM: **Topo**
 EQUIPMENT: **CME 55 ATV**
 LOGGED BY: **DRW**
 CHECKED BY: **G. Sauter**

DATE STARTED: **January 24, 2012**
 DATE COMPLETED: **January 24, 2012**
 DRILLING CONTRACTOR: **Walton**
 DRILLER: **Bill Holden**
 DRILLING METHOD: **HSA**
 SAMPLING METHOD: **Split Spoon**

WATER ENCOUNTERED DURING DRILLING: ∇ **19.5**
 WATER LEVEL: ∇ **17.4** ∇ **17.2** ∇ _____
 DATE: **1/24/12** **1/26/12** _____
 CAVED (ft): **20.3** **18.5** _____

SAMPLE NUMBER	SAMPLE DEPTH (ft)	SAMPLE RECOVERY (in)	BLOWS/ 6 inches	N (blows/ft)	ELEVATION (ft)	DEPTH (ft)	USCS	GRAPHIC SYMBOL	DESCRIPTION		REMARKS
									DESCRIPTION		
					60.0	0			Brown, moist, medium dense Silty SAND (Fill)		
1	1.0	18	7-7-4	11					Brown, moist, medium dense Silty SAND (Fill)		
					56.8				Brown-tan, moist, loose to medium dense, Silty SAND (Fill)		
2	4.0	14	2-2-7	9		5			Brown-tan, moist, loose to medium dense, Silty SAND (Fill)		
									Brown-orange, moist, medium dense, Silty SAND		
3	6.5	14	4-6-10	16				SM	Brown-orange, moist, medium dense, Silty SAND		
					50.0	10			Brown-tan, moist to wet, medium dense, Poorly-graded SAND		
4	9.0	14	4-4-7	11				SP	Brown-tan, moist to wet, medium dense, Poorly-graded SAND		
					48.0				Orange, wet, medium dense, Poorly-graded SAND		
5	14.0	18	4-10-14	24		15			Orange, wet, medium dense, Poorly-graded SAND		
									Bottom of hole at 25 ft.		
6	19.0	18	6-10-14	24		20			Bottom of hole at 25 ft.		
					38.0				Bottom of hole at 25 ft.		
7	23.5	18	7-8-9	17		25			Bottom of hole at 25 ft.		

STANDARD LOG OF BORING - 25 FEET WOODBRIDGE HIGH SCHOOL.GPJ 3/12/12

∇
 ∇

Note: Automatic Hammer used; NE = Not Encountered.



GEO-TECHNOLOGY ASSOCIATES, INC.
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 Georgetown, Delaware 19947

LOG OF BORING NO. B-4

LOG OF BORING NO. B-5

PROJECT: **Woodbridge High School**
 PROJECT NO: **120007**
 PROJECT LOCATION: **Sussex County, Delaware**

GROUND SURFACE ELEVATION: **48.0**
 DATUM: **Topo**
 EQUIPMENT: **CME 55 ATV**
 LOGGED BY: **DRW**
 CHECKED BY: **G. Sauter**

DATE STARTED: **January 24, 2012**
 DATE COMPLETED: **January 24, 2012**
 DRILLING CONTRACTOR: **Walton**
 DRILLER: **BillHolden**
 DRILLING METHOD: **HSA**
 SAMPLING METHOD: **Split Spoon**

WATER ENCOUNTERED DURING DRILLING: ∇ **10.5**
 WATER LEVEL: ∇ **6.9** ∇ **5.4** ∇ _____
 DATE: **1/24/12** **1/26/12** _____
 CAVED (ft): **11.8** **5.4** _____

SAMPLE NUMBER	SAMPLE DEPTH (ft)	SAMPLE RECOVERY (in)	BLOWS/ 6 inches	N (blows/ft)	ELEVATION (ft)	DEPTH (ft)	USCS	GRAPHIC SYMBOL	DESCRIPTION		REMARKS
									DESCRIPTION		
					-48.0	0			TOPSOIL		
1	1.0	18	4-10-17	27	47.5	0	SM	[Symbol]	Dark brown, moist, medium dense, Silty SAND		Topsoil: 6 in.
2	4.0	18	2-5-10	15	44.8	5	SP SM	[Symbol]	Brown-gray-orange, moist to wet, medium dense, Poorly-graded SAND with SILT		∇
3	6.5	12	4-8-14	22				[Symbol]			∇
4	9.0	12	1-1-2	3	39.5	10	SM	[Symbol]	Brown-orange-tan, moist to wet, very loose, Silty SAND		∇
5	14.0	8	3-2-2	4				[Symbol]			
6	19.0	3	10-13-12	25	30.8	20	SP	[Symbol]	Brown-orange, wet, medium dense, Poorly-graded SAND, with Gravel		
					27.5				Bottom of hole at 20.5 ft.		

STANDARD LOG OF BORING - 25 FEET WOODBRIDGE HIGH SCHOOL.GPJ 3/12/12

Note: Automatic Hammer used; NE = Not Encountered.



GEO-TECHNOLOGY ASSOCIATES, INC.
 21133 Sterling Avenue, Unit 7
 Georgetown, Delaware 19947

LOG OF BORING NO. B-5

LOG OF BORING NO. B-6

PROJECT: **Woodbridge High School**
 PROJECT NO: **120007**
 PROJECT LOCATION: **Sussex County, Delaware**

GROUND SURFACE ELEVATION: **47.0**
 DATUM: **Topo**
 EQUIPMENT: **CME 55 ATV**
 LOGGED BY: **DRW**
 CHECKED BY: **G. Sauter**

DATE STARTED: **January 25, 2012**
 DATE COMPLETED: **January 25, 2012**
 DRILLING CONTRACTOR: **Walton**
 DRILLER: **Bill Holden**
 DRILLING METHOD: **HSA**
 SAMPLING METHOD: **Split Spoon**

WATER ENCOUNTERED DURING DRILLING: ∇ **10.5**
 WATER LEVEL: ∇ **5.0** ∇ **4.8** ∇ _____
 DATE: **1/25/12** **1/26/12** _____
 CAVED (ft): **13.2** **5.1** _____

SAMPLE NUMBER	SAMPLE DEPTH (ft)	SAMPLE RECOVERY (in)	BLOWS/ 6 inches	N (blows/ft)	ELEVATION (ft)	DEPTH (ft)	USCS	GRAPHIC SYMBOL	DESCRIPTION		REMARKS
									DESCRIPTION		
					-47.0	0			TOPSOIL		
1	1.0	18	3-3-3	6	46.3		SM	[Symbol]	Brown-orange, moist, loose, Silty SAND		Topsoil: 8 in.
2	4.0	18	3-3-4	7	43.8		SM	[Symbol]	Gray-orange, moist to wet, loose, Silty SAND		∇
3	6.5	16	4-5-9	14	41.0		SM	[Symbol]	Orange-tan, wet, medium dense, Silty SAND		
4	9.0	12	5-6-12	18	38.5		SP SM	[Symbol]	Gray, moist to wet, medium dense, Poorly-graded SAND, with Silt and Gravel		∇
5	14.0	10	2-2-3	5	34.8		SP	[Symbol]	Orange, wet, loose to medium dense, Poorly-graded SAND		
6	18.5	18	5-7-13	20	26.5			[Symbol]	Bottom of hole at 20.5 ft.		

STANDARD LOG OF BORING - 25 FEET WOODBRIDGE HIGH SCHOOL.GPJ 3/12/12

Note: Automatic Hammer used; NE = Not Encountered.



GEO-TECHNOLOGY ASSOCIATES, INC.
 21133 Sterling Avenue, Unit 7
 Georgetown, Delaware 19947

LOG OF BORING NO. B-6

LOG OF BORING NO. B-7

PROJECT: **Woodbridge High School**
 PROJECT NO: **120007**
 PROJECT LOCATION: **Sussex County, Delaware**

GROUND SURFACE ELEVATION: **50.0**
 DATUM: **Topo**
 EQUIPMENT: **CME 55 ATV**
 LOGGED BY: **DRW**
 CHECKED BY: **G. Sauter**

DATE STARTED: **January 24, 2012**
 DATE COMPLETED: **January 25, 2012**
 DRILLING CONTRACTOR: **Walton**
 DRILLER: **Bill Holden**
 DRILLING METHOD: **HSA**
 SAMPLING METHOD: **Split Spoon**

WATER ENCOUNTERED DURING DRILLING: ∇ **10.5**
 WATER LEVEL: ∇ **11.4** ∇ **7.3** ∇ _____
 DATE: **1/25/12** **1/26/12** _____
 CAVED (ft): **13.5** **7.3** _____

SAMPLE NUMBER	SAMPLE DEPTH (ft)	SAMPLE RECOVERY (in)	BLOWS/ 6 inches	N (blows/ft)	ELEVATION (ft)	DEPTH (ft)	USCS	GRAPHIC SYMBOL	DESCRIPTION		REMARKS
									DESCRIPTION		
					-50.0	0			TOPSOIL		
1	1.0	18	4-3-5	8	49.3	0	SM	[Symbol: Dark brown, moist, loose, Silty SAND]	Dark brown, moist, loose, Silty SAND		Topsoil: 8 in.
2	4.0	18	9-10-9	19	46.8	5	SM	[Symbol: Brown-orange, moist, medium dense, Silty SAND]	Brown-orange, moist, medium dense, Silty SAND		
3	6.5	18	4-10-10	20	41.5	10	SM	[Symbol: Tan, moist to wet, medium dense, Silty SAND]	Tan, moist to wet, medium dense, Silty SAND		∇
5	14.0	12	3-10-11	21	32.8	15	SP	[Symbol: Orange, wet, medium dense, Poorly-graded SAND, with Gravel]	Orange, wet, medium dense, Poorly-graded SAND, with Gravel		∇ ∇
6	19.0	10	3-4-10	14	29.5	20			Bottom of hole at 20.5 ft.		

Note: Automatic Hammer used; NE = Not Encountered.

STANDARD LOG OF BORING - 25 FEET WOODBRIDGE HIGH SCHOOL.GPJ 3/12/12



GEO-TECHNOLOGY ASSOCIATES, INC.
 21133 Sterling Avenue, Unit 7
 Georgetown, Delaware 19947

LOG OF BORING NO. B-7

LOG OF BORING NO. B-8

PROJECT: **Woodbridge High School**
 PROJECT NO: **120007**
 PROJECT LOCATION: **Sussex County, Delaware**

GROUND SURFACE ELEVATION: **49.0**
 DATUM: **Topo**
 EQUIPMENT: **CME 55 ATV**
 LOGGED BY: **DRW**
 CHECKED BY: **G. Sauter**

DATE STARTED: **January 24, 2012**
 DATE COMPLETED: **January 24, 2012**
 DRILLING CONTRACTOR: **Walton**
 DRILLER: **Bill Holden**
 DRILLING METHOD: **HSA**
 SAMPLING METHOD: **Split Spoon**

WATER ENCOUNTERED DURING DRILLING: ∇ **10.5**
 WATER LEVEL: ∇ **6.8** ∇ **Dry** ∇ _____
 DATE: **1/24/12** **1/26/12** _____
 CAVED (ft): **14.8** **5.7** _____

SAMPLE NUMBER	SAMPLE DEPTH (ft)	SAMPLE RECOVERY (in)	BLOWS/ 6 inches	N (blows/ft)	ELEVATION (ft)	DEPTH (ft)	USCS	GRAPHIC SYMBOL	DESCRIPTION		REMARKS
									DESCRIPTION		
					-49.0	0			TOPSOIL		Topsoil: 12 in.
1	1.0	18	5-4-5	9	48.0		SM	Brown-orange, moist to wet, loose to medium dense, Silty SAND			
2	4.0	18	6-10-12	22		5					
3	6.5	18	3-6-6	12						∇	
4	9.0	18	6-8-10	18		10				∇	
					36.8		SP	Gray-tan, wet, medium dense, Poorly-graded SAND			
5	14.0	18	4-6-7	13		15					
					31.8		CL	Brown-orange, wet, stiff, Sandy Lean CLAY			
6	19.0	6	3-6-8	14		20					
7	23.5	8	6-6-6	12		25					
					24.0						
									Bottom of hole at 25 ft.		

STANDARD LOG OF BORING - 25 FEET WOODBRIDGE HIGH SCHOOL.GPJ 3/12/12

Note: Automatic Hammer used; NE = Not Encountered.



GEO-TECHNOLOGY ASSOCIATES, INC.
 21133 Sterling Avenue, Unit 7
 Georgetown, Delaware 19947

LOG OF BORING NO. B-8

LOG OF BORING NO. P-1

PROJECT: **Woodbridge High School**
 PROJECT NO: **120007**
 PROJECT LOCATION: **Sussex County, Delaware**

GROUND SURFACE ELEVATION: **48.0**
 DATUM: **Topo**
 EQUIPMENT: **CME 55 ATV**
 LOGGED BY: **DRW**
 CHECKED BY: **G. Sauter**

DATE STARTED: **January 25, 2012**
 DATE COMPLETED: **January 25, 2012**
 DRILLING CONTRACTOR: **Walton**
 DRILLER: **Bill Holden**
 DRILLING METHOD: **HSA**
 SAMPLING METHOD: **Split Spoon**

WATER ENCOUNTERED DURING DRILLING: **NE**
 WATER LEVEL: **Dry** **Dry** _____
 DATE: **1/25/12** **1/26/12** _____
 CAVED (ft): **4.0** **1.2** _____

SAMPLE NUMBER	SAMPLE DEPTH (ft)	SAMPLE RECOVERY (in)	BLOWS/ 6 inches	N (blows/ft)	ELEVATION (ft)	DEPTH (ft)	USCS	GRAPHIC SYMBOL	DESCRIPTION		REMARKS
									DESCRIPTION		
					-48.0	0			TOPSOIL		Topsoil: 8 in.
1	1.0	18	3-3-5	8	47.3		SM	Brown-orange, moist, loose, Silty SAND			
					45.0		SC	Brown-gray, moist, medium dense, Clayey SAND			
2	4.0	18	3-5-6	11	42.5	5		Bottom of hole at 5.5 ft.			

Note: Automatic Hammer used; NE = Not Encountered.

STANDARD LOG OF BORING - 25 FEET WOODBRIDGE HIGH SCHOOL.GPJ 3/12/12



GEO-TECHNOLOGY ASSOCIATES, INC.
 21133 Sterling Avenue, Unit 7
 Georgetown, Delaware 19947

LOG OF BORING NO. P-1



LOG OF BORING NO. P-2

PROJECT: **Woodbridge High School**
 PROJECT NO: **120007**
 PROJECT LOCATION: **Sussex County, Delaware**

GROUND SURFACE ELEVATION: **48.0**
 DATUM: **Topo**
 EQUIPMENT: **CME 55 ATV**
 LOGGED BY: **DRW**
 CHECKED BY: **G. Sauter**

DATE STARTED: **January 25, 2012**
 DATE COMPLETED: **January 25, 2012**
 DRILLING CONTRACTOR: **Walton**
 DRILLER: **Bill Holden**
 DRILLING METHOD: **HSA**
 SAMPLING METHOD: **Split Spoon**

WATER ENCOUNTERED DURING DRILLING: **NE**
 WATER LEVEL: **Dry** **Dry** _____
 DATE: **1/25/12** **1/26/12** _____
 CAVED (ft): **3.0** **2.7** _____

SAMPLE NUMBER	SAMPLE DEPTH (ft)	SAMPLE RECOVERY (in)	BLOWS/ 6 inches	N (blows/ft)	ELEVATION (ft)	DEPTH (ft)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
					-48.0 47.3	0			TOPSOIL	
1	1.0	18	4-6-8	14			SM		Brown-orange, moist, medium dense, Silty SAND	Topsoil: 8 in.
2	4.0	18	8-13-11	24	42.5	5			Bottom of hole at 5.5 ft.	

Note: Automatic Hammer used; NE = Not Encountered.

STANDARD LOG OF BORING - 25 FEET WOODBRIDGE HIGH SCHOOL.GPJ 3/12/12










GEO-TECHNOLOGY ASSOCIATES, INC.
 21133 Sterling Avenue, Unit 7
 Georgetown, Delaware 19947

LOG OF SAMPLING PROBE NO. C-1

PROJECT: **Woodbridge High School**
 PROJECT NO: **120007**
 PROJECT LOCATION: **Sussex County, Delaware**
 DATE STARTED: **1/30/2012**
 DATE COMPLETED: **1/30/2012**
 CONTRACTOR: **GTA**

GROUND SURFACE ELEVATION: **49.0**
 DATUM: **Topo**
 EQUIPMENT: **Auger / DCP**
 LOGGED BY: **DRW**
 CHECKED BY: **G. Sauter**

WATER ENCOUNTERED DURING DRILLING: ∇ **6**
 WATER LEVEL: ∇ **6.3** ∇ **5.2** ∇ _____
 DATE: **1/30/12** **1/31/12** _____
 CAVED (ft) **7.5** **5.3** _____

SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	*DCP BLOWS/ 1 3/4 inches	N (blows/ft.)	ELEVATION(ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION		REMARKS
									DESCRIPTION		
					49.0	0			TOPSOIL		
					48.0						
					47.0		SC		Brown, moist, Clayey SAND		Topsoil: 12 in.
	2.0		12-15-20-15				SC		Orange-brown-gray, moist, Clayey SAND		
					45.0						
	4.0		10-24-20-27				SM		Gray-brown, moist to wet, Silty SAND		∇
					42.0	5					∇
	6.0		10-12-15-10		41.0		SM		Gray, wet, Silty SAND		
					40.0		SM		Orange, wet, Silty SAND		
					39.0		SP		Gray, wet, Poorly graded SAND with Silt		
						10	SM		Bottom of hole at 10 ft.		

NOTES: *DCP - Dynamic Cone Penetrometer; NE - Not Encountered

LOG OF HAND AUGER WITH DCP WOODBRIDGE HIGH SCHOOL.GPJ 3/12/12



Geo-Technology Associates, Inc.

21133 Sterling Avenue, Unit 7
 Georgetown, Delaware 19947







LOG OF SAMPLING PROBE NO. C-1

LOG OF SAMPLING PROBE NO. C-2

PROJECT: **Woodbridge High School**
 PROJECT NO: **120007**
 PROJECT LOCATION: **Sussex County, Delaware**
 DATE STARTED: **1/30/2012**
 DATE COMPLETED: **1/30/2012**
 CONTRACTOR: **GTA**

GROUND SURFACE ELEVATION: **49.0**
 DATUM: **Topo**
 EQUIPMENT: **Auger / DCP**
 LOGGED BY: **DRW**
 CHECKED BY: **G. Sauter**

WATER ENCOUNTERED DURING DRILLING: ∇ **6.0**
 WATER LEVEL: ∇ **6.3** ∇ **5.2** ∇ _____
 DATE: **1/30/12** **1/31/12** _____
 CAVED (ft) **7.0** **5.4** _____

SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	*DCP BLOWS/ 1 3/4 inches	N (blows/ft.)	ELEVATION(ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION		REMARKS
									DESCRIPTION		
					49.0	0			Topsoil		
					48.0		SC		Brown, moist, Clayey SAND		Topsoil: 12 in.
	2.0		7-18-27-34		46.0		SM		Orange-gray, moist, Silty SAND		
	4.0		20-20-22-26		44.0	5	SM		Tan-gray, moist to wet, Silty SAND		∇
	6.0		6-8-7-6		43.0		SC		Tan-gray-orange, wet, Clayey SAND		∇
					41.0		ML		Dark gray, wet, Sandy SILT		
					40.0		SM		Gray, wet, Silty SAND		
					39.0	10			Bottom of hole at 10 ft.		

NOTES: *DCP - Dynamic Cone Pentrometer; NE - Not Encountered

LOG OF HAND AUGER WITH DCP WOODBRIDGE HIGH SCHOOL.GPJ 3/12/12



Geo-Technology Associates, Inc.

21133 Sterling Avenue, Unit 7
 Georgetown, Delaware 19947

LOG OF SAMPLING PROBE NO. C-2

LOG OF SAMPLING PROBE NO. CR-1

PROJECT: **Woodbridge High School**
 PROJECT NO: **120007**
 PROJECT LOCATION: **Sussex County, Delaware**
 DATE STARTED: **1/30/2012**
 DATE COMPLETED: **1/30/2012**
 CONTRACTOR: **GTA**

GROUND SURFACE ELEVATION: **48.0**
 DATUM: **Topo**
 EQUIPMENT: **Auger / DCP**
 LOGGED BY: **DRW**
 CHECKED BY: **G. Sauter**

WATER ENCOUNTERED DURING DRILLING: ∇ **6.3**
 WATER LEVEL: ∇ **6.5** ∇ **5.3** ∇ _____
 DATE: **1/30/12** **1/31/12** _____
 CAVED (ft) **6.8** **5.6** _____

SAMPLE NUMBER	SAMPLE DEPTH (ft.)	SAMPLE RECOVERY (in.)	*DCP BLOWS/ 1 3/4 inches	N (blows/ft.)	ELEVATION(ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION		REMARKS
									DESCRIPTION		
					48.0	0			Topsoil		
					47.0		SM	[Symbol]	Dark brown, moist, Silty SAND		Topsoil: 12 in.
	2.0		12-20-20-25		45.0		SM	[Symbol]	Brown-orange-gray, moist to wet, Silty SAND		
	4.0		18-25-28-28			5					∇
	6.0		17-22-22-30		41.0		SP SM	[Symbol]	Brown-gray, wet, poorly-graded SAND with Silt		∇
					39.0						
					38.0	10	SM	[Symbol]	Orange, wet, Silty SAND		
									Bottom of hole at 10 ft.		

NOTES: *DCP - Dynamic Cone Pentrometer; NE - Not Encountered

LOG OF HAND AUGER WITH DCP WOODBRIDGE HIGH SCHOOL.GPJ 3/12/12



Geo-Technology Associates, Inc.

21133 Sterling Avenue, Unit 7
 Georgetown, Delaware 19947

LOG OF SAMPLING PROBE NO. CR-1

APPENDIX C
LABORATORY DATA




COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

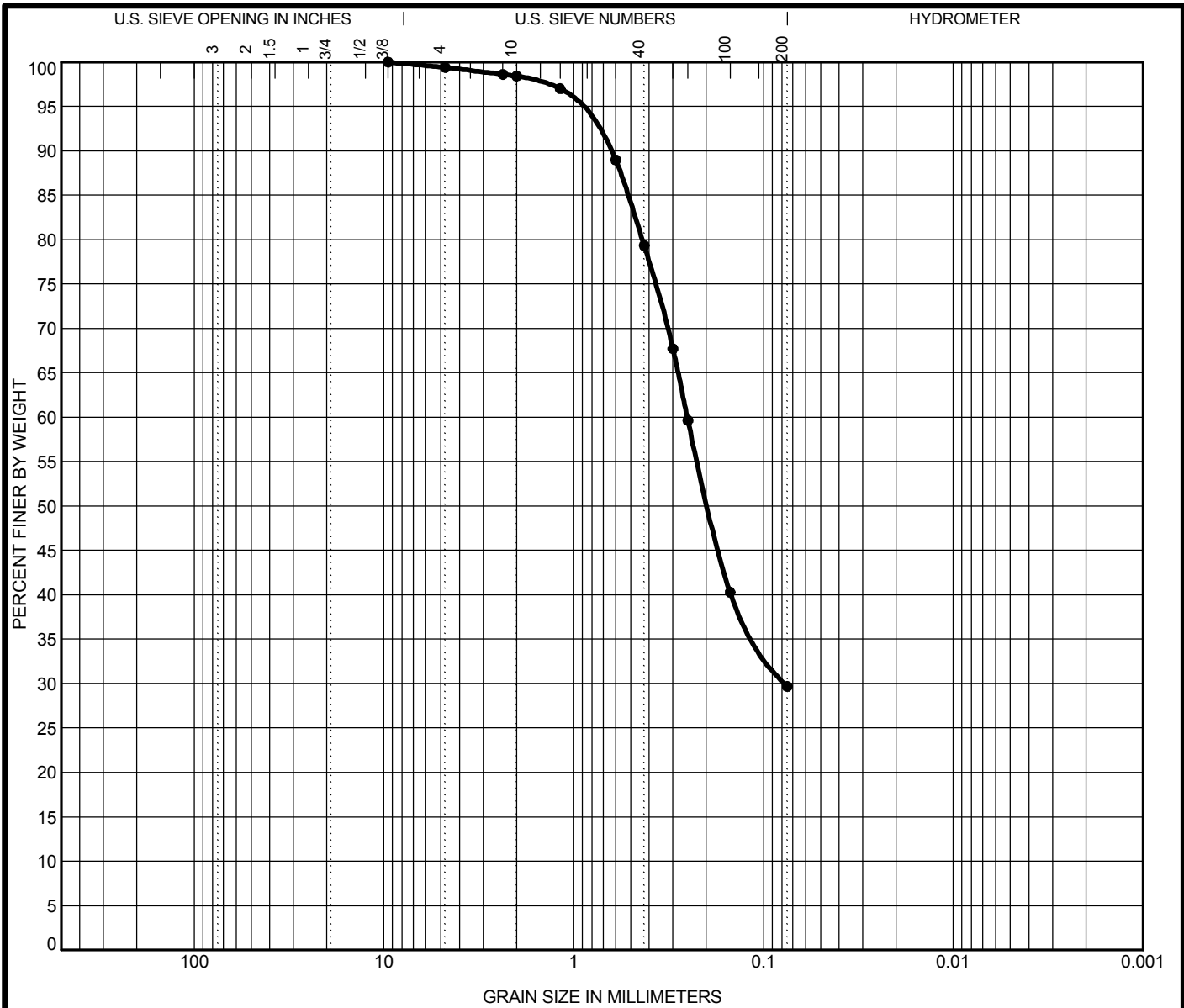
Specimen Identification	Classification	LL	PL	PI	Cc	Cu
● B-4 0.0-5 1/24/2012	SILTY SAND(SM)	NP	NP	NP		
USCS Classification	SILTY SAND(SM)					
AASHTO Classification	A-2-4					

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-4 0.0-5	4.75	0.223	0.075		0.0	70.0	30.0	
Reference Test Method:	ASTM D 421	ASTM D 422						

Natural Moisture Content	10.1%
Checked By:	GRS

 <p>Geo-Technology Associates, Inc. 21133 Sterling Avenue, Unit 7 Georgetown, Delaware 19947</p>	GRAIN SIZE DISTRIBUTION	
	Project: Woodbridge High School	
	Location: Sussex County, Delaware	
	Number: 120007	

GSA/SHA WOODBRIDGE HIGH SCHOOL GRJ 3/12/12




COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

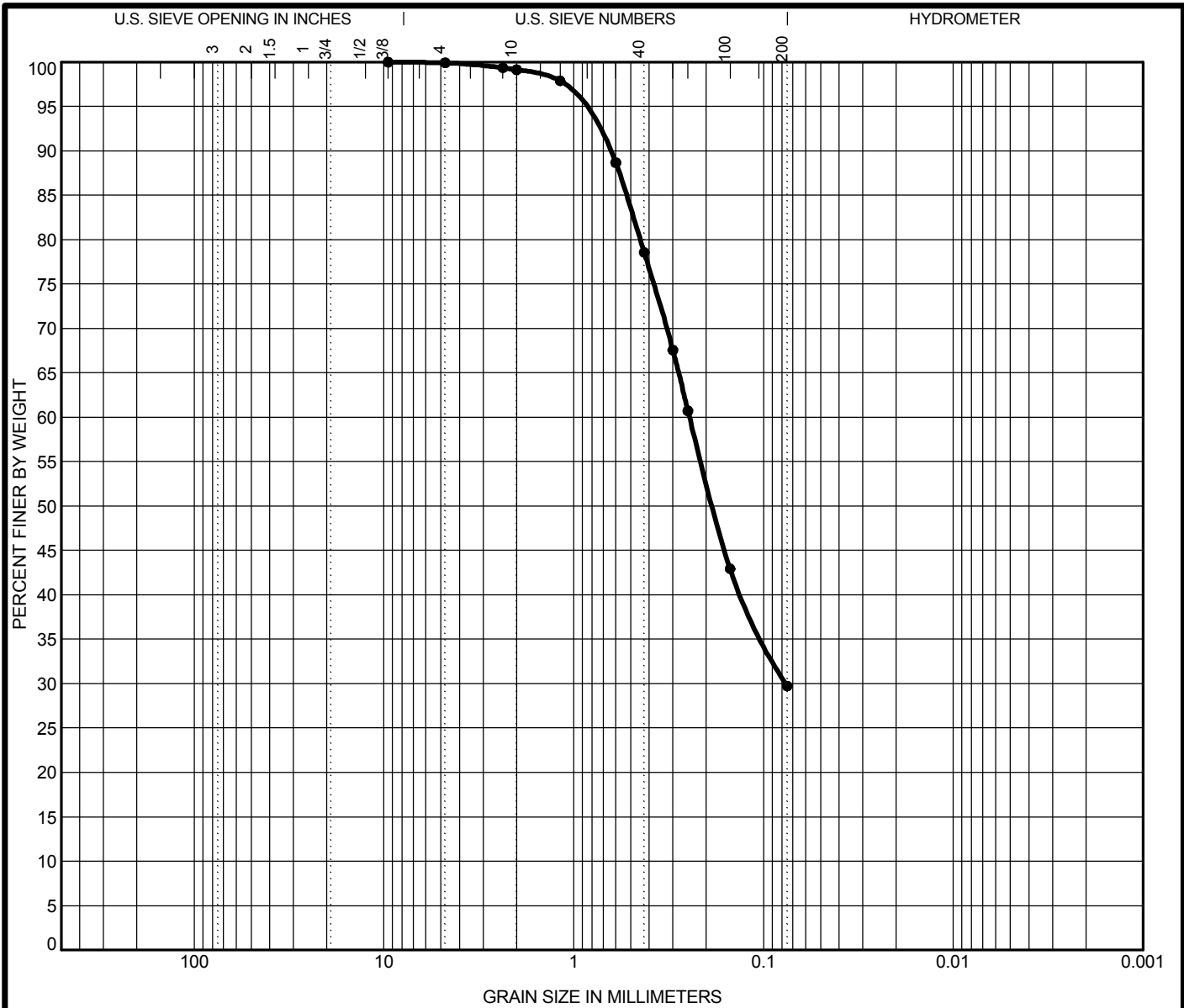
Specimen Identification	Classification					LL	PL	PI	Cc	Cu
● B-4 5.0-9						NP	NP	NP		
1/24/2012										
USCS Classification	SILTY SAND(SM)									
AASHTO Classification	A-2-4									

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-4 5.0-9	9.5	0.252	0.077		0.6	69.7	29.7	
Reference Test Method:	ASTM D 421	ASTM D 422						

Natural Moisture Content	12.5%
Checked By:	GRS

 Geo-Technology Associates, Inc. 21133 Sterling Avenue, Unit 7 Georgetown, Delaware 19947	GRAIN SIZE DISTRIBUTION	
	Project: Woodbridge High School	
	Location: Sussex County, Delaware	
	Number: 120007	

GSA/SHA WOODBRIDGE HIGH SCHOOL GRJ 3/12/12




COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

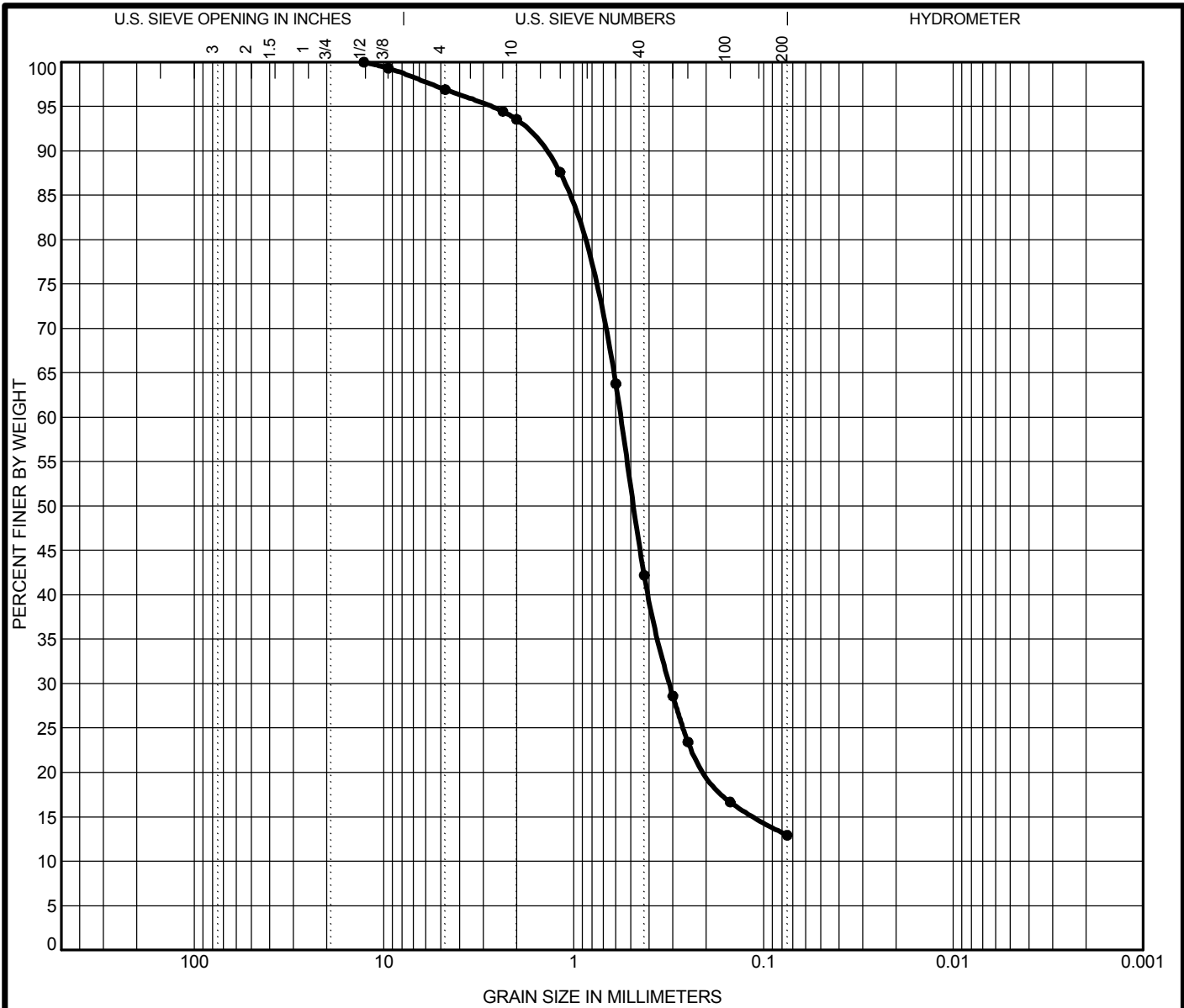
Specimen Identification	Classification					LL	PL	PI	Cc	Cu
● B-4 9.0-10.5						NP	NP	NP		
1/24/2012										
USCS Classification	SILTY SAND(SM)									
AASHTO Classification	A-2-4									

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-4 9.0-10.5	9.5	0.245	0.076		0.1	70.2	29.7	
Reference Test Method:	ASTM D 421	ASTM D 422						

Natural Moisture Content	13.7%
Checked By:	GRS

 Geo-Technology Associates, Inc. 21133 Sterling Avenue, Unit 7 Georgetown, Delaware 19947	GRAIN SIZE DISTRIBUTION	
	Project: Woodbridge High School	
	Location: Sussex County, Delaware	
	Number: 120007	

GSA/SHA WOODBRIDGE HIGH SCHOOL GRJ 3/12/12




COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

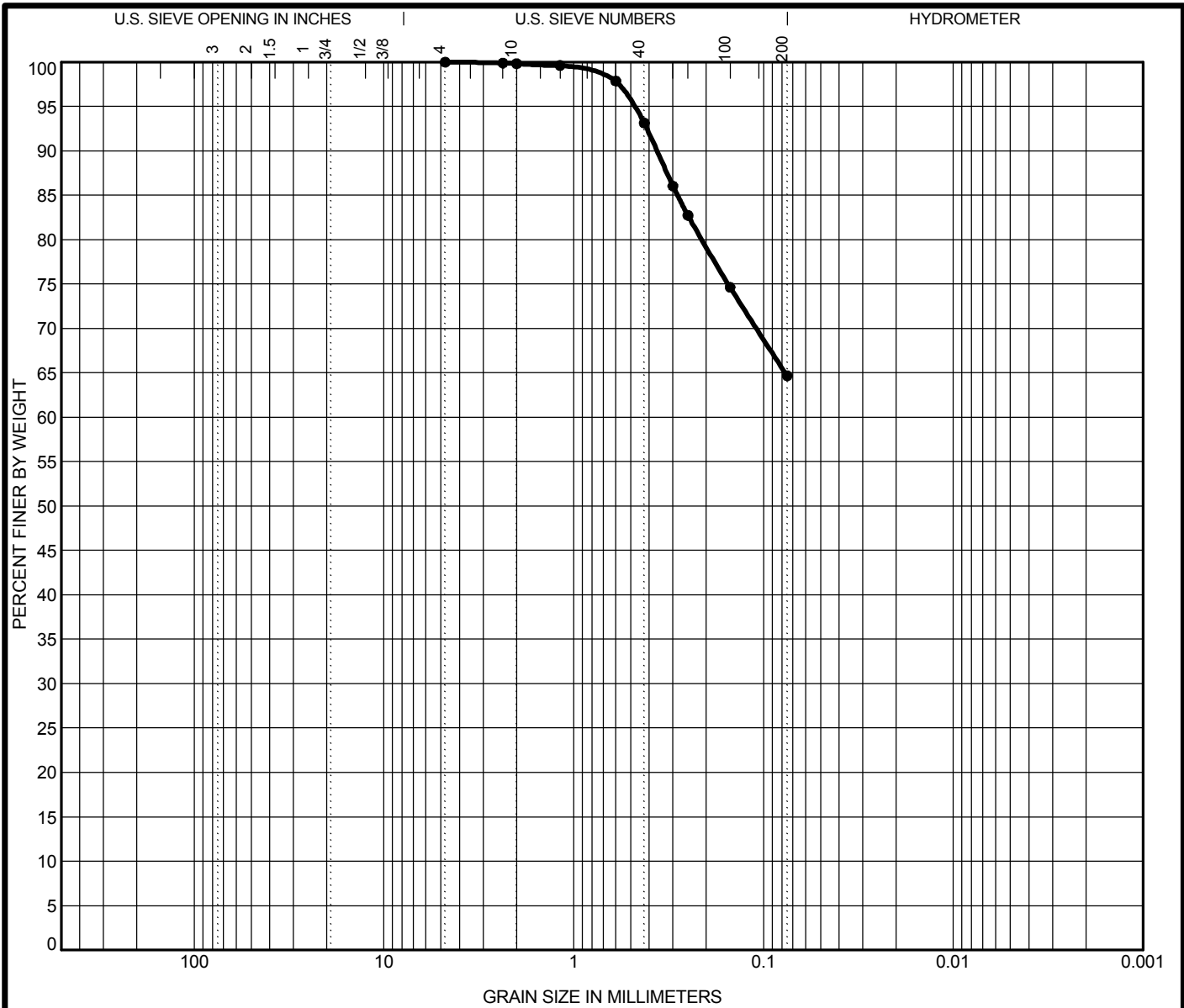
Specimen Identification	Classification	LL	PL	PI	Cc	Cu
● B-5 14.0-15.5		NP	NP	NP		
1/25/2012						
USCS Classification	SILTY SAND(SM)					
AASHTO Classification	A-1-b					

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-5 14.0-15.5	12.75	0.565	0.311		3.1	84.0	12.9	
Reference Test Method:	ASTM D 421	ASTM D 422						

Natural Moisture Content	21.9%
Checked By:	GRS

 Geo-Technology Associates, Inc. 21133 Sterling Avenue, Unit 7 Georgetown, Delaware 19947	GRAIN SIZE DISTRIBUTION	
	Project: Woodbridge High School	
	Location: Sussex County, Delaware	
	Number: 120007	

GSA/SHA WOODBRIDGE HIGH SCHOOL GRJ 3/12/12




COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

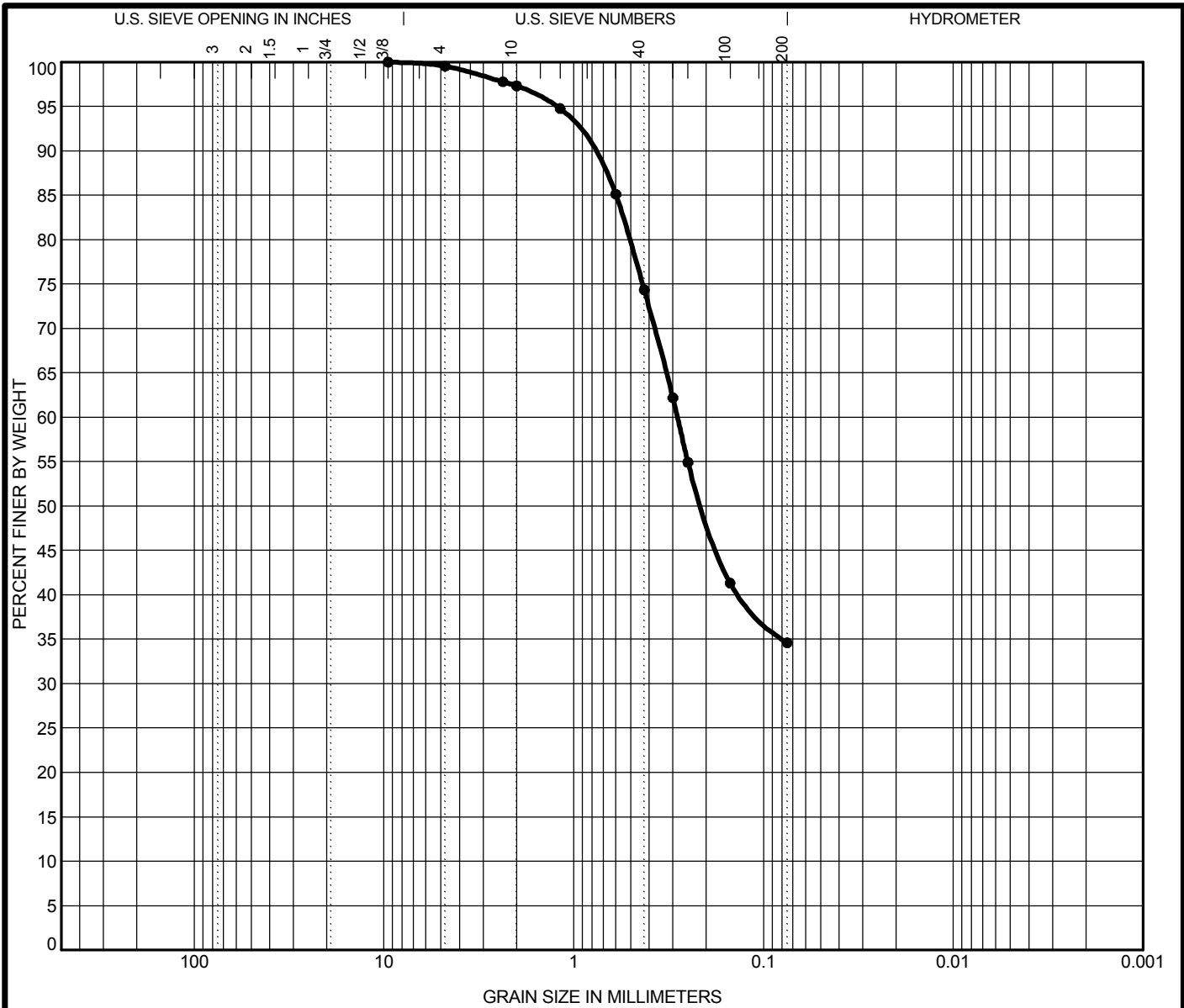
Specimen Identification	Classification	LL	PL	PI	Cc	Cu
● B-8 19.0-20.5 1/26/2012	SANDY LEAN CLAY(CL)	42	19	23		
USCS Classification	SANDY LEAN CLAY(CL)					
AASHTO Classification	A-7-6					

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-8 19.0-20.5	4.75				0.0	35.3	64.7	
Reference Test Method:	ASTM D 421	ASTM D 422						

Natural Moisture Content	28.9%
Checked By:	GRS

 Geo-Technology Associates, Inc. 21133 Sterling Avenue, Unit 7 Georgetown, Delaware 19947	GRAIN SIZE DISTRIBUTION	
	Project: Woodbridge High School	
	Location: Sussex County, Delaware	
	Number: 120007	

GSA/SHA WOODBRIDGE HIGH SCHOOL.GPJ 3/12/12




COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Classification	LL	PL	PI	Cc	Cu
● P-1 0.0-3 1/11/2012	SILTY SAND(SM)	NP	NP	NP		
USCS Classification	SILTY SAND(SM)					
AASHTO Classification	A-2-4					

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● P-1 0.0-3	9.5	0.284			0.5	64.9	34.6	
Reference Test Method:	ASTM D 421	ASTM D 422						

Natural Moisture Content	12.1%
Checked By:	GRS

 Geo-Technology Associates, Inc. 21133 Sterling Avenue, Unit 7 Georgetown, Delaware 19947	GRAIN SIZE DISTRIBUTION	
	Project: Woodbridge High School	
	Location: Sussex County, Delaware	
	Number: 120007	

GSA/SHA WOODBRIDGE HIGH SCHOOL.GPJ 3/12/12

Sample Date 1/24/2012
 Source of Material Onsite
 Sample Number/Depth B-4 / 0' - 5'
 Description of Material Brown, SILTY SAND(SM)

Test Method ASTM D 698
Preparation Method Dry; Manual Rammer

TEST RESULTS

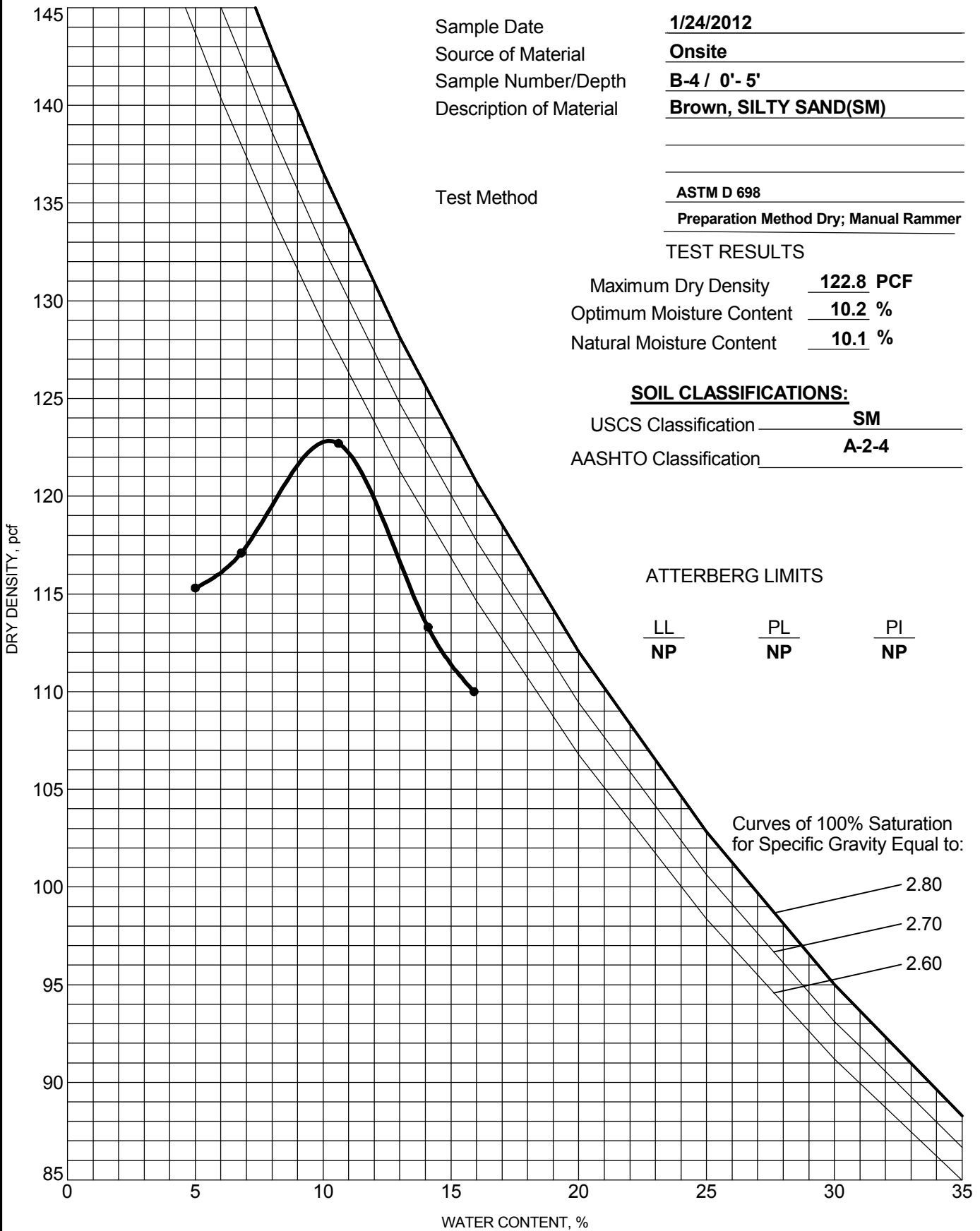
Maximum Dry Density 122.8 PCF
 Optimum Moisture Content 10.2 %
 Natural Moisture Content 10.1 %

SOIL CLASSIFICATIONS:

USCS Classification SM
 AASHTO Classification A-2-4

ATTERBERG LIMITS

LL	PL	PI
NP	NP	NP



PROCTOR, WOODBRIDGE HIGH SCHOOL.GPJ 3/12/12



Geo-Technology Associates, Inc.
 21133 Sterling Avenue, Unit 7
 Georgetown, Delaware 19947

MOISTURE-DENSITY RELATIONSHIP

Project: Woodbridge High School
 Location: Sussex County, Delaware
 Number: 120007

Sample Date 1/24/2012
 Source of Material Onsite
 Sample Number/Depth B-4 / 5' - 9'
 Description of Material Brown, SILTY SAND(SM)

Test Method ASTM D 698
 Preparation Method Dry; Manual Rammer

TEST RESULTS

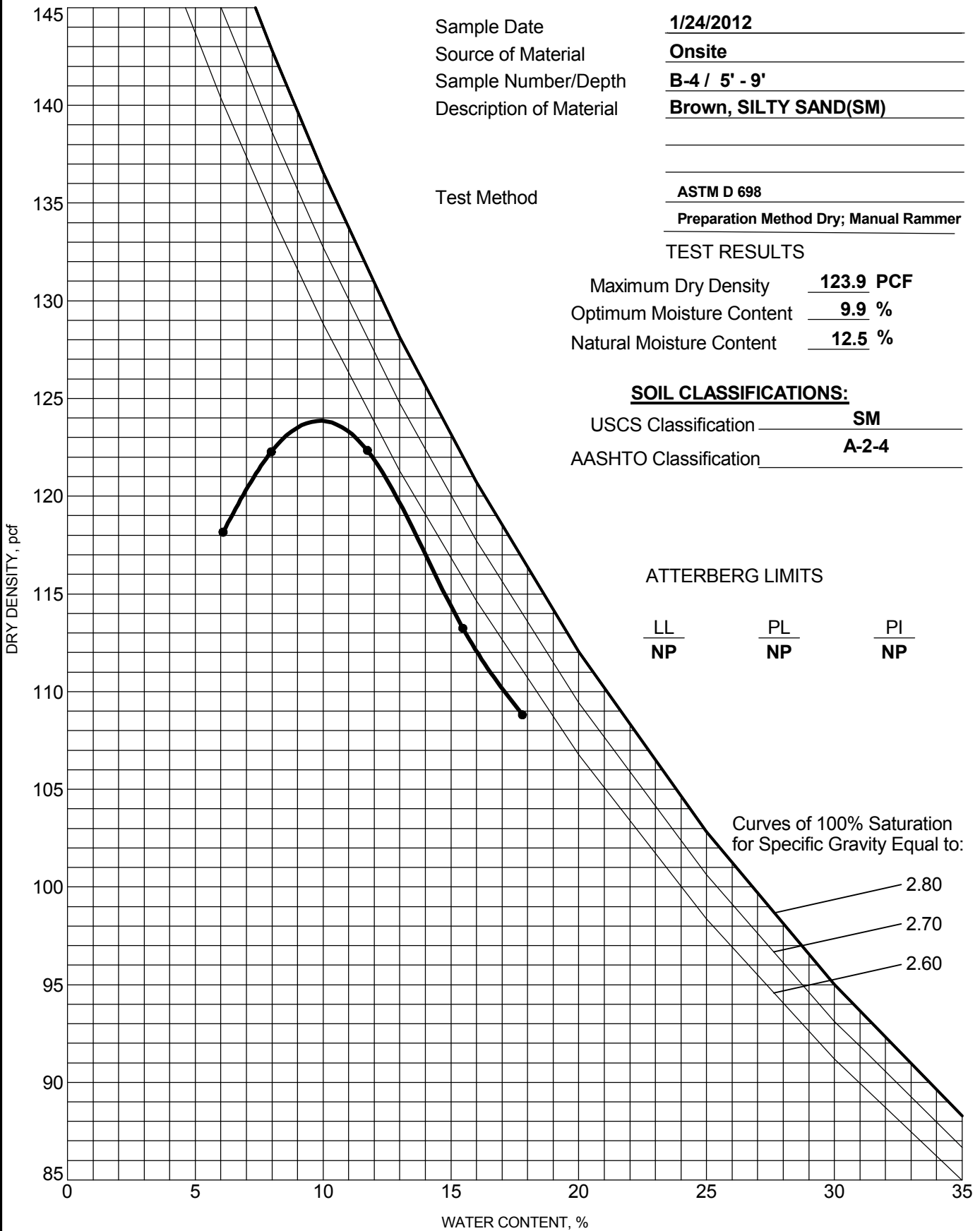
Maximum Dry Density 123.9 PCF
 Optimum Moisture Content 9.9 %
 Natural Moisture Content 12.5 %

SOIL CLASSIFICATIONS:

USCS Classification SM
 AASHTO Classification A-2-4

ATTERBERG LIMITS

LL PL PI
NP NP NP



PROCTOR, WOODBRIDGE HIGH SCHOOL.GPJ 3/12/12



Geo-Technology Associates, Inc.

21133 Sterling Avenue, Unit 7
 Georgetown, Delaware 19947

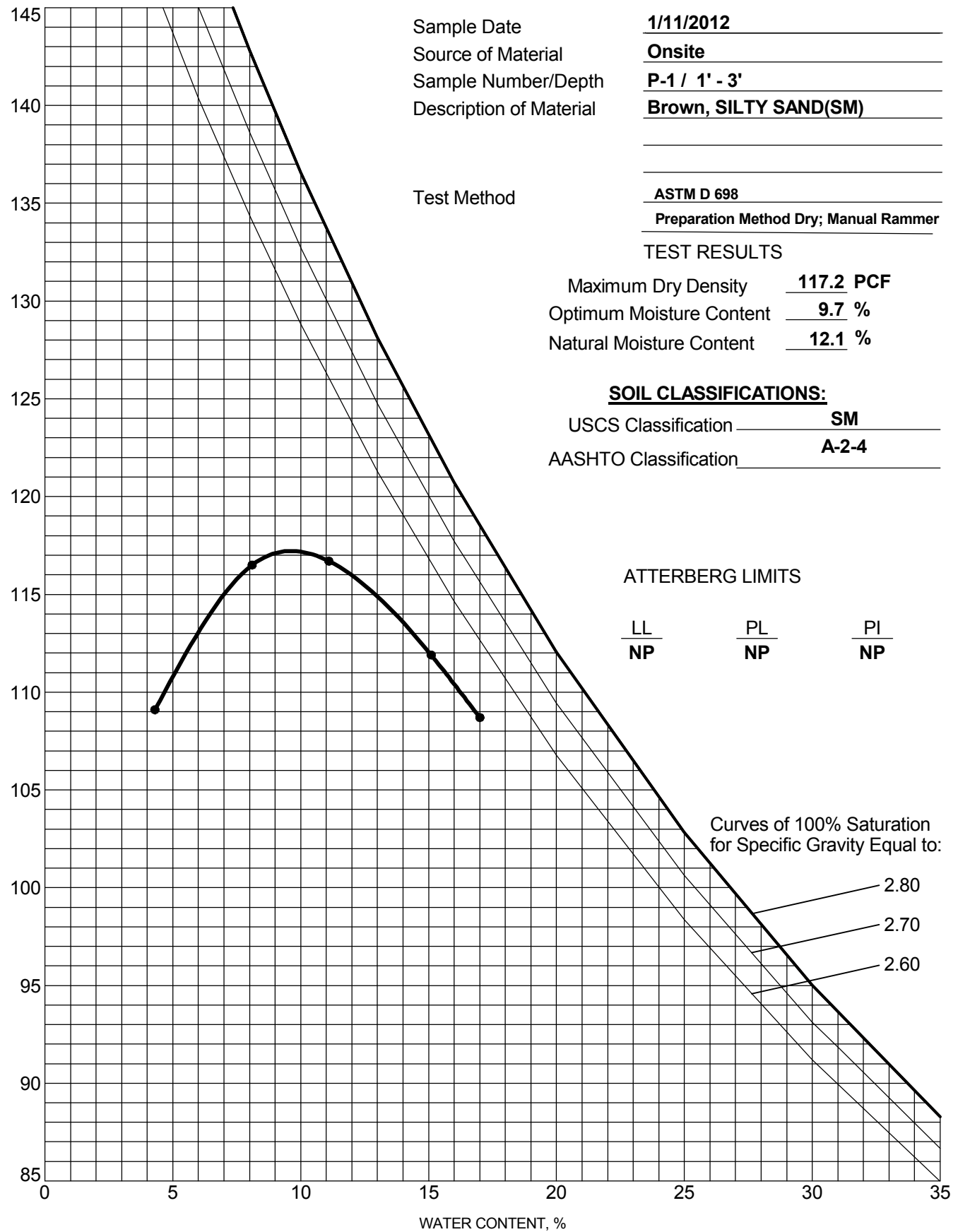
MOISTURE-DENSITY RELATIONSHIP

Project: Woodbridge High School

Location: Sussex County, Delaware

Number: 120007

DRY DENSITY, pcf



Sample Date 1/11/2012
 Source of Material Onsite
 Sample Number/Depth P-1 / 1' - 3'
 Description of Material Brown, SILTY SAND(SM)

Test Method ASTM D 698
 Preparation Method Dry; Manual Rammer

TEST RESULTS
 Maximum Dry Density 117.2 PCF
 Optimum Moisture Content 9.7 %
 Natural Moisture Content 12.1 %

SOIL CLASSIFICATIONS:
 USCS Classification SM
 AASHTO Classification A-2-4

ATTERBERG LIMITS

LL	PL	PI
NP	NP	NP

Curves of 100% Saturation
 for Specific Gravity Equal to:
 2.80
 2.70
 2.60

PROCTOR, WOODBRIDGE HIGH SCHOOL.GPJ 3/12/12



Geo-Technology Associates, Inc.
 21133 Sterling Avenue, Unit 7
 Georgetown, Delaware 19947

MOISTURE-DENSITY RELATIONSHIP

Project: Woodbridge High School
 Location: Sussex County, Delaware
 Number: 120007

Contract C-29: Voice and Data

BID FORM

For Bids Due: _____ To: Woodbridge School District
16359 Sussex Highway
Bridgeville, Delaware 19933

Name of Bidder: _____

Delaware Business License No.: _____ Taxpayer ID No.: _____

(Other License Nos.): _____

Phone No.: () _____ - _____ Fax No.: () _____ - _____

Email Address: _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

\$ _____ (\$ _____)

ALTERNATES

Alternate No. 1: ADD Tennis Courts - not applicable to Bid Pac C.

Alternate No. 2: ADD Stadium Support Facility

Add/Deduct _____ (\$ _____)

Alternate No. 3: DEDUCT Leave Excess Excavated Materials On Site – not applicable to Bid Pac C.

Alternate No. 4: Add Field Bleachers – Visitor Stands – not applicable to Bid Pac C.

Alternate No. 5: Add Field Bleachers – Home Stands – not applicable to Bid Pac C.

Alternate No. 6: Add Stadium Lighting – not applicable to Bid Pac C.

Alternate No. 7: Add Parking Lot Lighting – not applicable to Bid Pac C.

Alternate No. 8: Add Simulated Slate Roofing – not applicable to Bid Pac C.

Alternate No. 9: Add Terrazzo at Lobby Area and Vestibules – not applicable to Bid Pac C.

Alternate No. 10: Add Terrazzo at Cafeteria and Café Vestibule – not applicable to Bid Pac C.

Alternate No. 11: Add PVC at Classrooms and Corridors – not applicable to Bid Pac C.

Alternate No. 12: Provide Resinous Flooring at Bathrooms – not applicable to Bid Pac C.

Alternate No. 13: Provide Spray Foam Insulation – not applicable to Bid Pac C.

Alternate No. 14: Change 3-5/8 Regal Brick to Utility Brick – not applicable to Bid Pac C.

Alternate No. 15: Change Cast Stone Heads and Sills to Ground Face Heads and Sills – not applicable to Bid Pac C.

Alternate No. 16: Provide Full Height Ceramic Tile in Bathrooms – not applicable to Bid Pac C.

Alternate No. 17: Add PVC Jacketing for Exposed Piping and Ductwork – not applicable to Bid Pac C.

Alternate No. 18: Add Left/Right Clusters for Sound System – not applicable to Bid Pac C.

Alternate No. 19: Add Wireless Microphones– not applicable to Bid Pac C.

Alternate No. 20: Cisco switches.

Add/Deduct _____ (\$ _____)

UNIT PRICES: N/A

I/We acknowledge Addenda numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for SIXTY (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid.

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

(State of Corporation)

Business Address: _____

Witness: _____ By: _____
(SEAL) (Authorized Signature)

(Title)
Date: _____

ATTACHMENTS

- Sub-Contractor List
- Non-Collusion Statement
- Bid Bond
- Consent of Surety
- (Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 6962 (d)(10)b Delaware Code, the following sub-contractor listing must accompany the bid submittal. The name and address of the sub-contractor must be listed for each category where the bidder intends to use a sub-contractor to perform that category of work. In order to provide full disclosure and acceptance of the bid by the Owner, it is required that bidders list themselves as being the sub-contractor for all categories where he/she is qualified and intends to perform such work.

<u>Subcontractor Category</u>	<u>Subcontractor</u>	<u>Address (City & State)</u>
1. Telephone	_____	_____

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date.

All the terms and conditions of **C-29: Voice and Data** have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE
(TYPED): _____

AUTHORIZED REPRESENTATIVE
(SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

PHONE NUMBER: _____

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

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____ of
_____ in the County of _____ and State of _____ as
Principal, and _____ of _____ in the County of _____
_____ and State of _____ as Surety, legally authorized to do business in the State of Delaware
("State"), are held and firmly unto the **Woodbridge School District** in the sum of _____
Dollars (\$ _____), or percent not to exceed _____
_____ Dollars (\$ _____) of amount of bid on Contract No. _____ to be paid to the
Woodbridge School District for the use and benefit of the **Woodbridge School District** for which payment well and
truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and
severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bounden Principal who has submitted to the
Woodbridge School District a certain proposal to enter into this contract for the furnishing of certain material and/or
services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute
this Contract as may be required by the terms of this Contract and approved by the **Woodbridge School District** this
Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the
terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____ seal and dated this ___ day of _____ in the year of our Lord two thousand
and _____ (20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

Name of Bidder (Organization)

Corporate
Seal

By: _____
Authorized Signature

Attest _____

Title

Name of Surety

Witness _____

Title

CONSENT OF SURETY

DATE _____

To: **Woodbridge School District**
16359 Sussex Highway
Bridgeville, Delaware 19933

Gentlemen:

We, the _____

(Surety Company's Address)

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

(Contractor)

(Address)

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

(Surety Company)

By _____
(Attorney-in-Fact)

END OF SECTION

Contract: C-30 Audio/Video

BID FORM

For Bids Due: _____ To: Woodbridge School District
16359 Sussex Highway
Bridgeville, Delaware 19933

Name of Bidder: _____

Delaware Business License No.: _____ Taxpayer ID No.: _____

(Other License Nos.): _____

Phone No.: () _____ - _____ Fax No.: () _____ - _____

Email Address: _____

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

\$ _____ (\$ _____)

ALTERNATES

Alternate No. 1: ADD Tennis Courts - not applicable to Bid Pac C.

Alternate No. 2: ADD Stadium Support Facility

Add/Deduct _____ (\$ _____)

Alternate No. 3: DEDUCT Leave Excess Excavated Materials On Site – not applicable to Bid Pac C.

Alternate No. 4: Add Field Bleachers – Visitor Stands – not applicable to Bid Pac C.

Alternate No. 5: Add Field Bleachers – Home Stands – not applicable to Bid Pac C.

Alternate No. 6: Add Stadium Lighting – not applicable to Bid Pac C.

Alternate No. 7: Add Parking Lot Lighting – not applicable to Bid Pac C.

Alternate No. 8: Add Simulated Slate Roofing – not applicable to Bid Pac C.

Alternate No. 9: Add Terrazzo at Lobby Area and Vestibules – not applicable to Bid Pac C.

Alternate No. 10: Add Terrazzo at Cafeteria and Café Vestibule – not applicable to Bid Pac C.

Alternate No. 11: Add PVC at Classrooms and Corridors – not applicable to Bid Pac C.

Alternate No. 12: Provide Resinous Flooring at Bathrooms – not applicable to Bid Pac C.

Alternate No. 13: Provide Spray Foam Insulation – not applicable to Bid Pac C.

Alternate No. 14: Change 3-5/8 Regal Brick to Utility Brick – not applicable to Bid Pac C.

Alternate No. 15: Change Cast Stone Heads and Sills to Ground Face Heads and Sills – not applicable to Bid Pac C.

Alternate No. 16: Provide Full Height Ceramic Tile in Bathrooms – not applicable to Bid Pac C.

Alternate No. 17: Add PVC Jacketing for Exposed Piping and Ductwork – not applicable to Bid Pac C.

Alternate No. 18: Add Left/Right Clusters for Sound System – not applicable to Bid Pac C.

Alternate No. 19: Add Wireless Microphones– not applicable to Bid Pac C.

Alternate No. 20: Cisco switches.

Add/Deduct _____ (**\$** _____)

UNIT PRICES: N/A

I/We acknowledge Addenda numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for SIXTY (60) days from the date of opening of bids, and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid.

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

(State of Corporation)

Business Address: _____

Witness: _____ By: _____
(SEAL) (Authorized Signature)

(Title)
Date: _____

ATTACHMENTS

- Sub-Contractor List
- Non-Collusion Statement
- Bid Bond
- Consent of Surety
- (Others as Required by Project Manuals)

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 6962 (d)(10)b Delaware Code, the following sub-contractor listing must accompany the bid submittal. The name and address of the sub-contractor must be listed for each category where the bidder intends to use a sub-contractor to perform that category of work. In order to provide full disclosure and acceptance of the bid by the Owner, it is required that bidders list themselves as being the sub-contractor for all categories where he/she is qualified and intends to perform such work.

<u>Subcontractor Category</u>	<u>Subcontractor</u>	<u>Address (City & State)</u>
1. Audio/Visual	_____	_____

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date.

All the terms and conditions of **C-30: Audio/Visual** have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE
(TYPED): _____

AUTHORIZED REPRESENTATIVE
(SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

PHONE NUMBER: _____

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

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID BOND

TO ACCOMPANY PROPOSAL
(Not necessary if security is used)

KNOW ALL MEN BY THESE PRESENTS That: _____ of
_____ in the County of _____ and State of _____ as
Principal, and _____ of _____ in the County of _____
_____ and State of _____ as Surety, legally authorized to do business in the State of Delaware
("State"), are held and firmly unto the **Woodbridge School District** in the sum of _____
Dollars (\$ _____), or percent not to exceed _____
_____ Dollars (\$ _____) of amount of bid on Contract No. _____ to be paid to the
Woodbridge School District for the use and benefit of the **Woodbridge School District** for which payment well and
truly to be made, we do bind ourselves, our and each of our heirs, executors, administrators, and successors, jointly and
severally for and in the whole firmly by these presents.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bounden Principal who has submitted to the
Woodbridge School District a certain proposal to enter into this contract for the furnishing of certain material and/or
services within the State, shall be awarded this Contract, and if said Principal shall well and truly enter into and execute
this Contract as may be required by the terms of this Contract and approved by the **Woodbridge School District** this
Contract to be entered into within twenty days after the date of official notice of the award thereof in accordance with the
terms of said proposal, then this obligation shall be void or else to be and remain in full force and virtue.

Sealed with _____ seal and dated this ___ day of _____ in the year of our Lord two thousand
and _____ (20__).

SEALED, AND DELIVERED IN THE PRESENCE OF

Name of Bidder (Organization)

Corporate
Seal
Attest _____

By: _____
Authorized Signature

Title

Name of Surety

Witness _____

Title

CONSENT OF SURETY

DATE _____

To: **Woodbridge School District**
16359 Sussex Highway
Bridgeville, Delaware 19933

Gentlemen:

We, the _____

(Surety Company's Address)

a Surety Company authorized to do business in the State of Delaware hereby agrees that if

(Contractor)

(Address)

is awarded the Contract No. _____

We will write the required Performance and/or Labor and Material Bond required by Paragraph 9 of the Instructions to Bidders.

(Surety Company)

By _____
(Attorney-in-Fact)

END OF SECTION

SECTION 005200 - AGREEMENT

1. SUMMARY

- 1.1. The Agreement Form for this Project is the American Institute of Architects, Standard Form of Agreement between Owner and Contractor, Construction Manager as Advisor, AIA Document A132 - 2009 Edition.
- 1.2 A copy of AIA Document A132 – 2009 Edition is bound into this Project Manual following this page.

END OF SECTION

SECTION 006113 – PERFORMANCE AND PAYMENT BONDS

1. PERFORMANCE AND PAYMENT BONDS

1.1 Bonds must be in the following form:

1. Form of Performance Bond (attached).
2. Form of Payment Bond (attached).

SECTION 006113 - FORM OF PAYMENT BOND

Bond Number:

KNOW ALL PERSONS BY THESE PRESENTS, that we, _____, as principal ("Principal"), and _____, a _____ corporation, legally authorized to do business in the State of Delaware, as surety ("Surety"), are held and firmly bound unto the State of Delaware, **Woodbridge School District** ("Owner"), in the amount of _____ (\$_____), to be paid to Owner, for which payment well and truly to be made, we do bind ourselves, our and each and every of our heirs, executors, administrations, successors and assigns, jointly and severally, for and in the whole firmly by these presents.

Sealed with our seals and dated this _____ day of _____, 20____.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH, that if Principal, who has been awarded by Owner that certain contract known as Contract No. _____ dated the _____ day of _____, 20____ (the "Contract"), which Contract is incorporated herein by reference, shall well and truly pay all and every person furnishing materials or performing labor or service in and about the performance of the work under the Contract, all and every sums of money due him, her, them or any of them, for all such materials, labor and service for which Principal is liable, shall make good and reimburse Owner sufficient funds to pay such costs in the completion of the Contract as Owner may sustain by reason of any failure or default on the part of Principal, and shall also indemnify and save harmless Owner from all costs, damages and expenses arising out of or by reason of the performance of the Contract and for as long as provided by the Contract; then this obligation shall be void, otherwise to be and remain in full force and effect.

Surety, for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligation of Surety and its bond shall be in no way 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 any waiver of any provisions thereof, or by any assignment, subletting or other transfer thereof or of any work to be performed or any monies due or to become due thereunder; and Surety hereby waives notice of any and all such extensions, modifications, omissions, additions, changes, payments, waivers, things done and omitted to be done by and in relation to assignees, subcontractors, and other transferees shall have the same effect as to Surety as though done or omitted to be done by or in relation to Principal.

Surety hereby stipulates and agrees that no modifications, omission or additions in or to the terms of the Contract shall in any way whatsoever affect the obligation of Surety and its bond. Any proceeding, legal or equitable, under this Bond may be brought in any court of competent jurisdiction in the State of Delaware. Notices to Surety or Contractor may be mailed or delivered to them at their respective addresses shown below.

IN WITNESS WHEREOF, Principal and Surety have hereunto set their hand and seals, and such

of them as are corporations have caused their corporate seal to be hereto affixed and these presents to be signed by their duly authorized officers, the day and year first above written.

PRINCIPAL

Name: _____

Witness or Attest: Address: _____

By: _____ (SEAL)

Name: Name:

Title:

(Corporate Seal)

SURETY

Name: _____

Witness or Attest: Address: _____

By: _____ (SEAL)

Name: Name:

Title:

(Corporate Seal)

SECTION 006113 - FORM OF PERFORMANCE BOND

Bond Number: _____

KNOW ALL PERSONS BY THESE PRESENTS, that we, _____, as principal ("Principal"), and _____, a _____ corporation, legally authorized to do business in the State of Delaware, as surety ("Surety"), are held and firmly bound unto the State of Delaware, **Woodbridge School District** ("Owner"), in the amount of _____ (\$_____) to be paid to Owner, for which payment well and truly to be made, we do bind ourselves, our and each and every of our heirs, executors, administrations, successors and assigns. jointly and severally, for and in the whole, firmly by these presents.

Sealed with our seals and dated this _____ day of _____, 20_____.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH, that if Principal, who has been awarded by Owner that certain contract known as Contract No. _____ dated the _____ day of _____, 20 (the "Contract"), which Contract is incorporated herein by reference, shall well and truly provide and furnish all materials, appliances and tools and perform all the work required under and pursuant to the terms and conditions of the Contract and the Contract Documents (as defined in the Contract) or any changes or modifications thereto made as therein provided, shall make good and reimburse Owner sufficient funds to pay the costs of completing the Contract that Owner may sustain by reason of any failure or default on the part of Principal, and shall also indemnify and save harmless Owner from all costs, damages and expenses arising out of or by reason of the performance of the Contract and for as long as provided by the Contract; then this obligation shall be void, otherwise to be and remain in full force and effect.

Surety, for value received, hereby stipulates and agrees, if requested to do so by Owner, to fully perform and complete the work to be performed under the Contract pursuant to the terms, conditions and covenants thereof, if for any cause Principal fails or neglects to so fully perform and complete such work

Surety, for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligation of Surety and its bond shall be in no way 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 any waiver of any provisions thereof, or by any assignment, subletting or other transfer thereof or of any work to be performed or any monies due or to become due thereunder; and Surety hereby waives notice of any and all such extensions, modifications, omissions, additions, changes, payments, waivers, assignments, subcontracts and transfers and hereby expressly stipulates and agrees that any and all things done and omitted to be done by and in relation to assignees, subcontractors, and other transferees shall have the same effect as to Surety as though done or omitted to be done by or in relation to Principal.

Surety hereby stipulates and agrees that no modifications, omissions or additions in or to the

terms of the Contract shall in any way whatsoever affect the obligation of Surety and its bond.

Any proceeding, legal or equitable, under this Bond may be brought in any court of competent jurisdiction in the State of Delaware. Notices to Surety or Contractor may be mailed or delivered to them at their respective addresses shown below.

IN WITNESS WHEREOF, Principal and Surety have hereunto set their hand and seals, and such of them as are corporations have caused their corporate seal to be hereto affixed and these presents to be signed by their duly authorized officers, the day and year first above written.

PRINCIPAL

Name: _____

Witness or Attest: Address: _____

By: _____ (SEAL)

Name: _____
Title: _____

(Corporate Seal)

SURETY

Name: _____

Witness or Attest: Address: _____

By: _____ (SEAL)

Name: _____
Title: _____

(Corporate Seal)

END OF SECTION

SECTION 006216 – CERTIFICATE OF INSURANCE

In conjunction with Insurance Requirements AIA General Conditions, Article 11, the Contractor shall be bound by the following limits of liability insurance (for Contracts under this Bid Pac). The Contractor shall use the standard "ACCORD" for titled "Certificate of Insurance" in submitting his liability insurance limits. The required limits to be inserted in accordance with the sample "ACCORD" form in this section:

GENERAL NOTES

1. Other Insurance

1.1 Contractor shall carry any necessary insurance required to cover Owned and Rental equipment that may be necessary for them to use in the performance of the Work.

2. Contractor shall have the following additional items added to his required "ACCORD" form Certificate of Insurance:

1. Name and Address of Insured (Contractor).
2. Description of Operations/Locations -

3. Added Insured – Woodbridge School District and EDiS Company

4. Certificate Holder – Woodbridge School District
16359 Sussex Highway
Bridgeville, Delaware 19933

Contractors shall note that although not a part of AIA Document A232 - 2009 Edition, these additional articles apply as noted to this Project.

A sample certificate is bound into the Project Manual immediately following this Document.

END OF SECTION

SECTION 007200 – GENERAL CONDITIONS

1. SUMMARY

- 1.1. The General Conditions for this Project are the American Institute of Architects General Conditions of the Contract for Construction, Construction Manager as Advisor Edition, AIA Document A232 - 2009 Edition.
- 1.2 A copy of AIA Document A232 - 2009 Edition is bound into this Project Manual following this page.

END OF SECTION

AIA[®] Document A232[™] – 2009

General Conditions of the Contract for Construction, Construction Manager as Adviser Edition

for the following PROJECT:

(Name, and location or address)

Woodbridge School District
New Woodbridge High School

THE CONSTRUCTION MANAGER:

(Name, legal status and address)

EDiS Company
110 South Poplar Street, Suite 400
Wilmington, Delaware 19801

THE OWNER:

(Name, legal status and address)

Woodbridge School District
16359 Sussex Highway
Bridgeville, Delaware 19933

THE ARCHITECT:

(Name, legal status and address)

Fearn Clendaniel Architects, Inc.
6 Larch Avenue, Suite 398
Wilmington, Delaware 19804

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Documents A132[™]–2009, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Adviser Edition; B132[™]–2009, Standard Form of Agreement Between Owner and Architect, Construction Manager as Adviser Edition; and C132[™]–2009, Standard Form of Agreement Between Owner and Construction Manager as Adviser.

Init.

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 **The Contract Documents.** The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement), and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of addenda relating to bidding requirements).

§ 1.1.2 **The Contract.** The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and the Construction Manager or the Construction Manager's consultants, (3) between the Owner and the Architect or the Architect's consultants, (4) between the Contractor and the Construction Manager or the Construction Manager's consultants, (5) between the Owner and a Subcontractor or Sub-subcontractor (6) between the Construction Manager and the Architect, or (7) between any persons or entities other than the Owner and Contractor. The Construction Manager and Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of their duties.

§ 1.1.3 **The Work.** The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 **The Project.** The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by other Multiple Prime Contractors and by the Owner's own forces, including persons or entities under separate contracts not administered by the Construction Manager.

§ 1.1.5 **The Drawings.** The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

§ 1.1.6 **The Specifications.** The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 **Instruments of Service.** Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 **Initial Decision Maker.** The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2 and certify termination of the Agreement under Section 14.2.2.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

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§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an" but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect, or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants.

§ 1.6 Transmission of Data in Digital Form

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Article 4, the Construction Manager and the Architect do not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Information and Services Required of the Owner

§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or the

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portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.2 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities. Unless otherwise provided under the Contract Documents, the Owner, through the Construction Manager, shall secure and pay for the building permit.

§ 2.2.3 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.2.4 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.2.5 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.2.6 The Owner shall endeavor to forward all communications to the Contractor through the Construction Manager and shall contemporaneously provide the same communications to the Architect about matters arising out of or relating to the Contract Documents.

§ 2.3 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.4 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Construction Manager's and Architect's and their respective consultants' additional services made necessary by such default, neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect, after consultation with the Construction Manager. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The plural term "Multiple Prime Contractors" refers to persons or entities who perform construction under contracts with the Owner that are administered by the Construction Manager. The term does not include the Owner's own forces, including persons or entities under separate contracts not administered by the Construction Manager.

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§ 3.1.3 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.4 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Construction Manager or Architect in their administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Construction Manager and Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information submitted to the Construction Manager in such form as the Construction Manager and Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Construction Manager and Architect any nonconformity discovered by or made known to the Contractor as a request for information submitted to Construction Manager in such form as the Construction Manager and Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall make Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instruction concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner, the Construction Manager, and the Architect and shall not proceed with that portion of the Work without further written instructions from the Architect, through the Construction Manager. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of the Project already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work authorized by the Architect in accordance with Sections 3.12.8 or 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect, in consultation with the Construction Manager, and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 Warranty

The Contractor warrants to the Owner, Construction Manager, and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform with the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Construction Manager or Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work or portions thereof provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices, and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Owner, through the Construction Manager, shall secure and pay for the building permit. The Contractor shall secure and pay for other permits, fees, licenses and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 **Concealed or Unknown Conditions.** If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner, Construction Manager, and the Architect before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect and Construction

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Manager will promptly investigate such conditions and, if the Architect, in consultation with the Construction Manager, determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect, in consultation with the Construction Manager, determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner, Construction Manager, and Contractor in writing, stating the reasons. If the Owner or Contractor disputes the Architect's determination or recommendation, either party may proceed as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner, Construction Manager, and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents:

- 1 Allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- 2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- 3 Whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner and Architect through the Construction Manager, the name and qualifications of a proposed superintendent. The Construction Manager may reply within 14 days to the Contractor in writing stating (1) whether the Owner, the Construction Manager, or the Architect has reasonable objection to the proposed superintendent or (2) that any of them require additional time to review. Failure of the Construction Manager to reply within the 14 day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner, Construction Manager or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information and the Construction Manager's approval a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project schedule to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

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The Contractor shall cooperate with the Construction Manager in scheduling and performing the Contractor's Work to avoid conflict with, and as to cause no delay in, the work or activities of other Multiple Prime Contractors or the construction or operations of the Owner's own forces.

§ 3.10.2 The Contractor shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter update it as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Construction Manager's and Architect's approval. The Architect and Construction Manager's approval shall not unreasonably be delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Construction Manager and Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall participate with other Contractors, the Construction Manager and Owner in reviewing and coordinating all schedules for incorporation into the Project schedule that is prepared by the Construction Manager. The Contractor shall make revisions to the construction schedule and submittal schedule as deemed necessary by the Construction Manager to conform to the Project schedule.

§ 3.10.4 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner, Construction Manager and Architect and incorporated into the approved Project schedule.

§ 3.11 Documents and Samples at the Site

The Contractor shall maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These documents shall be available to the Architect and delivered to the Construction Manager for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. Their purpose is to demonstrate the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect and Construction Manager is subject to the limitations of Sections 4.2.9 through 4.2.11. Informational submittals upon which the Construction Manager and Architect are not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Construction Manager or Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Construction Manager Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents in accordance with the Project submittal schedule approved by the Construction Manager and Architect, or in the absence of an approved Project submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of other Multiple Prime Contractors or the Owner's own forces. The Contractor shall cooperate with the Construction Manager in the coordination of the Contractor's Shop Drawings, Product Data, Samples and similar submittals with related documents submitted by other Multiple Prime Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents to the Owner, Construction Manager, and Architect, that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so and (3) checked

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and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been reviewed and approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Construction Manager and Architect in writing of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Construction Manager and Architect on previous submittals. In the absence of such written notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 3.13 Use of Site

§ 3.13.1 The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.13.2 The Contractor shall coordinate the Contractor's operations with, and secure the approval of, the Construction Manager before using any portion of the site.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting and patching shall be restored to the condition existing prior to the cutting, fitting and patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner's own forces or of other Multiple Prime Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner's own forces or by other Multiple Prime Contractors except with written consent of the Construction Manager,

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Owner and such other Multiple Prime Contractors; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the other Multiple Prime Contractors or the Owner the Contractor's consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner, or Construction Manager with the Owner's approval, may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner, Construction Manager and Architect access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner, Construction Manager and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents or where the copyright violations are contained in Drawings, Specifications or other documents prepared by the Owner, Architect, or Construction Manager. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect through the Construction Manager.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Construction Manager, Architect, Construction Manager's and Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

ARTICLE 4 ARCHITECT AND CONSTRUCTION MANAGER

§ 4.1 General

§ 4.1.1 The Owner shall retain an architect lawfully licensed to practice architecture or an entity lawfully practicing architecture in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 4.1.2 The Owner shall retain a construction manager lawfully licensed to practice construction management or an entity lawfully practicing construction management in the jurisdiction where the Project is located. That person or entity is identified as the Construction Manager in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 4.1.3 Duties, responsibilities and limitations of authority of the Construction Manager and Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Construction Manager, Architect and Contractor. Consent shall not be unreasonably withheld.

§ 4.1.4 If the employment of the Construction Manager or Architect is terminated, the Owner shall employ a successor construction manager or architect as to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Construction Manager or Architect, respectively.

§ 4.2 Administration of the Contract

§ 4.2.1 The Construction Manager and Architect will provide administration of the Contract as described in the Contract Documents and will be the Owner's representatives during construction until the date the Architect issues the final Certificate for Payment. The Construction Manager and Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and report to the Owner and Construction Manager (1) known deviations from the Contract Documents and from the most recent Project schedule prepared by the Construction Manager, and (2) defects and deficiencies observed in the Work.

§ 4.2.3 The Construction Manager shall provide a staffing plan to include one or more representatives who shall be in attendance at the Project site whenever the Work is being performed. The Construction Manager will determine in general if the Work observed is being performed in accordance with the Contract Documents, will keep the Owner reasonably informed of the progress of the Work, and will report to the Owner and Architect (1) known deviations from the Contract Documents and the most recent Project schedule, and (2) defects and deficiencies observed in the Work.

§ 4.2.4 The Construction Manager will schedule and coordinate the activities of the Contractor and other Multiple Prime Contractors in accordance with the latest approved Project schedule.

§ 4.2.5 The Construction Manager, except to the extent required by Section 4.2.4, and Architect will not have control over, or charge of, construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Section 3.3.1, and neither will be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. Neither the Construction Manager nor the Architect will have control over or charge of or be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or of any other persons or entities performing portions of the Work.

§ 4.2.6 **Communications Facilitating Contract Administration.** Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Construction Manager, and shall contemporaneously provide the same communications to the Architect about matters arising out of or relating to the Contract Documents. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with other Multiple Prime Contractors shall be through the Construction Manager and shall be contemporaneously provided to the Architect if those communications are about matters arising out of or related to the Contract Documents. Communications by and with the Owner's own forces shall be through the Owner.

§ 4.2.7 The Construction Manager and Architect will review and certify all Applications for Payment by the Contractor, in accordance with the provisions of Article 9.

§ 4.2.8 The Architect and Construction Manager have authority to reject Work that does not conform to the Contract Documents and will notify each other about the rejection. The Construction Manager shall determine in general

whether the Work of the Contractor is being performed in accordance with the requirements of the Contract Documents and notify the Owner, Contractor and Architect of defects and deficiencies in the Work. Whenever the Construction Manager considers it necessary or advisable, the Construction Manager will have authority to require additional inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, upon written authorization of the Owner, whether or not such Work is fabricated, installed or completed. The foregoing authority of the Construction Manager will be subject to the provisions of Sections 4.2.18 through 4.2.20 inclusive, with respect to interpretations and decisions of the Architect. However, neither the Architect's nor the Construction Manager's authority to act under this Section 4.2.8 nor a decision made by either of them in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect or the Construction Manager to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons performing any of the Work.

§ 4.2.9 The Construction Manager will receive and promptly review for conformance with the submittal requirements of the Contract Documents, all submittals from the Contractor such as Shop Drawings, Product Data and Samples. Where there are Multiple Prime Contractors, the Construction Manager will also check and coordinate the information contained within each submittal received from Contractor and other Multiple Prime Contractors, and transmit to the Architect those recommended for approval. By submitting Shop Drawings, Product Data, Samples and similar submittals, the Construction Manager represents to the Owner and Architect that the Construction Manager has reviewed and recommended them for approval. The Construction Manager's actions will be taken in accordance with the Project submittal schedule approved by the Architect or, in the absence of an approved Project submittal schedule, with reasonable promptness while allowing sufficient time to permit adequate review by the Architect.

§ 4.2.10 The Architect will review and approve or take other appropriate action upon the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Upon the Architect's completed review, the Architect shall transmit its submittal review to the Construction Manager.

§ 4.2.11 Review of the Contractor's submittals by the Construction Manager and Architect is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Construction Manager and Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5 and 3.12. The Construction Manager and Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Construction Manager and Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.12 The Construction Manager will prepare Change Orders and Construction Change Directives.

§ 4.2.13 The Construction Manager and the Architect will take appropriate action on Change Orders or Construction Change Directives in accordance with Article 7, and the Architect will have authority to order minor changes in the Work as provided in Section 7.4. The Architect, in consultation with the Construction Manager, will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.14 Utilizing the documents provided by the Contractor, the Construction Manager will maintain at the site for the Owner one copy of all Contract Documents, approved Shop Drawings, Product Data, Samples and similar required submittals, in good order and marked currently to record all changes and selections made during construction. These will be available to the Architect and the Contractor, and will be delivered to the Owner upon completion of the Project.

§ 4.2.15 The Construction Manager will assist the Architect in conducting inspections to determine the dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion in conjunction with the Architect pursuant to Section 9.8; and receive and forward to the Owner written warranties and related

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documents required by the Contract and assembled by the Contractor pursuant to Section 9.10. The Construction Manager will forward to the Architect a final Application and Certificate for Payment or final Project Application and Project Certificate for Payment upon the Contractor's compliance with the requirements of the Contract Documents.

§ 4.2.16 If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

§ 4.2.17 The Architect will interpret and decide matters concerning performance under, and requirements of the Contract Documents on written request of the Construction Manager, Owner or Contractor through the Construction Manager. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.18 Interpretations and decisions of the Architect will be consistent with the intent of and reasonably inferable from the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions so rendered in good faith.

§ 4.2.19 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.20 The Construction Manager will receive and review requests for information from the Contractor, and forward each request for information to the Architect, with the Construction Manager's recommendation. The Architect will review and respond in writing to the Construction Manager to requests for information about the Contract Documents. The Construction Manager's recommendation and the Architect's response to each request will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include other Multiple Prime Contractors or subcontractors of other Multiple Prime Contractors.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Construction Manager for review by the Owner, Construction Manager and Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Construction Manager may reply within 14 days to the Contractor in writing stating (1) whether the Owner, the Construction Manager or the Architect has reasonable objection to any such proposed person or entity or, (2) that the Construction Manager, Architect or Owner requires additional time for review. Failure of the Construction Manager, Owner, or Architect to reply within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner, Construction Manager or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner, Construction Manager or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner, Construction Manager or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change,

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and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person or entity previously selected if the Owner, Construction Manager or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including responsibility for safety of the Subcontractor's Work, which the Contractor, by these Documents, assumes toward the Owner, Construction Manager and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner, Construction Manager and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon such assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor Contractor or other entity. If the Owner assigns the subcontract to a successor Contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor Contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY OTHER CONTRACTORS

§ 6.1 Owner's Right to Perform Construction with Own Forces and to Award Other Contracts

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, which include persons or entities under separate contracts not administered by the Construction Manager, and to award other contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 6.1.2 When the Owner performs construction or operations with the Owner's own forces including persons or entities under separate contracts not administered by the Construction Manager, the Owner shall provide for coordination of such forces with the Work of the Contractor, who shall cooperate with them.

§ 6.1.3 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights that apply to the Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11 and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner's own forces, Construction Manager and other Multiple Prime Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner's own forces or other Multiple Prime Contractors, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Construction Manager and Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that the Owner's own forces or other Multiple Prime Contractors' completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs, including costs that are payable to a separate contractor or to other Multiple Prime Contractors because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of delays, improperly timed activities, damage to the Work or defective construction by the Owner's own forces or other Multiple Prime Contractors.

§ 6.2.4 The Contractor shall promptly remedy damage the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner, separate contractors, or other Multiple Prime Contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner and other Multiple Prime Contractors shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, other Multiple Prime Contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Construction Manager, with notice to the Architect, will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Construction Manager, Architect and Contractor; a Construction Change Directive requires agreement by the Owner, Construction Manager and Architect and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.

§ 7.2 Change Orders

A Change Order is a written instrument prepared by the Construction Manager and signed by the Owner, Construction Manager, Architect and Contractor, stating their agreement upon all of the following:

- .1 The change in the Work;

- .2 The amount of the adjustment, if any, in the Contract Sum; and
- .3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Construction Manager and signed by the Owner, Construction Manager and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.7.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 7.3.5 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Construction Manager and Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.6 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Construction Manager shall determine the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Construction Manager may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

- .1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers compensation insurance;
- .2 Costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and
- .5 Additional costs of supervision and field office personnel directly attributable to the change.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Construction Manager and Architect. When

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both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Construction Manager and Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Construction Manager and Architect determine to be reasonably justified. The interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Construction Manager and Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Construction Manager shall prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order issued through the Construction Manager and shall be binding on the Owner and Contractor.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner, Owner's own forces, Construction Manager, Architect, any of the other Multiple Prime Contractors or an employee of any of them, or by changes ordered in the Work, or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control; or by delay authorized by the Owner pending mediation and arbitration, or by other causes that the Architect, based on the recommendation of the Construction Manager, determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

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ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.2 Schedule of Values

Where the Contract is based on a Stipulated Sum or Guaranteed Maximum Price, the Contractor shall submit to the Construction Manager, before the first Application for Payment, a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Construction Manager and Architect may require. This schedule, unless objected to by the Construction Manager or Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. In the event there is one Contractor, the Construction Manager shall forward to the Architect the Contractor's schedule of values. If there are Multiple Prime Contractors responsible for performing different portions of the Project, the Construction Manager shall forward the Multiple Prime Contractors' schedules of values only if requested by the Architect.

§ 9.3 Applications for Payment

§ 9.3.1 At least fifteen days before the date established for each progress payment, the Contractor shall submit to the Construction Manager an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner, Construction Manager or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Construction Manager and Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or material supplier unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 Where there is only one Contractor, the Construction Manager will, within seven days after the Construction Manager's receipt of the Contractor's Application for Payment, review the Application, certify the amount the Construction Manager determines is due the Contractor, and forward the Contractor's Application and Certificate for Payment to the Architect. Within seven days after the Architect receives the Contractor's Application for Payment from the Construction Manager, the Architect will either issue to the Owner a Certificate for Payment, with a copy to the Construction Manager, for such amount as the Architect determines is properly due, or notify the Construction Manager and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided

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in Section 9.5.1. The Construction Manager will promptly forward to the Contractor the Architect's notice of withholding certification.

§ 9.4.2 Where there are Multiple Prime Contractors performing portions of the Project, the Construction Manager will, within seven days after the Construction Manager receives the Multiple Prime Contractors' Applications for Payment: (1) review the Applications and certify the amount the Construction Manager determines is due each of the Multiple Prime Contractors; (2) prepare a Summary of Contractors' Applications for Payment by combining information from each Multiple Prime Contractors' application with information from similar applications for progress payments from other Multiple Prime Contractors; (3) prepare a Project Application and Certificate for Payment; (4) certify the amount the Construction Manager determines is due all Multiple Prime Contractors; and (5) forward the Summary of Contractors' Applications for Payment and Project Application and Certificate for Payment to the Architect.

§ 9.4.3 Within seven days after the Architect receives the Project Application and Project Certificate for Payment and the Summary of Contractors' Applications for Payment from the Construction Manager, the Architect will either issue to the Owner a Project Certificate for Payment, with a copy to the Construction Manager, for such amount as the Architect determines is properly due, or notify the Construction Manager and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1. The Construction Manager will promptly forward the Architect's notice of withholding certification to the Contractors.

§ 9.4.4 The Construction Manager's certification of an Application for Payment or, in the case of Multiple Prime Contractors, a Project Application and Certificate for Payment shall be based upon the Construction Manager's evaluation of the Work and the information provided as part of the Application for Payment. The Construction Manager's certification will constitute a representation that, to the best of the Construction Manager's knowledge, information and belief, the Work has progressed to the point indicated and the quality of the Work is in accordance with the Contract Documents. The certification will also constitute a recommendation to the Architect and Owner that the Contractor be paid the amount certified.

§ 9.4.5 The Architect's issuance of a Certificate for Payment or in the case of Multiple Prime Contractors, Project Application and Certificate for Payment, shall be based upon the Architect's evaluation of the Work, the recommendation of the Construction Manager, and information provided as part of the Application for Payment or Project Application for Payment. The Architect's certification will constitute a representation that, to the best of the Architect's knowledge, information and belief, the Work has progressed to the point indicated, that the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified.

§ 9.4.6 The representations made pursuant to Sections 9.4.4 and 9.4.5 are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Construction Manager or Architect.

§ 9.4.7 The issuance of a separate Certificate for Payment or a Project Certificate for Payment will not be a representation that the Construction Manager or Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed the Contractor's construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Construction Manager or Architect may withhold a Certificate for Payment or Project Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Construction Manager's or Architect's opinion the representations to the Owner required by Section 9.4.4 and 9.4.5 cannot be made. If the Construction Manager or Architect is unable to certify payment in the amount of the Application, the Construction Manager will notify the Contractor and Owner as provided in Section 9.4.1 and 9.4.3. If the Contractor, Construction Manager and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment or a Project Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Construction Manager or Architect may also withhold a Certificate for Payment or, because of

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subsequently discovered evidence or subsequent observations, may nullify the whole or a part of a Certificate for Payment or Project Certificate for Payment previously issued, to such extent as may be necessary in the Construction Manager's or Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from the acts and omissions described in Section 3.3.2 because of

- 1 defective Work not remedied;
- 2 third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;
- 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 a separate contractor;
- 6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- 7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.3 If the Architect or Construction Manager withholds certification for payment under Section 9.5.1, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or material or equipment suppliers to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Construction Manager and both will reflect such payment on the next Certificate for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment or Project Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Construction Manager and Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Construction Manager will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Owner, Construction Manager and Architect on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and material and equipment suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors to ascertain whether they have been properly paid. Neither the Owner, Construction Manager nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor except as may otherwise be required by law.

§ 9.6.5 Contractor payments to material and equipment suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors and suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, shall create any fiduciary

liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.7 Failure of Payment

If the Construction Manager and Architect do not issue a Certificate for Payment or a Project Certificate for Payment, through no fault of the Contractor, within fourteen days after the Construction Manager's receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents the amount certified by the Construction Manager and Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' written notice to the Owner, Construction Manager and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall notify the Construction Manager, and the Contractor and Construction Manager shall jointly prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. 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.

§ 9.8.3 Upon receipt of the list, the Architect, assisted by the Construction Manager, will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the list, which is not sufficiently complete in accordance with the requirements of the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect, assisted by the Construction Manager, to determine Substantial Completion.

§ 9.8.4 When the Architect, assisted by the Construction Manager, determines that the Work or designated portion thereof is substantially complete, the Construction Manager will prepare, and the Construction Manager and Architect shall execute a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and 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. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under Section 11.3.1.5 and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor and Construction Manager shall jointly prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall

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be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect after consultation with the Construction Manager.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Construction Manager, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon completion of the Work, the Contractor shall forward to the Construction Manager a written notice that the Work is ready for final inspection and acceptance and shall also forward to the Construction Manager a final Contractor's Application for Payment. Upon receipt, the Construction Manager will evaluate the completion of Work of the Contractor and then forward the notice and Application, with the Construction Manager's recommendations, to the Architect who will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Construction Manager and Architect will promptly issue a final Certificate for Payment or Project Certificate for Payment stating that to the best of their knowledge, information and belief, and on the basis of their on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Construction Manager's and Architect's final Certificate for Payment or Project Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect through the Construction Manager (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after 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 given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated 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 to indemnify the Owner against such lien. If such lien 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 lien, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Construction Manager and Architect so confirm, the Owner shall, upon application by the Contractor and certification by the Construction Manager and Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect through the Construction Manager prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- .1 liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents; or
- .3 terms of special warranties required by the Contract Documents.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract. The Contractor shall submit the Contractor's safety program to the Construction Manager for review and coordination with the safety programs of other Contractors.

The Construction Manager's responsibilities for review and coordination of safety programs shall not extend to direct control over or charge of the acts or omissions of the Contractors, Subcontractors, agents or employees of the Contractors or Subcontractors, or any other persons performing portions of the Work and not directly employed by the Construction Manager.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to

- 1 employees on the Work and other persons who may be affected thereby;
- 2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors;
- 3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction; and
- 4 construction or operations by the Owner or other Contractors.

§ 10.2.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

§ 10.2.3 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2, 10.2.1.3 and 10.2.1.4, except damage or loss attributable to acts or omissions of the Owner, Construction Manager or Architect or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner, Construction Manager and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured,

shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to, asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner, Construction Manager and Architect in writing.

§ 10.3.2 Upon receipt of the Contractor's written notice, the Owner shall obtain the services of a licensed laboratory to verify a presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor, Construction Manager and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. The Contractor, the Construction Manager and the Architect will promptly reply to the Owner in writing stating whether or not any of them has reasonable objection to the persons or entities proposed by the Owner. If the Contractor, Construction Manager or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor, the Construction Manager and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resumed upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased in the amount of the Contractor's reasonable additional costs of shut-down, delay and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Construction Manager, Architect, their consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall indemnify the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Liability Insurance

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set

forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- .1 Claims under workers' compensation, disability benefit and other similar employee benefit acts which are applicable to the Work to be performed;
- .2 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- .3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- .4 Claims for damages insured by usual personal injury liability coverage;
- .5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- .6 Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle; and
- .7 Claims for bodily injury or property damage arising out of completed operations; and
- .8 Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be submitted to the Construction Manager for transmittal to the Owner with a copy to the Architect prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage shall be furnished by the Contractor with reasonable promptness.

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Construction Manager, the Construction Manager's consultants, the Owner, the Architect, and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

§ 11.2 Owner's Liability Insurance

The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

§ 11.3 Property Insurance

§ 11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

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§ 11.3.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for the Architect's, Contractor's, and Construction Manager's services and expenses required as a result of such insured loss.

§ 11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.3.1.3 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

§ 11.3.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§ 11.3.2 **Boiler and Machinery Insurance.** The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Construction Manager, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

§ 11.3.3 **Loss of Use Insurance.** The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

§ 11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, adjoining or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

§ 11.3.7 **Waivers of Subrogation.** The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees each of the other, and (2) the Construction Manager,

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Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as the Owner and Contractor may have to the proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Construction Manager, Construction Manager's consultants, Architect, Architect's consultants, Owner's separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.8 A loss insured under the Owner's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.3.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

§ 11.3.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement. If the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Owner as fiduciary shall make settlement with insurers or distribution of insurance proceeds in accordance with the direction of the arbitrators.

§ 11.4 Performance Bond and Payment Bond

§ 11.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

§ 11.4.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Construction Manager's or Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by either, be uncovered for their observation and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered which the Construction Manager or Architect has not specifically requested to observe prior to its being covered, the Construction Manager or 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 at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or one of the other Contractors in which event the Owner shall be responsible for payment of such costs.

§ 12.2 Correction of Work

§ 12.2.1 Before or After Substantial Completion

The Contractor shall promptly correct Work rejected by the Construction Manager or Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof, or after the date for commencement of warranties established under Section 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4.

§ 12.2.2.2 The one-year period shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors or other Multiple Prime Contractors caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located except that, if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to covenants, agreements and obligations contained in the Contract Documents. Except as provided in

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Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate such assignment.

§ 13.3 Written Notice

Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity or to an officer of the corporation for which it was intended; or if delivered at or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

§ 13.4 Rights and Remedies

§ 13.4.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

§ 13.4.2 No action or failure to act by the Owner, Construction Manager, Architect or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed in writing.

§ 13.5 Tests and Inspections

§ 13.5.1 Tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Construction Manager and Architect timely notice of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.5.2 If the Construction Manager, Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Section 13.5.1, the Construction Manager and Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Construction Manager and Architect of when and where tests and inspections are to be made so that the Construction Manager and Architect may be present for such procedures. Such costs except as provided in Section 13.5.3, shall be at the Owner's expense.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure including those of repeated procedures and compensation for the Construction Manager's and Architect's services and expenses shall be at the Contractor's expense.

§ 13.5.4 Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Construction Manager for transmittal to the Architect.

§ 13.5.5 If the Construction Manager or Architect is to observe tests, inspections or approvals required by the Contract Documents, the Construction Manager or Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.6 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

§ 13.7 Time Limits on Claims

The Owner and the Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and the Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

1. Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
2. An act of government, such as a declaration of national emergency that requires all Work to be stopped;
3. Because the Construction Manager has not certified or the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
4. The Owner has failed to furnish to the Contractor promptly, upon the Contractor's request, reasonable evidence as required by Section 2.2.1.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, repeated suspensions, delays or interruptions of the entire Work by the Owner as described in Section 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' written notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner payment for Work executed including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner, Construction Manager and Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

1. repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
2. fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
3. repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
4. otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the above reasons exist, the Owner, after consultation with the Construction Manager, and upon certification by the Initial Decision Maker that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Construction Manager's and Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall, upon application, be certified by the Initial Decision Maker after consultation with the Construction Manager, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and the Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay or interruption as described in Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent:

- .1 that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of this Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition. A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim.

§ 15.1.2 Notice of Claims. Claims by either the Owner or Contractor must be initiated by written notice to the other party and to the Initial Decision Maker with a copy sent to the Construction Manager and Architect, if the Construction Manager and or Architect is not serving as the Initial Decision Maker. Claims by either party must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3 Continuing Contract Performance. Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents. The Construction Manager will prepare Change Orders and the Architect will issue a Certificate for Payment or Project Certificate for Payment in accordance with the decisions of the Initial Decision Maker.

§ 15.1.4 Claims for Additional Cost. If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.3.

§ 15.1.5 Claims for Additional Time

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay only one Claim is necessary.

§ 15.1.5.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

§ 15.1.6 Claims for Consequential Damages. The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- .1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.6 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision

Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of such request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect and Construction Manager, if the Architect or Construction Manager is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of an initial decision, demand in writing that the other party file for mediation within 60 days of the initial decision. If such a demand is made and the party receiving the demand fails to file for mediation within the time required, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.6 shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a

notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Either party, at its sole discretion, may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Either party, at its sole discretion, may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as the Owner and Contractor under this Agreement.

Additions and Deletions Report for AIA[®] Document A232[™] – 2009

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

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PAGE 1

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New Woodbridge High School

...

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SUPPLEMENTARY GENERAL CONDITIONS A232-2009

The following supplements modify the "General Conditions of the Contract for Construction," AIA Document A232-2009. Where a portion of the General Conditions is modified or deleted by the Supplementary Conditions, the unaltered portions of the General Conditions shall remain in effect.

ARTICLE 1: GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.1 THE CONTRACT DOCUMENTS

Delete the last sentence in its entirety and replace with the following:

"The Contract Documents also include Advertisement for Bid, Instructions to Bidder, sample forms, the Bid Form, the Contractor's completed Bid and the Award Letter."

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

Add the following Paragraphs:

1.2.4 In the case of an inconsistency between the Drawings and the Specifications, or within either document not clarified by addendum, the better quality or greater quantity of work shall be provided in accordance with the Architect's interpretation.

1.2.5 The word "PROVIDE" as used in the Contract Documents shall mean "FURNISH AND INSTALL" and shall include, without limitation, all labor, materials, equipment, transportation, services and other items required to complete the Work.

1.2.6 The word "PRODUCT" as used in the Contract Documents means all materials, systems and equipment.

1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

Delete Paragraph 1.5.1 in its entirety and replace with the following:

"All pre-design studies, drawings, specifications and other documents, including those in electronic form, prepared by the Architect under this Agreement are, and shall remain, the property of the Owner whether the Project for which they are made is executed or not. Such documents may be used by the Owner to construct one or more like Projects without the approval of, or additional compensation to, the Architect. The Contractor, Subcontractors, Sub-subcontractors and Material or Equipment Suppliers are authorized to

use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Architect and the Architect's consultants appropriate to and for use in the execution of their Work under the Contract Documents. They are not to be used by the Contractor or any Subcontractor, Sub-subcontractor or Material and Equipment Supplier on other Projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and Architect's consultants.

The Architect shall not be liable for injury or damage resulting from the re-use of drawings and specifications if the Architect is not involved in the re-use Project. ."

Delete Paragraph 1.5.2 in its entirety.

ARTICLE 2: OWNER

2.1 General

2.1.2 Delete Paragraph 2.1.2 in its entirety.

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

2.2.1 Delete the last sentence in this paragraph.

2.2.3 Add the following sentence:

"The Contractor, at their expense shall bear the costs to accurately identify the location of all underground utilities in the area of their excavation and shall bear all cost for any repairs required, out of failure to accurately identify said utilities."

2.2.5 Delete Subparagraph 2.2.5 in its entirety and substitute the following:

2.2.5 The Contractor shall be furnished free of charge up to five (5) sets of the Drawings and Project Manuals. Additional sets will be furnished at the cost of reproduction, postage and handling.

ARTICLE 3: CONTRACTOR

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

Delete the third sentence in Paragraph 3.2.4.

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

Add the following Paragraphs:

- 3.3.2.1 The Contractor shall immediately remove from the Work, whenever requested to do so by the Owner, any person who is considered by the Owner or Architect to be incompetent or disposed to be disorderly, or who for any reason is not satisfactory to the Owner, and that person shall not again be employed on the Work without the consent of the Owner or the Architect.
- 3.3.4 The Contractor must provide suitable storage facilities at the Site for the proper protection and safe storage of their materials. Consult the Owner and the Architect before storing any materials.
- 3.3.5 When any room is used as a shop, storeroom, office, etc., by the Contractor or Subcontractor(s) during the construction of the Work, the Contractor making use of these areas will be held responsible for any repairs, patching or cleaning arising from such use.

3.4 LABOR AND MATERIALS

Add the Following Paragraphs:

- 3.4.4 Before starting the Work, each Contractor shall carefully examine all preparatory Work that has been executed to receive their Work. Check carefully, by whatever means are required, to insure that its Work and adjacent, related Work, will finish to proper contours, planes and levels. Promptly notify the General Contractor/Construction Manager of any defects or imperfections in preparatory Work which will in any way affect satisfactory completion of its Work. Absence of such notification will be construed as an acceptance of preparatory Work and later claims of defects will not be recognized.
- 3.4.5 Under no circumstances shall the Contractor's Work proceed prior to preparatory Work proceed prior to preparatory Work having been completely cured, dried and/or otherwise made satisfactory to receive this Work. Responsibility for timely installation of all materials rests solely with the Contractor responsible for that Work, who shall maintain coordination at all times.

3.5 WARRANTY

Add the following Paragraphs:

- 3.5.1 The Contractor will warrant all materials and workmanship against original defects, except injury from proper and usual wear when used for the purpose intended, for two years after Acceptance by the Owner, and will maintain all items in condition that conforms with the Contract Documents during the period of warranty.

- 3.5.2 Non-conforming work during the period of warranty will be corrected by the Contractor at its expense upon demand of the Owner, it being required that the Work conforms to the Contract Documents at the expiration of the warranty period.
- 3.5.3 In addition to the General Warranty there are other warranties required for certain items for different periods of time than the one year as above, and are particularly so stated in that part of the specifications referring to same. The said warranties will commence at the same time as the General Warranty.
- 3.5.4 If the Contractor fails to remedy any failure, defect or damage within a reasonable time after receipt of notice, the Owner will have the right to replace, repair, or otherwise remedy the failure, defect or damage at the Contractor's expense.

3.11 DOCUMENTS AND SAMPLES AT THE SITE

Add the following Paragraphs:

- 3.11.1 During the course of the Work, the Contractor shall maintain a record set of drawings on which the Contractor shall mark the actual physical location of all piping, valves, equipment, conduit, outlets, access panels, controls, actuators, including all appurtenances that will be concealed once construction is complete, etc., including all invert elevations.
- 3.11.2 At the completion of the project, the Contractor shall obtain a set of reproducible drawings from the Architect, and neatly transfer all information outlined in 3.11.1 to provide a complete record of the as-built conditions.
- 3.11.3 The Contractor shall provide two (2) prints of the as-built conditions, along with the reproducible drawings themselves, to the Owner and one (1) set to the Architect. In addition, attach one complete set to each of the Operating and Maintenance Instructions/Manuals.

3.17 In the second sentence of the paragraph, insert "indemnify and" between "shall" and "hold".

ARTICLE 4: ARCHITECT AND CONSTRUCTION MANAGER

- 4.1 General
 - 4.1.2 Insert "As required by law," at the beginning of the first sentence.
- 4.2 Administration of the Contract
 - Delete the first sentence of Paragraph 4.2.10 and replace with the following:

The Architect will review and approve or take other appropriate action upon the Contractor's submittals such as Shop Drawings, Product Data and Samples for the purpose of checking for conformance with the Contract Documents.

Delete the second sentence of Paragraph 4.2.10 and replace with the following:

The Architect's action will be taken with such reasonable promptness as to cause no delay in the Work in the activities of the Owner, Contractor or separate Contractors, while allowing sufficient time in the Owner's professional judgment to permit adequate review.

Add the following to Paragraph 4.2.16:

There will be no full-time project representative provided by the Owner or Architect on this project.

Add to Paragraph 4.2.19 "and in compliance with all applicable codes, regulations and ordinances." to the end of the sentence.

ARTICLE 5: SUBCONTRACTORS

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

Delete Paragraph 5.2.3 in its entirety and replace with the following:

5.2.3 If the Owner, Architect or Construction Manager has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner, Architect or Construction Manager has no reasonable objection, subject to the statutory requirements of 29 Delaware Code § 6962(d)(10)b.3 and 4.

ARTICLE 6: CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

Delete Paragraph 6.1.3 in its entirety and replace with the following:

"When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Constructor who executes each separate Owner-Contractor Agreement."

6.2 MUTUAL RESPONSIBILITY

6.2.3 In the second sentence, strike the word "shall" and insert the word "may".

ARTICLE 7: CHANGES IN THE WORK

(SEE ARTICLE 7: CHANGES IN WORK IN THE GENERAL REQUIREMENTS)

ARTICLE 8: TIME

8.2 PROGRESS AND COMPLETION

Add the following Paragraphs:

8.2.1.1 Refer to Specification Section SUMMARY OF WORK for Contract time requirements.

8.2.4 If the Work falls behind the Progress Schedule as submitted by the Contractor, the Contractor shall employ additional labor and/or equipment necessary to bring the Work into compliance with the Progress Schedule at no additional cost to the Owner.

8.3 DELAYS AND EXTENSION OF TIME

8.3.1 Strike "arbitration" and insert "remedies at law or in equity".

Add the following Paragraph:

8.3.2.1 The Contractor shall update the status of the suspension, delay, or interruption of the Work with each Application for Payment. (The Contractor shall report the termination of such cause immediately upon the termination thereof.) Failure to comply with this procedure shall constitute a waiver for any claim for adjustment of time or price based upon said cause.

Delete Paragraph 8.3.3 in its entirety and replace with the following:

8.3.3 Except in the case of a suspension of the Work directed by the Owner, an extension of time under the provisions of Paragraph 8.3.1 shall be the Contractor's sole remedy in the progress of the Work and there shall be no payment or compensation to the Contractor for any expense or damage resulting from the delay.

Add the following Paragraph:

8.3.4 By permitting the Contractor to work after the expired time for completion of the project, the Owner does not waive its rights under the Contract.

- 8.3.5 The parties agree that Paragraph 8.3.3 of the Supplementary General Conditions does not apply to the Construction Manager in the event of a delay caused by a party other than the Construction Manager.

ARTICLE 9: PAYMENTS AND COMPLETION

9.2 SCHEDULE OF VALUES

Add the following Paragraphs:

- 9.2.1 The Schedule of Values shall be submitted using AIA Document G702, Continuation Sheet to G703.

9.3 APPLICATIONS FOR PAYMENT

Add the following Paragraph:

- 9.3.1.3 Application for Payment shall be submitted on AIA Document G702 "Application and Certificate for Payment", supported by AIA Document G703 "Continuation Sheet". Said Applications shall be fully executed and notarized.

Add the following Paragraphs:

- 9.3.4 Until Closeout Documents have been received and outstanding items completed the Owner will pay 95% (ninety-five percent) of the amount due the Contractor on account of progress payments.
- 9.3.5 The Contractor shall provide a current and updated Progress Schedule to the Architect with each Application for Payment. Failure to provide Schedule will be just cause for rejection of Application for Payment.

9.5 DECISIONS TO WITHHOLD CERTIFICATION

Add the following to 9.5.1:

- .8 failure to provide a current Progress Schedule;
.9 a lien or attachment is filed;
.10 failure to comply with mandatory requirements for maintaining Record Documents.

9.6 PROGRESS PAYMENTS

Delete Paragraph 9.6.1 in its entirety and replace with the following:

- 9.6.1 After the Architect and the Construction Manager have approved and issued a Certificate for Payment, payment shall be made by the Owner within 30 days after Owner's receipt of the Certificate for Payment.

9.7 FAILURE OF PAYMENT

In first sentence, strike the first reference to "seven" and insert "thirty (30)". Also strike "binding dispute resolution" and insert "remedies at law or in equity".

9.8 SUBSTANTIAL COMPLETION

9.8.5 In the second sentence, strike "shall" and insert "may".

ARTICLE 10: PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

Add the following Paragraphs:

10.1.1 Each Contractor shall develop a safety program in accordance with the Occupational Safety and Health Act of 1970. A copy of said plan shall be furnished to the Owner and Architect prior to the commencement of that Contractor's Work.

10.1.2 Each Contractor shall appoint a Safety Representative. Safety Representatives shall be someone who is on site on a full time basis. If deemed necessary by the Owner or Architect, Contractor Safety meetings will be scheduled. The attendance of all Safety Representatives will be required. Minutes will be recorded of said meetings by the Contractor and will be distributed to all parties as well as posted in all job offices/trailers etc.

10.2 SAFETY OF PERSONS AND PROPERTY

Add the following Paragraph:

10.2.4.1 As required in the Hazardous Chemical Act of June 1984, all vendors supplying any material that may be defined as hazardous must provide Material Safety Data Sheets for those products. Any chemical product should be considered hazardous if it has a caution warning on the label relating to a potential physical or health hazard, if it is known to be present in the work place, and if employees may be exposed under normal conditions or in foreseeable emergency situations. Material Safety Data Sheets shall be provided directly to the Owner, along with the shipping slips that include those products.

10.3 HAZARDOUS MATERIALS

Delete Paragraph 10.3.3 in its entirety.

Delete Paragraphs 10.3.6 in its entirety.

ARTICLE 11: INSURANCE AND BONDS

11.1 CONTRACTOR'S LIABILITY INSURANCE

11.1.4 Strike "the Owner" immediately following "(1)" and strike "and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations."

11.2 OWNER'S LIABILITY INSURANCE

Delete Paragraph 11.2 in its entirety.

11.3 PROPERTY INSURANCE

Delete Paragraph 11.3 and its subparagraphs in their entirety and replace with the following:

11.3 The Owner shall provide Builder's All Risk Insurance for the Project. The Contractor and all Subcontractors shall provide property coverage for their tools and equipment, as necessary. Any mandatory deductible required by the Contractor's Insurance shall be the responsibility of the Contractor.

11.4 PERFORMANCE BOND AND PAYMENT BOND

11.4.1 Add the following sentence: "The bonds will conform to those forms approved by the Office of Management and Budget."

ARTICLE 12: UNCOVERING AND CORRECTION OF WORK

12.2.2 AFTER SUBSTANTIAL COMPLETION

Add the following Paragraph:

12.2.2.1.1 At any time during the progress of the Work, or in any case where the nature of the defects will be such that it is not expedient to have corrected, the Owner, at its option, will have the right to deduct such sum, or sums, of money from the amount of the Contract as it considers justified to adjust the difference in value between the defective work and that required under contract including any damage to the structure.

12.2.2.2 Strike "one" and insert "two".

12.2.2.3 Strike "one" and insert "two".

12.2.5 In second sentence, strike "one" and insert "two".

ARTICLE 13: MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW

Strike "except that, if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4."

Insert "except that, if the parties have selected arbitration as the method of dispute resolution, the Delaware Arbitration Act, 10 Del. C. §5701, shall govern Section 15.4."

13.6 INTEREST

Strike "the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located." Insert "30 days of presentment of the authorized Certificate of Payment at the annual rate of 12% or 1% per month.

13.7 TIME LIMITS ON CLAIMS

Strike the last sentence.

Add the following Paragraph:

13.8 CONFLICTS WITH FEDERAL STATUTES OR REGULATIONS

13.8.1 If any provision, specifications or requirement of the Contract Documents conflict or is inconsistent with any statute, law or regulation of the government of the United State of America, the Contractor shall notify the Architect and Owner immediately upon discovery.

ARTICLE 14: TERMINATION OR SUSPENSION OF THE CONTRACT

14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

Delete Paragraph 14.4.3 in its entirety and replace with the following:

14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and cost incurred by reason of such termination along with reasonable overhead.

ARTICLE 15: CLAIMS AND DISPUTES

15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES

Delete Paragraph 15.1.6 and its subparagraphs in their entirety.

15.2 INITIAL DECISION

Delete Paragraph 15.2.5 in its entirety and replace with the following:

15.2.5 The Architect will approve or reject Claims by written decision, which shall state the reasons therefore and shall notify the parties of any change in the Contract Sum or Contract Time or both. The approval or rejection of a Claim by the Architect shall be subject to mediation and other remedies at law or in equity.

Delete Paragraph 15.2.6 and its subparagraphs in their entirety.

15.3 MEDIATION

15.3.1 Strike "binding dispute resolution" and insert "any or all remedies at law or in equity".

15.3.2 In the first sentence, delete "administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedure in effect on the date of the Agreement,". Also strike "binding dispute resolution" and insert "remedies at law and in equity".

15.4 ARBITRATION

Delete Paragraph 15.4 and its subparagraphs in their entirety.

END OF SUPPLEMENTARY GENERAL CONDITIONS

SECTION 007343 – WAGE RATE REQUIREMENTS

1. SUMMARY

- 1.1. In accordance with Delaware Code, Title 29, Chapter 69, Section 6912, all laborers and mechanics of the Contractor and all subcontractors employed to perform work directly upon the site of the work shall be paid unconditionally and not less often than once a week and without subsequent deduction or rebate on any account the full amounts accrued at the time of payment computed at wage rates not less than those determined by the Division of Industrial Affairs, Department of Labor, State of Delaware, as the prevailing rates in this area.
- 1.2. This approved scale of wages must be posted by the Contractor in a prominent and easily accessible place at the site of the work.
- 1.3. It is further stipulated that there may be withheld from the Contractor such accrued payment as may be considered necessary by the contracting officer to pay laborers and mechanics employed by the Contractor or any subcontractors on the work the difference between the rates of wages required and the rate of wages received by such laborers and mechanics and not refunded to the Contractor, subcontractor or their agents.
- 1.4. Where wage rates are published in this Manual they are issued by the State Department of Labor on the date indicated and are included for the convenience of Bidders. The Owner, the Architect, and the Construction Manager, accept no responsibility for the accuracy or applicability of any rates included herein. The actual wage rate determinations which will apply to the work will be those in effect on the first day of public advertisement for bids as determined by the State Department of Labor. It will be the responsibility of each bidder to contact the State Department of Labor and to incorporate these rates in his bid.
- 1.5. "In accordance with Delaware Code, Title 29, Section 6912, as amended July 5, 1994, contractors shall furnish sworn payroll information to the Department of Labor on a weekly basis for each contract which exceeds \$15,000 for renovation work and \$100,000 for new construction. The construction contract amount is based on a cumulative total of all contracts bid for a specific project. Payroll forms for submission may be obtained from the Department of Labor."
 - 1.5.1 A Payroll Report, available from the Department of Labor is to be used to provide this information.
- 1.6. A copy of the Prevailing Wages for the project is attached hereto.

END OF SECTION

STATE OF DELAWARE
DEPARTMENT OF LABOR
DIVISION OF INDUSTRIAL AFFAIRS
OFFICE OF LABOR LAW ENFORCEMENT
PHONE: (302) 451-3423

Mailing Address:
225 CORPORATE BOULEVARD
SUITE 104
NEWARK, DE 19702

Located at:
225 CORPORATE BOULEVARD
SUITE 104
NEWARK, DE 19702

PREVAILING WAGES FOR BUILDING CONSTRUCTION EFFECTIVE MARCH 15, 2013

CLASSIFICATION	NEW CASTLE	KENT	SUSSEX
ASBESTOS WORKERS	21.87	26.94	39.20
BOILERMAKERS	65.47	33.22	48.83
BRICKLAYERS	46.83	46.83	46.83
CARPENTERS	50.06	50.06	39.82
CEMENT FINISHERS	27.61	29.11	21.20
ELECTRICAL LINE WORKERS	43.49	37.29	28.44
ELECTRICIANS	60.60	60.60	60.60
ELEVATOR CONSTRUCTORS	75.33	40.93	30.55
GLAZIERS	64.10	64.10	54.20
INSULATORS	51.48	51.48	51.48
IRON WORKERS	59.12	59.12	59.12
LABORERS	38.30	38.30	38.30
MILLWRIGHTS	62.18	62.18	48.75
PAINTERS	42.02	42.02	42.02
PILEDRIVERS	67.87	37.64	30.45
PLASTERERS	28.55	28.55	17.50
PLUMBERS/PIPEFITTERS/STEAMFITTERS	59.00	49.26	46.28
POWER EQUIPMENT OPERATORS	57.06	57.06	24.13
ROOFERS-COMPOSITION	21.77	17.96	19.34
ROOFERS-SHINGLE/SLATE/TILE	17.59	17.50	16.45
SHEET METAL WORKERS	62.74	62.74	62.74
SOFT FLOOR LAYERS	45.97	45.97	45.97
SPRINKLER FITTERS	51.75	51.75	51.75
TERRAZZO/MARBLE/TILE FNRS	51.41	51.41	45.45
TERRAZZO/MARBLE/TILE STRS	59.03	59.03	52.63
TRUCK DRIVERS	26.58	23.89	20.03

CERTIFIED: _____

BY: _____
ADMINISTRATOR, OFFICE OF LABOR LAW ENFORCEMENT

NOTE: THESE RATES ARE PROMULGATED AND ENFORCED PURSUANT TO THE PREVAILING WAGE REGULATIONS ADOPTED BY THE DEPARTMENT OF LABOR ON APRIL 3, 1992.

CLASSIFICATIONS OF WORKERS ARE DETERMINED BY THE DEPARTMENT OF LABOR. FOR ASSISTANCE IN CLASSIFYING WORKERS, OR FOR A COPY OF THE REGULATIONS OR CLASSIFICATIONS, PHONE (302) 451-3423.

NON-REGISTERED APPRENTICES MUST BE PAID THE MECHANIC'S RATE.

THESE RATES ARE BEING PROVIDED IN ACCORDANCE WITH DELAWARE'S FREEDOM OF INFORMATION ACT.

THEY ARE NOT INTENDED TO APPLY TO ANY SPECIFIC PROJECT.

SECTION 01 11 00 - SUMMARY OF WORK

1. RELATED DOCUMENTS

1.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Sections, apply to work of this Section.

2. CONTRACTS

2.1 The work will be performed under separate prime contracts managed by the Construction Manager.

3. ALTERATIONS & COORDINATION

3.1 Contractor shall be responsible to coordinate their work with the work of others, including, but not limited to, the preparation of general coordination drawings, diagrams and schedules, and control of site utilization, from the beginning of activity, through project close-out and warranty periods.

4. KNOWLEDGE OF CONTRACT REQUIREMENTS

4.1 The Contractor and his Subcontractors, Sub-subcontractors and material men shall consult in detail the Contract Documents for instructions and requirements pertaining to the Work, and at his and their cost, shall provide all labor, materials, equipment and services necessary to furnish, install and complete the work in strict conformance with all provisions thereof.

4.2 The Contractor will be held to have examined the site of the Work prior to submitting his proposal and informed himself, his Subcontractors, Sub-subcontractors and material men of all existing conditions affecting the execution of the Work.

4.3 The Contractor will be held to have examined the Contract Documents and modifications thereto, as they may affect subdivisions of the Work and informed himself, his Subcontractors, Sub-subcontractors and material men of all conditions thereof affecting the execution of the Work.

4.4 The Scope of Work for the Contract is not necessarily limited to the description of each section of the Specifications and the illustrations shown on the Drawings. Include all minor items not expressly indicated in the Contract Documents, or as might be found necessary as a result of field conditions, in order to complete the Work as it is intended, without any gaps between the various subdivisions of work.

4.5 The Contractor will be held to be thoroughly familiar with all conditions affecting labor in the area of the Project including, but not limited to, Unions, incentive pay, procurements, living, parking and commuting conditions and to have informed his Subcontractors and

Sub-subcontractors thereof.

5. CONTRACT DOCUMENTS INFORMATION

- 5.1 The Contract Documents are prepared in accordance with available information as to existing conditions and locations. If, during construction, conditions are revealed at variance with the Contract Documents, notify the Construction Manager immediately, but no more than three (3) days from the day the variance is first known. Failure to give timely notice shall operate to waive any claim Contractor might otherwise have for an adjustment to Contract Time or Sum as a consequence of such variance.
- 5.2 The Specifications determine the kinds and methods of installation of the various materials, the Drawings establish the quantities, dimensions and details of materials, the schedules on the Drawings give the location, type and extent of the materials.
- 5.3 Dimensions given on the Drawings govern scale measurements and large scale drawings govern small scale drawings, except as to anything omitted unless such omission is expressly noted on the large scale drawings.
- 5.4 The techniques or methods of specifying to record requirements varies throughout text, and may include "prescriptive", "open generic/descriptive", "compliance with standards", "performance", "proprietary", or a combination of these. The methods used for specifying one unit of work has no bearing on requirements for another unit of work.
- 5.5 Whenever a material, article or piece of equipment is referred to in the singular number in the Contract Documents, it shall be the same as referring to it in the plural. As many such materials, articles or pieces of equipment shall be provided as are required to complete the Work.
- 5.6 Whenever a material, article or piece of equipment is specified by reference to a governmental, trade association of similar standard, it shall comply with the requirements of the latest publication thereof and amendments thereto in effect on the bid date.
- 5.7 In addition to the requirements of the Contract Documents, Contractor's work shall also comply with applicable standards of the construction industry and those industry standards are made a part of Contract Documents by reference, as if copied directly into Contract Documents, or as if published copies were bound herein.
- 5.8 Where compliance with two (2) or more industry standards, contract requirements, or sets of requirements is specified, and overlapping of those different standards or requirements establishes different or conflicting minimums or levels of quality, then the most stringent requirements, which are generally recognized to be also the most costly, is intended and will be enforced, unless specifically detailed language written into the Contract Documents clearly indicates that a less stringent requirement is to be fulfilled. Refer apparently equal but different requirements, and uncertainties as to which level of quality

is more stringent, to Architect for decision before proceeding.

- 5.9 Reference standards referenced directly in Contract Documents or by governing regulations have precedence over non-reference standards which are recognized in industry for applicability of work.
- 5.10 Contractor's bid is based on the complete set of Contract Documents including documents not specifically issued as part of the bid pack but referenced in same.

6. SCOPE OF WORK/GENERAL INFORMATION

- 6.1 A Scope of Work for each contract to be awarded on the project follows in this section. When a Contract has been awarded to a Contractor, the successful Contractor will be listed after the title of the Contract. When no Contract has yet been awarded, no Contractor's name will be listed. Previous Scopes of Work include addendum changes.
- 6.2 Contractor is responsible for performing the work listed in the Summary of Work for his contract. Contractor is also responsible for knowing the work that has been assigned to preceding contracts. No additional compensation or extension of time will be allowed a Contractor due to his ignorance of the work assigned to his Contract or to other contracts which may affect his work. The Contractor is responsible, however, for all items which are covered in the Specifications and Drawings relating to their Contract if not specifically mentioned in the Summary of Work.
- 6.3 The Construction Manager will provide onsite a source for temporary electric, temporary water and portable sanitation facilities only. It is each Contractor's responsibility to make the necessary connections, including all material for temporary electric and water. Please note that utility charges for office trailers will be the responsibility of the individual Contractors.
- 6.4 A dumpster will be provided on site for free use by Contractors to dispose of non-hazardous, common, work-related refuse. Clean-up is the responsibility of each Contractor. Clean up shall be performed on a daily basis. Contractors not complying will be advised in writing and back charged for all costs associated with the cleanup of their work.
- 6.5 Contractors are reminded that there are limited storage areas available on site. Offsite storage will be the responsibility of each individual Contractor.
- 6.6 Office trailer permits off site will be the responsibility of each individual Contractor. On site Contractor's field offices, one (1) per Contractor, if required, will be located as directed by the Construction Manager.
- 6.7 Contractor will be prepared to discuss and submit a detailed project schedule seven (7) days after receipt of Notice to Proceed and to begin its submittal process. The Project

Schedule is an integral part of this contract. Certain construction sequences and priorities must take place in order to meet the target dates. Concentrated work periods will occur and each Contractor is responsible to staff the project as required by the current Construction Schedule or as directed by the Construction Manager. Contractor will cooperate with the Construction Manager in planning and meeting the required sequences of work and Project Schedule as periodically updated by the Construction Manager.

- 6.8 All bids must include insurance limits in accordance with Article 11 of the Section 00 73 00 SUPPLEMENTARY CONDITIONS.
- 6.9 Hoisting, scaffolding and material handling is the responsibility of each Contractor, unless otherwise noted.
- 6.10 Contractor will be responsible for layout of its own work. The Construction Manager will provide benchmark and layout of the building line.
- 6.11 Contractor will be responsible to keep clean public roadways soiled by construction traffic on a daily basis. If cleaning is not done, the Construction Manager may perform the cleaning on an overtime basis and backcharge the Contractor responsible.
- 6.12 Contractor Scopes of Work and Schedule are interrelated. Familiarity with each is required.
- 6.13 The Construction Manager will provide testing services for soil, concrete, steel and fireproofing. Other testing as required by the Contract Documents will be in accordance with the technical specifications and/or the individual scope of work. Refer to Specification Section 00 45 00 - QUALITY CONTROL.
- 6.14 Safety is the responsibility of each individual Contractor. The project will be governed under the guidelines of OSHA.
- 6.15 Inter-Contractor shop drawing distribution will be performed by the Construction Manager. Contractor is individually responsible for either coordinating his work with these distributed drawings or notifying the Construction Manager, in writing, of any discrepancies.
- 6.16 Coordination with other trades will be required. The Contractor will be required to attend periodic coordination meetings with other trades where requirements, conflicts and coordination issues will be discussed and resolved. Attendance when requested will be mandatory. If inter-Contractor coordination is not satisfactorily performed, the conflicting Contractors shall mutually share the cost to relocate and/or reinstall their work.
- 6.17 Contractor shall submit a schedule of values to the Construction Manager prior to the

submission of their first invoice for approval on AIA G702/CMA, Application for Payment and G703, Continuation Sheet.

- 6.18 Contractor is expected to review and coordinate its Work with the complete set of Contract Documents, including all items noted as by his trade whether or not shown on that particular set of drawings. Documents are available at the site for review.
- 6.19 Contractor is responsible for obtaining all necessary permits required for his work, including street permits. Unless otherwise noted, building permit shall be secured by the Construction Manager. Any subcontractor who will be restricting access to street, right of way or adjacent property must notify the Construction Manager 48 hours in advance.
- 6.20 Contractor's License: Submit a copy of all business licenses required by local and state agencies.
- 6.21 Contractor shall absorb, without additional compensation, any and all costs of working beyond normal hours to maintain job progress in accordance with the current construction schedule.
- 6.22 No asbestos or PCB's in or on any material or equipment will be accepted or allowed on this project. All hazardous materials will be treated in accordance with all State and Federal regulations.
- 6.23 Daily cleanup of the work is the responsibility of each individual Contractor which includes broom cleaning of their debris as required. Contractor will be individually back charged by the Construction Manager for cleanup not satisfactorily performed by the Contractor.
- 6.24 In the event asbestos is uncovered, the Contractor shall notify the Construction Manager of the areas requiring removal of asbestos. The Construction Manager shall then coordinate the removal with the Owner.
- 6.25 This project is to be constructed adjacent to and in existing buildings. Contractor shall exercise all due precautions to minimize noise, air pollution and any other construction hazards which in any way would cause discomfort or danger to the occupants of the existing building in the area.
- 6.26 Existing mechanical, electrical, plumbing, sprinkler, medical gas, fire alarm, etc. systems will be shut off and locked out by the Owner as required by the Work. Tie-in's and modifications to those systems will be performed by the specific Contractor associated with the work as indicated in the Contract Documents. Re-energizing and re-start up of all systems should be performed by the Owner.
- 6.27 The Safety Cable System shall not be altered or removed without a written request

submitted to the Project Manager with a copy to the Field Manager. It shall be the responsibility of each and every Contractor that is removing or altering the Safety Cable System to maintain the fall protection safety provided by the safety cable and not leave the area unprotected. Each and every Contractor shall be responsible to re-install the Safety Cable System immediately after work is completed. Each and every Contractor shall be responsible to re-install the Safety Cable System in accordance to OSHA standards.

- 6.28 Normal work hours for this project are from 7:00 a.m. to 3:30 p.m. Any work to be performed outside of these hours must receive prior approval from the Construction Manager. Requests to work beyond normal work hours shall be submitted at least 48 hours prior.
- 6.29 Contractor is responsible for having a competent project superintendent/foreman on-site during all work performed under its contract.
- 6.30 In the event the Contractor has non-English speaking employees or subcontractors on the project, they shall have a superintendent or foreman on site, at all times, who speaks English and can communicate with Contractor's employees. Should the Contractor fail to meet this requirement, at any time, Construction Manager may direct all Work to stop until the proper supervision is on site. The Contractor will be responsible for maintaining the project work schedule and make up at its own expense, any delay to the Schedule resulting from the work stoppage.
- 6.31 Punch List Procedures: Contractor shall be given a copy of the punch list with his appropriate work identified. Contractor shall have nine (9) calendar work days to complete its punch list work. On the 10th day or as determined by the Construction Manager, the Construction Manager shall employ other contractors, as required, to complete any incomplete punch list work and retain from the appropriate Contractors retainage all costs incurred.
- 6.32 Contractor shall provide the necessary safety barricades and railings required to complete their work and comply with all OSHA, local code and contract specifications.
- 6.33 Contractor's pricing for Base Bid shall include all work associated with the high school, greenhouse, well pump house, mechanical courtyard and Camp Raider. Alternate pricing is required for the Stadium Support Building and other areas as identified in the alternate section.

**This Contract was previously bid and awarded under Bid Pac A.
Scope is issued for coordination and reference purposes only.
Contract has been awarded to Dixie Construction.**

CONTRACT NO. A-01 - SITEWORK

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 033000	Cast-In-Place Concrete
Section 055000	Metal Fabrications
Section 220500	Common Work Results for Plumbing
Section 220505	Plumbing Piping, Fitting and Valves
Section 221329	Duplex Grinder Pump Stations
Section 221330	Vortex Sanitary Sewerage Pumps
Section 221332	Pump Station Equipment and Fiberglass Wet Well
Section 221335	Integrated Pump Control System
Section 224005	Plumbing Equipment
Section 311000	Site Clearing
Section 312000	Earth Moving
Section 321216	Hot-Mix Asphalt Paving
Section 321313	Portland Cement Concrete Paving
Section 321823	Tennis Court Surface
Section 321824	Sports Equipment
Section 322210	Erosion and Sediment Control
Section 322510	Water Distribution
Section 323113	Chain Link Fences and Gates
Section 329200	Turf and Grasses
Section 330100	Sanitary Sewer Pressure Pipe
Section 330200	Sanitary Sewer Manholes and Miscellaneous Structures
Section 334100	Storm Drainage & Sanitary Sewerage

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide sitework, storm, sanitary and water utilities, paving, curbs, walks, topsoil/seeding required for stabilization.
2. Furnish, install, maintain and remove sediment control system including sediment control plan. Maintain sediment control until substantial completion established by DNREC.

3. Provide DNREC-required storm water maintenance for the existing bio-swale and pond areas.
4. Provide clearing, grubbing and removal of trees, roots and stumps as necessary to accomplish the work of this contract.
5. Provide topsoil stripping and stockpiling as necessary to accomplish the work of this contract.
6. Remove the existing stockpile from the building footprint and stockpile in designated area. It is the intent to use on site material and not imported fill. The use of this onsite material shall conform with the compaction requirements as specified in the Contract Documents. If the onsite material does not meet those requirements or if there is insufficient on site material available, this contractor shall import at no additional expense to the project sufficient material to complete the work.
7. This Contractor is responsible for the layout of bulk excavation. This Contractor to extend the bulk excavation outside building plan in order to facilitate foundation construction and maintain safety requirements.
8. Stockpiled materials can be considered suitable for reuse as structural fill materials 15' outside the building perimeter. Excavated site materials conforming to the requirements are suitable for reuse as structural utility backfill and in structural areas of mass earthwork construction. Stockpile materials required to be used as backfill will be tested and approved. All required fill materials under footings and backfill will be offsite structural borrow. Remove stockpile at Drill Area in front of Camp Raider. Assume 700 cubic yards.
9. Provide additional topsoil at building perimeter. Assume a 2' wide area, 12" deep around the entire exterior building footprint.
10. Provide alternate price to leave excess materials on site at designated stockpile location. Reference Alternate No. 3.
11. Provide rough grading and fine grading for area defined on site drawings for building, lawn areas, bituminous roads, parking and walkways. Preparation of subgrade for building slabs, walks and pavements.
12. Furnish, install and maintain select imported fill under slab.
13. The Sitework Contractor will bring the area beneath the building to an elevation that is 8 inches below finished concrete elevation. The area will then be turned over to the Concrete Contractor who will be excavating and installing the foundations. It will be the responsibility of the Sitework Contractor to maintain all open excavations and dewater as required until the excavation work is turned over to the Concrete Contractor. Once the Concrete Contractor has accepted this work it will be the responsibility of the Concrete Contractor to maintain

and dewater all excavations until the concrete work is complete. The Concrete Contractor and the Sitework Contractor are to coordinate this procedure so that there are no additional costs to the Owner for additional excavation or concrete. Backfilling around the foundation walls, inside and outside, will be the responsibility of the Concrete Contractor.

14. Provide a certified construction reviewer (CCR) to perform inspections and provide written reports; signed and sealed by a professional engineer.
15. Provide all permits related to work for this project outside of the building permit.
16. Provide entrance work and road improvements at Woodbridge Road (rebuilding of road and overlay of road). Provide DelDOT permits related to work for this project. Relocation of existing utility poles will be by Delaware Co-operative.
17. Furnish, install and remove temporary orange construction fencing as required by Construction Manager (including 1,000 linear feet in base bid).
18. Remove/relocate utilities including, but not limited to the removal of light standards.
19. Provide proof rolling of limit of excavation.
20. Provide onsite water supply system piping. Well, pumps, control equipment in pump house, water storage tank, etc. will be provided under Bid Pac B. Extend water services to New High School, Camp Raider, existing Ag Building and Stadium Support Facility. Provide cap and valve with blow off for future Greenhouse. Provide meter vault. Provide protection of existing wells and cleanouts.
21. Provide force main work complete. Provide wet tap at Adams Road, extension of the force main into site and to New High School, Camp Raider, existing Ag Building and Stadium Support Facility, three (3) pumping stations.
22. Provide fire hydrant.
23. Provide sanitary sewer manholes, piping, cleanouts and appurtenances. The sewer piping shall extend to within +/- 5 feet of the building lines. The connection from this point will be brought into the buildings by the Underslab Plumbing Contractor.
24. Provide storm drainage catch basins, manholes, piping, rainwater collection piping and appurtenances. The Sitework Contractor is responsible for the rainwater collection piping from the system to the downspout boots, including providing the downspout boots. Boot locations to be coordinated with the Roofing Contractor.
25. All utilities shall be brought to within +/- 5 feet of the building lines (New High School, Stadium Support Facility, Camp Raider and Ag Building) by this Contractor. The connection and all utilities from +/- 5 feet and into the building shall be by others.

26. Filling and backfilling as detailed below is the responsibility of this Contractor. Soil types shall be in accordance with Del Dot standard specifications.
27. Provide access for the Elevator Contractor to the cylinder hole and dispose of spoils from the cylinder excavation.
28. Provide perimeter protection of all excavated areas until suitably backfilled.
29. Provide pipe and backfill for foundation drainage.
30. Provide and maintain stabilized site entrances.
31. Provide street cleaning of mud, etc. on a daily basis.
32. Include all costs for temporary barricades, arrows, pedestrian protection, flagmen, etc. required to complete the work.
33. Base bid shall include all standard dewatering measures; utilizing trenches, crocks, stone and portable pumping measures. This Contractor to provide these measures as required to perform their work. Well pointing if necessary will be handled as a negotiated cost by the Owner.
34. This Contractor shall provide and maintain all temporary access roads around the perimeter of the building footprint. The road is to be constructed of stabilized stone material, crushed concrete or asphalt millings. Road will be 24' wide and 12" thick. Maintain for a duration of 24 months.
35. Temporary water will be available on site.
36. Temporary electric will be the responsibility of this Contractor for his own work.
37. Provide alternate #1 pricing to add Tennis Courts, sidewalks, nets, line striping and fencing.
38. Provide alternate #2 pricing to add Stadium Support Building.
39. Provide sawcutting and demolition required for paving, walks and curb rework and tie ins. Provide demolition of existing fencing and gates as required. Salvage gates and fence mesh as indicated on the plans. Provide new fencing and gates.
40. Remove and relocate existing bleachers for new field construction.
41. Remove existing fields, cap existing irrigation well, demolish and remove well enclosure, structure and associated wiring, conduit and site improvements. Include required DNREC permits.

42. Relocate existing goal posts and field related items for new fields. Relocate existing shot put areas.
43. Provide grading and storm piping at Future Play Areas.
44. Provide grease trap.
45. Provide concrete encasements for utility crossing, piping and water utility crossing separation and bends with thrust blocks for water lines.
46. Provide exterior concrete curbs, ADA depressed curbs and transition curbs, aprons, walks, ramps, stairs and steps. Provide cast metal nosings with abrasive treads at exterior stairs. Provide exterior door stoops. The Concrete Contractor shall provide concrete ramps and stairs that occur within the building footprint (auditorium, for example). The Sitework Contractor shall provide the concrete ramps at Camp Raider.
47. Provide asphalt walking paths to and between athletic fields as shown. Provide pavers and include a \$10,000 allowance for the radial decorative "W" logo at the new student drop off.
48. Provide paving, precast parking bumpers, all signage and striping. Provide Camp Raider drill area. Provide all payment markings, fire lane signs and traffic signs.
49. This Contractor shall include in the Base Bid the cost of remobilization, cleaning and tack coating the asphalt base course in order to install the asphalt top coat.
50. Provide retaining wall construction, including foundation and wall construction. Provide loading dock area concrete pad and dumpster pad. Provide trench drain at loading dock. Loading dock foundation wall construction will be provided by the Concrete Contractor.
51. This Contractor will prepare firm, properly graded and well drained areas for the Structural Steel Contractor to stage the steel and set up their crane for erection.
52. Landscaping will be bid under Bid Pac B. The work of the Sitework Contract included in Bid Pac A is limited to topsoil and seeding only.
53. Contractor to include a \$20,000 allowance in their Base Bid for miscellaneous sitework as determined by the Construction Manager.
54. Provide bollards indicated on the Civil Drawings.

**This Contract was previously bid and awarded under Bid Pac A.
Scope is issued for coordination and reference purposes only.
Contract has been awarded to Harkins Concrete Construction.**

CONTRACT NO. A-02 - CONCRETE

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 033000	Cast-In-Place Concrete
Section 071110	Under Slab Vapor Retarder
Section 071416	Cold Fluid-Applied Waterproofing
Section 072100	Thermal Insulation

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide concrete foundations, footings, stepped footings, piers, wall footings, grade beams, elevator pit walls and slab, foundation walls, excavation and backfill for foundation work, concrete slabs on grade, slabs on deck, stepped slabs for seating, thickened slabs, depressions and recessed slabs and reinforcing for the above. The Concrete Contractor shall provide concrete ramps and stairs that occur within the building footprint (auditorium, for example). Exterior ramps and stairs will be provided by the Sitework Contractor.
2. This Contractor will be responsible for laying out all concrete work as shown on the structural and architectural drawings.
3. This Contractor should carefully review the soil boring as they relate to subsurface conditions.
4. This Contractor to furnish and install reinforcing steel, admixtures, curing compounds and sealers required by the Contract Documents.
5. Provide supplemental reinforcing at openings as required on the Contract Documents.
6. Provide perimeter insulation at all foundation walls (concrete and masonry) and under slab.
7. Provide underslab vapor barrier, reglets, waterstops, control and construction joints (including caulking at control and construction joints).
8. Provide placement of related items furnished under other specification sections.

9. Anchor bolts and leveling plates to be installed by this Contractor and furnished by the Structural Steel contractor. Installation within required tolerances. Provide certified anchor bolt verification drawings to the Construction Manager for review prior to steel erection.
10. Provide all blockouts and embedments required by plans and specifications.
11. This Contractor to install all sleeves for incoming utilities at the perimeter and foundation walls. Sleeves shall be furnished by the Contractor providing the utility.
12. This Contractor is responsible for grouting all structural steel base, leveling plates and elevator sill angles.
13. Provide plywood covers on all diamonds slab on grade. Covers to be installed immediately following the placement of concrete slab on grade, and maintained by this Contractor until steel erection, at which time the Steel Contractor shall remove and dispose of the covers prior to steel erection.
14. Include all weather, frost protections and water pumping as required. This Contractor is also responsible for the premiums required for hot water, heated aggregate, blankets and admixtures for cold weather concrete. The Concrete Contractor will include an allowance of \$80,000 in the Base Bid for temporary weather protection described above. All unused portions of the allowance will be returned at the end of the Project.
15. Asphalt concrete paving and Portland cement concrete paving, sidewalks, curbs and door stoops shall be provided by others. The Concrete Contractor shall provide the loading dock foundation and wall construction complete. Pad and trench drain to be provided by the Sitework Contractor.
16. All concrete testing will be completed by the Construction Manager, however, it will be the responsibility of this Contractor to furnish all samples.
17. This Contractor will be responsible for laying out all concrete work as shown on the structural and architectural drawings. This Contractor to excavate to the bottom of all wall and column footings and to maintain all open excavations and dewater as specified until the excavation work is complete. This Contractor to coordinate masonry and foundation waterproofing work.
18. This Contractor shall furnish, install and maintain stone underslab. The Sitework Contractor will bring the area beneath the building to an elevation that is 8 inches below the top of concrete slab elevations. The area will then be turned over to the Concrete Contractor who will be excavating and installing the foundations. Backfilling around the foundation walls, inside and outside, will be the responsibility of the Concrete Contractor. This Contractor will also be responsible for additional excavation and backfilling within the building as may be required to accommodate raised and sloped floors and grade changes. Close coordination

with the Sitework, Masonry, Plumbing and Electrical Contractors is required.

19. The Concrete Contractor will be responsible to maintain all open excavations which they created and dewater as specified until the excavations are accepted by the Masonry Contractor. The Masonry Contractor will be responsible to maintain and dewater all excavations until the masonry work is complete. Once the masonry work is complete the areas will be turned over to the Concrete Contractor who will be responsible to maintain and dewater all excavations until the areas are properly backfilled and final acceptance. The Concrete Contractor and the Masonry Contractor are to coordinate this procedure so that there are no additional costs to the Owner for additional excavation or concrete.
20. Provide all standard dewatering measures required to perform work of this Contract.
21. This Contractor shall include a \$10,000 allowance for miscellaneous concrete work as determined by the Construction Manager.
22. Coordinate the "notch" in the concrete slabs to allow for a future Contractor to easily install expansion joint details.
23. Provide concrete fill at steel pan stair treads, landings and associated items.
24. Provide and maintain perimeter fall protection at excavated areas per OSHA standards.
25. Equipment bases and foundations shall be the responsibility of the Contractor providing the equipment.
26. Provide offsite disposal of all unsuitable excavated materials.
27. Provide sloping for floor drains/trenches in kitchen, showers, etc. as detailed (drains to be furnished by the Underslab Plumbing Contractor).
28. This Contractor shall include the finishing of concrete slabs around all floor penetrations throughout the first and second floor slab areas. These penetrations will consist of electrical boxes, stubbed conduits, mechanical piping and electrical and technology conduit studs, etc. Assume a minimum of 200 penetrations.
29. Provide foundation waterproofing at both concrete and masonry foundation walls.
30. This Contractor shall include a minimum of two additional out-of-sequence mobilizations for concrete slab installations.
31. Provide alternate pricing for the Stadium Support Facility.

**This Contract was previously bid and awarded under Bid Pac A.
Scope is issued for coordination and reference purposes only.
Contract has been awarded to Wilson Masonry.**

CONTRACT NO. A-03 – BELOW GRADE MASONRY

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 042200	Concrete Unit Masonry

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide below grade masonry foundation work, reinforcing, accessories and related work.
2. Provide CMU masonry units, grout fill, reinforcing at masonry walls, accessories, bond beams, masonry lintels and related work for masonry foundation systems. This Contractor shall provide CMU up to finish floor elevation.
3. Contractor will be responsible for laying out all masonry work as shown on the structural and architectural drawings. This Contractor is required for all elevations and dimensions as they affect other Contractor's work. Coordinate with Concrete Contractor who will provide excavation and backfill for foundation construction.
4. Provide caulking of masonry to masonry and to dissimilar materials.
5. Provide integral masonry flashings, expansion joints and other related items.
6. Provide mock up as required.
7. Provide weather protection and temporary heat as required to perform the work and maintain the project schedule. The Masonry Contractor shall include an allowance of \$20,000 in the Base Bid for temporary weather protection as described above. All unused portions of the allowance will be returned at the end of the project.
8. Provide scaffolding required to complete the work.
9. Provide dewatering of work areas after acceptance from the Concrete Contractor until reacceptance by the Concrete Contractor.

10. Install anchors, plates and other fasteners embedded in masonry work.
11. Install lintels provided by others in masonry work. Cast masonry lintels shall be provided by this Contractor.
12. This Contractor to install all sleeves for incoming utilities at the masonry perimeter and masonry foundation walls. Sleeves shall be furnished by the Mechanical and/or Electrical contractors.
13. This Contractor shall include a \$15,000 allowance for miscellaneous masonry work as determined by the Construction Manager.
14. The Masonry Contractor will be responsible for the disposal of masonry debris offsite.
15. Provide alternate pricing for the Stadium Support Facility.

**This Contract was previously bid and awarded under Bid Pac A.
Scope is issued for coordination and reference purposes only.
Contract has been awarded to Murphy Steel.**

CONTRACT NO. A-04 - STRUCTURAL STEEL & MISCELLANEOUS METALS

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 051200	Structural Steel Framing
Section 052100	Steel Joist Framing
Section 053100	Steel Decking
Section 055000	Metal Fabrications
Section 055100	Metal Stairs
Section 055213	Pipe and Tube Railings
Section 099113	Exterior Painting

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide structural steel, trusses, joists, mezzanines, platforms, and metal floor and roof decking, and acoustical decking and miscellaneous metals.
2. Furnish anchor bolts and leveling plates to the Concrete Contractor and Masonry Contractor for placement in concrete and masonry piers and walls.
3. This Contractor shall include a \$10,000 allowance for the maintenance portion of the perimeter cables. All other items remain the responsibility of the Steel Contractor. The allowance will be allocated by the Construction Manager on a time and material basis. All remaining allowance shall be returned to the Owner at completion.
4. This Contractor shall provide all floor and roof decking. This includes decking that occurs at cold-formed truss framing, as well as at structural steel framing. The Steel Contractor will also install the bent plate at the cold formed trusses.
5. Provide rolled and curved structural members.
6. Field check all anchor bolts prior to beginning erection.
7. Provide roof sump pans and related work.

8. Provide framing out for openings (roof drains, mechanical openings, access hatches, skylight, stairs, etc.). Assume opening frames will be field installed.
9. Provide prime paint systems, galvanizing, and related finishing of steel items, including touch up. Do not apply primer to steel that receives sprayed-on fireproofing.
10. Provide masonry or precast anchors welded to steel columns and beams.
11. Supply and install shear studs.
12. Furnish, install, maintain and remove perimeter safety steel cables at all floor levels to conform with all OSHA standards for all trades.
13. The Steel Contractor to provide all connections to masonry whether they are field welds or shop welds. Conditions that require in field welding and assembly are the responsibility of this Contractor. Field coordination with the masonry installer will be this Contractor's responsibility.
14. Provide layout, installation and alignment of pour stops and attachments at the slab edge condition. The pour stop will be installed in the field. Close coordination with the Metal Stud Framing Contractor is required.
15. Provide continuous concrete pour stop for slabs-on-deck, even if not specifically called out on the structural drawings.
16. Remove and dispose of the plywood covers installed by the Concrete Contractor at all diamonds on the slab on grade, prior to the erection of steel.
17. All steel testing will be the responsibility of the Construction Manager; however, this Contractor will cooperate with the testing agency in the inspection at the fabrication shop and in the field.
18. No electrical power for welders will be provided.
19. Provide data and submittal information related to the Scope of this Contract signed and sealed by a Professional Engineer as required by the Contract Documents.
20. This Contractor shall fabricate, weld and install all reinforcing anchors that connect the structural steel to the masonry systems. Provide all shop fabrication, a field installation and field welding regardless of the weld symbols.
21. This Contractor shall include all necessary staging, rigging, matting and remobilizations to accommodate the erection sequence. Provide temporary and permanent rigging, bracing and bridging, outriggers. Notch webs at weld splicing at purlins.

22. This Contractor shall include a \$100,000 allowance for additional miscellaneous metal work as determined by the Construction Manager.
23. This Contractor shall not assume crane access to the building within the building footprint, and shall include the cost of an appropriately sized crane to reach all areas from outside the building footprint. Erection from inside the building or from the slab-on-grade is not allowed.
24. Provide steel stairs, including treads, risers, landings, framing, stringers, guardrail, handrails, pickets, closure pieces, attachments, fasteners and brackets. The Steel Contractor will also provide all exterior handrails including those at Camp Raider and alternate pricing for the rails at the Stadium Support Facility. Wood handrail caps will be provided by the Carpentry and General Works Contractor.
25. Provide steel lintels.
26. Provide alternate pricing for the Stadium Support Facility.
27. Provide miscellaneous rough hardware, iron shapes, framing and support angles. Countertop support angles will be provided under Bid Pac B.
28. Provide structural framing members for skylight.
29. Provide frame and grate for the elevator sump pit.
30. Provide elevator hoist beam, pit ladder and sill angles.
31. Provide galvanizing, as required.
32. Provide anchoring devices, fasteners, inserts and other related items associated with the installation of the above items.
33. Provide field touch up paint.
34. Verify field dimensions.
35. Provide steel handrails, aluminum railings, ships ladders, alternating tread stairs, etc.
36. Provide shop drawings using Building Information Model (BIM) for coordination.
37. Coordinate steel at Auditorium with Theatrical Lights and Rigging.
38. Coordinate steel at Gym with hanging curtain requirements.

**This Contract was previously bid and awarded under Bid Pac A.
Scope is issued for coordination and reference purposes only.
Contract has been awarded to RG Degli Obizzi & Sons.**

CONTRACT NO. A-05 - UNDERSLAB PLUMBING

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 033000	Cast-In-Place Concrete
Section 210500	Common Work Results for Fire Protection
Section 210505	Fire Protection Piping, Fitting and Valves
Section 220500	Common Work Results for Plumbing
Section 220505	Plumbing Piping, Fitting and Valves
Section 224005	Plumbing Equipment
Section 230500	Common Work Results for HVAC
Section 230505	HVAC Piping, Fitting and Valves
Section 312000	Earth Moving

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide a complete underground plumbing and piping systems as indicated on the Drawings and in the Specifications.
2. Excavation and backfill for underground plumbing work as detailed below is the responsibility of this Contractor. Soil types shall be in accordance with the Contract Documents.
3. Provide permits/meters.
4. Provide pipe, underslab drains and cleanouts, trench drains within the building footprint.
5. Furnish sleeves for penetrations through wall, floors, etc. to Concrete or Masonry Contractor for installation.
6. Provide hoisting, rigging and scaffolding required to perform the work of this Contract.
7. Provide trap priming system.
8. All utilities will be brought to within +/- 5 feet of the building line by others. The Underslab Plumbing Contractor is responsible for connecting the utilities from +/- 5 feet outside the

building line and completing the system within the building. The Underslab Plumbing Contractor will bring the fire service line from 5' outside building line and into the Sprinkler Room.

9. Provide alternate pricing for the Stadium Support Facility.
10. This Contractor shall include a \$10,000 allowance in their base bid. Unused portions of the allowance will be returned to the Owner.
11. The extent of the work of this Contract is to provide underslab piping, drains, cleanouts and trap priming systems within the building footprint to 5 feet outside the building line only.

**This Contract was previously bid and awarded under Bid Pac A.
Scope is issued for coordination and reference purposes only.
Contract has been awarded to Mid-Atlantic Electrical Construction.**

CONTRACT NO. A-06 - UNDERSLAB ELECTRICAL

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 033000	Cast-In-Place Concrete
Section 260500	Common Work Results for Electrical
Section 260512	Kitchen Equipment Wiring
Section 260526	Grounding and Bonding
Section 260533	Raceway and Boxes
Section 260543	Underground Ductbanks
Section 260553	Electrical Identification
Section 261120	Utility Incoming Service Provisions
Section 312000	Earth Moving

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide a complete underground electrical system as indicated on the Drawings and in the Specifications.
2. Excavation and backfill for underground electrical work as detailed below is the responsibility of this Contractor. Soil types shall be in accordance with the Contract Documents.
3. Provide permits/meters.
4. Provide conduits, underslab floor boxes with 4" minimum stub ups within the building footprint.
5. Furnish sleeves for penetrations through wall, floors, etc. to Concrete or Masonry Contractor for installation.
6. Provide hoisting, rigging and scaffolding required to perform the work of this Contract.
7. All utilities will be brought to within +/- 5 feet of the building line by others. The Underslab Electrical Contractor is responsible for connecting the utilities from +/- 5 feet outside the building line and completing the system within the building. Power, voice and data services

will be provided to the building by the Utility Company. The Underslab Electrical Contractor will provide sleeves for these incoming services and coordinate locations.

8. Provide pull strings in all conduits.
9. Provide caps on open conduit ends.
10. Provide protective covers for all floor boxes.
11. Provide alternate pricing for the Stadium Support Facility.
12. This Contractor shall include a \$10,000 allowance in their base bid. Unused portions of the allowance will be returned to the Owner.
13. The extent of the work of this Contract is to provide underslab electrical conduits and floor boxes within the building footprint to 5 feet outside the building line only.

**This Contract was previously bid and awarded under Bid Pac A.
Scope is issued for coordination and reference purposes only.
Contract has been awarded to Delaware Elevator.**

CONTRACT NO. A-07 - HYDRAULIC ELEVATOR

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 142400	Hydraulic Elevators

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide passenger elevator complete.
2. Grouting of all elevator sill angles will be the responsibility of the Concrete Contractor.
3. This Contractor to furnish and install all rough wiring necessary for the installation of emergency telephones. All communication devices will be furnished and installed by the Owner.
4. Electric service and disconnect switch for the elevator are the responsibility of the Electrical Contractor. All other control wiring as specified, will be the responsibility of the Elevator Contractor.
5. This Contractor to submit for approval layout and excavation information for the elevator jack holes. The Construction Manager will supply all necessary bench marks.
6. This Contractor will be responsible for dewatering in order to complete installation of the jack holes.
7. This Contractor will be responsible for drilling the jack holes through unclassified material. Excavated material shall be disposed of by the Sitework Contractor.
8. Provide jack hole sleeve where indicated on the drawing.

**This Contract was previously bid and awarded under Bid Pac B.
Scope is issued for coordination and reference purposes only.
Contract has been awarded to Boro Construction.**

CONTRACT NO. B-08: ABOVE GRADE MASONRY

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 042000	Unit Masonry
Section 042200	Concrete Unit Masonry
Section 047200	Precast Concrete Masonry
Section 071113	Bituminous Dampproofing
Section 072100	Thermal Insulation
Section 072500	Weather Barriers
Section 076200	Sheet Metal Flashing and Trim
Section 078413	Penetration Firestopping
Section 078446	Fire-Resistive Joint Systems
Section 079200	Joint Sealants
Section 079500	Expansion Control

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide all above grade masonry work, face brick, special shapes, cast stone, flashings, reinforcing, accessories, insulation, dampproofing and related work.
2. Provide CMU masonry units, grout fill, reinforcing at masonry walls, accessories, bond beams, masonry lintels and related work for above grade masonry systems.
3. Contractor will be responsible for laying out all masonry work as shown on the structural and architectural drawings. This Contractor is required for all elevations and dimensions as they affect other Contractor's work.
4. Provide cleaning off top block of Bid Pac A foundation masonry to receive above grade masonry work.
5. Provide caulking of masonry to masonry and masonry to dissimilar materials.
6. Provide integral masonry flashings, expansion joints, expansion control at masonry construction and other related items. Provide flexible flashing/self-adhered membrane

flashing.

7. Provide rigid insulation. Provide fiberglass thermal insulation at flutes in deck at gym.
8. Provide grouting of door frames at masonry openings.
9. Provide mock ups as required.
10. Provide weather protection and temporary heat as required to perform the work and maintain the project schedule. The Masonry Contractor shall include an allowance of \$80,000 in the Base Bid for cold weather masonry work. All unused portions of the allowance will be returned at the end of the project.
11. Provide scaffolding required to complete the work.
12. Install anchors, anchor bolts, plates and other fasteners embedded in masonry work. Also provide all bracing, clips and angles at all masonry construction. See note 14 of the masonry reinforcing notes, as an example. Provide weeps, cavity drainage and vents.
13. Install lintels provided by others in masonry work. Cast masonry lintels shall be provided by this Contractor.
14. Provide temporary protection for final wash down/cleaning of masonry.
15. Flashing Summary:
 - a. Thru wall and cavity flashing below the roof line shall be by the Masonry Contractor.
 - b. Thru wall and cavity flashing above the roof line shall be by the Roofing Contractor.
16. Provide cutting, fitting and building into masonry work, embedments provided by others.
17. Provide all masonry construction, fire rated masonry, smoke partitions, firesafing and fire caulking at masonry construction as required.
18. Furnish masonry veneer anchors to Metal Stud and Drywall Contractor for installation.
19. Provide bond beams including reinforcing and fill.
20. This Contractor to install all sleeves for incoming utilities at the above grade masonry walls. Sleeves shall be furnished by the Mechanical and/or Electrical contractors.
21. This Contractor shall include a \$25,000 allowance in their Base Bid for miscellaneous masonry work as determined by the Construction Manager. Unused allowance will be returned to the Owner.
22. The Masonry Contractor will be responsible for the disposal of masonry debris offsite.

23. Provide pricing for Alternate #2 for the Stadium Support Facility.
24. Provide pricing for Alternate #12 for spray foam insulation.
25. Provide pricing for Alternate #13 for Regal (Emperor) brick.
26. Provide pricing for Alternate #14 for Ground Face Sills and Heads.
27. Provide dampproofing at above grade masonry installations.
28. Provide all cast stone/limestone work (pier caps, window sills, window headers, additional trim shapes, etc.).
29. At elevator entrance, tooth outside walls and add additional temporary lintel above elevator door frame.)
30. Provide masonry and cast stone associated with the exterior sign pedestal. Work will include above and below grade masonry work for the sign pedestal.
31. Provide daily clean up.
32. Provide pricing for all applicable alternates as described in Section 012300 – Alternates.
33. All warranties begin at overall project substantial completion.
34. This Contractor shall note that the foundations associated with Camp Raider have been provided under Bid Pac A.

**This Contract was previously bid and awarded under Bid Pac B.
Scope is issued for coordination and reference purposes only.
Contract has been awarded to ALN Construction.**

CONTRACT NO. B-09 – METAL STUDS AND DRYWALL

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 054000	Cold-Formed Metal Framing
Section 054400	Cold-Formed Metal Trusses
Section 061600	Sheathing
Section 064030	Architectural Fiberglass Column Covers
Section 072100	Thermal Insulation
Section 072500	Weather Barriers
Section 078100	Applied Fireproofing
Section 078413	Penetration Firestopping
Section 078446	Fire-Resistive Joint Systems
Section 079500	Expansion Control
Section 092116	Gypsum Board Shaft Wall Assemblies
Section 092216	Non-Structural Metal Framing
Section 092900	Gypsum Board

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide cold formed metal trusses, joists, metal studs, drywall, tile backing panels, insulation, exterior wall sheathing, gypsum wallboard, taping and spackling for exterior and interior of building.
2. Provide all metal stud framing and furring required to back up metal panels, brick, etc.
3. Provide metal stud construction related to roof over-build construction and all canopy construction (for example, at the loading dock, main entrance and any other exterior canopies).
4. Provide metal stud construction related to framing out for openings in interior and exterior walls.
5. Provide metal stud framing for the chimney construction. Coordinate work with roofing, masonry and other related trades.

6. Provide secondary support framing.
7. Provide clips, anchors, bridging, supports and other accessories that interface between structural steel framing and metal stud construction.
8. Provide wall sheathing, asphalt felts, air/vapor barriers and Tyvek on structural steel studs and on metal furring.
9. Provide expansion systems that occur in drywall construction (walls, soffits, ceilings, etc.).
10. Install masonry veneer anchors. Anchors shall be furnished by the Above Grade Masonry Contractor.
11. Provide batt insulation, both thermal and acoustical and related work.
12. Provide acoustical sealant of penetrations in insulated drywall partitions as required by the Contract Documents.
13. Provide sprayed-on fireproofing (exposed and concealed) of beams, columns and decking as required by the Contract Documents. Prepare all surfaces to receive fireproofing including priming substrate if needed. Removal of spray fireproofing to expose points of attachment to structural steel is to be performed in a workmanlike manner. Clean up all over spray materials on a daily basis. Protect fireproofing according to advice of fireproofing manufacturer and installer from damage resulting from construction operations or other causes so that fireproofing will be without damage or deterioration at time of Substantial Completion. Coordinate installation of fireproofing with other work in order to minimize the need for other trades to cut or remove fireproofing. As other trades successively complete installation of their work, maintain protection of structure afforded by fireproofing by patching any areas which have been removed or damaged prior to concealment of fireproofing by other work. Repair or replace work which has not been successfully protected.
14. Provide scaffolding for this work.
15. Provide signed and sealed structural analysis design data and engineered drawings, required by the Contract Documents for specific items included in this scope of work.
16. Comebacks and out-of-sequence work may be required and as such should be included.
17. No power for welding equipment will be provided.
18. Provide control joints, molded shapes and other accessories.
19. Provide all glass fiber reinforced gypsum work and fiberglass column covers including

- materials, taping and accessories (interior and exterior). Provide caulking associated with all fiberglass work and fiberglass to dissimilar materials.
20. Provide installation of access panels as indicated and installation of access panels supplied by other trades. Assume 200 panels.
 21. Provide fire resistant joint systems at interior and exterior metal stud construction (floors and walls).
 22. Provide fire taping and sealing at perimeter edge as shown on the drawings.
 23. Include two (2) passes per floor to “touch-up” mechanical penetrations to insure ratings required. The first pass will be required prior to ceiling grid installation and the second pass will be required prior to final inspection for Certificate of Occupancy.
 24. Bidders are advised to pay particular attention to top of wall conditions, fire and smoke safing of slabs and acoustical sealants.
 25. This Contractor shall include a \$20,000 allowance in their base bid for Miscellaneous Metal Stud and Drywall work at the direction of the Construction Manager. Unused allowance will be returned to the Owner.
 26. Provide daily clean up.
 27. Provide pricing for all applicable alternates as described in Section 012300 – Alternates.
 28. All warranties begin at overall project substantial completion.

**This Contract was previously bid and awarded under Bid Pac B.
Scope is issued for coordination and reference purposes only.
Contract has been awarded to Northeast Contractors.**

CONTRACT NO. B10: CARPENTRY AND GENERAL WORK

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 055000	Metal Fabrications
Section 061053	Miscellaneous Rough Carpentry
Section 061600	Sheathing
Section 062013	Exterior Finish Carpentry
Section 064023	Interior Architectural Woodwork
Section 079500	Expansion Control
Section 081113	Hollow Metal Doors and Frames
Section 081416	Flush Wood Doors
Section 083323	Overhead Coiling Doors
Section 083326	Overhead Coiling Grilles
Section 086200	Unit Skylights
Section 087100	Door Hardware
Section 096450	Stage Flooring
Section 096723	Resinous Flooring
Section 098413	Fixed Sound Absorptive Panels
Section 098416	Sound Diffusers and Reflectors
Section 098436	Sound Absorbing Ceiling Units
Section 101100	Visual Display Surfaces
Section 101200	Display Cases
Section 102113	Toilet Compartments
Section 102800	Toilet and Bath Accessories
Section 104413	Fire Extinguisher Cabinets
Section 104416	Fire Extinguishers
Section 105113	Metal Lockers
Section 107500	Flagpoles
Section 111300	Loading Dock Equipment
Section 115213	Projection Screens
Section 116123	Motorized Hoists and Controls
Section 116133	Fixed Rigging Systems and Controls
Section 116143	Stage Curtains
Section 116623	Gymnasium Equipment
Section 116643	Interior Electronic Scoreboards

Section 116653	Gymnasium Divider Curtains
Section 116843	Exterior Electronic Scoreboards
Section 126100	Fixed Audience Seating
Section 126600	Telescoping Stands
Section 131250	Permanent Grandstands
Section 144200	Wheelchair Lifts

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide labor and materials to perform the work related to all carpentry and general work.
2. Provide all rough carpentry related to the exterior skin of the building including wood nailers, roof cants, sleepers and blocking and exterior sheathing. Provide additional blocking as required to meet full depth of insulation at edges of tapered insulation at roof perimeter, all curbs, openings, penetrations, roof/wall transitions and other conditions. Coordinate depth of blocking with tapered insulation.
3. Provide all rough carpentry related to the interior of the building including blocking, wood nailers, plywood backing panels, equipment mounting panels, etc. for the installation of fire extinguishers, doors, windows, toilet accessories, cabinets, toilet partitions, casework, millwork, etc. including fire treating, as required. This Contractor shall provide wood blocking at all wall cabinets (custom, manufactured and science).
4. Provide exterior cellular PVC trim and cellular PVC panel siding. Provide HD polyurethane BAS relief logo signs.
5. Provide cementitious sheathing on metal decking above stage and gym. Metal decking provided by others.
6. Provide all (interior and exterior) metal and wood doors and frames, vision panels and borrowed lights and door louvers at interior doors where indicated.
7. Provide finish hardware related to all doors (hollow metal, wood and aluminum). Coordinate electrical and security requirements with those Contractors. Provide keying and all lock sets. Provide Owner with copy of pin schedule. Provide construction cylinders, removal of temporary cylinders and installation of permanent cylinders. All material to be stored by this Contractor until delivery is requested. Deliveries to correspond to the construction schedule. Provide field assistance to Electrical and Carpentry Contractors.
8. Provide overhead coiling grilles, overhead doors, security shutters and fire shutters, frames, hoods, locking devices, accessories and manual/electric door operators.
9. Provide additional supports for overhead coiling grilles and overhead doors, if required. Coordinate with structural drawings. Coordinate electrical requirements with any automatic

- door operations (include overhead doors).
10. Provide all field trimming required to adjust to field conditions.
 11. Provide all custom millwork, wood paneling, wood aprons, wood stools, standing/running trim, wood windowsills, ornamental work and custom cabinetry, hardware, brackets, slides, locks, etc. Provide metal countertop support steel. Provide proscenium millwork at Stage. Provide wood caps/handrails at metal railings (metal railings by the Structural Steel and Misc. Metals Contractor). The reception desk in Waiting 001 and the circulation desk in Media Center 100 are considered custom millwork. All other casework except the science casework is considered manufactured casework and will be provided under Contract B-19.
 12. Provide postal specialties, mailroom casework and ADA vanities.
 13. Provide solid surfacing countertops and windowsills.
 14. Provide closet and utility shelving.
 15. Provide shop finishing of millwork where specified.
 16. Provide stage performance flooring system.
 17. Provide resinous flooring.
 18. Provide acoustical and sound wall panels and treatment and all back mounting accessories.
 19. Provide custom fabricated sound reflectors.
 20. Provide sound absorbing ceiling units, panels and baffles.
 21. Provide visual display surfaces (markerboards, tackboards, visual display rails, visual display wall units, support systems and sliding visual display units).
 22. Provide display cases (glass shelving, glass sliding doors, tracks, standards, brackets, locks, tackable fabric wrapped panels, hardware and openings for lighting/power). Metal framing, track and glass surround will be provided by the Glass and Glazing Contractor.
 23. Provide projection screens and controls.
 24. Provide building lettering (interior and exterior), letter "W" stem mounted acrylic laser cut logo.
 25. Provide standard and athletic lockers with built-in combination locks, locker benches, concrete bases. Provide locker bases for owner-supplied lockers and installation of owner-supplied lockers in General Shop 510 and Carpentry Shop 511.

26. Provide toilet compartments.
27. Provide toilet and bath accessories.
28. Provide fire extinguishers, cabinets and accessories.
29. Provide gymnasium divider curtains. Provide supplemental support steel, fasteners, structure required for attachment to the building structure.
30. Provide gymnasium equipment, supplemental steel, fasteners and coordinate attachment to steel with Steel Contractor.
31. Coordinate cutting holes in casework with other trades.
32. Provide architectural expansion joint systems, including joint covers materials at concrete slabs. Drywall and masonry construction. Expansion joints will be provided by those trades.
33. Provide mirrors. Plate glass mirrors at Dressing Rooms A104 and A106 will be provided by the Glass and Glazing Contractor.
34. Provide fixed audience seating. Layout drawing for seating power requirements at auditorium slab shall be provided within two weeks of notice to proceed.
35. Provide flag poles with foundations, complete. Provide three (3) each – one at Camp Raider and two at the new high school.
36. Provide loading dock equipment (dock bumpers and dock lifts). Lift product data and shop drawings to be provided within two weeks of notice to proceed.
37. Provide rigging system, controls, stage curtain and motorized hoists with controls. Provide supplemental support and structural framing required to attach the rigging and hoist system to the building structure. Projection screen in the Auditorium will be provided by the Electrical Contractor.
38. Provide interior telescoping bleachers. Provide factory-applied school logo/graphic.
39. Provide safety interlock for gym equipment.
40. Provide scoreboards including foundations, control and scoreboards (exterior and interior), supplemental steel, fasteners and coordinate attachments.
41. Provide exterior permanent bleachers including foundations, fencing, structural support, press box including doors, windows and interior finishes, and engineered, sealed submittals.

42. Provide wheelchair/platform lifts.
43. Provide anchoring devices, fasteners, inserts and other related items associated with the installation of the above items.
44. This Contractor shall include a \$10,000 allowance in the Base Bid for temporary openings at elevated slabs and toe protection as directed by the Construction Manager. Unused portions of the allowance shall be returned.
45. This Contractor shall include in the base bid 40 hours of Journeyman carpenter time and 80 hours of common labor time for work to be directed by the Construction Manager. Unused portions of the allowance shall be returned.
46. This Contractor shall at a minimum provide a fire extinguisher, rated not less than 2A, for each 3,000 sq. ft. of the protected building area.
47. Coordinate electrical requirements with any automatic door operations.
48. Provide pricing for Alternate to provide resinous flooring.
49. This Contractor shall include a \$20,000 allowance in their base bid for Miscellaneous Carpentry work at the direction of the Construction Manager. Unused allowance will be returned to the Owner.
50. Provide pricing for all applicable alternates as described in Section 012300 – Alternates.
51. Provide daily clean up.
52. All warranties begin at the date of overall project substantial completion.
53. The Carpentry and General Works Contractor shall include labor and blocking materials to install one Smart Board and one Projector at all classrooms and at all conference rooms. Smart Boards and Projectors are being furnished by the Owner. Electrical Contractor shall provide and connect the power and the IT System Contractor shall provide and connect the data.
54. This Contractor shall include a \$50,000 allowance in their Base Bid for an exterior LED sign.
55. This Contractor to provide the site-built curb for the skylights. The skylight units will be provided by the Glass and Glazing Contractor. Coordinate curb requirements with the skylights.
56. Provide signed and sealed structural analysis design data and engineered drawings, required by the Contract Documents for specific items included in this scope of work.

57. Provide wood deck, wood ramps, wood steps and wood railings, complete at Camp Raider. Work will include all wood, hangers, fasteners, anchor bolts, excavation and concrete for foundations for Camp Raider. This work will be included in the Base Bid.

58. Provide all caulking related to casework, cabinetry and millwork.

**This Contract was previously bid and awarded under Bid Pac B.
Scope is issued for coordination and reference purposes only.
Contract has been awarded to Quality Exteriors.**

CONTRACT NO. B-11: ROOFING AND METAL PANELS

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 072100	Thermal Insulation
Section 073113	Asphalt Shingles
Section 073114	Composite Simulated Slate Shingles (Alternate)
Section 074213	Metal Wall Panels
Section 074600	Siding
Section 075323	EPDM Roofing
Section 076200	Sheet Metal Flashing and Trim
Section 077100	Roof Specialties
Section 077200	Roof Accessories
Section 079200	Joint Sealants
Section 079500	Expansion Control
Section 086200	Unit Skylights

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide asphalt shingle roofing system, EPDM roofing system including rigid and tapered insulation and all related accessories.
2. This Contractor shall carefully review the edge of roof details to determine if the roof can be placed before the exterior wall assembly is complete. This contractor shall include all costs associated with returning to the jobsite to complete the roof perimeter after wall assembly is complete.
3. Provide nailable roof insulation board with integral sheathing.
4. Provide caulking related to roofing, flashing and roof accessories.
5. Roof drains and associated plumbing shall be provided by the Mechanical Contractor. Flashing of the roof drains shall be by the Roofing Contractor. Openings for the roof drains in the roofing materials shall be cut by the Roofing Contractor. Openings in the metal deck shall be cut by others.

6. Provide metal parapet coping.
7. Provide roof hatches and smoke vents, roof vents, preformed flashing sleeves and penetrations.
8. Provide walk pads. Coordinate layout for adequate access to roof mounted equipment.
9. Provide ridge vents, snow guards, metal drip edges, gravel stops.
10. Roof curbs will be provided by the Mechanical Contractor. The Roofer will flash the curbs.
11. Provide expansion joints that are integral to the roof.
12. Provide gutters, downspouts and splash pans. Coordinate downspout locations with downspout boot. Boot to be furnished and installed by the Sitework contractor.
13. Provide metal scuppers and related work.
14. Wood blocking shall be provided by others.
15. Provide flashing and sheet metal.
16. Flashing Summary:
 - a. Thru wall and cavity flashing below the roof line shall be by the Masonry Contractor.
 - b. Thru wall and cavity flashing above the roof line shall be by the Roofing Contractor.
17. Provide all metal panels, metal soffits (canopy) and insulated composite metal panel (storefront infill) and all necessary anchoring devices. Provide metal strapping, hat channels, angles and subgirts at exterior wall panel and subgirts and hat channels with insulation at block construction.
18. Provide flashing of panels integral with the panel system.
19. Provide caulking of metal panels and metal panels to dissimilar materials.
20. Provide miscellaneous metal items and supplemental support framing necessary to support panels other than required structural steel.
21. Furnish anchorage items for embedding into other construction for support of panels.
22. Provide touch up of all welding.
23. Provide galvanized, epoxy or stainless steel, etc. anchors as specified.

24. Provide metal fascias and copings related to the panel system.
25. This Contractor shall coordinate his shop drawings with the Glass and Glazing Contractor's shop drawings.
26. Verification of field dimensions is the responsibility of this Contractor.
27. This Contractor shall include a \$20,000 allowance in their Base Bid for miscellaneous roofing/metal panel work at the direction of the Construction Manager. Unused allowance will be returned to the Owner.
28. Provide pricing for Alternate #8 for simulated slate in lieu of asphalt shingles. This alternate applies to the High School Building only.
29. Provide daily clean up.
30. Provide pricing for all applicable alternates as described in Section 012300 – Alternates.
31. All warranties begin at overall project substantial completion.

**This Contract was previously bid and awarded under Bid Pac B.
Scope is issued for coordination and reference purposes only.
Contract has been awarded to Service Glass.**

CONTRACT NO. B12: GLASS AND GLAZING

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 074213	Metal Wall Panels
Section 079200	Joint Sealants
Section 084113	Aluminum Framed Entrances and Storefront
Section 084413	Glazed Aluminum Curtain Walls
Section 085113	Aluminum Windows
Section 086200	Unit Skylights
Section 088000	Glazing

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide curtain wall, storefront, aluminum doors, windows, glass and glazing systems for exterior and interior.
2. Provide manual aluminum door systems.
3. Provide curtain wall systems.
4. Provide fixed and operable aluminum windows, hardware and screens.
5. Provide logos, graphics, patterns and designs on glass work provided under this Contract.
6. Finish hardware for aluminum entrances to be supplied by the Carpentry and General Works Contractor. Coordinate receipt of hardware and templates to facilitate fabrication of aluminum entrances as required by the Construction Schedule.
7. Provide all glass and glazing at exterior and interior of building. Provide glass at frames and openings provided under this Contract and under other Contracts.
8. Provide caulking related to windows, glass, glazing storefront doors and curtain wall systems. Provide interior and exterior caulking between the materials supplied under this section and the adjacent surfaces. Provide caulking integral to glass, glazing, curtain wall,

- storefront, window installations and provide second caulk joint at interior drywall/masonry construction.
9. Provide skylight system. Site-built curb is to be provided by the Carpentry and General Works Contractor.
 10. Provide mock-ups as required by the Drawings and Specifications.
 11. Provide custom break metal trim and infill. Provide metal cover at curtain wall interior sill, extruded metal partition end cap and metal expanding mullion, flush metal panels and curved metal sill and metal closure at storefront jambs including metal work, fillers, attachment clips and supports and associated caulking.
 12. Provide hoisting/scaffolding related to the work of this Contract.
 13. Coordinate edge of slab tolerances and field verify all rough openings.
 14. This Contractor shall include a \$20,000 allowance in their base bid for work at the direction of the Construction Manager. Unused allowance will be returned to the Owner.
 15. Provide water leak and air infiltration testing, as specified.
 16. Provide daily clean up. Final window cleaning will be provided by the Construction Manager.
 17. Provide pricing for all applicable alternates as described in Section 012300 – Alternates.
 18. All warranties begin at overall project substantial completion.
 19. Provide aluminum framing, tracks and glass surround at display cases. Sliding glass doors and shelves with hardware will be provided by the Carpentry and General Work Contractor.
 20. Provide plate glass mirrors at Dressing Rooms A104 and A106.
 21. Provide louvers at window openings within the wall system (similar to C-27 window type, for example).
 22. Provide aluminum framing, tracks and glass at display cases. Sliding glass doors and shelves with hardware will be provided by the Carpentry and General Work Contractor.
 23. Provide plate glass mirrors at Dressing Rooms A104 and A106.
 24. Provide signed and sealed structural analysis design data and engineered drawings, required by the Contract Documents for specific items included in this scope of work.

**This Contract was previously bid and awarded under Bid Pac B.
Scope is issued for coordination and reference purposes only.
Contract has been awarded to Flooring Solutions.**

CONTRACT NO. B-13: CERAMIC TILE

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 093000	Tiling

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide ceramic tile, quarry tile, thresholds, transition pieces.
2. Provide quarry tile.
3. Provide setting beds.
4. Provide marble thresholds and aluminum thresholds where specified.
5. Provide vapor retarding sealer prior to tile application.
6. Provide grout.
7. Provide logos, graphics, patterns and borders. Provide metal edge strips at floor and wall tile.
8. Provide cutting and fitting around work installed by others.
9. Provide all patching and leveling required to perform the work of this contract.
10. Provide protection of finished products until acceptance by Construction Manager.
11. Provide attic stock.
12. Provide crack suppression membrane for this set tile installation.
13. Provide cementitious backer units as part of the tile installation.

14. Provide metal strips installed as part of the tile installation.
15. This Contractor shall include a \$20,000 allowance in their Base Bid for additional Ceramic Tile work at the direction of the Construction Manager. Unused allowance will be returned to the Owner.
16. Protect tile floors after installation.
17. Provide pricing for all applicable alternates as described in Section 012300 – Alternates.
18. Provide attic stock.
19. All warranties begin at overall project substantial completion.

**This Contract was previously bid and awarded under Bid Pac B.
Scope is issued for coordination and reference purposes only.
Contract has been awarded to Roman Mosaic.**

CONTRACT NO. B-14: TERRAZZO

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 096623	Resinous Matrix Terrazzo Flooring

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide terrazzo stair treads, rising and landings, dividers and transitions.
2. Provide vapor retarding sealer prior to terrazzo application.
3. Provide dividers, metal strips, expansion joints, sealant at joint materials.
4. Provide cutting and fitting around work installed by others.
5. Provide patching and leveling.
6. Provide protection of finished products until acceptance by Construction Manager.
7. Provide crack suppression membrane for terrazzo installation.
8. Provide logos, graphics, patterns and borders.
9. This Contractor shall include a \$20,000 allowance in their base bid for Terrazzo work at the direction of the Construction Manager. Unused allowance will be returned to the Owner.
10. Provide pricing for Alternate for terrazzo at the Lobby and Vestibules.
11. Provide pricing for Alternate for terrazzo at the Cafeteria and Café Vestibule.
12. Provide pricing for all applicable alternates as described in Section 012300 – Alternates.
13. Provide daily clean up.

14. Provide attic stock.
15. All warranties begin at overall project substantial completion.

**This Contract was previously bid and awarded under Bid Pac B.
Scope is issued for coordination and reference purposes only.
Contract has been awarded to Cassidy Painting.**

CONTRACT NO. B-15: PAINTING

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 079200	Joint Sealants
Section 097200	Wall Coverings
Section 099113	Exterior Painting
Section 099123	Interior Painting
Section 099646	Intumescent Painting

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide all interior and exterior painting and vinyl wall covering.
2. Provide sealing all interior joints between dissimilar materials that require sealants.
3. Paint all exposed block work and concrete work.
4. Provide intumescent paint at lintels at gym entrance doors.
5. Prime, stain or seal all wood trim and doors that are not factory finished.
6. Paint exposed piping and ductwork (sprinkler, plumbing, electrical) in accordance with the Drawings and Specifications.
7. Paint downspout boots, paint exposed gas piping at generator.
8. Provide supplementary ventilation as required in enclosed spaces.
9. Paint and caulk all hollow metal frames and doors as shown on the door schedule.
10. Provide sealer at exposed concrete flooring.
11. Paint metal stairs and railings.

12. Prefinished items will not be painted by this Contractor.
13. Paint all semi-exposed wood blocking as indicated on the drawing.
14. Provide protection of adjacent surfaces.
15. Provide minor patching prior to application of finishes.
16. Provide clean up.
17. This Contractor to allow 80 man hours and all required paint materials for these man hours to be used as directed by the Construction Manager.
18. Final coat of paint is to be installed after ceilings are installed, as directed by Construction Manager.
19. This Contractor shall include a \$20,000 allowance in their base bid for Miscellaneous Painting at the direction of the Construction Manager. Unused allowance will be returned to the Owner.
20. Provide daily clean up.
21. Provide pricing for all applicable alternates as described in Section 012300 – Alternates.
22. Provide attic stock.
23. All warranties begin at overall project substantial completion.
24. Provide painting at exposed ceilings and structure in Auditorium, Stage, Gymnasium and other occupied spaces. Coordinate painting work with installation of conduits, lights, cabling, support, structure and devices.

**This Contract was previously bid and awarded under Bid Pac B.
Scope is issued for coordination and reference purposes only.
Contract has been awarded to Union Wholesale.**

CONTRACT NO. B-16: ACOUSTICAL CEILINGS

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 072100	Thermal Insulation
Section 079500	Expansion Control
Section 095113	Acoustical Panel Ceilings

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide acoustical panel ceilings, suspension system and hangers, braces, tees, seismic clips and hold down clips.
2. Provide acoustical lay in insulation blankets above ceiling where required by Specifications or Drawings.
3. Provide supplemental suspension hangers at large ducts above ceilings and at openings for lighting fixtures.
4. Provide continuous acoustical sealant on back of vertical leg before installing moldings.
5. Furnish and install hold down clips where required by governing regulations for fire resistant ratings.
6. Provide expansion joints integral to the acoustical ceiling systems.
7. Provide reflected ceiling layout coordination drawings.
8. This Contractor shall cut openings in ceilings for sprinkler heads, lights, mechanical diffusers and grilles, etc.
9. This Contractor shall include a \$15,000 allowance in their base bid for Miscellaneous Ceilings at the direction of the Construction Manager. Unused allowance will be returned to the Owner.

10. Provide pricing for all applicable alternates as described in Section 012300 – Alternates.
11. Provide daily clean up.
12. Provide attic stock.
13. All warranties begin at overall project substantial completion.

**This Contract was previously bid and awarded under Bid Pac B.
Scope is issued for coordination and reference purposes only.
Contract has been awarded to Flooring Solutions.**

CONTRACT NO. B-17: FLOORING

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 096513	Resilient Base and Accessories
Section 096519	Resilient Tile Flooring
Section 096566	Resilient Athletic Flooring
Section 096813	Tile Carpeting
Section 096816	Sheet Carpeting

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide carpet and resilient flooring.
2. Prepare subfloor for finished flooring including leveling and patching. Base bid shall include all flashing patching and surface preparation required to perform the work of this Contract.
3. Provide resilient flooring.
4. Provide rubber treads and risers.
5. Provide carpeting (tiles and sheet).
6. Provide rubber sheet flooring.
7. Provide solid PVC floor tile, solid vinyl tile floor and VCT flooring.
8. Provide resilient stair accessories.
9. Provide resilient base.
10. Provide resilient transition and reducer strips at edges of resilient flooring and at edges of carpeting.
11. Provide logos, graphics, patterns and borders.

12. Provide cleaning and protection.
13. Provide seaming diagrams.
14. Provide finish floor material in elevator cab.
15. Provide cutting and fitting around work of others.
16. This Contractor shall include a \$20,000 allowance in their Base Bid for Miscellaneous Flooring work at the direction of the Construction Manager. Unused allowance will be returned to the Owner.
17. Provide pricing for all applicable alternates as described in Section 012300 – Alternates.
18. Provide daily clean up.
19. Provide attic stock.
20. All warranties begin at overall project substantial completion.

**This Contract was previously bid and awarded under Bid Pac B.
Scope is issued for coordination and reference purposes only.
Contract has been awarded to Miller Flooring.**

CONTRACT NO. B-18: WOOD GYM FLOORING

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 096466	Wood Athletic Flooring

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide wood gym flooring system complete.
2. Prepare subfloor for finished flooring including leveling and patching. Base bid shall include all flashing patching and surface preparation required to perform the work of this Contract.
3. Provide wood floor.
4. Provide vapor barrier, underlayment and subfloor.
5. Provide blower fan and ductwork.
6. Provide vented wall base and corners.
7. Provide finishing, game lines, striping and school logos/graphics.
8. Provide transition between wood flooring and adjacent flooring material.
9. Provide cleaning and protection.
10. Provide cutting and fitting around work of others.
11. Provide pricing for all applicable alternates as described in Section 012300 – Alternates.
12. Provide daily clean up.
13. Provide attic stock.

14. All warranties begin at overall project substantial completion.

**This Contract was previously bid and awarded under Bid Pac B.
Scope is issued for coordination and reference purposes only.
Contract has been awarded to Reed Associates.**

CONTRACT NO. B-19: MANUFACTURED CASEWORK

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 123550	Institutional Casework

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide manufactured institutional casework, manufactured cabinetry, countertops, hardware and locks.
2. Provide cleaning and protection.
3. Provide cutting and fitting around work of others.
4. Provide pricing for all applicable alternates as described in Section 012300 – Alternates.
5. Provide daily clean up.
6. Provide attic stock.
7. All warranties begin at overall project substantial completion.
8. The reception desk in Waiting 001 and the circulation desk in Media Center 100 are considered custom millwork. All other casework except the science casework is considered manufactured casework and will be provided under Contract B-19.
9. Provide standard computer desk stations.

**This Contract was previously bid and awarded under Bid Pac B.
Scope is issued for coordination and reference purposes only.
Contract has been awarded to Modular Concepts.**

CONTRACT NO. B-20: SCIENCE CASEWORK

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 079200	Joint Sealants
Section 115314	Laboratory Fume Hoods with Vertical sash
Section 123600	Laboratory Casework

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide all cabinets, epoxy countertops, wall case shelving units, tables, shelving, benches, hardware, *locks*, etc. Provide all fixtures, sinks, faucets, on and built into countertops. Final connection will be by others. All work shall be pre-cut to receive items furnished by this contractor but installed by others.
2. All custom casework and millwork shall be provided by the Carpentry and General Work Contractor. Manufactured Casework shall be provided by the Manufactured Casework Contractor.
3. Provide all cutouts.
4. The Science Casework Contractor shall provide pre-formed table leg boots at the free-standing science tables.
5. All countertops, benches, cabinets and casework shall be field cut to size and shall have end panels.
6. Provide grommets for cable pass thru.
7. Provide fume/range hoods and any transition pieces required to connect equipment supplied under this contract with the building HVAC system.
8. Any items furnished as part of this Scope of Work that require mechanical or electrical rough ins or services that are different from those shown on the Contract Drawings shall be so noted at the time of bid. Failure to do so shall make this Contractor liable for costs of any

changes required by same.

9. Provide all caulking and sealants for proper installation and in accordance with public health regulation.
10. Provide daily cleanup of packing materials.
11. Start, test and demonstrate all equipment installed under this Contract.
12. On-site cutting of epoxy tops will not be permitted without use of wet-cutting equipment.
13. Provide cleaning and protection.
14. Provide pricing for all applicable alternates as described in Section 012300 – Alternates.
15. Provide daily clean up.
16. Provide attic stock.
17. All warranties begin at overall project substantial completion.
18. Provide self-contained acid neutralization tanks. These are referred to as “bottle taps” in the casework specifications. Also provide all filler and closure panels, lab accessories, water, lab gas and electrical service fittings and cover plates.
19. Provide corrosive cabinets.
20. This contract includes all science casework within the Science Labs and Prep Rooms.

**This Contract was previously bid and awarded under Bid Pac B.
Scope is issued for coordination and reference purposes only.
Contract has been awarded to Todd Devin Food Equipment.**

CONTRACT NO. B-21: KITCHEN EQUIPMENT

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 079200	Joint Sealants
Section 114000	Food Service Equipment

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide food service equipment.
2. All final connections shall be made by the Electrical and Mechanical Contractors.
3. Any discrepancies between the Drawings, Specifications and site conditions or ambiguities in the documents shall immediately be reported to the Construction Manager in writing. Inconsistencies shall be corrected in writing or by reissuing the drawings. If the Contract Documents disagree with the quality or quantity of work required, the better quality or greater quantity shall be supplied unless otherwise instructed in writing by the Construction Manager. Any work performed by the Contractor at locations in question after his discovery of discrepancies, inconsistencies, ambiguities, or errors, without securing resolution, shall be at the Contractor's risk.
4. This Contractor shall verify all measurements at the site and assume full responsibility for their correctness before proceeding with his work. No extra compensation will be allowed because of differences between site conditions and those indicated on the drawings.
5. Manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer and shall be protected from damage until acceptance. Prefinished products which are damaged before or after installation shall be replaced with new and perfect materials. Materials finished after installation which are damaged shall be refinished or replaced as the Construction Manager may direct. No additional charge will be honored by the Construction Manager for repair or replacement of finished materials.
6. Should this Contractor feel that the Contract Documents call for work which he cannot

guarantee, he shall so state, in writing, prior to bidding. Proceeding with any operation shall be construed as acceptance of all guarantee conditions.

7. Secure and provide certificates of inspection and occupancy required by authorities having jurisdiction. Deliver copies of certificates to the Construction Manager prior to filing application for final payment.
8. It is this Contractor's responsibility to make certain statutes, building codes, and regulations including those of the appropriate health agencies having jurisdiction over this type of facility are met.
9. Any items furnished as part of this Scope of Work that require mechanical or electrical rough ins or services that are different from those shown on the Contract Drawings shall be so noted prior to receipt of bids. Failure to do so shall make this Contractor liable for costs of any changes required by same.
10. Provide all caulking and sealants for proper installation and in accordance with public health regulations.
11. Start, test and demonstrate all equipment installed under this category of work. Provide proposed schedule, including names and telephone numbers of attending representatives (3) three weeks in advance of demonstration.
12. Obtain approvals and permits and coordinate inspections and testing with governing local and state agencies.
13. Provide refrigeration lines and control lines between equipment and condensing units.
14. Provide sinks and faucets.
15. Provide floor sinks and troughs.
16. Provide walk in cooler and freezer. Provide refrigeration units, refrigerant piping, condensate piping, controls. Insulation and roof curbs for the condensing units.
17. Provide pricing for all applicable alternates as described in Section 012300 – Alternates.
18. Provide daily clean up.
19. Provide attic stock.
20. All warranties begin at overall project substantial completion.
21. Provide ice machine at Gym Storage Room G114.

**This Contract was previously bid and awarded under Bid Pac B.
Scope is issued for coordination and reference purposes only.
Contract has been awarded to Bear Industries.**

CONTRACT NO. B-22: FIRE PROTECTION

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 033000	Cast-in-Place Concrete
Section 078413	Penetration Firestopping
Section 083113	Access Doors and Frames
Division 21	Fire Protection
Section 230548	Vibration Controls for HVAC, Plumbing and Fire Protection Equipment
Division 26	Electrical
Division 28	Electronic Safety and Security

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide a complete fire protection system including design, piping, fittings, couplings, valves and sprinkler heads.
2. Fire main into the building has been completed under Bid Pac A. This Contractor shall connect his service to the rough in provided by others. See Degli Obizzi UG rough in drawings.
3. Provide hydraulic calculations and design for the fire protection system. Include Fire Marshal approvals.
4. Provide concrete equipment pads, curbs and thrust blocks for fire protection work.
5. Provide penetrations including sleeves, seals, fire and smoke safing, cutting and patching.
6. Flow and tamper switches to be supplied by this Contractor and wired by the Electrical Contractor. It is this Contractor's responsibility to provide flow and tamper switches to meet applicable state and local codes.
7. Provide fire pump, controller and related work. Wiring of pump and controller to be by the Electrical Contractor.

8. Provide fire department connection, fire department hose cabinets, fire valve cabinets and valves.
9. Provide piping between building and Well Pump House. Provide above ground fire protection storage tank. Provide tank bubbler (ice melt) at Well House.
10. Provide meter, if required, and all applicable fees.
11. This Contractor to coordinate the need for and compatibility of his system to the emergency generator, supplied by others.
12. Provide pipe identification, labeling and tags.
13. Provide the necessary coordination with trade to avoid interferences with other work and make corrections at no extra charge.
14. This Contractor shall include a \$10,000 allowance in their Base Bid for Miscellaneous Fire Protection work at the direction of the Construction Manager. Unused allowance will be returned to the Owner.
15. Provide testing and inspections.
16. Provide as-built drawings.
17. Provide pricing for all applicable alternates as described in Section 012300 – Alternates.
18. Provide daily clean up.
19. Provide attic stock.
20. All warranties begin at overall project substantial completion.
21. Provide BIM coordination.

**This Contract was previously bid and awarded under Bid Pac B.
Scope is issued for coordination and reference purposes only.
Contract has been awarded to Worth and Company.**

CONTRACT NO. B-23: MECHANICAL AND PLUMBING

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 033000	Cast-in-Place Concrete
Section 077200	Roof Accessories
Section 078413	Penetration Firestopping
Section 079200	Joint Sealants
Section 083113	Access Doors and Frames
Section 089000	Louvers and Vents
Division 22	Plumbing
Section 221223	Facility Indoor Potable Water Storage Tanks
Section 230510	Direct Buried Chilled Water Piping
Section 230548	Vibration Controls for HVAC, Plumbing and Fire Protection Equipment.
Section 238221	Welding Fume Exhaust System
Section 312000	Earth Moving
Section 330000	General Mechanical Requirements
Section 400420	Potable Water Instrumentation and Controls
Division 23	Heating Ventilating and Air Conditioning
Division 33	Utilities

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide a complete mechanical, plumbing and piping system as indicated in the Contract Documents.
2. Division 16 of the specifications should be reviewed as it relates to the power wiring and other requirements for HVAC equipment including the coordination of furnishing and installing motor starters as provided in the specifications.
3. This Contractor shall be responsible to designate an individual within his organization, intimately familiar with this project and assigned on site, to act as the System Start-up Coordinator. This individual must be pre-approved by the Construction Manager. This individual's responsibilities shall include, but not be limited to, coordinating the start-up of

all mechanical equipment, including the coordination between the Electrical Contractor, the Controls Contractor, and the Testing, Adjusting and Balancing Contractor. This individual shall report on a weekly basis, in written form, to the Construction Manager. These reports shall include a summary of current conditions including manufacturers' start-ups, systems' deficiencies noted to date and the remediation of same, coordination issues between trades, system interfacing and forecasting, as necessary to project the completion of each individual system within the building.

4. Underslab plumbing rough ins for the high school slab on grade have been provided under Bid Pac A. The Mechanical and Plumbing Contractor shall provide connection of piping at rough ins to main building system piping. The Mechanical and Plumbing Contractor shall provide all excavation, backfill and all piping for underground mechanical/plumbing work between the mechanical courtyard and the building, domestic water piping, including meters and indoor potable water storage tanks and related accessories. Reference UG shop drawings from Bid Pac A UG Plumbing Contractor.
5. Insert the attached underground plumbing and underground electrical shop drawings prepared by RG Degli Obizzi and Mid-Atlantic Electrical Services. These drawings are being issued for coordination purposes. All Bidders shall note that there are differences in the rough in provided in the field by these contractors compared to the rough ins noted on the Contract Documents for underground utilities within the HS building. Bidders should follow the shop drawings for bidding purposes, and the awarded Contractor s will be required to verify actual field conditions to coordinate final connections. No change orders will be authorized for this coordination effort.
6. Provide BIM coordination.
7. Provide temporary heat and ventilation installation, maintenance and removal. Refer to Division 1, Specification section 015123 – TEMPORARY HEAT AND VENTILATION. This Contractor shall note that the permanent building equipment will not be permitted to use for temporary heating during construction. This Contractor shall provide all equipment, hoses, safety measures and ventilation requirements to provide temporary heat available by September 1, 2013. The cost of fuel will be by the Construction Manager.
8. Provide equipment bases and housekeeping pads. This includes all housekeeping pads inside the buildings (in the mechanical room and other equipment rooms, mezzanines and kitchen, well house) as well as the exterior chiller equipment pads. Slab at mechanical courtyard including foundations, reinforcing and concrete will be provided by the Concrete Contractor.
9. Provide chillers, equipment pads and piping between chiller pad and high school building. Concrete slab within the mechanical courtyard will be by others. Also provide control conduit for chiller control lines. Slab within the mechanical courtyard will be provided by the Concrete Contractor.

10. Provide HVAC equipment and filters.
11. Provide disconnects and starters.
12. Provide boiler intake, exhaust, inspection requirements, breeching packaged controls.
13. Provide emergency gas shut offs for boilers, kitchen equipment and science labs.
14. Provide steel, dunnage and grating for equipment support.
15. Provide permits/meters.
16. Provide Well Pump House equipment for domestic water system. See all drawings for equipment required in the Well House.
17. Provide plumbing piping, fixtures, valves, plaster traps. Provide joint sealants at plumbing fixtures.
18. Provide elevator sump pump with grate.
19. Provide water treatment chemical feed glycol system.
20. Provide disinfecting procedure and water sterilization.
21. Provide science lab connections. Provide eyewash and safety showers.
22. Provide refrigerator ice maker supply wall box, clothes washer rough ins, washing machine connections.
23. Provide pipe and duct insulation, grease wrap, duct insulation access panels.
24. Install duct smoke detectors furnished by the Electrical Contractor.
25. Provide penetrations through walls, floors, etc. including sleeves, link seals, cutting, patching and fire and smoke safing.
26. Cooperate with the Testing, Adjusting and Balancing Contractor.
27. Coordinate and cooperate with the Automatic Temperature Control Contractor for rough in, wiring, equipment and installation requirements.
28. The entity or Contractor supplying and installing the Automatic Temperature Control system for the Project (ATC Contractor) will contract directly with the Owner to perform such work (ATC Work) on the Project. However, the Mechanical Contractor shall be responsible for the following: all aspects of the control, coordination, administration and supervision of and

communication with the ATC Contractor and/or the ATC Work in, on or about the Project ensuring that the ATC Contractor complies with and adheres to and the Work is performed in accordance with the Contract Documents. The ATC Contractor and Mechanical Contractor shall furnish warranty, guarantee, certificate of compliance or other similar commitment or instrument for their respective work, as required by the Contract Documents.

29. Provide hoisting, rigging and scaffolding.
30. Provide ductwork, stainless steel ductwork, flex duct, grilles and diffusers.
31. Provide roof drains.
32. Provide all louvers and vents (fixed, blank off panels and screens), except the louvers at the glazed system.
33. Coordinate damper size, location and type of damper with architectural drawings.
34. Provide compressed air system, hose reels.
35. Provide piping work associated with the emergency generator (including fuel piping and exhaust piping). Include initial fill up of fuel tanks.
36. Gas piping, meter and pressure regulator valve will be provided by Chesapeake Gas. The Mechanical Contractor shall provide gas piping, meter inside the kitchen and equipment within the building.
37. Provide trap priming system.
38. Provide rough in and final connections of dust collector system, system equipment, ductwork and hose drops.
39. Provide clothes dryer venting.
40. Provide science lab exhaust fans and equipment.
41. Provide welding booth exhaust, fan, stainless steel drops.
42. Provide kitchen hood exhaust/make-up system including exhaust fan, make-up unit, ductwork, cleanout, access doors, insulation, accessories and interlocking controls. The Kitchen Equipment Contractor shall provide the hoods. The Mechanical Contractor shall provide assistance in the coordination of the tie-in of this system with the building HVAC system.
43. Provide dishwasher hood exhaust system including fan, sloped welded aluminum ductwork, insulation, accessories and interlocking controls with time delay.

44. Provide roof curbs, sloped roof curbs.
45. All utilities will be brought to within +/- 5 feet of the building line by others. The Mechanical Contractor is responsible for connecting the utilities from +/- 5 feet outside the building line and completing the system within the building.
46. Install Owner prepurchased equipment, if applicable.
47. Furnish access panels to Masonry/Drywall contractors for installation.
48. Provide rough ins to and final connections of kitchen equipment and appliances.
49. Provide pipe and duct identification, labeling and valve tags.
50. Provide vibration and isolation controls.
51. Provide as-built drawings.
52. Provide daily clean up.
53. All guarantees and warranties to begin at the substantial completion of the entire project. Maintain equipment prior to substantial completion.
54. This Contractor shall include a \$25,000 allowance in their base bid for Miscellaneous Mechanical and Plumbing work at the direction of the Construction Manager. Unused allowance will be returned to the Owner.
55. Provide pricing for all applicable alternates as described in Section 012300 – Alternates.
56. Provide attic stock.
57. Provide cutting and patching associated with the installation of the work required under this Contract. Base paving has been installed at the bus parking lot and the fire lane around the building.

**This Contract was previously bid and awarded under Bid Pac B.
Scope is issued for coordination and reference purposes only.
Contract has been awarded to Modern Controls.**

CONTRACT NO. B-24: AUTOMATIC TEMPERATURE CONTROLS

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 078413	Penetration Firestopping
Section 083113	Access Doors and Frames
Division 22	Plumbing
Division 23	HVAC
Division 26	Electrical

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide automatic temperature controls for equipment whose main purpose include all items in the automatic temperature control scope. Provided, however, that the controls do not directly switch the power lines to the equipment; the wiring of such controls to remain the responsibility under the Electrical Contract.
2. Cooperate in the BIM coordination effort.
3. The entity or Contractor supplying and installing the Automatic Temperature Control system for the Project (ATC Contractor) will contract directly with the Owner to perform such work (ATC Work) on the Project. However, the Mechanical Contractor shall be responsible for the following: all aspects of the control, coordination, administration and supervision of and communication with the ATC Contractor and/or the ATC Work in, on or about the Project ensuring that the ATC Contractor complies with and adheres to and the Work is performed in accordance with the Contract Documents. The ATC Contractor and Mechanical Contractor shall furnish warranty, guarantee, certificate of compliance or other similar commitment or instrument for their respective work, as required by the Contract Documents.
4. Provide permits as required for work under this contract scope.
5. Provide inspections as required under this contract scope.
6. Furnish access doors when specifically required for access to automatic temperature control.

7. Provide wiring for remote thermostats and remote prewired auxiliary control panels for packaged equipment.
8. Exclude automatic temperature controls when specified as integral part of packaged equipment.
9. Provide electrical wiring for thermostats and controls which directly switch the power line to the equipment (directly shall mean not through magnetic coil) shall be provided by the Electrical Contractor.
10. Power wiring shall be provided by the Electrical Contractor.
11. Control power supply outlets shall be provided by the Electrical Contractor.
12. Provide penetrations through walls, floor, etc. including sleeves, cutting, patching and smoke/fire safing.
13. This Contractor shall include a \$10,000 allowance in their Base Bid for Miscellaneous ATC work at the direction of the Construction Manager. Unused allowance will be returned to the Owner.
14. Provide pricing for all applicable alternates as described in Section 012300 – Alternates.
15. Provide daily clean up.
16. Provide attic stock.
17. All warranties begin at overall project substantial completion.

**This Contract was previously bid and awarded under Bid Pac B.
Scope is issued for coordination and reference purposes only.
Contract has been awarded to Butler Balancing.**

CONTRACT NO. B-25: TESTING, ADJUSTING AND BALANCING

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 019113	General Commissioning Requirements
Section 019114	Plumbing Commissioning Requirements
Section 019115	HVAC Commissioning Requirements

1. Provide all water and air testing and balancing.
2. This Contractor must be certified by AABC, NEBB or TABB.
3. Perform the testing, adjusting and balancing of the Hydronic Piping Systems to meet optimum performance capability within design parameters, sequence of operations and installation limits.
4. Perform the testing, adjusting and balancing of the HVAC systems, plumbing systems and equipment exhaust systems to meet optimum performance capabilities within design parameters, sequence of operations and installation limits.
5. Verify that automatic control devices are functioning properly. Balancer must provide verification of actual control sensor versus actual readings performed during balancing and report any deficiencies at the time of the function verification.
6. Provider an initial TAB of the air and hydronic systems while the systems are being started.
7. Provide the final TAB after the mechanical systems and the ATC systems are completed.
8. Attend Pre-Install, Function Performance Testing, Start Up, Pre-Commissioning and Commissioning coordination meetings and provide relative input. Participate in the function performance testing and final commissioning. Coordinate and cooperate with the Independent Commissioning Agent. The balancer shall include the costs for a pre-commissioning meeting with all MEP related trades prior to mobilization as well as additional follow up meetings required to discuss, coordinate and execute any changes required based on balancing findings.

9. Perform Initial and Final Inspections as specified.
10. Prepare and issue TAB reports in a timely manner. Provide a working (pencil) copy of all preliminary readings to the Construction Manager within 5 working days from the date in which the testing and balancing occurs. Provide final written report within 10 working days of substantial completion.
11. Provide daily hand written field reports with any deficiencies to the Construction Manager.
12. Perform additional tests, as specified, within 90 days of completing TAB, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
13. The TAB work will be performed during normal work hours in an occupied environment.
14. The TAB may not be performed during near-peak summer or winter conditions. Perform additional inspection, testing, adjusting and balancing during near-peak summer and/or winter conditions. This will require remobilization.
15. Coordinate and cooperate with the Mechanical, Plumbing and ATC Contractors for the balancing work.
16. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed.
17. Provide pricing for all applicable alternates as described in Section 012300 – Alternates.
18. Provide daily clean up.
19. Provide attic stock.
20. All warranties begin at overall project substantial completion.

**This Contract was previously bid and awarded under Bid Pac B.
Scope is issued for coordination and reference purposes only.
Contract has been awarded to Nickle Electrical.**

CONTRACT NO. B-26: ELECTRICAL

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 312000	Earth Moving
Section 033000	Cast-in-Place Concrete
Section 078413	Penetration Firestopping
Section 083113	Access Doors and Frames
Section 260500	Common Work Results for Electrical
Section 260510	Elevator Equipment Wiring and Provisions
Section 260511	Cooler and Freezer Wiring
Section 260512	Kitchen Equipment Wiring
Section 263213	Engine Generators
Section 265100	Interior Lighting
Section 265561	Theatrical Lighting and Control
Section 265563	Theatrical Fixtures
Section 265668	Exterior Athletic Lighting
Section 269119	Theatrical Systems Electrical Infrastructure
Division 26	Electrical
Division 27	Communications
Section 270500	Common Work Results for Communications
Section 270536	Cable Trays for Communications Systems
Section 275116	Rescue Assistance Two Way Communications
Section 275118	Stadium Public Address System
Section 275313	Atomic Clock System
Division 28	Electronic Safety and Security
Section 283100	Fire Alarm System

This contract also includes, but is not necessarily limited to, all labor, materials and equipment for the following:

1. Provide a complete electrical system as indicated on the drawings, schedules and in the specifications.
2. Division 22 and Division 23 of the specifications should be reviewed as it relates to the power wiring and other requirements for Plumbing and HVAC equipment including the

coordination of furnishing and installing motor starters and controllers as detailed in the Specifications and on the Drawings.

3. Provide BIM coordination.
4. Excavation and backfill for underslab conduit and boxes within the building footprint have been provided under Bid Pac A. All other underground electrical work is the responsibility of this Contractor. Soil types shall be in accordance with Del DOT standard specifications. This includes the power and control conduit for the chiller equipment courtyard. Reference UG electrical shop drawings from Bid Pac A UG Electrical contract. The Bid Pac B Electrical Contractor shall remove the temporary covers and shall provide all floor activations, accessories and covers for a complete installation.
5. Insert the attached underground plumbing and underground electrical shop drawings prepared by RG Degli Obizzi and Mid-Atlantic Electrical Services. These drawings are being issued for coordination purposes. All Bidders shall note that there are differences in the rough in provided in the field by these contractors compared to the rough ins noted on the Contract Documents for underground utilities within the HS building. Bidders should follow the shop drawings for bidding purposes, and the awarded Contractor s will be required to verify actual field conditions to coordinate final connections. No change orders will be authorized for this coordination effort.
6. Provide concrete for duct banks, light standards, below ground conduit encasement, equipment bases, housekeeping pads and any other concrete work specifically related to the electrical work. Include requirements of Sussex County, State and local codes for concrete encasement.
7. Provide temporary electric installation, maintenance and removal. Refer to Division 1, specification section 015113 - TEMPORARY ELECTRIC. The Electrical Contractor to provide power and lights for the project. Include 6 months rental (set up, maintenance and removal) and fuel for a generator sized adequately to light the building and provide power for the trades until the permanent system is available. Anticipate providing power by 1 December 2012.
8. Provide site electrical and site lighting. Include light fixtures, light poles, excavation, backfill and foundations for poles. Provide power to all scoreboards, wells, pumping stations, motorized equipment and other items requiring power outside of the buildings.
9. Provide conduits for incoming utility service provisions (power, telephone and CATV distribution). Refer to the attached drawing E60.01 issued under Bid Pac A and included in this Addendum #6 for reference for the extent of incoming communications conduits. These conduits are to be included in the scope of Bid Pac B work and provided by Contract B26 Electrical.
10. Provide electrical service to Camp Raider.

11. Provide permits, testing and inspections.
12. Provide penetrations through walls, floors, etc. including sleeves, link seals, cutting, patching and smoke/fire safing.
13. Provide daily clean up.
14. Provide hoisting, rigging and scaffolding.
15. Provide all primary service work is to be provided by Delaware Co-Op. This includes the service, transformers and meter. The cost of the service will be by the Co-Op/Owner. Refer to the attached drawing E60.01 issued under Bid Pac A and included in this Addendum #6 for routing. The B26 Electrical Contractor shall bring service into the building from the meter side and into the building under the Base Bid of Bid Pac B Contract C26 Electrical., including all utility company related costs/fees for this work.
16. Provide a complete fire alarm system. Water flow devices are supplied and installed by the Sprinkler Contractor and wired by this Contractor. Include tie-in to fire sprinkler flow and tamper switch. Furnish duct smoke detectors to the Mechanical Contractor for installation.
17. Provide rescue assistance system.
18. Provide elevator shunt trip and coordinate fire alarm requirements with Authorities Having Jurisdiction.
19. Provide automatic transfer switches.
20. Provide heat tracing.
21. Ice melt system – tank bubbler at Well House will be provided by the Fire Protection Contractor.
22. Provide rough ins (back boxes, conduits and pull strings) for special systems (CCTV, Access Control, Intercom, Intrusion Detection, sound, security, atomic clock system). Coordinate rough ins for power for card access system. Provide cable tray system at MDF/IDF Rooms.
23. Provide lightning protection with master UL certification.
24. Provide grounding and bonding of building columns and interior spaces as required. Bid Pac A Contractor has provided sleeves with caps at every other column.
25. Provide pull strings and boxes for voice/data boxes.
26. Provide rough-in and final connection and related work for equipment provided under other

contracts (i.e. kitchen, elevators, HVAC, sprinkler, motorized doors, display cases, hand dryers, gym equipment, divider curtain, etc.). Provide power to automatic hardware. Low voltage wiring from the controller to hardware shall be provided by the Carpentry and General Work Contractor.

27. Provide a complete audio and audiovisual communication system at the Auditorium and Supporting Spaces, Band Room and Chorus Room. Provide the Stadium public address system. Provide the auditorium projection screen and associated supplemental steel, fasteners and attachments to the rigging/structure. Also provide electrical connections and control for the screen.
28. This Contractor shall note that all cabling, equipment, devices, terminations, programming and installations the Gymnasium and Cafeteria sound system and the voice and data system shall be provided by the IT Contractor. Rough ins including back boxes, conduits and pull strings for these systems will be provided under the Electrical Contract.
29. Provide all interior and exterior lighting fixtures and lighting control systems.
30. Provide theatrical lighting and control, theatrical fixtures and theatrical systems electrical infrastructure.
31. Provide rough-in and final connection of kitchen equipment and appliances. Refer to specification section 114000 Food Service Equipment for specifics. Coordinate power/plug requirements with rough in for equipment with the Kitchen Equipment Contractor.
32. Provide stage lighting systems including fixtures, controls, wiring, light grids, supports and attachments.
33. Provide natural gas emergency generator, complete, including initial maintenance service.
34. Furnish access doors at the Metal Stud and Drywall Contractor for installation in walls. The Electrical Contractor will install the access doors in CMU walls.
35. Provide short circuit analysis, coordination study and arc flash hazard analysis.
36. Provide as-built drawings.
37. All guarantees and warranties to begin at the substantial completion of the entire project. This includes obtaining extended warranties from the manufacturers. Maintain equipment prior to substantial completion.
38. This Contractor shall include a \$25,000 allowance in their base bid for Miscellaneous Electrical work at the direction of the Construction Manager. Unused allowance will be returned to the Owner.

39. Provide pricing for all applicable alternates as described in Section 012300 – Alternates.
40. Provide daily clean up.
41. Provide attic stock.
42. All warranties begin at overall project substantial completion.
43. Provide atomic clock system.
44. Provide cutting and patching associated with the installation of the work required under this Contract. Base paving has been installed at the bus parking lot and the fire lane around the building.
45. The Carpentry and General Works Contractor shall include labor and blocking materials to install one Smart Board and one Projector at all classrooms and at all conference rooms. Smart Boards and Projectors are being furnished by the Owner. Electrical Contractor shall provide and connect the power and the IT System Contractor shall provide and connect the data.

CONTRACT B-27: IT SYSTEMS – NOT USED

**This Contract was previously bid and awarded under Bid Pac B.
Scope is issued for coordination and reference purposes only.
Contract has been awarded to Advantech.**

CONTRACT NO. B-28: SECURITY

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 078413	Penetration Firestopping
Division 26	Electrical
Section 281300	Access Control
Section 281600	Intrusion Detection System
Section 282300	Video Surveillance (CCTV Systems)

1. Provide a complete intrusion and detection system.
2. Provide card access system. Provide coordination with door and frame installation and fire alarm system for a complete system.
3. Provide camera system (CCTV).
4. The Security Contractor shall coordinate access control card reader requirements for the elevator control panel at the elevator at the first and second floor with the Elevator Contractor.
5. Provide devices, equipment, fixtures, components, wiring, terminations and programming for the systems included in this Contract.
6. Provide penetrations through walls, floors, etc., including sleeves, cutting, patching and smoke/fire safing.
7. Provide coordination of the work of this contract with the Electrical Contractor, including final equipment locations.
8. Rough ins of backboxes and conduits and pull strings in walls will be completed by the Electrical Contractor. The Security Contractor shall coordinate box locations with final equipment locations.
9. This Contractor shall include a \$10,000 allowance in their Base Bid for Miscellaneous Security work at the direction of the Construction Manager. Unused allowance will be returned to the

Owner.

10. Provide pricing for all applicable alternates as described in Section 012300 – Alternates.
11. Provide daily clean up.
12. Provide attic stock.
13. All warranties begin at overall project substantial completion.

CONTRACT NO. C-29: VOICE AND DATA

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 081113	Access Doors and Frames
Section 260500	Common Work Results for Electrical
Section 260519	Conductors and Cables
Section 260526	Grounding and Bonding
Section 260528	Electrical Firestopping
Section 260529	Hangers and Supports
Section 260533	Raceways and Boxes
Section 260553	Electrical Identification
Section 262726	Wiring Devices
Section 270500	Common Work Results for Communications
Section 272000	Communications Equipment and Cabling
Section 275000	Public Address and Intercom Systems

1. Provide all labor, equipment, accessories and materials for a complete functional Electronic Communication System and a complete and operable Network System.
2. Provide all labor, equipment, accessories and materials for a complete functional public address and intercom system.
3. This Contractor shall note that construction is in progress. A site survey is required prior to submitting the bid for this Contract.
4. Provide cabling, outlets, devices, equipment, fixtures, components, wiring, terminations and programming for the systems included in this Contract.
5. Provide backbone cabling, horizontal cabling, equipment racks, cable management system, uninterruptable power supplies, rack automatic transfer switches, switches and accessories, patch panels, patch cords, fiber enclosures, fiber optic patch cords, surge protection, backboards, optical fiber cable hardware, information outlets, voice over IP system and wireless access point system (WAP).
6. Provide public address and intercom system complete, equipment cabinets, AM/FM tuner and CD player, power amplifiers, call switches, ceiling and wall mount speakers and speaker horns. Connect system to sound enhancement system for muting classroom sound enhancement system when public address system is active. Provide synchronization of public address and intercom system's clock with the master clock system for automatic bell

schedules. The head-end public address equipment shall communicate, monitor and provide all functions to remote units via the school's network.

7. Provide penetrations through walls, floors, etc., including sleeves, cutting, patching and smoke/fire safing.
8. Provide access panels for required access to concealed components.
9. Provide coordination of the work of this contract with the Electrical Contractor, including final equipment locations.
10. Rough ins of backboxes and conduits in walls will be completed by the Electrical Contractor. The Voice and Data Contractor shall coordinate box locations with final equipment locations. Cable tray within the MDF and IDF rooms will be provided by the Electrical Contractor. Supplemental ladder racks will be provided by the Voice and Data Contractor as required.
11. Provide bridle rings, supporting hardware, cable ties, device and equipment support and hangers.
12. Provide grounding and bonding.
13. Provide cable color coding. Provide equipment, device and cable labeling and identification products.
14. This Contractor shall include a \$10,000 allowance in their Base Bid for miscellaneous Voice and Data work at the direction of the Construction Manager. Unused allowance will be returned to the Owner.
15. Provide pricing for all applicable alternates as described in Section 012300 – Alternates. Base Bid condition is that the Owner supplies the switches and the Contractor installs them. The Alternate is for the Contractor to provide (furnish and install) the switches. DTI will configure the switches in either case.
16. Coordinate installations with Delaware Department of Technology and Information (DTI). DTI will configure all switches connected to the School's network.
17. This Contractor shall configure and integrate the WAPs with the existing configuration parameters used at the existing high school located at 307 Laws Street, Bridgeville, DE.
18. Provide testing, inspections, startup service and certifications.
19. Provide demonstration and training.
20. Provide operation and maintenance manuals.

21. Provide daily clean up.
22. Provide attic stock, maintenance and extra materials.
23. All warranties begin at overall project substantial completion.

CONTRACT NO. C-30: AUDIO/VIDEO SYSTEMS

A. Work included in this contract consists of, but is not necessarily limited to, all labor, materials and equipment for:

- Technical Specification sections:

Division 0	Bidding and Contract Requirements
Division 1	General Requirements
Section 081113	Access Doors and Frames
Section 260500	Common Work Results for Electrical
Section 260519	Conductors and Cables
Section 260526	Grounding and Bonding
Section 260528	Electrical Firestopping
Section 260529	Hangers and Supports
Section 260533	Raceways and Boxes
Section 260553	Electrical Identification
Section 262726	Wiring Devices
Section 270500	Common Work Results for Communications
Section 274100	Audio-Visual (A/V) Systems
Section 275115	Gymnasium and Cafeteria Sound Systems

1. Provide all labor, equipment, accessories and materials for a complete, functional audio/video systems including A/V classroom presentation system, A/V conference/training room presentation system, A/V cafeteria/multimedia presentation system and network video distribution system.
2. Provide all labor, equipment, accessories and materials for a complete and functional gymnasium sound reinforcement system, cafeteria sound system and hearing assistance system.
3. This Contractor shall note that construction is in progress. A site survey is required prior to submitting the bid for this Contract.
4. Provide audio/video cabling, audio/video modules, face plates, jacks and appurtenances for TIA/EIA Category 6 data cabling system for the Audio/Video presentation system.
5. Provide auditorium cameras, AV studio camera, distributed media engine, encoding audio video module, multi-format self-boosting set top box and technical support for the Network Video Distribution System.
6. Provide complete structured cabling system for Audio/Video Classroom Presentation System, Audio/Video Conference Room Presentation Systems, Audio/Video Cafeteria Presentation System and Network Video Distribution System.

7. Provide cabling (structured and jumpers), interactive whiteboards with protectors, sound enhancement system, document cameras, interactive whiteboard cabling kits, sound enhancement cabling kits, teacher-projector drops, concealed cabling for the Audio/Video classroom presentation system.
8. Provide interactive whiteboards with projectors, sound enhancement system, document cameras, training room drops, interactive whiteboard cabling kits, sound enhancement cabling kits, training room cabling kits, and concealed cabling for the Audio/Video Training Room presentation system.
9. Coordinate mounting of recessed work surface portal in training room table with furniture vendor. Assume that furniture vendor will cut hole in table.
10. Provide ceiling mounted projector and mounting hardware, sound system, projector drop, projector drop cabling kit, ceiling mounted projector drop, ceiling mounted projector drop cabling, concealed cabling for the Cafeteria/Multipurpose Audio/Visual presentation system.
11. Provide Studio Broadcast System complete, and tripod, cabling, headphones and microphone system.
12. Provide network video distribution system complete.
13. Provide gymnasium and cafeteria FM wireless microphone system, general purpose microphone, microphone stands, microphone mixer, iPod dock, programmable dual DSP processor, power amplifier, gymnasium loudspeakers, cafeteria loudspeakers, equipment cabinets, hearing assistance system – gymnasium and cafeteria, wiring and connectors.
14. Provide communication grounding, earthing and bonding. Provide fire-retardant-treated plywood backboards for equipment mounting.
15. Provide bridge rings, supporting hardware, cable ties, device and equipment support and hangers.
16. Provide cable color coding. Provide equipment, device and cable labeling and identification products.
17. The Audio/Visual Contractor shall provide all cabling, equipment, devices, terminations, programming and installations the Gymnasium and Cafeteria sound system and the voice and data systems. Rough ins including backboxes, conduits and pull strings for these systems will be provided under the Electrical Contract.
18. The Carpentry and General Works Contractor shall include blocking materials for one Smart Board and one Projector at all classrooms and at all conference rooms. Smart Boards and Projectors are being provided by the Audio/Video Contractor. Electrical Contractor shall provide and connect the power and the Voice and Data Contractor shall provide and connect

the data.

19. Provide labor, materials, equipment, software tools and services for installation, testing and operating an Audio/Video and Network Video Distribution System. This Contractor shall provide computer, test equipment and other accessories required to provide each Audio/Video presentation system.
20. Coordinate installations with Delaware Department of Technology and Information (DTI). DTI will configure all switches connected to the School's network.
21. Provide demonstration and training.
22. Provide operation and maintenance manuals.
23. Provide daily clean up.
24. Provide attic stock, maintenance and extra materials.
25. All warranties begin at overall project substantial completion.
26. This Contractor shall include a \$10,000 allowance in their Base Bid for miscellaneous Voice and Data work at the direction of the Construction Manager. Unused allowance will be returned to the Owner.
27. Base Bid condition is that the Owner supplies the switches and the Contractor installs them. The Alternate is for the Contractor to provide (furnish and install) the switches. DTI will configure the switches in either case.

END OF SECTION

SECTION 012100 - ALLOWANCES

1. RELATED DOCUMENTS

- 1.1 The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the Work specified in this Section.
- 1.2 Refer to provisions in AIA Document A232 – 2009 EDITION, GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, CONSTRUCTION MANAGER AS ADVISOR EDITION, for requirements in addition to those specified in Division 1.
- 1.3 Refer to Scope Information Sheets for all contracts bound in the Project Manual under Section 011100 - SUMMARY OF WORK. The Scope Information Sheets describe generally the work included in each contract, but the work is not necessarily limited to that described.
- 1.4 For work being constructed under separate prime contracts, provisions of this Section apply to each contract being bid.
- 1.5 Include in the Contract Sum all lump sum and unit cost allowances stated in the Contract Documents.
- 1.6 Designate in the construction progress schedule the delivery dates for products specified under each allowance.
- 1.7 Designate in the Schedule of Values the quantities of materials required under each unit cost allowance.

2. ALLOWANCES FOR PRODUCTS

- 2.1 The amount of each allowance includes:
 - A. The cost of the product or labor to the Contractor or Subcontractor, less any applicable trade discounts.
 - B. Delivery to the site.
 - C. Labor required under the allowance, only when labor is specified to be included in the allowance. If labor is not specified to be included in the allowance, it shall be included in the Contractor's bid and in the resulting Contract Sum.
 - D. Applicable taxes.
 - E. Profit and overhead.

- 2.2 In addition to the amount of each allowance, include in the Contract Sum the Contractor's costs for:
- A. Handling at the site; including unloading, uncrating and storage.
 - B. Protection from the elements and from damage.
 - C. Labor for installation and finishing, except where labor is specified to be a part of the allowance.
 - D. Other expenses required to complete the installation.
 - E. Contractor's and Subcontractor's overhead and profit.
- 2.3 Refer to Scope Information Sheets under Section 011100 - SUMMARY OF WORK for the amount of each lump sum allowance and for work specified in the specification sections listed below.
- A. B-08: Above Grade Masonry:
 - 1. 80,000 for cold weather masonry work.
 - 2. \$15,000 for miscellaneous masonry work.
 - B. B-09: Metal Studs & Drwyall
 - 1. \$100,000 for Auditorium scaffolding.
 - 2. \$10,000 for miscellaneous drywall work.
 - C. B-10: Carpentry & General Work
 - 1. \$10,000 temporary opening protection.
 - 2. 40 hours Carpenter's time.
 - 3. 40 hours Laborer's time.
 - 4. \$10,000 miscellaneous carpentry work.
 - D. B-11: Roofing & Metal Panels
 - 1. \$10,000 for miscellaneous roofing work.
 - E. B-12: Glass & Glazing
 - 1. \$10,000 for miscellaneous glass and glazing work.
 - F. B-13: Ceramic Tile
 - 1. \$5,000 for miscellaneous ceramic tile work.
 - G. B-14: Terrazzo
 - 1. \$5,000 for miscellaneous terrazzo work.
 - H. B-15: Painting

1. 80 hours plus paint materials.
 2. \$10,000 for miscellaneous painting.

 - I. B-16: Acoustical Ceilings
 1. \$5,000 for miscellaneous ceilings.

 - J. B-17: Flooring
 1. \$10,000 for miscellaneous flooring.

 - K. B-23: Mechanical & Plumbing
 1. \$10,000 for miscellaneous mechanical and plumbing.

 - L. B-26: Electrical
 1. \$10,000 for miscellaneous electrical.

 - M. B-28: Security
 1. \$10,000 for miscellaneous security work.

 - N. C-29: Voice and Data
 1. \$10,000 for miscellaneous voice and data work.

 - O. C-30: Audio/Video
 1. \$10,000 for miscellaneous audio/visual work.
3. ADJUSTMENT OF COSTS
- 3.1 Should the net cost be more or less than the specified amount of the allowance, the Contract Sum will be adjusted accordingly by Change Order.
 - A. For products and labor specified under a unit cost allowance, the unit cost shall apply to the quantities actually used with a nominal allowance for waste, as determined by receipted invoices, or by field measurement.

 - 3.2 At Contract closeout, reflect all approved changes in Contract amounts in the final statement of accounting.

END OF SECTION

SECTION 012200 - UNIT PRICES

1. GENERAL PROVISIONS

- 1.1 The general provision of the Contract, including the Conditions of the Contract (General, Supplementary and other conditions, if any) and Division 1 as appropriate, apply to the Work specified in this Section.
- 1.2 Refer to provisions in AIA Document A232 – 2009 EDITION, GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, CONSTRUCTION MANAGER AS ADVISOR EDITION, for requirements in addition to those specified in Division 1.
- 1.3 For work being constructed under separate prime contract, provisions of this Section apply to each contract being bid.

2. BASE BID

- 2.1 The Base Bid shall consist of all work shown or specified in the Contract Documents, exclusive of any Additive Unit Prices specified herein.
- 2.2 The Base Bid shall include all work in any Subtractive Unit Prices specified herein.

3. UNIT PRICES

- 3.1 State in the Bid Form the amount to be added to (or subtracted from) the Base Bid per unit of measurement for each Unit Price specified. State this amount to include all overhead and profit. No surcharge in addition to the Unit Price listed will be permitted.
- 3.2 See Section 002113, INSTRUCTIONS TO BIDDERS for related information.
- 3.3 For description of Unit Prices requested, refer to the specification. The method of stating the Unit Prices is described in the Bid Form.
- 3.4 Where both add and deduct unit prices are requested, there shall not be more than a 15% variation between the two.

4. APPLICATION OF UNIT PRICES

- 4.1 Unit prices stated in the Bid Form will apply from the time the Bid is submitted until Contract completion.

5. MEASUREMENT OF QUANTITIES

5.1 Quantities shall be determined by field measurement by contractor personnel and as verified by the Construction Manager.

5.2 At the Contractor's option, and at his expense, measurement may be made by a registered surveyor.

6. LIST AND DESCRIPTION OF UNIT PRICES

N/A

END OF SECTION

SECTION 012300 - ALTERNATES

1. GENERAL PROVISIONS

- 1.1 The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other conditions, if any) and Division 1 as appropriate, apply to the Work specified in this Section.
- 1.2 Refer to provisions in AIA Document A232 – 2009 Edition, GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, CONSTRUCTION MANAGER AS ADVISOR EDITION, for requirements in addition to those specified in Division 1.
- 1.3 For work being constructed under separate prime contracts, provisions of this Section apply to each contract being bid.

2. BASE BID

- 2.1 The Base Bid shall consist of all work shown or specified in the Contract Documents, exclusive of any Additive Alternates specified herein.
- 2.2 The Base Bid shall include all work in any Subtractive Alternates specified herein.

3. ALTERNATES

- 3.1 State in the Bid Form the amount to be added to the Base Bid for each Alternate specified.
- 3.2 See Section 002113 - INSTRUCTIONS TO BIDDERS for related information.
- 3.3 The description of Alternates contained herein is in summary form. Detailed requirements for materials and execution shall be as specified in other sections and as shown on drawings.

Alternate No. 1: Add Five (5) Tennis Courts – NOT APPLICABLE to Bid Pac C

Base Bid: Do not provide tennis court construction.

Alternate No. 1: Provide five (5) tennis courts. The scope of work shall include, but not be limited to: stone base, grading, sports surface system, line striping, nets, and posts with tension system and fencing. State on the Bid Form a price to be added to the Base Bid for all work related to adding five (5) tennis courts.

Alternate No. 2: Add Stadium Support Facility

Base Bid: Do not provide the Stadium Support Facility. Water, power and sewer rough ins to 5' outside the building line are part of the Base Bid.

Alternate No. 2: Provide all work associated with the Stadium Support Facility. The scope of work shall include, but not be limited to: above grade masonry (exterior and interior), roofing, interior finishes (carpentry work, doors, frames, accessories), painting, flooring materials, ceilings, above grade plumbing rough ins and fixtures, HVAC ductwork and equipment and above grade electrical roughs, devices and fixtures will also be included in the Alternate pricing. State on the Bid Form a price to be added to the Base Bid for all work related to the addition of the Stadium Support Facility.

Alternate No. 3: Leave Excess Materials On Site - NOT APPLICABLE to Bid Pac C

Base Bid: Remove all excess materials off site.

Alternate No. 3: Leave all excess excavated materials on site in designated stockpile location. State on the Bid Form a price to be added to the Base Bid for all work related to leaving excess materials on site.

Alternate No. 4: Add Field Bleachers – Visitor Stands - NOT APPLICABLE to Bid Pac C

Base Bid: Do not provide Field Bleachers at Visitor Stands.

Alternate No. 4: Provide Field Bleachers at Visitor Stands including foundations, complete. State on the Bid Form a price to be added to the Base Bid for all work related to providing field bleachers at the visitor stands.

Alternate No. 5: Add Field Bleachers – Home Stands - NOT APPLICABLE to Bid Pac C

Base Bid: Do not provide Field Bleachers at Home Stands.

Alternate No. 5: Provide Field Bleachers at Home Stands including Press Box and foundations complete. State on the Bid Form a price to be added to the Base Bid for all work related to providing field bleachers at the home stands.

Alternate No. 6: Add Stadium Lighting - NOT APPLICABLE to Bid Pac C

Base Bid: Do not provide Stadium Lighting.

Alternate No. 6: Provide Stadium Lighting complete. State on the Bid Form a price to be added to the Base Bid for all work related to provide stadium lighting.

Alternate No. 7: Add Parking Lot Lighting - NOT APPLICABLE to Bid Pac C

Base Bid: Do not provide Parking Lot Lighting.

Alternate No. 7: Provide lighting at far parking lots and driveways. State on the Bid

Form a price to be added to the Base Bid for all work related to provide parking lot lighting.

Alternate No. 8: Add Simulated Slate Roofing - NOT APPLICABLE to Bid Pac C

Base Bid: Provide asphalt shingle roofing.

Alternate No. 8: Provide simulated slate roofing in lieu of asphalt shingles. State on the Bid Form a price to be added to the Base Bid for all work related to providing simulated slate roofing.

Alternate No. 9: Add Terrazzo at Lobby Area and Vestibules - NOT APPLICABLE to Bid Pac C

Base Bid: Provide PVC flooring at Lobby Area and Vestibules.

Alternate No. 9: Provide Terrazzo flooring in lieu of PVC flooring at Lobby Area and Vestibules. State on the Bid Form a price to be added to the Base Bid for all work related to providing Terrazzo at Lobby and Vestibules.

Alternate No. 10: Add Terrazzo at Cafeteria and Café Vestibule - NOT APPLICABLE to Bid Pac C

Base Bid: Provide PVC flooring at Cafeteria at Café Vestibule.

Alternate No. 10: Provide Terrazzo flooring in lieu of PVC flooring at Cafeteria. State on the Bid Form a price to be added to the Base Bid for all work related to providing Terrazzo at the Cafeteria.

Alternate No. 11: Add PVC at Classrooms and Corridors - NOT APPLICABLE to Bid Pac C

Base Bid: Provide VCT flooring at Classrooms and Corridors.

Alternate No. 11: Provide PVC flooring in lieu of VCT flooring at Classrooms and Corridors. State on the Bid Form a price to be added to the Base Bid for all work related to providing PVC at Classrooms and Corridors.

Alternate No. 12: Provide Resinous Flooring at all Bathrooms - NOT APPLICABLE to Bid Pac C

Base Bid: Provide ceramic tile flooring at all Bathrooms.

Alternate No. 12: Provide resinous flooring in lieu of ceramic tile flooring at all Bathrooms. State on the Bid Form a price to be added to or deduct from the Base Bid for all work related to providing resinous flooring at bathrooms.

Alternate No. 13: Provide Spray Foam Insulation - NOT APPLICABLE to Bid Pac C

Base Bid: Provide rigid board insulation.

Alternate No. 13: Provide spray foam insulation in lieu of rigid board insulation. State on the Bid Form a price to be added to or deducted from the Base Bid for all work related to providing spray foam insulation.

Alternate No. 14: Change 3-5/8 Regal Brick to Utility Brick - NOT APPLICABLE to Bid Pac C

Base Bid: Provide 3-5/8 Regal (Emperor) Brick.

Alternate No. 14: Provide Utility Brick in lieu of 3-5/8 Regal (Emperor) Brick. State on the Bid Form a price to be added to or deducted from the Base Bid for all work related to providing Utility Brick.

Alternate No. 15: Change Cast Stone Heads and Sills to Ground Face Heads and Sills - NOT APPLICABLE to Bid Pac C

Base Bid: Provide Cast Stone Heads and Sills.

Alternate No. 15: Provide Ground Face Heads and Sills in lieu of Cast Stone Heads and Sills. State on the Bid Form a price to be added to or deducted from the Base Bid for all work related to changing cast stone heads and sills.

Alternate No. 16: Provide Full Height Ceramic Tile in Bathrooms - NOT APPLICABLE to Bid Pac C

Base Bid: Provide ceramic tile wainscot with epoxy paint.

Alternate No. 16: Provide full height ceramic tile in bathrooms in lieu of ceramic tile wainscot with epoxy paint. State on the Bid Form a price to be added to or deducted from the Base Bid for all work related to provide full height ceramic tile in bathrooms.

Alternate No. 17: Add PVC Jacketing for Exposed Piping and Ductwork - NOT APPLICABLE to Bid Pac C

Base Bid: Provide unjacketed insulation at exposed piping and ductwork.

Alternate No. 17: Provide PVC jacketing for exposed piping and ductwork. State on the Bid Form a price to be added to or deducted from the Base Bid for all work related to provide PVC jacketing for exposed piping and ductwork.

Alternate No. 18: Add Left/Right Clusters for Sound System - NOT APPLICABLE to Bid Pac C

Base Bid: Do not provide Left/Right clusters for Sound System in Auditorium.

Alternate No. 18: Provide Left/Right clusters for Sound System in Auditorium. State on the Bid Form a price to be added to or deducted from the Base Bid for all work related to provide Left/Right clusters for Sound System in Auditorium.

Alternate No. 19: Add Wireless Microphones - NOT APPLICABLE to Bid Pac C

Base Bid: Do not provide wireless microphones at Auditorium.

Alternate No. 19: Provide wireless microphones at Auditorium. State on the Bid Form a price to be added to or deducted from the Base Bid for all work related to provide wireless microphones.

Alternate No. 20: Cisco Switches

Base Bid: Owner shall furnish the Cisco switches. Contractor shall install them. The Alternate is for the Contractor to provide (furnish and install) the switches. DTI will configure the switches in either case.

Alternate No. 20: Contractor shall furnish the Cisco switches. Installation by the Contractor is included in the Base Bid. State on the Bid Form a price to be added to or deducted from the Base Bid for all work related to furnishing the Cisco switches.

END OF SECTION

SECTION 012600 - CHANGE ORDER PROCEDURES

1. GENERAL:

- 1.1 The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the Work specified in this Section.
- 1.2 Refer to provisions in AIA Document A232 – 2009 EDITION, GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, CONSTRUCTION MANAGER AS ADVISOR EDITION, for requirements in addition to those specified in Division 1.
- 1.3 The Construction Manager is responsible for processing all change orders. Each request will be assigned a change order request (COR) number. The Change Order Request & Execution Form will be initiated via the web-based project management system (Building Blok) used by the CM.
- 1.4 It is to be clearly understood that no extra work shall commence without an approved written and executed change order from the Owner.

2. INITIATING A CHANGE ORDER:

- 2.1 Specific changes initiated by the Owner, Architect, Construction Manager (CM) or Contractor will be processed as follows:
 - A. The Owner will authorize the Architect to prepare sufficient documents to establish an accurate price. These documents to be forwarded to the Construction Manager and Owner “for pricing only, not authorized for construction.” The Construction Manager will develop the estimate (within 2 weeks) showing a breakdown by trades with all trade contractor quotes. The Owner will approve or reject the change request within two (2) weeks. If the Owner elects to proceed with the change, the Construction Manager will prepare formal change orders to the various trade contractors involved in the change and reference in all formal change orders the original change order request number.
 - B. Field Change: Contractor shall immediately notify the Construction Manager of a change due to field conditions or site conditions. If documents cannot be prepared for pricing due to schedule constraints, the Construction Manager will make every effort in estimating the field change. If the Owner and Construction Manager agree that certain field changes should be handled on a time and material basis, the Construction Manager will closely monitor the Contractor's labor and material affecting this change. At the completion of the work a formal change order will be issued.
 - C. Contractor Change: If a Contractor initiates a change order for work not included in the Contract, the Construction Manager and Architect will research the validity of the request, verify quantities and pricing and submit to the Owner for approval on a change order request.

D. Time limits on change order requests must be submitted in writing to the Construction Manager within 2 working days following a change in work giving rise to such a request or within 2 working days after the discovery of conditions giving rise to such a request. Supporting documentation required to substantiate such requests must be submitted within 10 working days.

2.2 The additional cost, or credit to the Owner resulting from a change in the Work shall be by mutual agreement of the Owner, Contractor, Construction Manager and the Architect.

3. PROCESSING A CHANGE ORDER:

3.1 The Contractor will fill in the Change Order Request & Execution Form (COREF) with a brief description of the change, any time extension, and cost changes.

3.2 The Contractor will attach to the COREF copies of the written quotations from the trade contractors, Contractors, and suppliers. The Labor Detail Sheet and the Change Order Detail forms must be added as an attachment to the COREF. The Contractor and each sub-tier contractor (as applicable) must fill out the Labor Detail Sheet and Change Order Detail Sheet. Samples of these forms are attached.

3.3 In all cases, this cost or credit shall be based on the "DPE" wages required and the "invoice price" of the materials/equipment needed.

3.4 "DPE" shall be defined to mean "direct personnel expense". Direct payroll expense includes direct salary plus customary fringe benefits (prevailing wage rates) and documented statutory costs such as workman's compensation insurance, FICA, and unemployment insurance (a maximum of the prevailing wage rate times 1.35).

A. "Fringe Benefit" is any medical, life or disability insurance, paid time off, etc.

B. "Worker's Compensation" is the insurance required for injuries including medical leave, etc.

C. "FICA" is the costs association with Social Security and Medicare insurance.

D. "Unemployment insurance" is the cost associated with the governmental assessment for employee's unemployment benefits.

3.5 "Invoice price" of materials/equipment shall be defined to mean the actual cost of materials and/or equipment that is paid by the Contractor (or Subcontractor) to a material distributor, direct factory vendor, store, material provider, or equipment leasing entity.

3.6 In addition to the above, the Contractor is allowed markup for overhead and profit on additional work performed as outlined in Specification Section 012613, Contractor Compensation.

- 3.7 Building Blok Procedures: The Contractor will submit all change order requests and supporting documentation via the Building Blok web-based project management system. Each Contractor will be issued a unique login and password. Each contractor must submit the information as follows:
- A. Create a new change order, from your "To-Do List" by clicking on the "Create Issue" tab in the upper right corner and select "Change Order Request".
 - B. The Contractor will enter a brief description of the change in the "Summary" block. A detailed description of the change will be entered in the "Description of Change" block, to include any changes to documents or time extension. The cost of the change will be entered in the "Total Cost Change" block.
 - C. The Labor Detail Sheet and the Change Order Detail forms must be added as an attachment to the request. The Contractor and each sub-tier contractor (as applicable) must fill out the Labor Detail Sheet and Change Order Detail Sheet. Samples of these forms are included behind this section. In addition to these forms, the Contractor also must attach any material and equipment rental quotations. All of these documents should be scanned and saved as a PDF file. Click on the "Browse" box to upload the file. Be sure to wait until Building Blok tells you the file was "Uploaded Successfully".
 - D. Once the information is entered on the form and the proper attachments are uploaded, the contractor will click "Save". The Contractor will be prompted to enter their password to approve an electronic signature. Once you save the request you will have an opportunity to check it before submitting it to the CM. After you verify the COREF is correct click "Recommend Approval" to submit the change request to the CM. The Contractor will then be prompted to re-enter the password to approve an electronic signature and complete the submission request. Click on "Home" in the upper left corner to make sure the change order does not appear on your To-Do List.
 - E. The Change Order Request will then be reviewed by the CM Project Manager and Recommended for Approval, Rejected, or returned to the Contractor for additional information. Once the Construction Manager, Owner, and Architect have approved the request all parties will receive an email from Building Blok notifying them that a fully executed Change Order and Contract Recalculation Form can be downloaded from Building Blok. Hard copies of the executed change order and recalculation form will not be provided by the CM.

It is to be clearly stated that no extra work shall commence without an approval from the Construction Manager.

END OF SECTION



CHANGE ORDER REQUEST & EXECUTION FORM

110 South Poplar Street
 Suite 400
 Wilmington, DE 19801

Tel. 302-421-5700
 Fax 302-421-5715

DATE:
 CONTRACT:
 CONTRACTOR:

PROJECT NAME:
 REQUEST NUMBER:
 CHANGE ORDER NUMBER:
 STATE PO NUMBER:

The following is a summary of the request submitted by the contractor as described above. All supporting documents have been attached and described herewith. This summary shall contain a total amount of compensation requested by the contractor as well as any request for an extension in contract time. It shall be understood that the amounts described below shall remain valid for a period of sixty days from the date described above unless otherwise stated.

A detailed breakdown of Labor, material, equipment, and subcontract costs must be attached to be considered for review.

1. Summary Description(s):
2. Total Cost Change:

REVIEWED		
This request has been reviewed and ___ approval ___ disapproval is recommended by:		
Name	Title	Date
APPROVED		
This change order request is not approved until executed by all parties bound by a contractual relationship. Upon execution it shall represent a modification to the agreement and is subject to all terms and conditions of the contract documents.		
Contractor: _____		Architect: _____
Signed By: _____		Signed By: _____
Title: _____		Title: _____
Date: _____		Date: _____
EDiS Company _____		Owner: _____
Signed By: _____		Signed By: _____
Title: _____		Title: _____
Date: _____		Date: _____



CHANGE ORDER DETAIL FORM
(Provided by contractor, subcontractor or sub tier contractor)

DATE SUBMITTED:

CONTRACT:

CONTRACTOR:

PROJECT NAME:

CHANGE ORDER REQUEST #:

LABOR SECTION			
TRADESMAN(s):	LABOR HOURS	RATE (per schedule)	SUBTOTAL
Subtotal			

MATERIAL SECTION			
MATERIAL:	QUANTITY	UNIT COST	SUBTOTAL
Subtotal			

EQUIPMENT SECTION			
EQUIPMENT:	QUANTITY	UNIT COST	SUBTOTAL
Subtotal			

SUBTOTAL	
SUBCONTRACTOR/ SUB TIER*	
OH & PROFIT (10% on sub/sub tier only)	
BOND COST	
OH & PROFIT (15% on own work)	
GRAND TOTAL	



LABOR DETAIL FORM

(Provided by contractor, subcontractor, or sub-tier contractor)

DATE:

CONTRACT:

CONTRACTOR:

PROJECT NAME:

CHANGE ORDER REQUEST #:

CLASSIFICATION:			
Base Wage Rate:			
Health Insurance			
Holidays			
Sick Days			
Life Insurance			
Disability Insurance			
Dental Insurance			
Company Vehicle			
401K			
Education			
Other (<i>specify below</i>)			
Subtotal			
Posted Prevailing Rate			
FICA (Social Security & Medicare)			
SUTA (State Unemployment)			
FUTA (Federal Unemployment)			
General Liability Insurance			
Worker's Compensation			
Total Wage Rate			

SECTION 012613 - CONTRACTOR COMPENSATION

1. GENERAL

- 1.1 The Contractor agrees to perform any additional Work, for the net cost of materials and labor (including wages paid, payroll taxes, and all insurance) plus the following percentage for all of his overhead and profit, which includes Field Supervision:

The percentages to be added or allowed for any Work change involving both added Work and omitted Work shall be applied only to the net difference in cost.

- (a) 15% mark-up (10% overhead and 5% profit) by the Contractor on Work performed by his own forces.
 - (b) For work done by a Subcontractor, 10% for subcontractor overhead and 5% for subcontractor profit to which the Contractor may add 7.5% for his overhead and profit combined.
 - (c) Contractor mark-up shall include supervision, home and field overhead, all self-owned small tools and equipment.
- 1.2 When the Contractor is directed to perform overtime work at the CM (Owner) expense to accelerate contractual work, the cost for same shall only be the actual premium costs incurred by the Contractor.

END OF SECTION

SECTION 012900 - PAYMENT PROCEDURES

1. GENERAL PROVISIONS

- 1.1 The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other conditions, if any) and Division 1 as appropriate, apply to the Work specified in this Section.
- 1.2 Refer to provisions in AIA Document A232 - 2009 Edition, GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, CONSTRUCTION MANAGER AS ADVISOR EDITION, for requirements in addition to those specified in Division 1.
- 1.3 For work being constructed under separate prime contracts, provisions of this Section apply to each contract being bid.

2. REQUIREMENTS INCLUDED

- 2.1 Submit Applications for Payment to Construction Manager in accordance with the schedule and procedures established in the Contract Documents.

3. RELATED REQUIREMENTS

- 3.1 Owner-Contractor Agreement.
- 3.2 Conditions of the Contract: Article 9 PAYMENTS AND COMPLETION.
- 3.3 Section 01 31 13: Project Coordination Meetings
- 3.4 Section 01 33 00: Submittal Procedures
- 3.5 Section 01 77 00: Closeout Procedures

4. FORMAT AND DATA REQUIRED

- 4.1 Submit itemized applications typed on AIA Document G732, Application and Certificate for Payment, and Continuation Sheet G703, examples of which will be furnished to the Contractor at the Pre-Construction meeting.
- 4.2 Provide itemized data on Continuation Sheet:
 1. Format, schedules, line items and values: Duplicates of those of the schedule of values previously accepted by the Construction Manager.

5. PREPARATION OF APPLICATIONS FOR PROGRESS PAYMENTS

- 5.1 Form: AIA Document G732

1. Fill in required information, including that for Change Orders executed prior to date of submittal of application.
2. Fill in summary of dollar values to agree with respective totals indicated on Continuation Sheets.

5.2 Continuation Sheets:

1. Line items of components of Work will be subject to Owner's review and approval under the Provisions of Section 013300 - SUBMITTALS, and the General Conditions. Continuation Sheets shall follow Schedule of Values submitted at the start of the job.
2. Fill in total list of all scheduled components of Work, with item number and scheduled dollar value for each item. Fill in values of work completed in the period.
3. Fill in dollar value in each column for each scheduled line item when work has been performed or products stored; round off values to nearest dollar.
4. List each Change Order executed prior to date of submission, at the end of the Continuation Sheets; list by Change Order Number, and description, as for an original component item of work.

6. PREPARATION OF APPLICATION FOR FINAL PAYMENT

- 6.1 Fill in Application form as specified in progress payments.

7. SUBMITTAL PROCEDURES

7.1 Complete Invoice:

1. Submit completed Application to the Construction Manager by the date stipulated in the Project Manual.

- 7.2 Number: Submit 3 copies of each invoice.

END OF SECTION

SECTION 013113 - PROJECT COORDINATION MEETING

1. PROJECT COORDINATION MEETING

1.1 An on-site project coordination meeting will be held on a biweekly basis throughout the project construction period.

2. ATTENDANCE

2.1 Attendance at the project coordination meeting is mandatory of each Contractor or major supplier on the project.

2.2 The representative of the Contractor shall be the Project Manager and field superintendent, unless a substitute representative has been approved by the Construction Manager.

2.3 Contractor will begin attending the Project Coordination Meetings at least 4 weeks prior to mobilization on site, and will continue until the Contractor has fulfilled the obligations of his Contract.

2.4 Contractors that fail to attend these meetings will be penalized, through a deductive change order, \$100 for each meeting they miss, unless they have prior permission to miss the meeting.

2.5 EDiS will prepare meeting minutes and distribute them to all of the Contractors. Each Contractor is required to review the meeting minutes and follow up on items assigned. Each Contractor will be responsible for disseminating information discussed during these meetings to their field personnel, subcontractors, and suppliers.

3. AGENDA

3.1 The Construction Manager will set the agenda for the biweekly Project Coordination Meeting.

3.2 At a minimum, the Contractor shall be prepared to discuss the following:

1. Actual vs. as planned progress for the prior two week period.

2. Planned construction activities for the next four weeks.

3. Contract document clarifications.

4. Coordination items with other contractors.

5. Quality Control.

6. Recently issued change orders.
7. Potential change orders.
8. Submittals and shop drawings.
9. Other items requiring Construction Manager's attention.

END OF SECTION

SECTION 013116 - BIM MODELING COORDINATION DRAWING GUIDELINES

1. GENERAL

- 1.1 All Sheetmetal, Mechanical Piping, Plumbing, Fire Protection (FP), Electrical and ATC Subcontractors will be required to prepare 3D coordination drawing using the latest AutoCAD and Navisworks Clash Detective programs. Coordination drawings will be distributed via email and/or disk. The mechanical piping and plumbing work may be awarded to the same subcontractor so some steps such as emailing amongst themselves may not apply; the procedures contained herein will generally be the same. All costs shall be included in the contractors bid.

NOTE: The coordination drawings will be administered through the Building Blok Project Manager system. See Section 01 12 50 Web Based Project Manager System for Construction.

- 1.2 Contract architectural, MEP and structural drawings (3D) will be available electronically from the designated FTP site.
- 1.3 All ductwork, piping and electrical systems shall be thoroughly dimensioned as to location and height above finished floor. Each different system will be drawn in a different color. Yellow shall not be used. Text shall be uniform in size across all trades. Object blocks (i.e. sprinkler heads) shall be indicated close to their actual size. Piping 2" and larger shall be indicated as a double line. Insulation thickness of pipes and duct shall be indicated.
- 1.4 The Sheetmetal Subcontractor will take the lead and develop a drawing list for approval by the Construction Manager subdividing the buildings into separate areas of zones. The drawing list will be for submission and will indicate a submission schedule coordinated with the construction activities. The drawings shall be developed in a sequential fashion so as to not delay installation of the work or the overall project schedule. The Sheetmetal Subcontractor shall include a master key plan so that the area of each drawing can be readily identified as to the location within each building. The Construction Manager shall prepare a schedule identifying the activity and duration of each submission.
- 1.5 Following a coordination kick-off meeting, a list of each subcontractor, their coordination contact person, phone number and email addresses will be generated and distributed to all parties. As each drawing is completed, it is to be emailed to each party on the coordination list.
- 1.6 The Sheetmetal Subcontractor shall maintain a weekly status log on the Building Blok System. Each subcontractor is responsible to submit and coordinate his work with each trade.
- 1.7 Preparation of coordination drawings shall commence at the issuance of a letter of

intent. The coordination drawings may lack data in certain instances pending receipt of equipment drawings, but sufficient space shall be allotted for the items affected. When final information is received, such data shall be promptly inserted on the composite by that subcontractor.

- 1.8 Coordination drawings shall indicate clearances for servicing and accessing equipment, including space for equipment disassembly required for periodic maintenance.
- 1.9 Coordination is the responsibility of all MEP subcontractors; the Sheetmetal Contractor shall assign a project manager dedicated to oversee this process. The Sheetmetal Project Manager will call meetings, weekly, or as required, which subcontractors must attend to avoid delay. Failure to attend will require the subcontractor to field run the work not coordinated. No extra compensation will be paid to any subcontractor for relocating any equipment, duct, pipe, conduit or other material that has been installed without proper coordination. If the installation of any uncoordinated work or improper installation or coordinated work necessitates additional work by other Subcontractors, The cost of such additional work shall be assessed to the Subcontractor responsible as determined by the Construction Manager.
- 1.10 At the conclusion of each composite drawing(s) coordination process, the Sheetmetal Subcontractor will notify the Construction Manager whereupon an on-site coordination meeting will be scheduled for the purpose of signing off on each respective drawing(s). Each Subcontractor will not be authorized to release any material for fabrication or installation until the composite drawing(s) has been prepared and the signature process is executed and approved by the Construction Manager.
- 1.11 Coordination drawings of the underground and underslab piping by the plumbing Subcontractor and electrical work will be required. These drawings shall be prepared in 3D modeling software. The Plumbing Contractor shall proceed in the preparation of the coordinated underground plumbing drawings. The Plumbing Contractor shall add to the background drawings pertinent information such as footings, grade beams, column piers, etc. into the background. The Plumbing Contractor shall include location, invert, size and plumbing accessories, dimensioned to centerline of adjacent columns. At the completion of this work, the Plumbing Contractors will E-mail their work to the Electrical Contractor for incorporation of all below slab electrical conduit and electrical utilities. Upon completion of this work, the Plumbing Contractor shall prepare a coordinated underground composite plan for sign-off as described in Paragraph 1.22 below:
- 1.12 As soon as practical, the Sheetmetal Subcontractor will coordinate the background model of all architectural elements of the building indicating all walls, partitions, columns, concrete beams, structural steel with bottom of steel elevations, windows, doors, room numbers, ceiling heights, ceiling types, and ceiling layouts, floor

elevations and other structural and architectural features. The Sheetmetal Subcontractor shall prepare but not limited to reflected ceiling plans showing the location of light fixtures (which shall include depths), speakers, smoke/heat detectors, fire alarm horn/strobes, sprinklers, grilles, registers, diffusers and any other components requiring coordination. In addition, the Sheetmetal Subcontractor shall inform the Project Manager of any changes in layouts or dimensions as may be issued during the coordination process through addendums, bulletins, RFIs etc. The Sheetmetal Subcontractor shall electronically forward these background drawings to all participants.

- 1.13 Once the layout drawings are prepared all subcontractors shall incorporate all equipment and panels into the model prior to the Sheetmetal Subcontractor proceeding with their own work. Thereafter the Sheetmetal Subcontractor will prepare layout drawings of all ductwork. These drawings will show all wall fire ratings, registers, grilles, diffusers and similar features as well as locations of all valves, dampers, damper operators and other items requiring access for maintenance. All dimensions should be from centerlines of columns and ductwork elevations shall be from finished floor slab.
- 1.14 The Sheetmetal Subcontractor upon completion of his work will electronically forward his data to the Mechanical Piping Subcontractor and copy all participants. The Mechanical Piping Subcontractor shall download the sheetmetal data and incorporate, by separate layer, their own piping routing, valves (including control valves) with valve tags, as well as other areas requiring access for service and maintenance to determine their relationship and possible interference with the mechanical, architectural or structural features to be performed as part of the work.
- 1.15 The Mechanical Piping Subcontractor upon completion of his work will electronically forward his data to the Plumbing Subcontractor and copy all participants. The Plumbing Subcontractor shall download the sheetmetal and piping data and incorporate, by separate layer, their own routing as well as other areas requiring access for service and maintenance to determine their relationship and possible interference with the mechanical, architectural or structural features to be performed as part of the work.
- 1.16 The Plumbing Piping Subcontractor upon completion of his work will electronically forward his data to the FP Subcontractor and copy all participants. The FP Subcontractor shall download the drawing and incorporate, by separate layer, their own routings as well as other areas requiring access for service and maintenance, to determine their relationship and possible interferences with the mechanical, electrical, plumbing and architectural or structural items to be installed as part of the overall work.
- 1.17 The Fire Protection Subcontractor will then electronically forward his data to the Electrical Subcontractor(s) and copy all participants. The electrical Subcontractor shall download the drawing and incorporate, by separate layer, their own routings

of conduit equal to or greater than 2", bus ducts, cable tray, junction boxes, as well as the depth of all light fixtures, access panels, etc. as required to determine the relationship and possible interferences with the plumbing, mechanical, architectural or structural items to be installed as part of the overall work. In addition the Electrical Subcontractor shall indicate the location of all electrical panels, substations, switchgear, and MCC's. The Electrical Subcontractor will be responsible to verify that the electrical lighting layout shown on these drawings is correct and to make corrections and additions of all other light fixtures as required. In areas where no mechanical work occurs, but where other crowded electrical installations are evident, the Electrical Subcontractor shall prepare similar drawings.

- 1.18 The Carpentry Subcontractor shall review each issuance of every drawing to determine any possible interference with wall, soffit or ceiling construction and resolve with the respective subcontractors. The ATC Subcontractor shall review each issuance of every drawing to determine any possible interference regarding locations of controls to ensure sufficient access to them is being maintained.
- 1.19 The Sheetmetal Subcontractor shall provide one color composite set of drawings and forward them to the Construction Manager. This composite will then be reviewed during meetings determined by the Construction Manager at which all subcontractors shall be represented in order to review and resolve any real or apparent interference or conflicts.
- 1.20 In the preparation of all the final composite drawings, large scale details as well as cross and longitudinal sections shall be made as required to fully delineate all conditions. Particular attention shall be given to the locations, size and clearance dimensions of equipment items, shafts and similar features. The final composite drawings shall include the locations of all controls, tie-ins, connections for other subcontractor's work, and pipe and duct insulation as required. Each trade subcontractor indicating their acceptance and approval of the indicated routings and layouts and their relationship with the adjoining or contiguous work of all subcontractors shall then sign off these final composite drawings. Therefore, no unauthorized deviations will be permitted. If deviations are made without the knowledge and agreement of the Construction Manager and other affected Subcontractors, the work in question will be subject to removal and correction at no additional cost to the Owner.
- 1.21 In preparing the composite drawings, minor changes in duct, pipe or conduit routings that do not affect the intended function may be made as required to avoid space conflicts, when mutually agreed. Items may not be revised, exposed items relocated or items run exposed when not intended without approval. No changes shall be made in any structural members or architectural features which affect the function or aesthetics of the buildings. If conflicts or interferences cannot be satisfactorily resolved, the Architect shall be notified and his decision obtained.
- 1.22 After final composite drawings have been accepted and approved, the Sheetmetal

Subcontractor shall print one (1) color copy to be signed by all subcontractors. The Sheetmetal Subcontractor shall provide and distribute two (2) prints to each of the subcontractors, and two (2) set of prints for submittal purposes to the Construction Manager. Subcontractors requiring further prints for their own distribution go to Building Blok to download. The original signed off drawing shall be sent to the Construction Manager for permanent possession.

- 1.23 The record copies of final composite drawings shall be retained by each subcontractor as a working reference. All shop drawings, prior to their submittal to the Construction Manager shall be compared with the composite drawings and developed accordingly by the subcontractor responsible. Any revisions to the composite drawings, which may become necessary during the process of the work, shall be noted by all subcontractors and shall be neatly and accurately recorded on the record copies. Each subcontractor shall be responsible for the up-to-date maintenance of his own record copies of the composite drawings and to keep one (1) copy available at the site. The composite drawings and any subsequent changes thereto shall be utilized by each subcontractor in its development of the as-built drawings. Note: the coordination drawings may be used as "As-builts" (with appropriate changes and changing to title block).

2. COORDINATION FOR ELECTRICAL AND CONTROLS

- 2.1 The Electrical Subcontractor and the ATC Subcontractor will prepare coordinated floor plan drawings of electrical, control devices and panel locations on architectural floor plans using 3D modeling software. All devices and panels shall be indicated on these plans with indication of the location from nearest end wall or column and the mounting height from finished floor.
- 2.2 The Electrical Subcontractor and ATC Subcontractor will prepare coordinated electrical and special systems room drawings indicating all electrical, ATC , fire alarm, security, nurse call and telecommunications panels, equipment and devices using a 3D modeling software.
- 2.3 Devices indicated on the plans shall include but not be limited to receptacles, switches, emergency power off switches, dimmers, sensors, wall mounted exit lights, fire alarm horns and strobes, fire alarm pull stations, security devices, nurse call, thermostats, humidistats, tele/data outlets and all special systems.
- 2.4 Panels indicated on the plans shall include but not be limited to lighting, power, receptacles, BAS/ATC, security and fire alarm.
- 2.5 Plans shall show the necessary clearances in front of each panel as required by electrical codes.
- 2.6 The Carpentry Subcontractor shall review these plans and coordinate the spacing of wall studs and location of blocking to allow for the installation of the devices and

panels per these coordinated drawings.

- 2.7 Failure to properly perform this coordination may require the relocation of the devices after they are installed. The subcontractor will be responsible for all relocation costs incurred which may involve but no limited to reframing work, drywall repairs and repainting.

3. COORDINATED SLEEVE DRAWINGS

- 3.1 The Sheetmetal, Plumbing, Mechanical, Fire Protection, Electrical and ATC Contractors will prepare coordinated floor and wall sleeve opening drawings for review by the Structural Engineer.
- 3.2 The above work will be for foundation walls and slabs only.
- 3.3 Coordinated drawings shall differentiate between those openings that are already indicated on the contract drawings, openings that will be sleeved prior to the floor or wall being poured and those openings that will be core-drilled.

END OF SECTION

SECTION 013119 – PRE-INSTALLATION MEETINGS

1. PRE-INSTALLATION MEETINGS

1.1 An on-site pre-installation meeting will be held at least two weeks prior to commencement of installation of work.

2. ATTENDANCE

2.1 Attendance at the pre-installation meeting is mandatory of each Contractor and/or major supplier as required for each specific meeting listed below.

2.2 The following individuals shall attend these meetings:

- Contractors' Project Manager
- Contractors' Field Superintendent
- Contractors' Safety Representative (as needed)
- Key Subcontractors, Suppliers, and Vendors
- EDiS Project Manager
- EDiS Field Manager
- EDiS Safety Director (as needed)
- EDiS MEP Specialist (as needed)
- Owner's Representative (as needed)
- Architect/Engineer (as needed)
- Governmental Agency Representatives (as needed)
- Testing/Inspection Agency Representatives (as needed)
- Utility Company Representatives (as needed)

3. SUBMITTALS

3.1 Each contractor is responsible to have all submittals and mock-ups, as related to the pre-installation meeting scope of work, submitted and approved prior to commencement of the pre-installation meeting.

4. LIST OF REQUIRED MEETINGS

- Sitework – Erosion and Sediment Control
- Sitework
 - Bulk Grading
 - Asphalt Paving
 - Concrete Curbs, Gutters, & Sidewalks
- Landscaping
- Site Utilities
- Foundations & Concrete Slabs
- Underslab Utilities
- Structural Steel Erection & Miscellaneous Metals OSHA mandated Safety Meeting
- Roofing OSHA mandated Safety Meeting
- Building Envelope
 - Exterior Structural Stud Assembly

- Masonry & Stone
- Curtain Wall/Glazing/Storefronts
- Doors/Frames/Hardware
- Interior Glass and Glazing
- Finish Carpentry & Millwork
- Acoustical Ceilings/Acoustical Wall Panels
- Paint and VWC
- Flooring (VCT, Carpet)
- Terrazzo Flooring
- Hydraulic Elevators
- Kitchen Equipment
- Athletic Courts and Equipment
- Partition Walls
 - Metal Studs
 - Drywall
 - Insulation
 - Doors/Frames/Hardware
- Hydraulic Elevators
- Fire Protection
 - Fire Sprinkler Systems
 - Fire Alarm Systems
 - Ansul System
- MEP Coordination
 - Mechanical Piping Roughin
 - Plumbing Roughin
 - Insulation
 - Electrical Roughin
 - Electrical – Bonding, grounding, lightning protection
 - Automatic Temperature Controls
 - Commissioning
- Voice/Data Low Voltage Wiring
- Security System
- Audio-Visual Equipment
- Owner Furnished Equipment
- Final Cleaning

5. AGENDA

- 3.1 At a minimum, the Contractor shall be prepared to discuss the items as listed on the agenda template shown on the following page:

PROJECT: _____
PRE-INSTALLATION MEETING : (Insert Phase of Work)

A. ATTENDEES:

<u>NAME</u>	<u>COMPANY</u>	<u>WORK ITEM</u>	<u>CONTRACT</u>

B. TESTING & INSPECTION REQUIREMENTS *(THESE REQUIREMENTS COME FROM THE PROJECT MANUAL)*

C. REVIEW CONTRACT DRAWINGS AND SPECIFICATIONS

<u>Drawing / Spec No.</u>	<u>Comments / Conflicts</u>

D. REVIEW SCOPES OF WORK *(SEE SECTION 011100 IN THE PROJECT MANUAL)*

E. REVIEW RELEVANT RFI'S

F. REVIEW SUBMITTALS *(SEE THE SUBMITTAL REGISTER)*

G. REVIEW MATERIALS AND DELIVERIES

H. REVIEW SCHEDULE AND SEQUENCE OF WORK

I. JOB SITE SAFETY (SEE THE CONTRACTOR'S SAFETY PROGRAM OR OSHA)

- Safety Plans must be submitted before the start of work
- Certificates of Insurance need to be submitted before the start of work
- Minimum PPE – Hardhats, steel toe boots, safety glasses
- Lock-out, Tag, Test and Try ALL utilities is critical before the start of demolition
- Signage & HAZCOM Requirements
- Potential Hazards
 - Excavations >4 ft
 - Slips/trips/falls
 - Existing utilities to remain and protected
 - Overhead debris
 - Power tools
 - Heavy equipment

J. COORDINATION WITH OTHER TRADES

K. ACTION ITEMS AND RESPONSIBILITY

END OF SECTION

SECTION 013125- WEB-BASED PROJECT MANAGEMENT SYSTEM

1. GENERAL PROVISIONS

- 1.1 The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the Work specified in this Section.
- 1.2 Refer to provisions in AIA Document A232 - 2009 EDITION, GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, for requirements in addition to those specified in Division 1.
- 1.3 Refer to Scope Information Sheets for all contracts bound in the Project Manual under Section 011100 - SUMMARY OF WORK. The Scope Information Sheets describe generally the work included in each contract, but the work is not necessarily limited to that described.
- 1.4 All Contractors shall use Internet/Web-based project management software to transmit documents, track, and otherwise manage this project.
- 1.5 Use of this project management software will not change any contractual responsibilities of the construction team members.

2. DEFINITIONS

- 2.1 System: A real time web-based software that shares data, translates data, organizes data, facilitates communication, archives actions, and offers scheduling prompts to identified Users.
- 2.2 Users: Authorized participants of this project furnished with a unique password and authorized to access the system to view/input/export data. Owner, Construction Manager, Architect, and the Contractors are all Users. Other Users may be added as necessary.
- 2.3 Contacts: Entities identified to automatically receive specific transmissions or entities selected to receive specific information sent by the system through to an e-mail address.
- 2.4 Signees: Those individuals identified, by the Contractors, authorized to sign change orders and payment applications via electronic signature. This electronic signature is as contractually binding as an original signature on paper.

3. USE OF SYSTEM

- 3.1 The use of the system is mandatory for the documentation of the transmittal of all non-oral information, even if the actual transmission of the information is by another means.
- 3.2 The use of the system will be mandatory by the Contractors to send, retrieve, and respond to data.

3.3 In addition to this web-based project management system, the Contractors will be required to use electronic mail (email) for day-to-day communication and correspondence. Email will be the primary means of transmitting written communication (i.e. meeting minutes, draft pay applications, etc.).

4. QUALITY ASSURANCE

4.1 A three hour training session in the use of the software for this project will be offered by the Construction Manager at a location convenient to the project site. Attendance by one member of each Contractor's organization is mandatory. Additional attendees may enroll based on availability of training space. All attendees must have a working knowledge of computers. Training can not begin until three working days after the receipt of the submittals indicated below.

4.2 Technical assistance will be provided by on-line help, email, or telephone for all Users throughout the life of the project.

5. SUBMITTALS

5.1 Submit to the Construction Manager, within 5 days following the receipt of the letter of intent to award, in an electronic template, the following:

- a. Electronic logo of organization (as needed)
- b. Names, mailing address and electronic address of its Users and Contacts.
- c. Designation the role/responsibility for each User

6. SOFTWARE AND HARDWARE REQUIREMENTS

6.1 Each User shall provide and maintain a computer with high speed internet access and an email address. The computer shall have a high speed internet browser (Internet Explorer 8.0 or higher, Firefox version 3.6.12 or higher, Google Chrome or Safari version 5.0 or higher) and a high speed cable Internet access, high speed DSL or T1 line.

6.2 License(s) to Use System - Each Contractor will be provided unlimited licenses to use the system for this project. Each license will allow secure unlimited usage from the notice to proceed until the original contract completion date.

7. SYSTEM DESCRIPTION

7.1 The web based project management system is a "secure, real-time, interactive, centralized database" specifically established and maintained for the management of this construction project. The product is designed to facilitate communication and improve the time management of its users by facilitating the sharing of information. Information will be available 24/7, from any computer meeting the specifications listed above. The information is fully protected. The electronic platform allows information to be transmitted across the internet reducing printing and postage costs and the time associated with such activities.

- 7.2 The system contains a directory of the project participants.
- 7.3 The system includes templates, with the CM's letterhead, for each document created inside the system. The template allows the use of "pull down" menus to complete significant portions of each document.
- 7.4 The system allows the templates (and attached documents created outside the system) to be distributed to Users and Contacts.
- 7.5 The System contains "translation software" to permit the viewing (and marking) of documents created outside the system. The system can view documents created by different software programs and can deliver images of its translation to any computer meeting the criteria listed above.
- 7.6 The system can be personalized by the Construction Manager to automatically send e-mail notices upon issuance of certain documents if such a practice facilitates the User's business needs.
- 7.7 The system is the product of *Building Blok LLC* (www.buildingblok.com) and will be continuously updated.
- 7.8 The Construction Manager will administer the Building Blok User accounts for this project.
8. DOCUMENTS CREATED INSIDE THE SYSTEM
- 8.1 The following documents shall be created on templates inside the system.
- a. Transmittals for submittals processed in the system. The transmittals are automatically created by the system when the submittal is uploaded.
 - b. Submittal Register showing all of the submittals required of the contract, assigned to each Contractor.
 - c. Submittal Log: The CM will maintain submittal log after it is initialized.
 - d. RFI (Requests for Information)
 - e. Change Orders
 - f. RFP (Requests for Proposal)
 - g. ASI (Architect's Supplemental Instructions)
 - h. Tasks & Memos as determined by the CM
 - i. Payment Applications
 - j. Closeout Tracking Log
- 8.2 The following documents may, at each Users option, be created on the system.
- a. Morning & Afternoon Activity Reports generated by the system
 - b. E-mails: Contacts that do not have access to the system may be sent information from the system, by the system.
 - c. Reports of information on the system
 - d. Project Notices: "Broadcast" messages can be sent to other Users system entry screen.

9. DOCUMENTS CREATED OUTSIDE THE SYSTEM AND DISTRIBUTED BY THE SYSTEM

9.1 The following documents are expected to be created outside the system and distributed through the system. The actual documents may be scanned or electronically attached to the transmittal.

- a. Technical Submittals: Shop drawings, product data, testing reports, certifications, installation instructions, operation & maintenance manuals, will be submitted and distributed through the system. The Architect will return all submissions through the system electronically. The Construction Manager will distribute submittals (after Architect's action) electronically. Contractors may download and distribute submittals to their subcontractors and suppliers or elect to print paper copies for distribution, or both.
- b. Photographs: Digital photographs and scanned images can be loaded onto the system and shared.
- d. Schedule of Values/ Payment Applications: (The "pencil" review of these documents can occur inside the system).
- e. Change Orders: (The "pencil" review of these documents can occur inside the system.)
- g. Schedules: The schedule document(s) will be available for review on the system.
- h. Data created in other software may be uploaded to the system electronically.

10. DOCUMENTS CREATED OUTSIDE THE SYSTEM AND DISTRIBUTED OUTSIDE THE SYSTEM

10.1 The following documents are expected to be created outside the system and distributed outside the system. The actual documents may be scanned or electronically attached to the transmittal.

- a. Schedules: The Construction Manager will develop the Master Schedule through Microsoft Project 2003. The schedule will be distributed either through hard copies at meetings or through email.
- b. Product samples, color samples, physical samples are still required to be provided per the technical specifications, however, the transmittal documenting the distribution shall be done inside the system and submitted electronically and printed to accompany the actual submission.
- c. Meeting minutes will be created using Microsoft Word 2003 and distributed through hard copies at meetings or through email.
- d. AIA closeout documents, which require an "original" signature, will be created and distributed outside the system.

END OF SECTION

SECTION 013216 - CONSTRUCTION SCHEDULE

1. PRE-BID CONSTRUCTION SCHEDULE

- 1.1 Time is a critical element of this Project. By entering a bid, the Contractor agrees to adhere to the intermediate Milestone Dates and Dates of Substantial and Final Completion established herein. The Contractor also understands that all work must be performed in an orderly and closely coordinated sequence in order to achieve the specified Milestones and Completion Dates, and the Contractor hereby agrees to perform his work in conformance with the Pre-Bid Construction Schedule established herein, or with the then current and approved Project Construction Schedule as amended from time to time by the Construction Manager.
- 1.2 The Pre-Bid Construction Schedule includes allowances for time lost due to adverse and abnormal weather conditions, other than floods, hurricanes, tornadoes, lightning and other like acts of God. The Contractor understands and agrees that it shall not be entitled to any extensions of the Contract Time or adjustment to the Contract Sum, except as allowed in the General Conditions of the Contract for Construction. The Contractor further acknowledges that the Work may be required to be performed during the winter season, that conditions during this season may be adverse and abnormal, but that such conditions will not be the basis for an extension of the Contract Time or adjustment to the Contract Sum.

2. SCHEDULING OF THE WORK AFTER AWARD OF CONTRACT

- 2.1 After award of Contract, or issuance of a Notice to Proceed, the Contractor will meet with the Construction Manager to review the Pre-Bid Construction Schedule, and the overall project plan for construction. Following the above review the Contractor will meet with each subcontractor and supplier to view the detailed plans for performing his Work. Following these meetings and within fourteen (14) days after award of the Contract or issuance of a Notice to Proceed, the Contractor shall prepare and submit for the Construction Manager's approval a Work Schedule providing for the expeditious, timely and practical execution of the Work. The Contractor's Work Schedule shall include activity descriptions and durations for shop drawings, fabrication, delivery and installation. If the Construction Manager so requests, the Contractor shall provide adequate explanation regarding crew sizes, production rates and similar data used to arrive at the durations and sequences.
- 2.2 The Construction Manager shall review the Contractor's Work Schedule, coordinate it with the separate work by other contractors, the Owner and the Construction Manager, and after coordination, shall incorporate it into the approved Project Construction Schedule. The approved Project Construction Schedule shall be issued to the Contractor and the Contractor shall perform his Work in conformity therewith.
- 2.3 The Contractor shall submit proposed schedule revisions and obtain the written approval of the Construction Manager therefore before deviating from the Project

Construction Schedule.

- 2.4 The Construction Manager will incorporate approved schedule revisions into the Project Construction Schedule, and shall otherwise update and revise the Project Construction Schedule as the Construction Manager, at his sole discretion, deems necessary.


3. ADHERENCE TO THE SCHEDULE

- 3.1 The Contractor shall start each part of its Work on the date designated for start in the approved Project Construction Schedule unless advised by the Construction Manager. The Contractor shall carry the Work forward expeditiously with adequate forces, equipment and materials, and shall complete each part of his work on or before the date designated in the approved Project Construction Schedule.
- 3.2 If the Construction Manager determines that the Contractor is behind schedule, the Construction Manager shall have the right to require that the Contractor take steps, at the Contractor's expense, to accelerate its Work. Such steps shall include increases in manpower, equipment and materials and/or overtime as the Construction Manager may deem necessary. If the Contractor fails to comply with the Construction Manager's instructions relating to improved rate of progress, the Contractor may be held in default under the appropriate provisions of the General Conditions of the Contract.
- 3.3 Each Contractor shall, if directed by the Construction Manager, provide the Construction Manager a 2-week look ahead of anticipated manpower showing the number of men, classification, and anticipated work.

END OF SECTION

Woodbridge School District
New High School
Bid Pac C Bid Schedule

ID	Task Name	Duration	Start	Finish	2012												2013												2014											
					A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J
1	Preconstruction and Design Activities	407 days	Thu 9/22/11	Fri 4/12/13	[Summary bar]																																			
2	Regulatory and Agency Reviews	246 days	Thu 9/22/11	Thu 8/30/12	[Task bar]																																			
3	Programming and Design Activities	248 days	Thu 9/22/11	Mon 9/3/12	[Task bar]																																			
4	Bid Pac A Construction Documents	73 days	Wed 3/21/12	Fri 6/29/12	[Task bar]																																			
5	Bid Pac B Construction Documents	107 days	Wed 3/21/12	Thu 8/16/12	[Task bar]																																			
6	Bid Pac C Construction Documents	50 days	Mon 2/4/13	Fri 4/12/13	[Task bar]																																			
7	Bidding and Award	274 days	Mon 5/21/12	Thu 6/6/13	[Summary bar]																																			
8	Camp Raider	15 days	Mon 5/21/12	Fri 6/8/12	[Task bar]																																			
9	Bid Pac A	36 days	Mon 7/2/12	Mon 8/20/12	[Task bar]																																			
10	Bid Pac B	42 days	Fri 8/17/12	Mon 10/15/12	[Task bar]																																			
11	Bid Pac C	39 days	Mon 4/15/13	Thu 6/6/13	[Task bar]																																			
12	Construction Activities	543 days	Mon 6/11/12	Wed 7/9/14	[Summary bar]																																			
13	Camp Raider	25 days	Mon 6/11/12	Fri 7/13/12	[Task bar]																																			
14	Preliminary Site utilities	30 days	Tue 8/21/12	Mon 10/1/12	[Task bar]																																			
15	Sitework and Utilities	30 days	Tue 9/18/12	Mon 10/29/12	[Task bar]																																			
16	Foundations and Steel	100 days	Tue 10/2/12	Mon 2/18/13	[Task bar]																																			
17	Building enclosure	200 days	Tue 1/22/13	Mon 10/28/13	[Task bar]																																			
18	Finishes	160 days	Tue 9/17/13	Mon 4/28/14	[Task bar]																																			
19	DeDOT Entrance, Stadium and Landscaping	240 days	Tue 10/30/12	Mon 9/30/13	[Task bar]																																			
20	Technology	220 days	Fri 6/7/13	Thu 4/10/14	[Task bar]																																			
21	Furniture	20 days	Tue 4/29/14	Mon 5/26/14	[Task bar]																																			
22	Finish Sitework	120 days	Tue 10/29/13	Mon 4/14/14	[Task bar]																																			
23	Substantial Completion	1 day	Tue 5/27/14	Tue 5/27/14	[Milestone diamond]																																			
24	Punchlist	30 days	Wed 5/28/14	Tue 7/8/14	[Task bar]																																			
25	Final Documentation	30 days	Wed 5/28/14	Tue 7/8/14	[Task bar]																																			
26	Project Completion	1 day	Wed 7/9/14	Wed 7/9/14	[Milestone diamond]																																			



WSD BPC Bid Schedule 050713
Date: Tue 5/7/13

Task		Inactive Task		Manual Summary	
Split		Inactive Task		Start-only	
Milestone		Inactive Milestone		Finish-only	
Summary		Inactive Summary		Progress	
Project Summary		Manual Task		Deadline	
External Tasks		Duration-only			
External Milestone		Manual Summary Rollup			

CONSULTANTS:

CIVIL ENGINEER
 CDA ENGINEERING
 8 LARCH AVE, SUITE 401
 WASHINGTON, DE 19384
 P. 302-550-1202 F. 302-551-1314

STRUCTURAL ENGINEER
 BAKER WYGRAM ASSOCIATES, INC.
 1040 S. STATE STREET
 DOVER, DE 19901
 P. 302-734-7400 F. 302-734-7892

MECHANICAL ENGINEER
 GPE ASSOCIATES, INC.
 8719 BROOKS DRIVE
 EASTON, MD 21604
 P. 410-822-8558 F. 410-822-6306

ELECTRICAL ENGINEER
 GPE ASSOCIATES, INC.
 8719 BROOKS DRIVE
 EASTON, MD 21604
 P. 410-822-8558 F. 410-822-6306

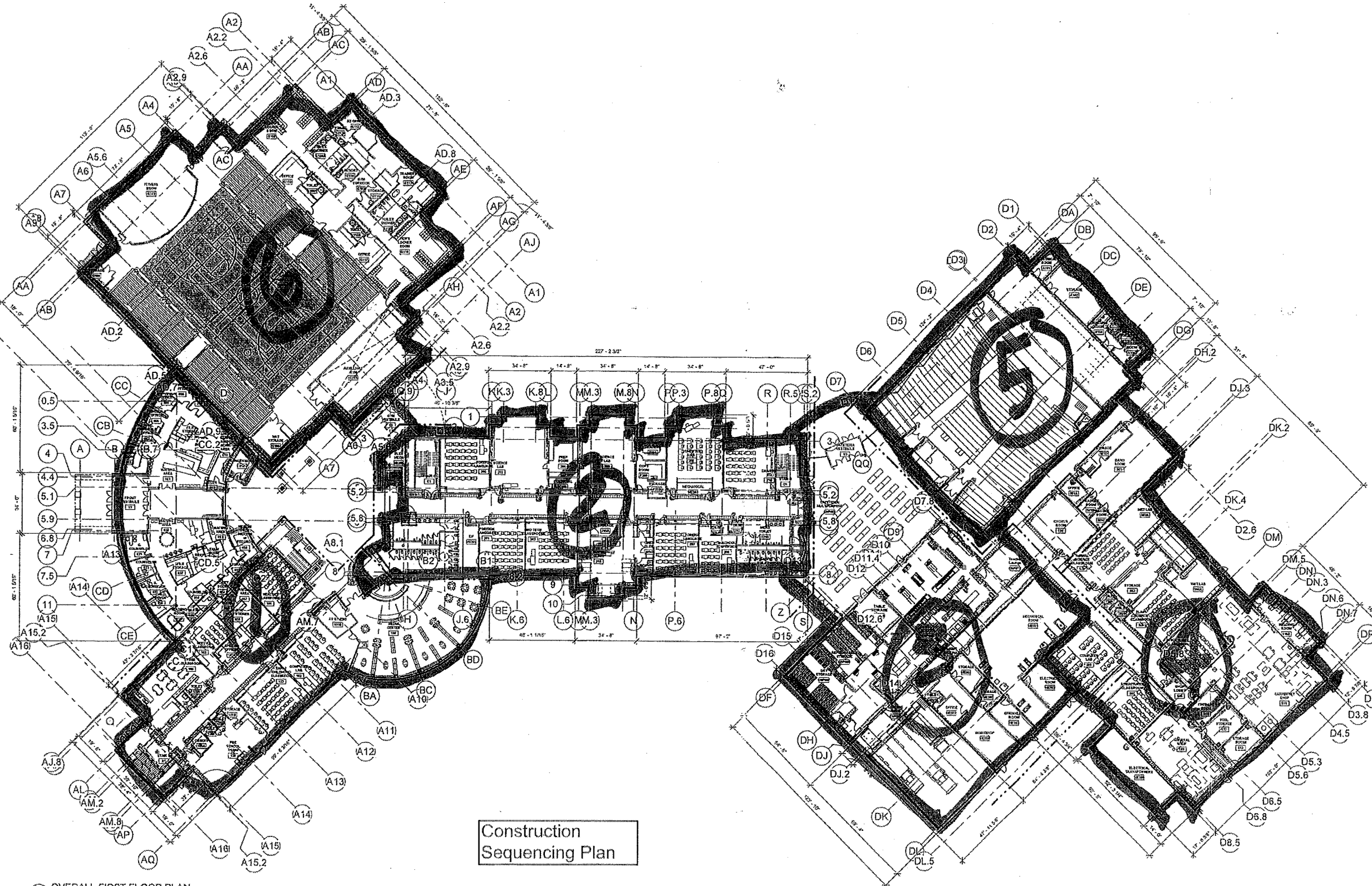


ISSUE DATES:

100% DD DRAWINGS NOT FOR CONSTRUCTION	03-15-12
---------------------------------------	----------

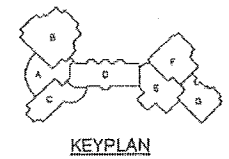
Fearn Clendaniel
 ARCHITECTS, INC.
 51 Larch Avenue, Suite 303, Wilmington, Delaware 19804
 Ph. 302-996-7515 Fax. 302-996-7885
 www.fearnclendaniel.com

PROJECT	
WOODBRIDGE SCHOOL DISTRICT	
WOODBRIDGE HIGH SCHOOL	
Woodbridge Road	
DRAWING TITLE	
OVERALL FIRST FLOOR PLAN	
OWN BY: WBC	CHK BY: KBF
DATE: 03-29-2012	PROJ. NUMBER: 11109
SCALE: 3/8" = 1'-0"	DRAWING NUMBER: A10-01



Construction Sequencing Plan

First Floor	Gross S.F.	127,000 S.F.
Second Floor	Gross S.F.	30,700 S.F.
Mezzanine	Gross S.F.	1,500 S.F.
Mech. Platform	Gross S.F.	3,000 S.F.
SubTotal	Gross S.F.	162,200 S.F.
Stadium Suppt		
Total	Gross S.F.	4,900 S.F.
	Gross S.F.	167,100 S.F.



1 OVERALL FIRST FLOOR PLAN
 3/8" = 1'-0"

SECTION 013219 - SUBMITTAL REGISTER

1. SUBMITTALS/SUBMITTAL REGISTER

- 1.1 The Contractor shall submit all items listed or specified within the sections of the Specifications included in its Work. Submittals shall include such items as: contractor's, manufacturer's or fabricator's drawings; descriptive literature including, but not limited to, catalog cuts, diagrams, operation charts or curves; test reports; samples, operations and maintenance manuals, including parts lists; certifications; warranties and other required submittals. Submittals pertinent to materials and equipment which are subject to advance approval shall be scheduled and made prior to the acquisition or the delivery thereof.
- 1.2 The Contractor shall carefully control procurement operations to assure that each individual submittal is made on or before the dates required for timely performance of its Work.
- 1.3 Within seven (7) days after award of Contract or issuance of Notice to Proceed, the Contractor shall execute and submit to the Construction Manager, seven (7) copies of the Submittal Register, on a form to be provided by the Construction Manager, on which shall be listed each item of equipment and material of each type for which fabricator's drawings and/or related descriptive data, test reports, samples, spare parts, operation and maintenance manuals, or other types of submittals required by the Specifications. The Submittal Register form shall be reproduced by the Contractor. The order of listing of items on the Register shall conform to the sequence of the items as they occur within the divisions. Drawings of component items forming a system or that are interrelated shall be scheduled to be correlated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled. Adequate time shall be allowed for review and approval and possible resubmittal of any item subject to approval, because no delay damages or time extensions will be allowed for time lost in late submittals or resubmittals. The Construction Manager and Architect/Engineer will review the Submittal Register for approval action. The approved Register will become a part of the Contract and Contractor will be subject to requirements thereof. The Contractor shall revise and/or update the Register monthly to take into account all changes in the Contract. Each such revised edition and/or revision to the Register shall be resubmitted to the Construction Manager. This Register shall be coordinated with related submittals of other Contractors.

2. SAMPLES

- 2.1 Submit tagged or labeled samples in triplicate, unless another quantity is otherwise specified by the Construction Manager.
- 2.2 Tags or labels shall be securely affixed and contain as a minimum the following information: Project Name, Contractor's Name, Contract Title and Number, Date, Transmittal Number, Product Manufacturer's or Fabricator's Name and Product Identifier.

END OF SECTION

SECTION 013226 - CONTRACTOR DAILY REPORTS

1. CONTRACTOR DAILY REPORTS

1.1 The Contractor shall submit a Daily Report to the Construction Manager on the forms provided covering the following subjects:

1. Work in Progress, including areas where work is being performed, nature of the operations in progress, and the manpower assigned.
2. Extra Work (Time and Material) in progress.
3. Materials Received.
4. Trade labor breakdown including identification of all workers on site and the number of hours (or portions thereof) worked by each.
5. Inspection Checklist (performed daily).

1.2 The Contractor shall submit the Daily Report to the Construction Manager by 9:00 AM on the next workday following the workday covered in the Daily Report.

2. DAILY EXTRA WORK REPORT

2.1 The Contractor shall submit on the form provided a Daily Extra Work Report on each day he performs authorized Extra Work on a time and material basis.

2.2 A separate Daily Extra Work Report shall be submitted for each separate authorized Extra Work item done on a time and material basis.

2.3 The Contractor shall submit his Daily Extra Work Report as an attachment to his Daily Report by 9:00 AM on the next workday following the workday covered in the Daily Extra Work Report.

3. Sample Daily Report

3.1 A sample daily report follows this section for your reference.

END OF SECTION



EDIS COMPANY

CONTRACTOR'S DAILY REPORT

Project Name: _____
 Date: _____
 Contractor: _____
 Contract No. & Description: _____
 Weather: _____
 Foreman's Name (Print) _____

TRADE	*CLASS	MANPOWER COUNT	TOTAL MAN HOURS	TODAY'S DESCRIPTION / LOCATION OF WORK
TOTAL				

* INDICATE: F = FOREMAN; J = JOURNEYMAN; A = APPRENTICE

Work Status/Work Planned: _____

Construction Equipment: _____

Qualified Operator(s) _____

Deliveries or Materials: _____

Machinery, tools, material, and equipment to be used: _____

Inspection of work area, machinery, tools, material, or equipment _____

The use of any machinery, tool, material, or equipment which is not in compliance with any applicable requirement is prohibited. Such machine, tool, material or equipment shall either be identified as unsafe by tagging or locking the controls to render them inoperable or shall be physically removed from its place of operation.

Please See Other Side

Below is a general checklist of requirements on this project. Contractors will check off items that pertain to their contract and project tasks. Notify EDiS Field Manager of any issues. This checklist is not meant to be all inclusive. Please refer to additional OSHA regulations for compliance.

House Keeping

- Material Storage Area's Orderly
- Trash Containers Available and Emptied daily
- Fire Hazards
- Lighting and ventilation
- Exits and Stair clear passage
- Walkways, corridors clear passage
- Daily debris /trash removal
- _____

Personal Protective Equipment

- Hard Hats being worn
- Safety Glasses with side shields being worn
- Secondary Eye/Face protection
- Respirators as required
- Hand protection when needed
- Ear protection when needed
- Inspected & Maintained
- _____

Fire Prevention

- Fire extinguishers inspected
- Flammable / Combustibles properly store
- Approved Fuel cans used and labeled
- Oxygen / Acetylenes stored properly
- _____

Electrical

- GFI in use
- Three prong insulated extension cords used
- Extension cords in good condition
- Lockout / Tag-out program in use
- _____

Excavations

- Miss Utility been contacted
- Properly Barricaded
- Ladders in use at depths over 4'-0"
- Ladders every 25'-0" distance
- Shored, sloped, benched as required
- Dewatering as needed
- _____

Ladders

- Good condition
- Correct pitch
- Extends 3'-0" above landing
- Open and secured / tied off
- _____

Scaffolds

- Certified Scaffold Installer
- Guardrails, toe boards, and planking secured
- Appropriate signage
- Adequate cross bracing
- Secured to building over 25'-0" in height
- _____

Cranes

- Rated Load Capacity available in cab
- Swing Radius barricaded
- Appropriate certificates / decals / hand signals
- Daily safety inspection log completed
- _____

Fall Protection

- Fall protection plan on file
- Full harness / shock absorbing lanyard used
- Anchoring points secured
- Perimeter barricades
- Open sided floor protection
- 6'-0" Tie-off utilized
- _____

Paperwork

- MSDS Information
- Contractors Safety Program
- Hazardous Communications Training
- Hazardous Communications Program
- Contractor Qualified Representation
- _____

Other

- _____
- _____

Foreman / Competent Person:

Print Name _____

EDiS COMPANY

CONTRACTOR SUBMITTAL FORM

Contractor:

Contract #: _____

Project Name:

To:

The following submittal (s) for the Architect's Review and Approval:

Shop Drawings Product Data Samples Samples Other (Identify) _____

Design Data Calculations Certificates Coordination Drawings Reports

Qualification Statements Other (Identify) _____

No. of Copies	Date	Submittal Number	Spec. Section #	Description of Submittal Items	Requested Return Date	EDIS Submittal Number (by EDIS)

Deviations from Contract Documents requirements are identified as follows: _____

Remarks: _____

We hereby certify that _____ (Contractor) _____ has reviewed and approved submittals transmitted herewith for compliance and conformance with requirements of the Contract Documents.

Signed: _____ **Date:** _____

SECTION 013300 – SUBMITTAL PROCEDURES

1. GENERAL PROVISIONS

1.1 The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the Work specified in this Section.

2. ITEMS TO BE SUBMITTED AT START OF WORK

2.1 Performance/Labor and Material Payment Bond(s): One (1) copy of each bond simultaneously with the signed Agreement. See General Conditions Article 11.4 and Supplementary Conditions.

2.2 Policies or Certificates of Insurance: Two (2) copies simultaneously with the signed Agreement. See General Conditions Article 11 and Supplementary Conditions.

2.3 Contractor's License: Submit a copy of all business licenses required by local and state agencies.

2.4 Contractor's Schedule of Values: Two (2) copies for approval within 21 days after the Agreement is signed. See General Conditions Article 9.2 and provisions in this Section.

2.5 Contractor's Progress Schedule: Two (2) copies for review and reference within 21 days after the Agreement is signed. See General Conditions Article 3.10 and provisions in this Section.

2.6 Submittal Schedule: Two (2) copies for review and reference within 21 days after the Agreement is signed. See provisions in this Section.

2.7 Products List: Two (2) copies for approval within 30 days after the Agreement is signed. See provisions in Section 016200 - MATERIAL AND EQUIPMENT.

3. NON-RESIDENT CONTRACTOR & SUBCONTRACTORS BONDS

3.1 Refer to requirements in Section 011100 - INSTRUCTIONS TO BIDDERS for filing of Surety Bonds with the Division of Revenue.

3.2 If such bonds are required on this project, it will be the responsibility of the Contractor to produce evidence to the Construction Manager that they have been filed, or if not required, to supply a notarized statement that they are not required. This must be done within seven (7) days after award of Contract and in any event before construction starts.

4. RELATED REQUIREMENTS

- 4.1 See Section 017700 - CONTRACT CLOSE OUT: for submittal requirements for Contract Close out.

5. SUBMITTALS

- 5.1 All submittals shall be directed to the Construction Manager in the manner directed by the Construction Manager, and paragraph 9 of this section. Contractor shall use the Contractor Submittal Form appended to this section.
- 5.2 Prepare a Submittal's Schedule for Shop Drawings, Product Data and Samples. Show:
1. The dates for Contractor's submittals.
 2. The dates submittals will be required for Owner-furnished products.
 3. The date approved submittals will be required from the Architect.
- 5.3 Should the Architect or Construction Manager elect to omit any items from the list of items to be reviewed, it shall not relieve the Contractor from compliance with the Contract Documents with regard to that item. In such instance, the Contractor may still elect to have submittals prepared for his own use without review by the Architect or Construction Manager.

6. SHOP DRAWINGS

- 6.1 Conform to provisions in General Conditions applying to Shop Drawings.
- 6.2 Present in a clear and thorough manner.
1. Identify details by reference to sheet and details, schedule or room numbers shown on Contract Drawings.
 2. Maximum sheet size: 30" x 42".

7. PRODUCT DATA

- 7.1 Conform to provisions in General Conditions applying to Product Data.
- 7.2 Preparation:
1. Clearly mark each copy to specifically identify products or models pertinent to project.
 2. Show performance characteristics and capacities.

3. Show dimensions and clearances required.
4. Show wiring or piping diagrams and controls.

7.3 Manufacturer's standard schematic drawings and diagrams:

1. Modify drawings and diagrams to delete information which is not applicable to the Work.
2. Supplement standard information to provide information specifically applicable to the Work.

8. SAMPLES

8.1 Conform to provisions in General Conditions applying to Samples.

8.2 Provide samples of sufficient size and quantity to clearly illustrate:

1. Functional characteristics of the project, with integrally related parts and attachment devices.
2. Full range of color, texture and pattern.

8.3 Field samples and mock-ups; See requirements, if any, in other specification Sections.

9. SUBMITTAL REQUIREMENTS

9.1 Make submittals promptly through the Construction Manager in accordance with published schedule, and in such sequence as to cause no delay in the Work or in the Work of any other contractor.

9.2 Number of submittals required.

1. Shop drawings: Submit eight (8) copies for each submittal. Copies will be marked up with corrections and comments, stamped and returned. Any additional copies required by the Contractor shall be made by him.
2. Product Data: Submit eight (8) copies. Four (4) will be retained by the Architect, the Construction Manager and the Consultants. Four (4) will be reviewed, marked and stamped by the Architect and returned to the Contractor by the Construction Manager. Any additional copies required by the Contractor shall be made by him from the stamped copy.
3. Samples: Submit four (4) each. When approved it will be returned to the Construction Manager to be retained at the site for reference use.

9.3 Submittals shall contain:

1. The date of submission and the dates of any previous submissions.
2. The Project title and number.
3. Contract identification.
4. The names of the Contractor, Supplier and Manufacturer.
5. Identification of the product, with the specification section number.
6. Field dimensions, clearly identified as such.
7. Relation to adjacent or critical features of the Work or materials.
8. Applicable standards, such as ASTM or Federal Specification numbers.
9. Identification of deviations from Contract Documents.
10. Identification of revisions on resubmittals.
11. An 8 inch x 3 inch blank space for Contractor and Architect's stamps.
12. Contractor's stamp, initialed or signed, certifying review of submittal, verification of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the Work and of Contract Documents. Submittals which have not been stamped with this stamp or its approved equivalent will be returned without being reviewed.

9.4 Shop Drawing coordination and interface with work of other Contracts and adjacent work is the responsibility of each individual Contractor.

9.5 All submittals shall be accompanied by the contractor's submittal form, a copy of which is part of this section. The contractor's submittal form must be completed in its entirety by the contractor.

10. RESUBMISSION REQUIREMENTS

10.1 Make any corrections or changes in the submittals required by the Architect and resubmit until approved.

10.2 Shop drawings and Product Data:

1. Revise initial drawings or data, and resubmit as specified for the initial

submittal.

2. Indicate any changes which have been made other than those requested by the Architect.
 - a. Architect reserves the right to charge Contractor for additional review required beyond (2) two reviews of each shop drawings, product data, samples or similar submittals.

10.3 Samples: Submit new samples as required for initial submittal.

11. FINAL DISTRIBUTION OF APPROVED SUBMITTALS

11.1 The Construction Manager will receive and log submittals and forward to Architect after processing.

11.2 The Construction Manager will distribute copies of Shop Drawings and Product Data which carry the Architect's stamp to:

1. Contractor that made submittal.
2. Jobsite File.
3. Record Document File.
4. Other Contractors, as required for coordination.

11.3 The Construction Manager will distribute samples as required.

11.4 The Contractor will distribute copies of Shop Drawings and Product Data which carry the Architect's stamp to:

1. Subcontractors.
2. Suppliers.
3. Fabricators.

12. SCHEDULE OF VALUES

12.1 Use AIA Document G732, Continuation Sheet to G702.

13. PROGRESS SCHEDULE

13.1 Prepare schedules in the form of a horizontal bar chart.

1. Provide separate horizontal bar chart for each trade or operation.
 2. Horizontal time scale: Identify the first work day of each week.
 3. Scale and spacing: To allow space for notations and future revisions.
 4. Minimum sheet size 11 inches by 17 inches.
- 13.2 Format of listings: The chronological order of the start of each item of work.
- 13.3 Show the complete sequence of construction by activity.
- 13.4 Show the dates for the beginning, and completion of, each major element of construction such as:
1. Site clearing.
 2. Site utilities.
 3. Foundation work.
 4. Structural framing.
 5. Subcontractor work.
 6. Equipment installation.
- 13.5 Show projected percentage of completion for each item as of the first day of each month.
- 13.6 Update Progress Schedule monthly and submit with Application for Payment and Schedule of values.
- 13.7 Indicate progress of each activity to date of submission.
- 13.8 Show changes occurring since previous submission of schedule:
1. Major changes in scope.
 2. Activities modified since previous submission.
 3. Revised projections of progress and completion.
 4. Other identifiable changes.
- 13.9 Provide a narrative report as needed to define:

1. Problem areas, anticipated delays and the impact of the schedule.
 2. Corrective action recommended, and its effect.
 3. The effect of changes on schedules of other prime contractors.
- 13.10 Submit one reproducible transparency.
- 13.11 After review, distribute copies of the schedule to:
1. Jobsite File.
 2. Subcontractors.
 3. Architect.
 4. Owner.
- 13.12 Instruct recipients to report promptly to the Contractor, in writing, any problems anticipated by the projections shown in the schedules.

END OF SECTION

CONTRACTOR

COMPETENT / QUALIFIED PERSON DESIGNATION LOG

Project:

Field Manager:

Contract: Contractor:	Applicable to Subcontractor (yes / no)		Foreman	Competent Person (if not foreman)
Subpart C-General Provisions				
1926-20 General Safety				
Subpart D - Health and Environmental Controls				
1926-53 Ionizing Radiation				
1926-55 Gases, Vapors, Fumes, Dusts, Mists				
1926-57 Ventilation				
1926.59 Hazard Communication				
1926.62 Lead				
Subpart E - Personal Protective Equipment				
1926.101 Hearing				
1926.103 Respirator Protection				
Subpart H - Materials Handling, Storage				
1926.251 Rigging Equipment for Material Handling				
Subpart J - Welding and Cutting				
1926.354 Welding, Cutting and Heating				
Subpart K - Electrical				
1926.404 Wiring Design and Protection				
Subpart L - Scaffolding				
1926.451 Scaffolding				
Subpart M - Fall Protection				
1926.502 Fall Protection Criteria and Practices				
1926.503 Training				
Subpart N - Cranes, Derrick -Redesignated 1926.1501				
Subpart O - Motor Vehicles and Equipment				
1926.601 Motor Vehicles				
Subpart P - Excavations				
1926.651 Specific Excavation Requirements				
1926.652 Requirements to Protective Systems				
Subpart S - Tunnels, Shafts, Caissons				
1926.800 Tunnels, Shafts, Caissons				
1926.803 Compressed Air				
Subpart T - Demolition				
1926.850 Preparatory Operations				
1926.852 Chutes				
1926.859 Mechanical Demolition				

Contract: Contractor:	Applicable to Subcontractor (yes / no)		Foreman	Competent Person (if not foreman)
Subpart V - Power Transmission and Distribution				
1926.955 Overhead Lines				
Subpart X - Stairways and Ladders				
1926.1053 Ladders				
1926.1060 Training Requirements				
Subpart Z - Toxic and Hazardous Substances				
1926.1101 Asbestos				
1926.1101 thru 1926.1148 Toxic and Hazardous Substances				

I certify that the listed employees are competent persons, as defined and required by specific OSHA standards. They are capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Name (print)

Contractor Signature

Date

CONTRACTOR COMPETENT PERSON DESIGNATION LOG
PU09, Revised 3/2012

013523-1

SECTION 013523 - SAFETY PROGRAM

1. GENERAL

- 1.1 The Contractor shall be responsible for initiating, maintaining and supervising all safety activities and programs in connection with the Work.
- 1.2 Contractor shall be responsible for the safety of its personnel.
- 1.3 Hard hats and safety glasses must be worn by all personnel on the jobsite, except in contractor's administrative office/trailer. All equipment must comply with OSHA standards. All job site personnel shall wear long pants, shirts (no tank tops) and work boots.

2. SAFETY PROGRAM

- 2.1 Prior to commencing the Work, the Contractor shall submit to the Construction Manager (1) electronic copy and (1) bound copy of its safety program and one (1) copy of MSDS information in a 2" ringed notebook. One paper copy of the safety program and MSDS will be retained by the Construction Manager in the field office.
- 2.2 The safety program shall outline those hazards peculiar to the Contractor's Work, and the steps to be taken to eliminate or reduce the risk of injury or loss due to those hazards. **The program shall be site specific.** Contractor shall implement and enforce its safety program, which is in accordance with all OSHA, Federal, State and local laws.
- 2.3 Contractor shall designate a qualified Safety Supervisor to implement their safety program. Unless otherwise approved by the Construction Manager, the Safety Supervisor shall be the Contractor's Field Superintendent/Foremen.
- 2.4 **Contractor shall furnish the names and qualifications of the competent persons and qualified persons who may be required for their scope of work by the Contractor's safety procedures, and by federal, state and/or local regulations. Examples include competent persons and/or qualified persons for steel erection, excavation, scaffold erection, confined space entry, crane and rigging operations, annual crane inspections, fall protection including horizontal lifeline systems, etc. See the attached Competent/Qualified Person Designation Log.**
- 2.5 **Contractor shall provide written certification showing that all employees have been trained on the Contractor's Safety Program. The written certification record shall contain the name or other identity of the employee trained, the date(s) of the training and the signature of the person who conducted the training or the signature of the employer. If the employer relies on training conducted by another employer or completed prior to the effective date of this section, the certification record shall include the date the employer determined the prior training was**

adequate rather than the date of actual training. The employer shall instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to his work environment to control or eliminate any hazards or other exposure to illness or injury. Please forward certification (document) of training for each employee on an EDiS project. The latest training certificate shall be maintained.

- 2.6 Contractor shall provide certification of training on the following programs, as they pertain to your contract and project tasks: Scaffold, Fall Protection, Crane Operator, Signal Person, Crane Maintenance, Steel Erection Fall Protection, Respiratory Protection, Powder-Actuated Tools, and Motor Vehicles. Certification of training must include: Employee's name, date of training, person conducting the training, topics covered, and a statement that the student has successfully completed the course. This list is not meant to be all inclusive; please refer to OSHA regulations for applicable safety requirements.
- 2.7 Contractor Daily Reports with Safety Inspection Checklist will be submitted daily to Field Manager, verifying inspection of work area, machinery, equipment and tools.
- 2.8 Prior to starting work on-site, the Contractor shall arrange with the on-site Field Manager to have their employees complete the EDiS Company Zero Accidents Safety Orientation program.
- 2.9 Contractor shall hold weekly safety toolbox talks with all of its employees every Monday at 12:30 PM. The Contractor shall designate a responsible, capable person to conduct these meetings. Contractor's safety supervisor or superintendent must submit to the Construction Manager weekly toolbox talks attendance sheets and the topics discussed.

3. SUBSTANCE ABUSE POLICY STATEMENT

The Construction Manager is committed to providing a safe work site environment for its employees and Contractors' employees. The Construction Manager does not condone or permit employees and Contractors' employees to use or be under the influence of drugs or alcohol while they are on any of the Construction Manager's work sites. The Policy is as follows:

- 3.1 It is a violation of the Construction Manager's policy for employees and Contractors' employees to use, possess, sell, trade, or otherwise engage in the use of illegal drugs and alcohol.
- 3.2 It is a violation for employees and Contractors' employees to report to work while influenced by illegal drugs or alcohol.
- 3.3. It is a violation for employees and Contractors' employees to use prescription drugs

illegally (i.e. to use prescription drugs that have not been legally obtained) and to use prescription drugs in a manner other than the prescribed intentions.

- 3.4 Employees and Contractors' employees who are taking medication, which is prescribed by their physician, are expected to discuss potential side effects with their prescribing physician, as it relates to the work requirements.

Violations of this policy will require disciplinary action. If any employees or Contractors' employees are observed or suspected of being influenced by drugs or alcohol, they will be instructed to stop work and may be required to leave the work site.

4. EXECUTION

- 4.1 Contractor shall comply with all applicable federal, state and local laws, regulations and orders relating to occupational safety and health, and related procedures, and shall, to the extent permitted by law, indemnify and hold Construction Manager, Owner and Architect, and their respective directors, officers, or agents and employees, harmless from any and all liability, public or private, penalties, contractual or otherwise, losses, damages, costs, attorney's fees, expenses, causes of action, claims or judgments resulting from a claim filed by anyone in connection with the aforementioned acts, or any rule, regulation or order promulgated thereunder, arising out of the Contractor's Work, this Agreement or any subcontract executed in prosecution of the Work. Contractor further agrees in the event of a claim of violation of any such laws, regulations, orders or procedures arising out of or in any way connected with the performance of this agreement, Construction Manager may immediately take whatever action is deemed necessary by Owner and/or Construction Manager to remedy the claim or violation. Any and all costs or expenses paid or incurred by Owner and/or Construction Manager in taking such action shall be borne by Contractor, and may be deducted from any payments due Contractor.

- 4.2 The Contractor agrees to (1) take all necessary steps to promote safety and health on the job site; (2) cooperate with Owner and/or Construction Manager and other Contractors in preventing and eliminating safety and health hazards: (3) train, instruct and provide adequate supervision to ensure that its employees are aware of, and comply with, applicable Federal and State safety and health laws, standards, regulations and rules, safe healthful work practices and all applicable safety rules, regulations and work practices and procedures (4) not create any hazards or expose any of its employees, employees of the Owner and/or Construction Manager or employees of Contractors to any hazards; and (5) where the Contractor is aware of the existence of a hazard not within its control, notify the Construction Manager of the hazard as well as warn exposed persons to avoid the hazard.

- 4.3 The Contractor's Superintendent or Safety Supervisor shall immediately, verbally report, and promptly thereafter confirm in writing to the Construction Manager any unsafe conditions or practices that are observed, or violations of job safety which are not within the Contractor's control.

- 4.4 Contractors shall immediately, verbally report, and promptly thereafter confirm in writing, to the Construction Manager any unsafe practices or conditions that are observed which are not under the Contractor's control.
- 4.5 The Contractor's Superintendent or Safety Supervisor shall insure that adequate first aid supplies are available, and that personnel are qualified to administer first aid/CPR, as required by State and/or Federal regulations.
- 4.6 Contractor shall promptly notify Construction Manager of any personal injury requiring medical treatment of any of the Contractor's employees at the Project site; or of significant damage to property arising in connection with Contractor's performance, as promptly as possible after the occurrence of such injury or damage. Within twenty-four hours of such occurrence, Contractor shall furnish to Construction Manager a complete written report of such injury or damage.
- 4.7 Contractor certifies that the forgoing terms shall be made applicable to all Contractors' suppliers, materialmen or anyone furnishing labor and/or materials to the site.
- 4.8 The Contractor shall continue to educate his job Safety Supervisor or Superintendent of their responsibilities, which shall include:
 1. Instructing workers and subcontractors under its supervision in safe work practices and work methods at the time they are given work assignments.
 2. Ensuring that its workers and subcontractors have and use the proper protective equipment and suitable tools for the job.
 3. Continuously checking to see that no unsafe practices or conditions are allowed to exist on any part of his job.
 4. Acquainting its workers and subcontractors with all applicable safety requirements and seeing that they are enforced.
 5. Setting a good example for his workers.
 6. Making a complete investigation of accidents to determine facts necessary to take corrective action.
 7. Promptly completing a "Supervisor's Investigation Form" with his Supervisor's assistance and distributing as required. This form will be provided by the Construction Manager.
 8. Holding weekly "tool box" safety meetings with his men to:
 - a. Discuss observed unsafe work practices or conditions including a review of

current Construction Manager safety report.

b. Review the accident experience of his crew and discuss correction of accident causes.

c. Encourage safety suggestions from his men.

9. Seeing that prompt medical treatment is administered to an injured employee.

10. Correcting or reporting immediately to job superintendent any observed unsafe conditions, practices or violations of job security.

11. Making all reports required by these Contract Documents to the Construction Manager in a full and timely fashion.

5. SAFETY MEETINGS

5.1 The Contractor's Project Manager or Superintendent shall attend weekly or biweekly supervisory job meetings. The first topic of these meetings will be job site safety. The weekly safety reports will be reviewed and violations must be corrected immediately. Contractors will be encouraged to participate in the on-going jobsite safety.

6. TOOL BOX SAFETY MEETINGS

6.1 The Contractor shall schedule weekly "tool box" safety sessions to be held by his job safety supervisor or superintendent for all of his employees.

6.2 A member of the Contractor's management staff shall periodically attend "tool box" safety sessions to evaluate their effectiveness and offer any appropriate suggestions for improvement.

7. REPORTS

7.1 Contractors shall report all accidents or injuries on a timely basis in accordance with all applicable regulations.

7.2 Contractors shall promptly complete an accident investigation report of all accidents.

7.3 A record of all "tool box" safety sessions shall be made and submitted to the Construction Manager on forms to be provided.

8. SAFETY REPRESENTATIVE

8.1 The Construction Manager may employ the services of a Safety Representative on the project.

- 8.2 The Safety Representative *will* visit the job site on a weekly basis to determine if the work is being performed in a safe manner and in accordance with OSHA, State and Local safety regulations. Safety representative is not responsible for observing and documenting all possible safety violations. The Contractor's Safety Representative or Superintendent shall attend job site safety inspections with the Safety Representative on a weekly basis.
- 8.3 The Safety Representative will file a written report with the Construction Manager at the end of each inspection listing the safety violations observed during the inspection.
- 8.4 The Construction Manager will distribute the Safety Representative's report to all Contractors. All safety violations must be corrected immediately.

9. RIGHT TO STOP THE WORK DUE TO SAFETY VIOLATIONS

- 9.1 The Construction Manager, in its sole discretion, may order the Contractor to stop the work due to safety violations under the following circumstances:
1. If the Construction Manager observes the Contractor is violating safety regulations and the Contractor takes no immediate action to correct the violation.
 2. If the Contractor has been notified by the Construction Manager in writing that he is in violation of safety regulations and fails to take action to correct the violation within 24 hours of the notice.
- 9.2 If the Construction Manager directs the Contractor to stop the work due to safety violation, it will be done in accordance with the General Conditions of the Contract. Contractor shall not be permitted an adjustment of the Contract Time or Sum for the days lost to any suspension of work.
- 9.3 If the Construction Manager or Safety Representative observes Contractor's employee violating this safety program or OSHA Standards in an habitual manner, or creating a serious life safety violation, the Construction Manager or Safety Representative may instruct the Contractor's superintendent or foreman to remove the violator from the work site for failure to comply with the safety program and the contract.

10. EMERGENCY PROCEDURES

- 10.1 The Construction Manager shall establish a central meeting location for the assembly of all Contractors' employees in the event of a major job site emergency.
- 10.2 Contractor shall assemble all of their personnel and account for all employees. Contractor must immediately report to the Project Superintendent with the status of their employees.

11. FALL PROTECTION PROCEDURES

11.1 Contractor is responsible, in accordance with federal, state, local laws and regulations including OSHA, to provide and enforce their own site specific fall protection program and equipment. The following fall protection procedures shall be enforced by all Contractors as a minimum standard.

All workers on walking/working surfaces with unprotected sides or edges six feet (6') or higher above the next lower level must be protected from falls by the use of guardrail systems, net systems, fall arrest systems or control access zone programs. It is intended that when fall protection is required, it is required 100% of the time. All contractors are reminded that relevant industry regulations require that contractors comply with the following standards.

1. Workers constructing or working near leading edges must be protected.
 2. Workers on the face of formwork or reinforcing steel must be protected at a height of 6 feet (6') or greater.
 3. Scaffolds shall be guarded at 6 feet (6') above next lower level.
 4. Brick layers performing overhand bricklaying and related work six feet (6') or higher above lower levels must be protected from falls.
 5. Roofers must comply with OSHA standards for roof work.
 6. The Contractor's controlled access zone plan shall be included in their site-specific safety program and shall be submitted prior to the start of work. Contractors are responsible for assuring programs are OSHA compliant.
 7. Guidelines for Residential Construction or any interpretations will not be accepted in lieu of 1926 Standards.
 8. Contractors must provide certification per OSHA CFR29 § 1926.503(b) of employee training and retraining on fall protection upon request.
- 11.2 Contractor shall provide its own fall protection. Fall protection may be provided by guardrail systems, net systems, or personal fall arrest systems. All fall protection systems must comply with OSHA standards.

11.3 Stepladders, exposed to shafts or edges of the building, greater than six feet (6') above the next lower level, must be tied off or otherwise secured. Employee must wear fall protection, i.e. harness/lanyard.

11.4 The Safety Cable System shall not be altered or removed without a written request submitted to the Project Manager with a copy to the Field Manager. It shall be the responsibility of each and every Contractor that is removing or altering the Safety

Cable System to maintain the fall protection safety provided by the safety cable and not leave the area unprotected. Each and every Contractor shall be responsible to re-install the Safety Cable System immediately after work is completed. Each and every Contractor shall be responsible to re-install the Safety Cable System in accordance to OSHA standards.

11.5 Fall protection will be enforced for Structural Steel Erectors.

1. As for a Contractor engaged in structural steel erection, the Contractor is specifically advised that structural steel erectors shall comply with all protection requirements for all work at a height of six feet (6') or greater above the next lower level, 100 percent of the time, by any of the following means.
 - a. Standard guardrail system.
 - b. Personal Fall Arrest System (PFAS) – full body harness with shock absorbing lanyard. Maximum free fall distance permitted, with lanyard and lanyard attachment shall not exceed six feet (6'). Anchor point must be capable of supporting five thousand pounds. Perimeter guard cables or alignment cables may not be used for anchor points.
 - c. Access to work area shall be provided by ladders. There shall be sufficient number of ladders available to reduce the amount of “beam walking.” When it is absolutely necessary to traverse a beam, 100% fall protection must be utilized.
 - d. Steel erection Contractors must, at all times, be able to certify in writing that each of his employees has been properly trained in both OSHA fall protection standards and the Contractor’s site specific project fall protection procedures.
 - e. Prior to the erection of the steel, the Contractor shall meet with the Project Manager and Safety Representatives to review and document site specific procedures.

END OF SECTION

Certification of Training Documents to be Submitted with Safety Policy/Program

Provide a certification of training for employees on your safety program.

In addition, Contractor shall provide certification of training on the following programs, as they pertain to your contract and project tasks. Certification of training must include: Employee's name, date of training, person conducting the training, topics covered, and a statement that the student has successfully completed the course. This list is not meant to be all inclusive: please refer to OSHA regulations for applicable safety requirements.

- a. Scaffold: 1926.454
- b. Fall Protection 1926.503
- c. Crane Operator: 1926.1427
- d. Signal person (this is for any persons connecting material or equipment for lifting):
1926.1428
- e. Crane maintenance: 1926.1429
- f. Steel erection fall protection: 1926.761
- g. Respiratory protection (medical clearance and training records complying with 1910.134
- h. Powder-actuated tools: 1926.302
- i. Motor Vehicles (are those vehicles that operate within an off-highway jobsite, not open to public traffic): 1926.21

SECTION 014500 - QUALITY CONTROL

1. DESCRIPTION

1.1 Quality control services include inspections and tests performed by independent agencies and governing authorities, as well as by the Contractor. Inspection and testing services are intended to determine compliance of the work with requirements specified. Specific quality control requirements are specified in individual specification sections.

2. RESPONSIBILITIES

2.1 Contractor Responsibilities: Except where indicated as being the Owner's responsibility, quality control services are the Contractor's responsibility, including those specified to be performed by an independent agency and not by the Contractor. The Contractor shall employ and pay an independent agency, testing laboratory or other qualified firm to perform quality control services specified.

1. The Owner will engage and pay for services of an independent agency to perform the inspections and tests that are specified as Owner's responsibilities.

2.2 Retest Responsibility: Where results of inspections or test do not indicate compliance with Contract Documents, retests are the Contractor's responsibility.

2.3 Responsibility for Associated Services: The Contractor shall cooperate with independent agencies performing inspections or test. Provide auxiliary services as are reasonable. Auxiliary services include:

1. Provide access to the Work.
2. Assist taking samples.
3. Deliver samples to test laboratory.

2.4 Coordination: The Contractor and independent test agency shall coordinate the sequence of their activities and shall avoid removing and replacing work to accommodate inspections and test. The Contractor is responsible for scheduling time for inspections and tests.

2.5 Qualifications for Service Agencies: Contractor shall engage only inspection and test service agencies which are pre-qualified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories.

2.6 Submittals: Contractor shall submit a certified written report of each test, Inspection or similar service, in duplicate to the Construction Manager. Contractor shall submit

additional copies of each report to any governing authority, when the authority so directs.

- 2.7 Report Data: Written inspection or test reports shall include:
1. Name of testing agency or test laboratory.
 2. Dates and locations of samples, tests or inspections.
 3. Names of individual present.
 4. Complete inspection of test data.
 5. Test results.
 6. Interpretations.
 7. Recommendations.
- 2.8 Repair and Protection: Upon completion of inspection or testing, Contractor shall repair damaged work and restore substrates and finishes. Contractor shall comply with requirements for "Cutting and Patching."
- 2.9 The 2003 IBC code the following testing is code required:
1. Structural tests and special inspections must be conducted by an approved agency (an agency or firm regularly engaged in conducting tests or furnishing inspection services, approved by the authority having jurisdiction.) This means that contractors will no longer be allowed to cast their own test cylinders for example.
 2. Continuous special inspection (the full-time observation of work by an approved special inspector who is present until completion of the work) is required for any steel welds and connections. Critical elements may include: all slip critical bolted connections, complete and partial groove welds, multi-pass fillet welds and single pass fillet welds greater than 5/16".
 3. Continuous special inspection is required during the placement of all concrete and shotcrete for the proper application techniques with a few exceptions.
 4. Periodic special inspection (the part-time observation by an approved special inspector) is required for any steel welds and connections. Critical elements may include: all slip critical bolted connections, complete and partial groove welds, multi-pass fillet welds and single pass fillet welds greater than 5/16".
 5. Spray applied fireproofing requires periodic special inspection for the structural

member surface conditions, application, thickness, density and bond strength.

6. Based on the classification, occupancy, and design of the structure, the code requires periodic special inspection for placement of masonry units and reinforcing steel and continuous special inspection of grout placement.

END OF SECTION

SECTION 015113 - TEMPORARY ELECTRICITY

1. GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

1. Electrical Basic Materials and Methods, Division 26.

1.2 DESCRIPTION OF SYSTEM

1. Power Source

1. Suppliers: Delaware Co-Op
2. **This Contractor to supply power and lights for own work.**

1.3 REQUIREMENTS AND REGULATORY AGENCIES

1. The Electrical Contractor will obtain permits as required by local governmental authorities.
2. The temporary electrical service shall comply with National Electrical Code, 1990 Edition and applicable local codes and utility regulations.

1.4 USE OF PERMANENT SYSTEM

1. The Electrical Contractor shall regulate any part of the permanent electrical system which is used for construction purposes to prevent interference with safety and orderly progress of the Work.
2. Contractors shall leave permanent electrical services in a condition as good as new and clean.

2. PRODUCTS

2.1 MATERIALS

1. General

1. The materials may be new or used, but must be adequate in capacity for the purposes intended and must not create unsafe conditions or violate the requirements of applicable codes.

2. Conductors

1. Use wire, cable, or busses of appropriate type, sized in accordance with the National Electrical Code for the applied loads.
2. Use only UL labeled wire and devices.

2.2 EQUIPMENT

1. Provide appropriate enclosure for the environment in which used in compliance with NEMA standards.

3. EXECUTION

3.1 GENERAL

1. Install all work with a neat and orderly appearance.
2. Make structurally sound throughout.
3. Maintain to give continuous service and to provide safe working conditions.
4. Modify temporary power and light installation as job progress requires.

3.2 INSTALLATION

1. Locate so that interference with storage areas, traffic areas and work under other Contracts is avoided.

3.3 REMOVAL

1. Remove all temporary equipment and materials completely upon completion of construction.
2. Repair all damage caused by the installation and restore to satisfactory condition.

END OF SECTION

SECTION 015123 - TEMPORARY HEATING, COOLING AND VENTILATING

1. GENERAL

1.1 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

1. Temporary Electric: Section 015113
2. Temporary Facilities: Section 015200
3. Heating Requirements for Cold Weather Installation and Protection of Materials: Respective specification section for each item of work.

1.2 DEFINITIONS

1. Temporary Enclosures: Sufficient preliminary enclosures of an area of structure, or of an entire building, to prevent entrance or infiltration of rain water, wind or other elements and which will prevent undue heat loss from within enclosed area.
2. Permanent Enclosure: Stage of construction at which all moisture and weather protection elements of construction have been installed in accordance with Contract Documents, either for a portion of structure, or for an entire building.

1.3 DESCRIPTION OF SYSTEM

1. Prior to the building or portion of building being permanently enclosed, the contractor shall provide temporary heat and ventilation and weather protection necessary for his work, as described below. After permanent enclosure, the Construction Manager will provide temporary heat and ventilation in enclosed areas required to:
 1. Facilitate progress of Work.
 2. Protect Work and products against dampness and cold.
 3. Prevent moisture condensation on surfaces.
 4. Provide suitable ambient temperatures and humidity levels for installation and curing of materials.
 5. Provide adequate ventilation to meet health regulations for safe working environment.

2. Temperatures Required

1. Generally, 24 hours a day: Minimum of 40 degrees F.
 2. 24 hours a day during placing, setting and curing of cementitious materials:
As required by specification section for each product.
 3. 24 hours a day, seven days prior to, and during, placing of interior finishes:
woodwork, resilient floors, painting and finishing: As required by
specification section for each product.
 4. 24 hours a day after application of finishes, and until Substantial Completion:
Minimum of 50 degrees F.
3. Ventilation Required:
1. Contractors shall prevent hazardous accumulations of dusts, fumes, mists,
vapors or gases in areas occupied during construction.
 1. Provide local exhaust ventilation to prevent harmful dispersal of
hazardous substances into atmosphere of occupied areas.
 2. Dispose of exhaust materials in manner that will not result in harmful
dispersal of hazardous substances into atmosphere of occupied areas.
 3. Continuously ventilate storage spaces containing hazardous or volatile
materials.
 2. Contractors shall provide adequate ventilation for:
 1. Curing installed materials.
 2. Dispersal of humidity.
 3. Temporary sanitary facilities.
 3. Duration of Operations:
 1. For Personnel:
 1. At all times personnel occupy an area subject to hazardous
accumulations of harmful elements.
 2. Continue operation of ventilation and exhaust system for time after
cessation of work process to assure removal of harmful elements.
 2. For curing installed materials: As required by specification section for
respective materials.

3. For humidity dispersal: Continuously ventilate to provide suitable ambient conditions for work.
4. The Construction Manager shall maintain strict supervision of operation of temporary heating and ventilating equipment in order to:
 1. Enforce conformance with applicable codes and standards.
 2. Enforce safe practices.
 3. Prevent abuse of services.

1.4 COSTS OF INSTALLATION AND OPERATION

1. The Contractor shall be responsible for all installation and operating costs for any heat and ventilation as required in this section until the permanent HVAC system is in operation.
2. After the permanent HVAC system is operational, the Owner will pay the costs of fuel for temporary heat and ventilation. The Contractor will pay the costs for maintaining the system until final acceptance by the Owner.
3. The Contractor shall be responsible for all installation and operating costs for any heat required to supplement that which is to be supplied by the Construction Manager in 1.3, above.

1.5 REQUIREMENTS OF REGULATORY AGENCIES

1. The Construction Manager will obtain and pay for permits as required by governing authorities for those activities required by this Section.
2. Contractor shall comply with Federal, State and local codes, and utility company regulations.

2. PRODUCTS

2.1 MATERIALS

1. General

1. Materials may be new or used, but must be adequate for purposes intended and must not create unsafe conditions nor violate requirements of applicable codes.

2.2 EQUIPMENT

1. Standard products, meeting code requirements.
 2. Provide required facilities, including piping, wiring and controls.
 3. Portable Heater: Standard Units, meeting code requirements.
 1. Safety Controls against explosion, overheating, and carbon monoxide build up.
 2. Vent direct-fired units to outside.
 3. Provide adequate combustion air.
 4. Oil-Fired heaters will not be allowed.
3. EXECUTION
- 3.1 GENERAL
1. Comply with applicable sections of Division 15 - Mechanical.
 2. Install work in neat and orderly manner.
 3. Make structurally, mechanically and electrically sound throughout.
 4. Maintain to give safe, continuous service at required times and to provide safe working conditions.
 5. Modify and extend system as work progress requires.
- 3.2 INSTALLATION
1. Locate units to provide equitable distribution of heat and air movements.
 2. Locate to avoid interference with, or hazards to:
 1. Work or movement of personnel.
 2. Traffic areas.
 3. Materials handling.
 4. Storage areas.
 5. Work of other Contractors.

6. Finishes.

3.3 OPERATION OF PERMANENT EQUIPMENT

1. The Construction Manager will coordinate with Contractor.
2. The Contractor will place permanent HVAC system in operation only upon written authorization by the Construction Manager.
3. Before operating the permanent HVAC equipment, the Contractor shall confirm to the Construction Manager that:
 1. Inspection has been made by proper authorities.
 2. Systems, equipment piping, strainers, filters and associated operating items are sufficiently complete, cleaned, and ready for operation.
 3. Controls and safety devices are complete and tested, or adequate temporary controls are provided.
 4. Before operating the permanent HVAC equipment, the Contractor shall install temporary filters:
 1. For air handling units.
 2. For permanent ducts.

3.4 REMOVAL

1. The Contractor shall completely remove temporary materials and equipment when no longer required, or on completion of construction.
2. The Contractor shall clean and repair damage caused by temporary installation, and restore equipment to specified or original condition.
3. The Contractor shall remove temporary filters and install new filters, or clean permanent filters, in the permanent HVAC system prior to final acceptance by the Owner.

END OF SECTION

SECTION 015200 - CONSTRUCTION FACILITIES & TEMPORARY CONTROLS

1. GENERAL

1.1 DESCRIPTION

1. Construction Manager and Contractors shall provide all temporary facilities throughout the construction period unless otherwise indicated in the Contract Documents.
2. Construction Manager and Contractors shall pay all costs for providing, maintaining and removing of all temporary facilities unless otherwise indicated in the Contract Documents.

1.2 RELATED WORK SPECIFIED ELSEWHERE

1. Temporary Electric: Section 015113.

2. FACILITIES

2.1 TEMPORARY SANITATION FACILITIES

1. Construction Manager will provide and maintain sanitary facilities for all personnel on the project.
2. The number of sanitary facilities required shall be based on the total number of workers employed on the site and shall be in accordance with the provisions of the applicable code.
3. Construction Manager will maintain sanitary facilities in a sanitary and clean condition at all times.

2.2 TEMPORARY WATER

1. Drinking Water: Contractor shall provide potable water for drinking purposes for all his personnel on the site. He shall furnish disposable drinking cups at water stations. Each water station shall be equipped with a suitable trash container for disposal of the drinking cups.
2. Construction Water: Construction Manager will provide and maintain tap locations for construction water of sufficiently pure and potable quality to avoid deleterious effect on any materials used. Location of construction water tap locations will be determined by the Construction Manager depending on the stage of construction of the incoming water service. Contractor shall provide and maintain all hoses, piping and valves as required for obtaining construction water from taps provided by the Construction Manager.

2.3 TEMPORARY TELEPHONES

1. Construction Manager will not provide any telephones or fax machines for Contractor's personnel. Each Contractor is responsible for its own phones and fax machines.

2.4 FIELD OFFICE

1. During the period of the Work and until final acceptance of the project, the Construction Manager will provide a weatherproof building for the Construction Manager's Field Project Manager(s) and Superintendent(s). Contractor shall make provisions for its own field office, subject to approval by the Construction Manager.

2.5 FIRE PROTECTION

1. The Construction Manager will provide and maintain portable fire extinguishers on each floor level and building area. Number to conform to applicable codes.
2. Contractor shall provide additional fire extinguishers as required by OSHA regulations for its work.
3. Fire extinguishers shall be Multi-Purpose (ABC) dry chemical, UL labeled.

2.6 ACCESS ROADS AND PARKING AREAS

1. The Construction Manager will provide and maintain access roads on the site.
2. Neither the Construction Manager nor the Owner will provide parking for Contractor's personnel on or about the project site. All parking provisions required for Contractors will be solely the responsibility of the Contractors or their personnel.

2.7 STORAGE AREAS

1. The Construction Manager will assign storage areas on the site. Storage areas are extremely limited and will be assigned in a manner which will best facilitate the work.
2. Contractor shall provide all other storage space required for its work at off-site locations.
3. All combustible or flammable materials must be safely stored in a secured area in strict accordance with regulations, codes and laws enforced by local, State or Federal agencies, whichever is the most stringent.

2.8 FIRST AID STATION

1. The Construction Manager will provide and maintain an unmanned first aid station for all personnel in his jobsite office.

2.9 SECURITY

1. The Construction Manager will provide the following security measures at the site: security lighting will be provided.
2. All other safety and security measures shall be the responsibility of each Contractor. These measures shall include but are not limited to the provision of secured storage for tools, construction equipment, and materials and equipment scheduled for installation in the building.

2.10 BENCH MARKS AND BASELINE

1. The Construction Manager will lay out and establish and maintain bench marks and baselines.
2. The Contractor shall lay out his own work and shall be responsible for the accuracy of same.
3. Contractor shall check grades, lines, levels and dimensions as shown on the drawings and shall promptly report errors or inconsistencies in same to the Construction Manager before Work proceeds.
4. The Contractor is responsible for damaging or altering the bench marks and baselines established by the Construction Manager and shall bear the costs of replacing same.

2.11 FIELD OFFICE AND STORAGE TRAILERS

1. Contractor shall provide and maintain its own field office and storage trailers as required.
2. Contractor shall provide temporary heat and power for its field office and storage trailer.
3. Contractor's field offices and storage trailers shall be located as directed by the Construction Manager.

2.12 PROJECT SIGN

1. The Construction Manager will provide a Project Sign naming the major

participants, as determined by the Owner.

2.13 TRASH DISPOSAL

1. Each Contractor shall be responsible for clean up and depositing its common trash in the dumpsters provided by the Construction Manager.
2. The Construction Manager will not provide a trash chute.
3. The Construction Manager will provide dumpsters, and will arrange for disposal of common, non-hazardous, work-related trash deposited in these dumpsters.

2.14 HOISTING

1. Contractor shall provide its own materials hoists and cranes. No personnel hoist will be provided.

2.15 SCAFFOLDING AND WORKING PLATFORMS

1. No scaffolding shall be provided by the Construction Manager. Each Contractor shall provide all scaffolding required to perform its Work.

2.16 SAFETY BARRICADES AND RAILINGS

1. The Structural Contractor shall provide barricades around elevator, stair, shaft and cut openings in floors and roofs, and edges of floors and roofs. All barricades shall at a minimum, be constructed of two runs of 1/2" diameter wire rope cable with adequate turn-buckle and eyes such that no more than 60' of cable need be loosened or removed at any given location for access. All cables shall be installed such that no more than 3" of deflection of the cable is achieved at any point between supports. The methods and materials used in barricading shall be in accordance with OSHA and local code regulations, and shall be approved by the Construction Manager prior to installation. Barricades will be installed immediately after the installation of the floor slab on any level or part of a level on the Building. Until a level has been fully barricaded, the Structural Contractor will be responsible for maintenance of the barricades. After a level has been fully barricaded, the Construction Manager will assume maintenance of the barricades until a subsequent contractor requires the barricades to be removed in order to accomplish his work, at which time that contractor will assume maintenance of the barricades.
2. After the barricades are no longer needed, the Construction Manager will remove the barricades from the site. The Construction Manager will determine the location and scheduling of barriers to be removed.
3. Contractor shall provide for its own barricades at all other trenches, excavations,

and locations not specifically identified in Paragraph 1 above.

4. Contractors who remove barricades shall be responsible for replacing them. If, after proper notification, in writing, from the Construction Manager the responsible Contractor does not correct his deficiencies in safety barricade placement, the Construction Manager reserves the right to undertake this work and backcharge the responsible Contractor(s).
5. During the execution of his work, Contractor will provide daily maintenance of, and upon completion of same, restore all barricades in a manner acceptable to prevailing safety standards enforced by local, State or Federal ordinance, whichever is most stringent. The intent is to leave no floor penetration or perimeter opening in an unsafe condition.
6. The Construction Manager shall arrange for temporary ladders required for access to each of the floor levels after the completion of floor slab work, and until the final stairs are ready for use.

2.17 PUMPING AND DRAINAGE

1. Contractor shall provide its own pumping and drainage.
2. When an area is released by one Contractor to another, the Contractor releasing an area shall be responsible for leaving it in a drained condition. The incoming Contractor shall assume responsibility for drainage on the day that he is scheduled to start work in the area. If the incoming Contractor is late in starting work, he shall assume responsibility for pumping and drainage arising as a result.

2.18 TEMPORARY BUILDING ENCLOSURES

1. The Construction Manager will equip all temporary exterior doors of the building with self-closing hardware and padlocks.
2. All other temporary enclosures and protection shall be provided by the Contractor requiring the protection.
3. Temporary enclosures required due to late delivery of materials or untimely installation of work shall be the responsibility of the Contractor responsible for the delay.

2.19 TEMPORARY POWER AND LIGHTING

1. Contractor shall provide all extension cords and outlets as required for obtaining electric power from power centers provided by the Electrical Contractor. Refer to Section 015113 - TEMPORARY ELECTRIC.

2. Contractor shall provide its own additional temporary lighting of sufficient lighting levels to properly install his work.

2.20 TEMPORARY HEAT

1. Contractor shall provide temporary heat as required for its operations. Once a building has reached the "Permanent Enclosure" stage, temporary heat will be provided as specified in Section 015123 - TEMPORARY HEAT AND VENTILATION.
2. Equipment and methods of temporary heating shall be satisfactory to the Construction Manager.

2.21 PROTECTION OF ADJACENT MATERIALS

1. Contractor shall protect adjacent materials and finishes from damage as a result of its work.

2.22 CLEAN UP

1. Contractor shall arrange for clean up and removal of debris resulting from its operations, and shall dispose of debris in accordance with the provisions of Paragraph 2.13 above. Clean up shall be scheduled on a continual basis to ensure that building, grounds and public properties are maintained free from accumulations of waste materials and trash, but in any case not less than once a week.
2. The Contractor will ensure that all waste materials that are combustible or flammable will be removed from the building at the end of each work day. All trash considered to be edible by rodent will be disposed of in metal containers and removed by the end of the work day.
3. At completion of its Work, each Contractor shall remove waste materials, rubbish, tools, equipment, and clean up all exposed surfaces in preparation for final cleaning.
4. If, after notification in writing from the Construction Manager, the Contractor does not correct its deficiencies in housekeeping within twenty four (24) hours, the Construction Manager reserves the right to undertake the Work and to backcharge the Contractor.
5. Final clean up prior to Owner occupancy shall be arranged for by the Construction Manager.

2.23 DUST PROTECTION

1. Contractor shall erect and maintain dust proof protection whenever its operations will produce dust and dirt that might filter through the building into occupied or finished areas. Contractor shall be responsible for all cleaning required due to its failure to provide such dust protection.

2.24 PROTECTION OF EXISTING CONSTRUCTION

1. Contractor shall be responsible for all damage that it may cause to materials and equipment stored or installed by other Contractors.

2.25 OTHER

1. Contractor shall provide any other Temporary Facilities and services that it requires and which are not specifically identified above.

3. PERMITS

- 3.1 The Construction Manager will obtain the Building Permit. All other permits are to be obtained and paid for by the Contractor requiring them.

4. EXECUTION

4.1 GENERAL

1. Contractor shall install all temporary facilities in accordance with applicable codes.
2. Contractor shall maintain temporary facilities for which it is responsible throughout the construction period.
3. Contractor shall remove all temporary facilities for which it is responsible when they are no longer required or when the Construction Manager directs the removal of same.
4. Contractor shall repair all damage to the Project Site caused by the installation of its temporary facilities.

END OF SECTION

SECTION 016200 - MATERIAL AND EQUIPMENT

1. GENERAL CONDITIONS

- 1.1 The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate apply to the Work specified in this Section.
- 1.2 Where work is to be executed under Separate Prime Contracts, the provisions of this Section apply to each Contract.

2. REQUIREMENTS INCLUDED

- 2.1 All materials and equipment incorporated into the Work shall:
 1. be new;
 2. conform to applicable specifications and standards; and
 3. comply with size, make, type and quality specified, or as specifically approved in writing by the Architect.
- 2.2 Manufactured and Fabricated Products shall conform to the following requirements:
 1. Designed, fabricated and assembled in accord with the best engineering and shop practices.
 2. Manufactured like parts of duplicate units to standard sizes and gauges, to be interchangeable.
 3. Two or more items of the same kind shall be identical, by the same manufacturer.
 4. Products shall be suitable for service conditions.
 5. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.
- 2.3 Contractor shall not use materials or equipment for any purpose other than that for which it is designated or is specified.
- 2.4 Materials removed from existing structures shall not be reused in the completed work unless specifically indicated or specified.
- 2.5 For materials and equipment specifically indicated or specified to be reused in the Work:

1. Contractor shall use special care on removal, handling storage and reinstallation, to assure proper function in the completed Work.
2. Arrange for transportation, storage and handling of products which require off-site storage, restoration or renovation. Pay all costs for such work.

3. MANUFACTURER'S INSTRUCTIONS

3.1 When Contract Documents require that installation of work shall comply with manufacturer's printed instructions, Contractor shall obtain and distribute copies of such instructions to parties involved in the installation, including two copies to Construction Manager.

1. Maintain one set of complete instructions at the job site during installation and until completion.

3.2 Contractor shall handle, install, connect, clean, condition and adjust products in strict accord with such instructions and in conformity with specified requirements.

1. Should job conditions or specified requirements conflict with manufacturer's instructions, Contractor shall consult with Construction Manager for further instructions.
2. Contractor shall perform work in accord with manufacturer's instructions. Contractor shall not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

4. TRANSPORTATION AND HANDLING

4.1 Contractor shall arrange deliveries of Products in accord with construction schedules, coordinate to avoid conflict with work and conditions at the site.

1. Deliver Products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
2. Contractor shall immediately on delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals, and that Products are properly protected and undamaged.

4.2 Contractor shall provide equipment and personnel to handle Products by methods to prevent soiling or damage to Products or packaging.

5. STORAGE AND PROTECTION

5.1 Contractor shall store Products in accord with manufacturer's instructions, with seals and labels intact and legible.

1. Contractor shall store Products subject to damage by the elements in weathertight enclosures.
2. Contractor shall maintain temperature and humidity within the ranges required by manufacture's instructions.

5.2 Exterior Storage

1. Contractor shall store fabricated Products above the ground, on blocking or skids, to prevent soiling or staining. Cover Products which are subject to deterioration with impervious sheet coverings; provide adequate ventilation to avoid condensation.
2. Contractor shall store loose granular materials in a well-drained area on soiled surfaces to prevent mixing with foreign matter.

5.3 Contractor shall arrange storage in a manner to provide easy access for inspection. Contractor shall make periodic inspections of stored Products to assure that Products are maintained under specified conditions, and free from damage or deterioration.

5.4 Contractor shall store flammable materials so as to prevent contact with flames and fire. Conform with manufacturer's recommendations and local laws. Pay particular attention to storage of:

1. Roof insulation.
2. Roofing materials, including solvents.
3. Paint materials.
4. Cleaning and other solvents.
5. Fuels.

5.5 Protection after Installation:

1. Contractor shall provide substantial coverings as necessary to protect installed Products from damage from traffic and subsequent construction operations. Remove when no longer needed.

6. SUBSTITUTIONS AND PRODUCT OPTIONS

6.1 Product List.

1. Within 30 days after Contract Date, Contractor shall submit to Construction

Manager a complete list of major products proposed to be used, with the name of the manufacturer and the installing Contractor.

6.2 Contractor's Options.

1. For Products specified only by reference standard, Contractor shall select any Product meeting that standard.
2. For Products specified by naming several Products or manufacturers, Contractor shall select any one of the Products or manufacturers named which complies with the specifications.
3. For Products specified by naming one or more Products or manufacturers and "or equal", Bidders must, during the bidding period, submit a request for substitutions for any Product or manufacturer not specifically named. See provisions in Paragraph 6.3.
4. For Products specified by naming only one Product and manufacturer, there is no option; and Contractor shall provide the precise Product specified.

6.3 Substitutions.

1. Until a date no later than ten (10) days before the date Bids are due, Architect will consider written requests from bidders for substitution of Products. **The contractor will submit any substitution requests to the Construction Manager for transmittal to the Architect. The architect will review requests and will notify Bidders in an Addendum if the requested substitution is acceptable.**
2. Should the Bidder desire a substitution, it shall submit a separate request for each Product, supported with complete data, with drawings and samples as appropriate, including:
 1. Comparison of the qualities of the proposed substitution with that specified.
 2. Changes required in other elements of the Work because of the substitution.
 3. Effect on the construction schedule.
 4. Cost data comparing the proposed substitution with the Product specified.
 5. Any required license fees or royalties.
 6. Availability of maintenance service, and source of replacement materials.
3. Architect, in its sole discretion, shall be the judge of the acceptability of the proposed substitution.

4. A request for a substitution constitutes a representation that Bidder:
 1. has investigated the proposed Product and determined that it is equal to or superior in all respects to that specified;
 2. will provide the same warranties or bonds for the substitution as for the Product specified;
 3. will coordinate the installation of an accepted substitution into the Work, and make such other changes as may be required to make the Work complete in all respects; and
 4. waives all claims for additional costs, under his responsibility, which may subsequently become apparent.

- 6.4 Architect will review requests for substitutions with reasonable promptness, and notify Bidders, in writing, through the Construction Manager, of the decision to accept or reject the requested substitution. Any decision to accept a substitution must be confirmed in an Addendum issued during the bidding period in order to be valid. Oral approvals will not be binding.

END OF SECTION

SECTION 017329 - CUTTING AND PATCHING

1. GENERAL

- 1.1 Definition: "Cutting and Patching" includes cutting into existing construction to provide for the installation or performance of other work and subsequent fitting and patching required to restore surfaces to their original condition.
- 1.2 Refer to Other Sections of these specifications for specific cutting and patching requirements and limitations applicable to individual units of work.
- 1.3 Structural Work: Do not cut and patch structural work in a manner resulting in a reduction of load carrying capacity or load deflection ratio. Submit proposal and request and obtain Architect's/Engineer's approval before proceeding with cut and patch of structural work.
- 1.4 Operational/Safety Limitations: Do not cut and patch operational elements and safety components in a manner resulting in decreased performance, shortened useful life, or increased maintenance. Submit proposals and requests and obtain Architect's/Engineer's approval before proceeding with cut and patches of structural work.
- 1.5 Visual/Quality Limitations: Do not cut and patch work exposed to view (exterior and interior) in manner resulting in noticeable reduction of aesthetic qualities and similar qualities, as judged by Architect/Engineer.
1. Engage the original Installer/Fabricator, or (if not available) an acceptable equivalent entity, to cut and patch the following categories of exposed work but not limited to
 2. Exterior wall materials, i.e., curtain wall
 3. Finish floor materials, i.e., substrate, carpet, ceramic tile
 4. Walls
 5. Ceilings
- 1.6 Limitation on Approvals: Architect's/Engineer's approval to proceed with cutting and patching does not waive right to later acquire removal/replacement of work found to be cut and patched in an unsatisfactory manner, as judged by Architect/Engineer.

2. MATERIALS

- 2.1 General: Use materials for cutting and patching that are identical to existing materials. If identical materials are not available, or cannot be used, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials for cutting and patching that will result in equal or better performance characteristics.

3. EXECUTION

- 3.1 Inspection: Before cutting, examine surfaces to be cut and patched and conditions under which the work is to be performed. If unsafe or otherwise unsatisfactory conditions are encountered, take corrective action before proceeding with the work.
- 3.2 Temporary Support: To prevent failure provide temporary support of work to be cut.
- 3.3 Protection: Protect other work during cutting and patching to prevent damage. Provide protection from adverse weather conditions for that part of the project that may be exposed during cutting and patching operations.
1. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
 2. Take precautions not to cut existing pipe, conduit or duct serving the building but scheduled to be relocated until provisions have been made to bypass them.
- 3.4 Cutting: Cut the work using methods that are least likely to damage work to be retained or adjoining work. Where possible review proposed procedures with the original installer; comply with original installer's recommendations.
1. Where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut through concrete and masonry using a cutting machine such as a carborundum saw or core drill. Cut holes and slots neatly to size required with minimum disturbance of adjacent work. To avoid marring existing finished surfaces, cut and drill from the exposed or finished side into concealed surfaces. Temporarily cover openings when not in use.
- 3.5 Patching: Patch with seams which are durable and as invisible as possible. Comply with specified tolerances for the work.
1. Restore exposed finishes of patched areas and where necessary extend finish restoration into retained adjoining work in a manner which will eliminate evidence of patching and finishing.

4. WARRANTY

- 4.1 Warranties: Remove, replace, patch and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void warranties.

END OF SECTION

SECTION 017700 – CONTRACT CLOSEOUT

1. DESCRIPTION OF REQUIREMENTS

1.1 Provisions of this section apply to the procedural requirements for the actual close out of the Work, not to the administrative matters such as final payment or the changeover of insurance. Close out requirements relate to both substantial and final completion of the Work; they also apply to individual portions of completed work as well as the Total work. Specific requirements contained in other sections have precedence over the general requirements contained in this section.

2. PROCEDURES AT SUBSTANTIAL COMPLETION

2.1 Prerequisites: Contractor shall comply with the General Conditions and complete the following before requesting inspection of the Work, or a designated portion of the Work, for certification of substantial completion:

1. submit executed warranties, workmanship bonds, maintenance agreements, inspection certificates, releases of liens, tax certification and similar required documentation for specific units of work, and documents needed to enable Owner's unrestricted occupancy and use;
2. submit record documentation, maintenance manuals, tools, spare parts, keys and similar operational items;
3. complete instructions of Owner's operating personnel, and startup of systems; and;
4. complete final cleaning and remove temporary facilities and tools.

2.2 Inspection Procedures: Upon receipt of Contractor's request, Architect/Engineer will either proceed with inspection or advise Construction Manager of prerequisites not fulfilled. Following initial inspection, Architect/Engineer will either prepare certificate of substantial completion, or advise Construction Manager of work which must be performed prior to issuance of certificate. The Architect/Engineer will repeat the inspection when requested and assure that the work has been substantially completed. Results of the completed inspection will form the initial "punch list" for final acceptance.

1. Architect reserves the right to charge Contractor for additional reinspections required beyond initial inspection and one (1) reinspection per area.

2.3 Punch List Procedures: Each Contractor shall be given a copy of the punch list with its appropriate work identified. Each Contractor shall be given 9 (nine) calendar work days to complete their punch list work. On the 10th day or as determined by the Construction Manager the Construction Manager shall employ other Contractors, as

required, to complete any incomplete punch list work and retain from the appropriate Contractors retainage all costs incurred.

3. PROCEDURES AT FINAL ACCEPTANCE

3.1 Reinspection Procedure: The Architect/Engineer will reinspect the Work upon receipt of the Contractor's notice that, except for those items whose completion has been delayed due to circumstances that are acceptable to the Architect/Engineer, the Work has been completed, including punch list items from earlier inspections. Upon completion of reinspection, the Architect/Engineer will either recommend final acceptance and final payment, or will advise the Contractor of work not completed or obligations not fulfilled as required for final acceptance. If necessary, this procedure will be repeated.

4. RECORD DOCUMENTATION

4.1 Record Drawings: Contractor shall maintain a complete set of either blue or black line prints of the contract documents and shop drawings for record markup purposes throughout the Contract Time. Contractor shall mark up these drawings during the course of the Work to show both changes and the actual installation, in sufficient detail to form a complete record for Owner's purposes giving particular attention to work that will be concealed and difficult to measure and record at a later date, and Work which may require servicing or replacement during the life of the project. Require the entities marking prints to sign and date each mark up. Bind prints into manageable sets, with durable paper cover, appropriately labeled.

4.2 Maintenance Manual: Contractor shall provide 3-ring vinyl covered binders containing required maintenance manuals, properly identified and indexed and including operating and maintenance instructions extended to cover emergencies, spare parts, warranties, inspection procedures, diagrams, safety, security, and similar appropriate data for each system of equipment item.

4.3 State Tax Certification: Contractor shall provide recent Delaware State Tax Certification form as issued by State of Delaware, Department of Finance, Division of Revenue, Carvel State Office Building, 820 N. French Street, Wilmington, Delaware 19801.

5. GENERAL CLOSE OUT REQUIREMENTS

5.1 Operator Instruction: Contractor shall require each Installer of systems requiring continued operation and maintenance by Owner's operating personnel, to provide on location instruction to Owner's personnel, sufficient to ensure safe, secure, efficient, non-failing utilization and operation of systems. Contractor shall provide instructions for the following categories of work:

1. Mechanical/electrical/electronic systems (not limited to work of Division 25 and

26).

2. Roofing, flashing, joint sealers.
3. Floor finishes.

6. FINAL CLEANING

6.1 At the time of project close out Contractor shall clean or reclean the Work to the condition expected from a normal, commercial building cleaning and maintenance program. Complete the following cleaning operations before requesting the Architect/Engineer's inspection for certification of substantial completion:

1. Remove non-permanent protections and labels.
2. Polish glass.
3. Clean exposed finishes.
4. Touch up minor finish damage.
5. Clean or replace mechanical systems filters.
6. Remove debris.
7. Broom clean unoccupied spaces.
8. Sanitize plumbing and food service facilities.
9. Clean light fixtures and replace burned out lamps.
10. Sweep and wash paved areas.
11. Police yards and grounds.

END OF SECTION

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:

- 1. Access doors and frames for walls and ceilings.

- B. Related Sections include the following:

- 1. Division 03 Section "Cast-in-Place Concrete" for blocking out openings for access doors and frames in concrete.
- 2. Division 04 Section "Unit Masonry" for anchoring and grouting access door frames set in masonry construction.
- 3. Division 07 Section "Roof Accessories" for roof hatches.
- 4. Division 08 Section "Door Hardware" for mortise or rim cylinder locks and master keying.
- 5. Division 09 Section "Acoustical Tile Ceilings" for suspended acoustical tile ceilings.

1.3 SUBMITTALS

- A. Product Data: For each type of access door and frame indicated. Include construction details, fire ratings, materials, individual components and profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each door face material, at least 3 by 5 inches (75 by 125 mm) in size, in specified finish.
- D. Access Door and Frame Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.
- E. Ceiling Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim are shown and coordinated with each other.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain access door(s) and frame(s) through one source from a single manufacturer.
- B. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. NFPA 252 or UL 10B for vertical access doors and frames.
 - 2. ASTM E 119 or UL 263 for horizontal access doors and frames.
- C. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.5 COORDINATION

- A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

2.1 STEEL MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - 1. ASTM A 123/A 123M, for galvanizing steel and iron products.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS) with A60 (ZF180) zinc-iron-alloy (galvannealed) coating or G60 (Z180) mill-phosphatized zinc coating; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified thickness according to ASTM A 924/A 924M.
- C. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Surface Preparation for Steel Sheet: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
 - 2. Surface Preparation for Metallic-Coated Steel Sheet: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds,

mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.

- a. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
 3. Factory-Primed Finish: Apply shop primer immediately after cleaning and pretreating.
- D. Drywall Beads: Where set in drywall partitions, provide edge trim formed from 0.0299-inch (0.76-mm) zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Acudor Products, Inc.
 2. Babcock-Davis; A Cierra Products Co.
 3. Bar-Co, Inc. Div.; Alfab, Inc.
 4. Cendrex Inc.
 5. Dur-Red Products.
 6. Elmdor/Stoneman; Div. of Acorn Engineering Co.
 7. Jensen Industries.
 8. J. L. Industries, Inc.
 9. Karp Associates, Inc.
 10. Larsen's Manufacturing Company.
 11. MIFAB, Inc.
 12. Milcor Inc.
 13. Nystrom, Inc.
 14. Williams Bros. Corporation of America (The).
- B. Flush Access Doors and Frames with Exposed Trim: Fabricated from metallic-coated steel sheet.
1. Locations: Wall and ceiling surfaces.
 2. Door: Minimum 0.060-inch- (1.5-mm-) thick sheet metal, set flush with exposed face flange of frame.
 3. Frame: Minimum 0.060-inch- (1.5-mm-) thick sheet metal with 1-1/4-inch- (32-mm-) wide, surface-mounted trim.
 4. Hinges: Spring-loaded, concealed-pin type.
 5. Latch: Cam latch operated by key with interior release.
 6. Lock: Mortise cylinder.
 - a. Lock Preparation: Prepare door panel to accept cylinder specified in Division 08 Section "Door Hardware."

- C. Fire Rated, Uninsulated, Flush Access Doors and Frames with Exposed Trim: Fabricated from metallic-coated steel sheet.
 - 1. Locations: Wall surfaces.
 - 2. Fire-Resistance Rating: Not less than that of adjacent construction.
 - 3. Door: Minimum 0.060-inch- (1.5-mm-) thick sheet metal, flush construction.
 - 4. Frame: Minimum 0.060-inch- (1.5-mm-) thick sheet metal with 1-1/4-inch- (32-mm-) wide, surface-mounted trim.
 - 5. Hinges: Concealed-pin type.
 - 6. Automatic Closer: Spring type.
 - 7. Lock: Self-latching device with mortise cylinder lock.
 - a. Lock Preparation: Prepare door panel to accept cylinder specified in Division 08 Section "Door Hardware."

2.3 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
 - 1. Exposed Flanges: As indicated.
 - 2. For trimless frames with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
 - 3. Provide mounting holes in frame for attachment of masonry anchors. Furnish adjustable metal masonry anchors.
- D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
 - 1. For mortise cylinder lock, furnish two keys per lock and key all locks alike.
 - a. Locks to match Owner keying requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.

- B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.
- C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.
- D. For personnel access doors in plumbing chases, set door head at 6'-0" elevation and sill at 2'-0" above adjacent floor level to allow for convenient access without step or ladder.

3.2 ADJUSTING AND CLEANING

- A. Adjust doors and hardware after installation for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

DIVISION 26
SECTION 260500
COMMON WORK RESULTS FOR ELECTRICAL
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- 3.7. PROVISIONS FOR ACCESS
- 3.8. PAINTING AND FINISHES
- 3.9. COLOR SELECTION
- 3.10. PROTECTION OF WORK
- 3.11. OPERATION OF EQUIPMENT
- 3.12. TESTING AND ADJUSTMENT
- 3.13. WALL AND FLOOR PENETRATIONS
- 3.14. EQUIPMENT BY OTHERS

- 3.15. PHASING
- 3.16. OUTAGES
- 3.17. CUTTING AND PATCHING
- 3.18. PENETRATION OF WATERPROOF CONSTRUCTION
- 3.19. CONCRETE AND MASONRY WORK
- 3.20. CONNECTIONS AND ALTERATIONS TO EXISTING WORK
- 3.21. COORDINATION
- 3.22. EXCAVATION AND BACKFILLING

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 ALTERNATES

- A. Refer to Division 01 Section, "Alternates" for description of work under this Section affected by Alternates.

1.3 SUMMARY

- A. Section Includes:

1. Electrical equipment coordination and installation.
2. Sleeves for raceways and cables.
3. Sleeve seals.
4. Foam Duct Sealant.
5. Grout.
6. Plywood Backboards.
7. Common electrical installation requirements.

- B. Provide all labor, materials, equipment, and services necessary for and incidental to the complete installation and operation of all electrical work.

- C. Unless otherwise specified, all submissions shall be made to, and acceptances and approvals made by the Architect and the Engineer.

- D. Contract Drawings are generally diagrammatic and all offsets, fittings, transitions and accessories are not necessarily shown. Furnish and install all such items as may be required to fit the work to the conditions encountered. Arrange conduits, equipment, and other work generally as shown on the Contract Drawings, providing proper clearance and access. Where departures are proposed because of field conditions or other causes, prepare and submit detailed shop drawings for approval in accordance with Article "Submittals" specified below. The right is reserved to make reasonable changes in location of equipment, boxes, conduit/wiring, and devices, up to the time of rough-in or fabrication.

- E. Conform to the requirements of all rules, regulations and codes of local, state and federal authorities having jurisdiction.

- F. Coordinate the work under Division 26 with the work of all other construction trades.

- G. Be responsible for all construction means, methods, techniques, procedures, and phasing sequences used in the work. Furnish all tools, equipment and materials necessary to properly

perform the work in first class, substantial, and workmanlike manner, in accordance with the full intent and meaning of the Contract Documents.

- H. Arrange conduit, wiring, equipment, and other work generally as shown, providing proper clearances and access. Carefully examine all Contract Drawings and fit the work in each location without substantial alteration. Where departures are proposed because of field conditions or other causes, prepare and submit detailed shop drawings for approval in accordance with Article "Submittals" as hereinafter specified. The right is reserved to make reasonable changes in location of equipment, conduit and wiring up to the time of rough-in or fabrication.

1.4 EXAMINATION OF SITE

- A. Examine the site, determine all conditions and circumstances under which the work must be done, and make all necessary allowances for same. No additional cost to the Owner will be permitted for Contractor's failure to do so.
- B. Examine and verify specific conditions described in individual Specifications sections.
- C. Verify that utility services are available, of the correct characteristics, and in the correct locations.

1.5 INTERPRETATION OF DOCUMENTS

- A. Any discrepancies between Drawings, Specifications, Drawings and Specifications, or within Drawings and Specifications shall be promptly brought to the attention of the Owner during the bidding period. No allowance shall subsequently be made by reason of failure to have brought said discrepancies to the attention of the Owner during the bidding period or of any error on the Bidder's part.
- B. The locations of products shown on Drawings are approximate. Place the devices to eliminate all interference with above-ceiling ducts, piping, etc. Where any doubt exists, the exact location shall be determined by the Owner.
- C. All general trades and existing conditions shall be checked before installing any outlets, power wiring, etc.
- D. Equipment sizes shown on the Drawings are estimated. Before installing any wire or conduit, obtain the exact equipment requirements and install wire, conduit, or other item of the correct size for the equipment actually installed. However, wire and conduit sizes shown on the Drawings shall be taken as a minimum and shall not be reduced without written approval from the Owner.
- E. Where variances occur between the Drawings and Specifications or within either document itself, the item or arrangement of better quality, greater quality, or higher cost shall be included in the Contract Price. The Engineer will decide on the item and manner in which the work shall be installed.

- F. Contract Drawings are generally diagrammatic and all offsets, fittings, transitions, and accessories are not necessarily shown. Furnish and install all such items as may be required to fit the work to the conditions encountered. Arrange conduits, equipment, and other work generally as shown on the Contract Drawings, providing proper clearance and access. Where departures are proposed because of field conditions or other causes, prepare and submit detailed Shop Drawings for approval in accordance with Article "Submittals" as herein after specified. The right is reserved to make reasonable changes in location of equipment, conduit/wiring, and devices, up to the time of rough-in or fabrication.
- G. Work not specifically outlined, but reasonably incidental to the completion of the work, shall be included without additional compensation from the Architect, Engineer, and Owner.
- H. Perform the work in a first-class, substantial and workmanlike manner. Any materials installed which do not present an orderly and neat workmanlike appearance shall be removed and replaced when so directed by the Engineer, at the Contractor's expense.
- I. Contact and coordinate service entrance equipment and layout with local power company prior to ordering or installing any service entrance equipment. Contractor shall furnish and install all incoming raceway and service entrance cables. If the power company plans to install cable and/or conduit, Contractor is responsible for proper coordination of cable, conduit, lug sizes, etc., for proper interface between utility owned/installed equipment and Contractor-installed equipment.
- J. The Owner shall make the application for electrical service and pay for all service charges, as coordinated with the Contractor.
- K. The complete set of Architectural, Civil, Structural, Theatrical, Food Service, Mechanical, and Electrical Drawings and Specifications apply to this work. The successful Bidder shall familiarize himself with all other related documents.

1.6 ELECTRICAL WORK UNDER OTHER DIVISIONS

A. Mechanical Equipment and Systems

1. In general, power wiring and motor starting equipment for mechanical equipment and systems are furnished and installed under Electrical Division 26.
2. Certain mechanical units are furnished from the factory with starters, contactors, transformers, fuses, wiring, etc., required for fans, pumps, etc. When this equipment is supplied from the factory, the Electrical Contractor must supply power circuit(s) to the unit and a disconnecting means. Coordinate with Mechanical Contractor so that one and only one, set of starters, fuses, switches, etc., is provided and installed.
3. In general, control and interlock equipment for HVAC systems (including associated wiring, conduit, transformers, relays, contacts, etc.) is furnished under Division 23. Division 26 shall install and connect all such equipment as necessary.
4. Controls, wiring, conduit, transformers, etc., for smoke, fire, and motor-operated dampers are provided under Division 23. Division 26 shall install and connect all such equipment.

- B. Architectural Equipment: In general, any electrically operated or controlled equipment furnished under architectural divisions shall be supplied with control wiring, transformers, contacts, etc. Provide power circuits and disconnects to such equipment and install all electrical control equipment related thereto.
- C. Kitchen Equipment: In general, any electrically operated or controlled equipment furnished under food service divisions shall be supplied and installed by the kitchen equipment supplier. Provide wiring devices, power circuits and disconnects for such equipment and install all electrical control equipment related thereto. Refer to Kitchen Consultant's Drawings for additional electrical wiring and conduits.
- D. Owner Furnished Equipment: In general, Owner furnished equipment is either provided or wired by the equipment supplier. Provide power circuits to such equipment and make final connections to equipment being provided by the Owner.
- E. Carefully review the Contract Documents and coordinate the electrical work under the various Divisions.

1.7 FIRE SAFE MATERIALS

- A. Unless otherwise indicated, materials and equipment shall conform to UL, NFPA and ASTM standards for fire safety with smoke and fire hazard rating not exceeding flame spread of 25 and smoke developed of 50.

1.8 REFERENCED STANDARDS, CODES AND SPECIFICATIONS

- A. Specifications, Codes and Standards listed below are included as part of this Specification, latest edition:
 - 1. ADA - Americans with Disabilities Act
 - 2. ANSI - American National Standards Institute
 - 3. ASTM - American Society for Testing and Materials
 - 4. CSA - Canadian Standards Association
 - 5. DNREC - Delaware Department of Natural Resources and Environmental Control
 - 6. EPA - Environmental Protection Agency
 - 7. FM - Factory Mutual
 - 8. IBC - International Building Code
 - 9. IEEE - Institute of Electrical and Electronics Engineers
 - 10. NEC - National Electrical Code
 - 11. NECA - National Electrical Contractors Association
 - 12. NEMA - National Electrical Manufacturers Association
 - 13. NFPA - National Fire Protection Association
 - 14. OSHA - Occupational Safety and Health Act
 - 15. UL - Underwriters' Laboratories
- B. The application standards of the local electric utility company.

- C. Electrical construction materials shall, where a listing is normal for the particular class of material, be listed in *Electrical Construction Materials List* of the Underwriters' Laboratories, Inc. (U.L.) and shall bear the listing label. Electrical equipment shall, where a listing is normal for the particular class of equipment, be listed in the *Electrical Appliance and Utilization Equipment List* of the Underwriters' Laboratories, Inc. (U.L.) and shall bear the listing label. Materials and equipment listed and labeled as "approved for the purpose" by other nationally recognized testing laboratory, inspection agency or approved organization (such as E.T.L. or Factory Mutual) shall be acceptable.

1.9 SUBMITTALS

- A. Product Data: For items specified in Part 2 of this Section.

1.10 SUBMITTALS, REVIEW AND ACCEPTANCE

- A. Equipment, materials, installation, workmanship and arrangement of work are subject to review and acceptance. No substitution will be permitted after acceptance of equipment or materials except where such substitution is considered by the Architect and/or Engineer, to be in best interest of Owner.
- B. After acceptance of Material and Equipment List, submit eight (8) copies, as required under the General Conditions, of complete descriptive data for all items. Data shall consist of Specifications, data sheets, samples, capacity ratings, performance curves, operating characteristics, catalog cuts, dimensional drawings, wiring diagrams, installation instructions, and any other information necessary to indicate complete compliance with Contract Documents. Edit submittal data specifically for application to this project.
- C. Thoroughly review and stamp all submittals to indicate compliance with contract requirements prior to submission. Coordinate installation requirements and any electrical requirements for equipment submitted. Contractor shall be responsible for correctness of all submittals.
- D. Submittals will be reviewed for general compliance with design concept in accordance with Contract Documents, but dimensions, quantities, or other details will not be verified.
- E. Identify submittals, indicating intended application, location and service of submitted items. Refer to Specification sections or paragraphs and Drawings where applicable. Clearly indicate exact type, model number, style, size and special features of proposed item. Submittals of a general nature will not be acceptable. For substituted items, clearly list on the first page of the submittal all differences between the specified item and the proposed item. The Contractor shall be responsible for corrective action and maintaining the Specification requirements if differences have not been clearly indicated in the submittal.
- F. Submit actual operating conditions or characteristics for all equipment where required capacities are indicated. Factory order forms showing only required capacities will not be acceptable. Call attention, in writing, to deviation from contract requirements.
- G. Acceptance will not constitute waiver of contract requirements unless deviations are specifically indicated and clearly noted. Use only final or corrected submittals and data prior to fabrication and/or installation.

- H. For any submittal requiring more than two (2) reviews by the Engineer (including those caused by a change in subcontractor or supplier) the Owner will withhold Contractor's funds by a change order to the contract to cover the cost of additional reviews. One review is counted for each action including rejection or return of any reason.

1.11 SHOP DRAWINGS

- A. Prepare and submit Shop Drawings for all electrical equipment, specially fabricated items, modifications to standard items, specially designed systems where detailed design is not shown on the Contract Drawings, or where the proposed installation differs from that shown on Contract Drawings.
- B. Submit Product Data and Shop Drawings including but not limited to the list below, in addition to provisions of the paragraph above. Identify all shop drawings by the name of the item and system and the applicable Specification paragraph number and Drawing number.
- C. Every submittal including, but not limited to the list below, shall be forwarded with its own transmittal as a separate, distinct shop drawing. Grouping of items/systems that are not related shall be unacceptable.

Items and Systems

1. Access Doors
2. Analysis & Coordination Study
3. Arc Flash Hazard Analysis
4. Arc Flash Hazard Labels
5. Ballasts for Lighting Fixtures
6. Battery Packs for Lighting Fixtures
7. Conductors and Cables - 600V or Less
8. Conduit and Raceway
9. Disconnect (Safety) Switches - Fused/Non-Fused
10. Electrical Connection Coordination Schedule
11. Electricity Meter
12. Emergency Off Push-Buttons
13. Emergency Transfer Relays
14. Enclosed Circuit Breakers
15. Equipment Nameplates/Labels
16. Firestopping Materials
17. Foam Duct Sealant
18. Fuses, 600V or Less
19. Generator
20. Ground Conductors
21. Ground Rods
22. Grout
23. Handholes
24. Hangers and Supports
25. Identification Products
26. Installation/Coordination Drawings of Electrical Room Layouts
27. Installation/Coordination Drawings of Mechanical Room Layouts

28. Installation/Coordination Drawings of Mezzanine/Penthouse Layouts
 29. Installation/Coordination Drawings of Other Spaces as indicated in the Specifications
 30. Junction and Pull Boxes, Custom Sizes
 31. Junction and Pull Boxes, Standard Sizes
 32. Lamps
 33. Lighting Calculations / Shop Drawings
 34. Lighting Contactors
 35. Lighting Control Panels
 36. Lighting Fixtures, Exterior
 37. Lighting Fixtures, Interior
 38. Lighting, Stadium/Athletic
 39. Lightning Protection System Wiring Diagrams
 40. Lightning Protection System Product Data
 41. Lightning Protection System Shop Drawings
 42. Motor Controllers
 43. Motor Starters
 44. Operation and Maintenance Manual
 45. Outlet and Device Boxes
 46. Panelboard Circuit Directories
 47. Panelboards
 48. Photocells
 49. Receptacles
 50. Record Drawings
 51. Retractable Cord Reels
 52. Sleeve Seals
 53. Sleeves
 54. Surge Protective Devices
 55. Switchboards
 56. Testing Agency Qualifications
 57. Tests and Reports
 58. Toggle/Snap Switches
 59. Transfer Switches, Automatic
 60. Transformers, 600V and Less
 61. Underground Ductbank Products
 62. Wiring Diagrams
- D. Submittals shall include, but not be limited to, the following information: size, type, functional characteristics, compliance with standards in Division 26, required service access which shall be suitable for intended location and use, electrical service connections and requirements, and deviations from Contract Document requirements.
- E. Submit for approval any other shop drawings as required by the Engineer. No item listed above shall be delivered to the site, or installed, until approved. After the proposed materials have been approved, no substitution will be permitted except where approved by the Engineer.
- F. Submit for approval schematic diagrams of each electrical system installed in the building. Diagrams shall indicate device location, service, type, make, model number and the identification number of each device in the particular system. Following approval by all authorities, the diagrams shall be framed, mounted under glass and hung in each Main

Equipment Room. Deliver the tracing or sepia from which the diagrams were reproduced to the Owner.

- G. Submittals shall include Riser Diagrams and Schematic Wiring Diagrams, complete conduit and wire requirements, outlet and junction box sizes and power requirements, for the following systems:
1. Athletic/Stadium Lighting
 2. Fire Alarm System
 3. Generator and Automatic Transfer Switch(es)
 4. Grounding and Bonding System
 5. Lightning Protection System
 6. Low Voltage Lighting Control System
 7. Occupancy Sensor Layout
- H. For any shop drawing requiring more than two (2) reviews by the Engineer (including those caused by a change in subcontractor or supplier) the Owner will withhold Contractor's funds by a change order to the contract to cover the cost of additional reviews. One review is counted for each action including rejection or return for any reason.
- I. Prepare and submit a detailed schedule of values indicating the Contract costs for the major work items. Provide additional detail and information as requested by the Engineer.

1.12 DEFINITIONS

- A. *Approve*: To permit use of material, equipment or methods conditional upon compliance with contract documents requirements.
- B. *Building Line*: Exterior wall of building.
- C. *Child Care Facility*: A building or structure, or portion thereof for educational, supervisory, or personal services for more than four children seven years old or younger.
- D. *Concealed*: Hidden from sight in chases, formed spaces, shafts, hung ceilings, embedded in construction or attic.
- E. *Conduits* include conduit, all fittings, identification, and other accessories relative to such conduit.
- F. *Contractor*: The Electrical Contractor and any of his subcontractors, vendors, suppliers, or fabricators.
- G. *EPDM*: Ethylene-propylene-diene terpolymer rubber
- H. *Exposed*: Not installed underground or *concealed* as defined above.
- I. *Finished Spaces*: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceiling, unexcavated spaces, crawl spaces, and tunnels.

- J. *Furnish and install or provide:* To supply, erect, install, and connect to complete for readiness for regular operation, the particular work referred to.
- K. *Location, Damp:* Locations protected from water and not subject to saturation with water or other liquids, but subject to moderate degrees of moisture. Examples of such locations include interior locations such as basements, crawlspaces, attics, cold-storage rooms, etc...
- L. *Location, Dry:* A location not normally subject to dampness or wetness. A dry location may temporarily be subject to dampness or wetness during building construction.
- M. *Location, Wet:* Locations subject to saturation with water or other liquids, locations exposed to weather, and installations underground or in concrete slabs or masonry in direct contact with the Earth. Examples of such locations include all exterior locations (including those under canopies, roofed open porches, etc...) commercial kitchens, and vehicle washing areas.
- N. *NBR:* Acrylonitrile-butadiene rubber.
- O. *Review:* Limited observation or checking to ascertain general conformance with design concept of the work and with information given in contract documents. Such action does not constitute a waiver or alteration of the contract requirements.

1.13 RECORD DRAWINGS

- A. Upon completion of the electrical installations, the Contractor shall deliver to the Architect one complete set of prints of the electrical Contract Drawings which shall be legibly marked in red pencil to show all changes and departures of the installation as compared with the original design. They shall be suitable for use in preparation of Record Drawings.
- B. Contractor shall incorporate all sketches, addendums, value engineering, change orders, etc., into record drawings prior to delivering the same to the Architect.

1.14 WARRANTY

- A. Contractor's attention is directed to warranty obligations contained in the General Conditions.
- B. The above shall not in any way void or abrogate equipment manufacturer's guarantee or warranty. Certificates of equipment manufacturer's warranties shall be included in the operations and maintenance manuals.
- C. The Contractor guarantees for a two year period from the time of final acceptance by the Owner:
 - 1. That the work contains no faulty or imperfect material or equipment or any imperfect, careless, or unskilled workmanship.
 - 2. That all work, equipment, machines, devices, etc. shall be adequate for the use to which they are intended, and shall operate with ordinary care and attention in a satisfactory and efficient manner.

3. That the Contractor will re-execute, correct, repair, or remove and replace with proper work, without cost to the Owner, any work found to be deficient. The Contractor shall also make good all damages caused to their work or materials in the process of complying with this section.
4. That the entire work shall be water-tight and leak-proof.

1.15 OPERATIONS AND MAINTENANCE MANUALS

- A. The Contractor shall have prepared six (6) copies of the Operations and Maintenance Manual and deliver these copies of the manual to the Owner. The manual shall be as specified herein. The manual must be approved and will not be accepted as final until so stamped.
- B. The manual shall be bound in a three-ring loose-leaf binder similar to National No. 3881 with the following title lettered on the front: *Operations and Maintenance Manual – New Woodbridge High School - Electrical*. No sheets larger than 8-1/2 inches x 11 inches shall be used, except sheets that are neatly folded to 8-1/2 inches x 11 inches and used as a pull-out. Provide divider tabs and table of contents for organizing and separating information.
- C. Provide the following data in the manual:
 1. As first entry, an approved letter indicating the starting/ending time of Contractor's warranty period.
 2. Maintenance operation and lubrication instructions on each piece of equipment furnished.
 3. Complete catalog data on each piece of electrical equipment furnished including approved Shop Drawing/Submittal with Engineer's Comments (if any).
 4. Manufacturer's extended limited warranties on equipment.
 5. Provide sales and authorized service representatives names, address, and phone numbers of all equipment and subcontractors.
 6. Provide supplier and subcontractor's names, address, and phone number.
 7. Catalog data of all equipment, starters, etc. shall include wiring diagrams, parts list and assembly drawing.
 8. Access panel charts with index illustrating the location and purpose of access panels.
 9. Approved Electrical Certificates.
 10. Start-up reports for equipment.
- D. Submit Operations and Maintenance Manual prior to anticipated date of Substantial Completion for Engineer review and approval. Substantial Completion requires that Operations and Maintenance Manuals be reviewed and approved.

- E. Post one (1) copy of all instructions, lists, charts and diagrams at the equipment mounted under glass or approved plastic cover.
- F. Deliver all instruction materials to the Owner prior to the formal instruction period.
- G. Upon completion of all work, thoroughly instruct the Owner's representatives in the proper operation and maintenance of all electrical equipment and systems.
- H. Instructions shall be done only after completed systems have been put into operation and tested for proper operation and performance.
- I. Instructions shall be given only by experts in the equipment or system and shall include descriptions and demonstrations of procedures of operation, data record keeping, etc.
- J. Furnish the necessary technicians, skilled workers, and helpers to operate the electrical systems and equipment of the entire project for one 8-hour day.
- K. Where specified in technical sections, provide longer periods required for specialized equipment.
- L. Instruct the Owner or designated personnel in operation, maintenance, lubrication, and adjustment of systems and equipment.
- M. The Operations and Maintenance Manual shall be available at the time of the instructions, for use by Instructors and Owner personnel.
- N. Schedule the general and specialized instruction periods for a time agreed upon by the Owner and Engineer.

1.16 INSTALLATION AND COORDINATION DRAWINGS

- A. Prepare, submit and use composite installation and coordination drawings to assure proper coordination and installation of the work. Drawings shall include, but not be limited to the following:
 - 1. Mechanical Rooms indicating transformers, panelboards, enclosures, boxes, conduits, mechanical equipment, ductwork, and piping, etc...
 - 2. Electrical Rooms indicating switchboards, panelboards, enclosures, boxes, transformers, conduits, wireways, etc...
- B. Draw plans to a scale not less than ¼ inch equals one foot. Include plans, sections and elevations of the proposed work, showing all equipment (mechanical, plumbing and electrical), conduit and wiring in the areas involved. Fully dimension all work, horizontally and vertically. Show coordination with other work including piping, ductwork and other mechanical work, walls, doors, ceilings, columns, beams, joists and other architectural and structural work.

- C. Identify all equipment and devices on wiring diagrams. Where field connections are shown to factory-wired terminals, furnish manufacturer's literature showing internal wiring of equipment.
- D. Prepare, submit, and use scaled layout drawings indicating dimensions, clearances, and actual equipment dimensions. Layout Drawings shall include, but not be limited to the following:
 - 1. Pad-mounted equipment and equipment connections.
 - 2. Underground conduits, ductbanks, and building penetrations.
- E. Prepare scaled coordination drawings in accordance with the Specifications. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:
 - 1. Indicate the proposed locations of power, lighting, and all special system raceways, equipment, and materials. Include the following:
 - a. Working space and dedicated space clearances per the NEC.
 - b. Clearances for equipment disassembly required for periodic maintenance.
 - c. Exterior wall and foundation penetrations.
 - d. Fire-rated wall and floor penetrations.
 - e. Equipment connections and support details.
 - f. Sizes and locations of required concrete bases.
 - 2. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction, including, but not limited to, the following: Major conduits and feeders.
 - 3. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
 - 4. The successful Bidder shall be responsible for indicating all raceways described in notes or indicated by home run symbols.
 - 5. The successful Bidder shall check all trades' Drawings, including Civil, Architectural, Structural, Plumbing, and Mechanical, to avoid possible demolition and installation conflicts.

PART 2 PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:

- a. For sleeve cross-section rectangle perimeter less than **50 inches (1270 mm)** and no side more than **16 inches (400 mm)**, thickness shall be **0.052 inch (1.3 mm)**.
- b. For sleeve cross-section rectangle perimeter equal to, or more than, **50 inches (1270 mm)** and 1 or more sides equal to, or more than, **16 inches (400 mm)**, thickness shall be **0.138 inch (3.5 mm)**.

2.2 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advance Products & Systems, Inc.
 - b. Bridgeport Fittings, Inc.
 - c. Calpico, Inc.
 - d. GS Metals Corporation
 - e. Metraflex Co.
 - f. O-Z/Gedney
 - g. Pipeline Seal and Insulator, Inc.
 - h. Raco, Inc.
2. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
3. Pressure Plates: Stainless Steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.4 FOAM DUCT SEALANT

- A. Description: Two-part, high-expansion foam duct sealant to keep water, acids, dust, gases, insects and rodents out of ducts (conduits).
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. American Polywater Corporation

- C. Basis of Design: FST Foam Sealant by American Polywater Corporation.
- D. The foam duct sealant shall be a two-part "blown" urethane foam with 98% closed cell content.
- E. The foam duct sealant shall have a compressive strength of 300 pounds (ASTM D1691), a tensile strength of 250 pounds (ASTM D1623), and a flexural strength of 450 pounds (ASTM D790).
- F. The foam duct sealant shall be compatible with common cable jacket materials. The cured foam shall be an inert solid that does not affect jacket materials.
- G. The foam duct sealant shall withstand temperatures from -20 degrees Fahrenheit to 200 degrees Fahrenheit and shall not lose function in direct sunlight
- H. The foam duct sealant shall be chemically resistant to gasoline, oils, dilute acids and bases, and most unsaturated hydrocarbons.
- I. The foam duct sealant shall foam and react in five to ten minutes at 70 degrees Fahrenheit.
- J. When installed, the sealant shall be capable of holding 7.25 psi air pressure continuously (equivalent of 16.4 feet water-head pressure).

2.5 PLYWOOD BACKBOARDS

- A. 4'x8' x 3/4" thick, AC grade or better, fire-retardant plywood, with no added urea formaldehyde.
- B. Backboards shall be painted with a minimum of two coats of flame retardant paint to match adjacent wall color.

2.6 FASTENERS

- A. All fasteners located in public spaces including classrooms, corridors, lobbies, toilet rooms, etc., shall be provided with tamper proof fasteners. Provide Pin Phillips hardware as manufactured by Challenge Industries or approved equal.

PART 3 EXECUTION

3.1 TEMPORARY FACILITIES:

- A. General: Refer to the Division 01 Sections for general requirements of temporary facilities.

3.2 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.

- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Install equipment with working space and dedicated space in strict accordance with 2008 NEC Article 110.26.
- E. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- F. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- G. Verify exact electrical service requirements for each piece of equipment receiving electrical connections. Provide proper service for each.
- H. Include any and all items required by the National Electrical Code and/or field conditions for the proper connection and installation of each piece of equipment.
- I. Right of Way: Give to piping systems installed at a required slope.
- J. Coordinate electrical work with architectural items and equipment by others. Typical equipment refers to, but is not limited to, the following:
 - 1. Countertops, Casework and Cabinets.
 - a. Do not install outlets, switches, etc., behind casework, cabinets, etc.
 - b. Data, phone, and other low voltage system outlets shall be mounted above the counter tops to match power outlets in the same areas.
 - c. Coordinate counter top outlets with drilling of casework/counters.
 - d. Coordinate surface raceways and outlets above and below counters with approved casework shop drawings to avoid conflicts with sinks and other appurtenances.
 - 2. Kitchen Equipment.
 - a. Verify kitchen equipment nameplates and connection requirements prior to rough-in.
 - b. Fans and Exhaust Hoods.
 - c. Dishwasher Hoods and Fans.
 - 3. Classroom and Lab Equipment.
 - a. Verify classroom and lab equipment nameplates and connection requirements prior to rough-in.
 - b. Exhaust Hoods and Fume Hoods.

3.3 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors **2 inches (50 mm)** above finished floor level.
- G. Size pipe sleeves to provide **1/4-inch (6.4-mm)** annular clear space between sleeve and raceway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
 - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements of Division 07 Section "Joint Sealants."
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements of Division 26, Section "Electrical Firestopping".
- K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for **1-inch (25-mm)** annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for **1-inch (25-mm)** annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals. Seal interior of each raceway with Foam Duct Sealant as specified herein.
- N. Cut sleeves to length for mounting flush with both surfaces of walls.

3.4 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.

- B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.5 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 26 Section, "Electrical Firestopping".

3.6 SUPPORTS, HANGERS AND FOUNDATIONS

- A. Provide supports, hangers, braces, attachments and foundations required for the work. Support and set the work in a thoroughly substantial and workmanlike manner without placing strains on materials, equipment, or building structure, submit shop drawings for approval. Coordinate all work with the requirements of the structural division.
- B. Supports, hangers, braces, and attachments shall be standard manufactured items or fabricated structural steel shapes. All interior hangers shall be galvanized or steel with rust inhibiting paint. All exterior hangers shall be constructed of stainless steel utilizing stainless steel rods, nuts, washers, bolts, etc.
- C. Installing Equipment Foundations (Housekeeping Pads):
 1. Provide four (4) inch high concrete foundations (housekeeping pads) for all floor-mounted equipment extending a minimum of 6 inches beyond equipment bases for interior equipment and a minimum of 12 inches beyond equipment bases for exterior equipment, unless otherwise noted. Furnish foundations, bolts, sleeves, and appurtenances and set under the section furnishing the equipment. Anchor the concrete foundations by dowels inserted into the floor slab. Provide welded wire fabric reinforcement, chamfer exposed edges and corners, and finish exposed surfaces smooth.
 2. Unless otherwise specified, provide all concrete work required in accordance with the requirements of Division 03.
 3. Equipment shall be properly aligned. Level and grout equipment where necessary. Support conduit independently of equipment and so as not to cause a strain or thrust.
 4. Determine exact location of all equipment, foundations, and supports after Shop Drawings of equipment have been approved.
- D. Where new concrete housekeeping pads are placed on existing concrete, saw cut the existing concrete to the perimeter dimension of the new pad to a depth of ½ inch. Break out the top ½ inch area of the existing concrete. Add stubs of #4 rebar angled into the existing concrete at a depth of approximately 50 percent of the existing slab thickness. The top portion of the rebar stub shall extend into the new pad by approximately 50 percent of its thickness. Furnish one rebar stub per every two square feet of new pad. Chemically bond the new concrete to the existing concrete.

3.7 PROVISIONS FOR ACCESS

- A. The Contractor shall provide access panels and doors for all concealed equipment, and other devices requiring maintenance, service, adjustment or manual operation.
- B. Where access doors are necessary, furnish and install manufactured painted steel door assemblies consisting of hinged door, key locks, and frame designed for the particular wall or ceiling construction. Properly locate each door. Door sizes shall be a 12 inches x 12 inches for hand access, 18 inches x 18 inches for shoulder access and 24 inches x 24 inches for full body access where required. Review locations and sizes with Architect prior to fabrication. Provide U.L. approved and labeled access doors where installed in fire rated walls or ceilings. Doors shall be Milcor Metal Access Doors as manufactured by Inland-Ryerson, Mifab, or approved equal.
 - 1. Acoustical or Cement Plaster: Style B
 - 2. Hard Finish Plaster: Style K or L
 - 3. Masonry or Dry Wall: Style M
- C. Where access is by means of liftout ceiling tiles or panels, mark each ceiling grid using small color-coded and numbered tabs. Provide a chart or index for identification. Place markers within ceiling grid not on ceiling tiles.
- D. Access panels, doors, etc. described herein shall be furnished under the section of Specifications providing the particular service and to be turned over to the pertinent trade for installation. Coordinate installation with installing Contractor. All access doors shall be painted in baked enamel finish to match ceiling or wall finish.
- E. Submit shop drawings indicating the proposed location of all access panels/doors. Access doors in finished spaces shall be coordinated with air devices, lighting and sprinklers to provide a neat and symmetrical appearance.
- F. Provide sufficient access and working space for repair and maintenance about all lighting and electrical equipment to permit ready and safe operation and maintenance of such equipment OSHA 29 CFR 1910 Subpart D and 1910.303(g).

3.8 PAINTING AND FINISHES

- A. Provide protective finishes on all materials and equipment. Use coated or corrosion-resistant materials, hardware and fittings throughout the work. Paint bare, untreated ferrous surfaces with rust-inhibiting paint. All exterior components including supports, hangers, nuts, bolts, washers, vibration isolators, etc. shall be stainless steel.
- B. Clean surfaces prior to application of insulation, adhesives, coatings, paint, or other finishes.
- C. Provide factory-applied finishes where specified. Unless otherwise indicated factory-applied paints shall be baked enamel with proper pretreatment.

- D. Protect all finishes and restore any finishes damaged as a result of work under Division 26 to their original condition.
- E. The preceding requirements apply to all work, whether exposed or concealed, as defined herein.
- F. Remove all construction marking and writing from exposed equipment, ductwork, piping and building surfaces. Do not paint manufacturer's labels or tags.
- G. All exterior equipment and conduits shall be painted to match adjacent surface in color as selected by Architect, unless otherwise indicated by the Architect.
- H. All exposed conduit, equipment, etc. in finished spaces shall be painted. Colors shall be as selected by the Architect and conform to ANSI Standards.

3.9 COLOR SELECTION

- A. Color of finishes shall be as selected by the Architect.

3.10 PROTECTION OF WORK

- A. Protect work, material and equipment from weather and construction operations before and after installation. Properly store and handle all materials and equipment.
- B. Cover temporary openings in conduits and equipment to prevent the entrance of water, dirt, debris, or other foreign matter. Deliver conduits with factory applied end caps.
- C. Cover or otherwise protect all finishes.
- D. Replace damaged materials, devices, finishes and equipment.
- E. Protect stored conduits from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, where stored inside.

3.11 OPERATION OF EQUIPMENT

- A. Clean all systems and equipment prior to initial operation for testing, or other purposes. Lubricate, adjust, and test all equipment in accordance with manufacturer's instructions. Do not operate equipment unless all proper safety devices or controls are operational. Provide all maintenance and service for equipment that is authorized for operation during construction.
- B. Where specified, or otherwise required, provide the services of the manufacturer's factory-trained servicemen or technicians to start up the equipment. Where factory start-up of equipment is not specified, provide field start-up by qualified technician.
- C. Submit factory start-up sheets or field start-ups sheets for all equipment prior to the commencement of testing.
- D. Do not use electrical systems for temporary services or during construction, unless approved by Owner in writing. Refer to Division 01, Section "Temporary Facilities and Controls".

- E. Upon completion of work, clean and restore all equipment to new conditions; replace expendable items.

3.12 TESTING AND ADJUSTMENT

- A. Perform all tests which are specified or required to demonstrate that the work is installed and operating properly. Where formal tests are required, give proper notices and perform all necessary preliminary tests to assure that the work is complete and ready for final test.
- B. Adjust all systems, equipment and controls to operate in a safe, efficient and stable manner.
- C. On all circuits, 600 volts or less, provide circuits that are free from ground faults, short circuits and open circuits.
- D. Other tests of a specific nature for special equipment shall be as specified under the respective equipment.
- E. Submit all test results to the Architect/Engineer for approval.

3.13 WALL AND FLOOR PENETRATIONS

- A. All penetrations of partitions, ceilings, roofs and floors by or conduit under Division 26 shall be sleeved, sealed, and caulked airtight for sound and air transfer control. Penetrations of mechanical room partitions, ceilings, and floors shall be as specified in Division 26.
- B. All penetrations of fire rated assemblies shall be sleeved, sealed, caulked and protected to maintain the rating of the wall, roof, or floor. Fire Marshal approved U.L. assemblies shall be utilized. See Division 26, Section, "Electrical Firestopping".
- C. Where penetrating through exterior walls or below grade, provide waterproof pipe penetration seals, as specified in another division of these Specifications.
- D. Provide conduit escutcheons for all exposed conduit penetrations in finished interior spaces and all exposed exterior penetrations. Escutcheons shall match those provided under Division 23.
- E. Conduit sleeves:
 - 1. Galvanized steel pipe, standard weight where pipes are exposed and roofs and concrete and masonry walls. On exterior walls provide anchor flange welded to perimeter.
 - 2. Twenty-two (22) gauge galvanized steel elsewhere.

3.14 EQUIPMENT BY OTHERS

- A. This Contractor shall make all system connections required to equipment furnished and installed under other divisions or furnished by the Owner. Connections shall be complete in all respects to render this equipment functional to its fullest intent.

- B. It shall be the responsibility of the supplier of the equipment to furnish complete instructions for connections. Failure to do so will not relieve the Contractor of any responsibility for improper equipment operation.

3.15 PHASING

- A. Refer to Architectural Specifications and Contract Drawings for any required phasing.
- B. Maintain building egress and traffic ways at all times. Coordinate egress requirements with the State Fire Marshal, the Owner and Authorities Having Jurisdiction (AHJ).
- C. Provide dust barriers/partitions, penetration closures, etc, to ensure safety of building occupants and protection of existing surroundings.
- D. The Building shall remain watertight at all times.
- E. Refer to phasing plans for additional requirements.
- F. Within thirty days of Award of Contract, the Contractor shall submit a minimum of six (6) copies of the proposed Phasing Plan (Drawings and detailed written description) to the Architect for review and approval based on the general and specific requirements indicated on the Drawings and Specifications. The phasing plan shall reflect the work of all trades. The phasing plan shall be updated as often as needed (i.e. major deviations and/or modified sequence of events) and reviewed during each progress meeting so the facility and Architect can be aware of the areas of construction and progress as it relates to the approved schedule.
- G. While work is in progress, except for designated short intervals during which connections are made, continuity of service shall be maintained to all existing systems. Interruptions shall be coordinated with the Owner as to time and duration. The Contractor shall be responsible for any interruptions to service and shall repair any damages to existing systems caused by his operations.

3.16 OUTAGES

- A. Provide a minimum of fourteen (14) days notice to schedule outages. The Contractor shall include in their bid outages and/or work in occupied areas to occur on weekends, holidays, or at night. Coordinate and get approval of all outages with the Owner.
- B. Submit *Outage Request Form*, attached at the end of this Section, to Owner for approval.

3.17 CUTTING AND PATCHING

- A. Accomplish all cutting and patching necessary for the installation of work under Division 26. Damage resulting from this work to other work already in place, shall be repaired at Contractor's expense. Where cutting is required, perform work in neat and workmanlike manner. Restore disturbed work to match and blend with existing construction and finish, using materials compatible with the original. Use mechanics skilled in the particular trades required.
- B. Do not cut structural members without approval from the Architect or Engineer.

3.18 PENETRATION OF WATERPROOF CONSTRUCTION

- A. Coordinate the work to minimize penetration of waterproof construction, including roofs, exterior walls, and interior waterproof construction. Where such penetrations are necessary, furnish and install all necessary curbs, sleeves, flashings, fittings and caulking to make penetrations absolutely watertight.
- B. Where conduits penetrate roofs, flash pipe with Stoneman *Stormtite*, Pate or approved equal, roof flashing assemblies with skirt and caulked counter flashing sleeve.
- C. Furnish and install pitch pockets or weather tight curb assemblies where required.
- D. Furnish and install curbs, vent assemblies, and sleeves specifically designed for application to the particular roof construction, and install in accordance with the manufacturer's instructions. The Contractor shall be responsible for sleeve sizes and locations. All roof penetrations shall be installed in accordance with manufacturer's instructions, the National Roofing Contractors Association, SMACNA, and as required by other divisions of these Specifications.

3.19 CONCRETE AND MASONRY WORK

- A. Furnish and install concrete and masonry work for equipment foundations, supports, pads, and other items required under Division 26. Perform work in accordance with requirements of Division 03 and other applicable Divisions of these Specifications.
- B. Concrete shall test not less than 3,000 psi compressive strength after 28 days.
- C. Grout shall be non-shrink, high strength mortar, free of iron of chlorides and suitable for use in contact with all metals, without caps or other protective finishes. Apply in accordance with manufacturer's instructions and standard grouting practices.
- D. Installing Outdoor Equipment Foundations:
 - 1. Provide equipment foundations as indicated in Article "Supports, Hangers, and Foundations" in this Section.
 - 2. Place reinforcement accurately in position shown, securely fasten and support to prevent displacement before or during pouring. Clean, bend, place, and splice reinforcement in accordance with approved shop drawings. Lap ends and sides of mesh reinforcement in slabs not less than one inch. Coverage of main reinforcing shall be as follows:
 - a. Slabs - 3/4 inch
 - b. Concrete poured against earth - 3 inches
 - c. Other locations - 2 inches
 - 3. Properly align, level, and grout all equipment where necessary.

3.20 CONNECTIONS AND ALTERATIONS TO EXISTING WORK

- A. Unless otherwise noted on the Drawings, where existing electrical work is removed, including hangers, to a point below finished floors or behind finished walls and capped, such point shall be far enough behind finished surfaces to allow for installation of normal thickness of required finish material.
- B. Where work specified in Division 26 connects to existing equipment, conduits, etc., Contractor shall perform all necessary alterations, cuttings, fittings, etc., of existing work as may be necessary to make satisfactory connections between new and existing work, and to leave completed work in a finished and workmanlike condition.
- C. Where the work specified under Division 26, or under other Divisions, requires relocation of existing equipment, conduit etc., Contractor shall perform all work and make necessary changes to existing work as may be required to leave completed work in a finished and workmanlike condition.
- D. Where the relocation of existing equipment is required for access or the installation of new equipment, the Contractor shall temporarily remove and/or relocate and re-install as required to leave the existing and new work in a finished and workman like condition.

3.21 COORDINATION

- A. Coordinate arrangement, mounting, and support of electrical equipment:
 - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 - 3. To allow right of way for piping and conduit installed at required slope.
 - 4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
 - 5. To provide working space and dedicated space clearances per 2008 NEC Article 110.26.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames".
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 26 Section "Electrical Firestopping".

3.22 EXCAVATION AND BACKFILLING

- A. General:
 - 1. Perform all necessary excavation, or installation of work under Division 26, in whatever materials or conditions encountered, using suitable methods and equipment.
 - 2. Accurately establish required lines and grades and properly locate the work.
 - 3. Determine the locations of all existing utilities before commencing the work.

- B. Excavation: (Refer also to other portions of the Specifications)
 - 1. Excavate only the required elevations. If excavation is carried below the foundation lines or other required limits, backfill the excess with concrete.
 - 2. Keep banks of trenches as nearly vertical as possible, and provide sheeting and/or shoring as required for protection of work and safety of personnel. Follow local, State, OSHA, and MOSHA Guidelines.
 - 3. Keep excavations dry. Protect excavations from freezing.

- C. Backfilling: (Refer also to other portions of the Specifications)
 - 1. Backfill excavations to the required elevations and restore surfaces to their original or required conditions.
 - 2. Backfill shall be similar material, free from objectionable matter such as rubbish, roots, stumps, brush, rocks and other sharp objects. Unless otherwise indicated, suitable material from the excavation may be used for backfill.
 - 3. Carefully place and mechanically tamp backfill in layers not exceeding 12 inches loose thickness. Compact to 95 percent minimum.
 - 4. Do not backfill against frozen material. Do not use frozen material for backfill.

END OF SECTION

OUTAGE REQUEST FORM

DATE APPLIED: _____ BY: _____

DATE FOR OUTAGE: _____ FIRM: _____

START OUTAGE-TIME: _____ DATE: _____

END OUTAGE - TIME: _____ DATE: _____

AREAS AND ROOMS: _____

FLOOR(S): _____

AREA(S): _____

ROOM(S): _____

WORK TO BE PERFORMED: _____

SYSTEM(S): _____

REQUEST APPROVED BY: _____
(FOREMAN OR OTHER PERSON IN CHARGE)

(FOR OWNER'S USE ONLY):

APPROVED: _____

YES ___ NO ___ BY: _____ DATE: _____

DATE/TIME-AS REQUESTED: _____ OTHER : _____

OWNER'S PRESENCE REQUIRED: _____

YES: ___ NO: ___ NAME: _____

POINT OF CONTACT: _____ PHONE: _____

DIVISION 26
SECTION 260519
CONDUCTORS AND CABLES
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SECTION 260519 - CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

1.3 SUBMITTALS

- A. Field Test Reports: Indicate and interpret test results for compliance with performance requirements. Indicate procedures and values obtained.
- B. Product Data: Provide for each cable assembly type, wire, cables, conductors, and connectors.
- C. Factory Test Reports: Indicate procedures and values obtained.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.
- E. Project Record Documents: Record actual locations of components and circuits.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: In addition to requirements specified in Division 01 Section *Quality Control*, an independent testing agency shall meet OSHA criteria for accreditation of testing laboratories, Title 29, Part 1907; or shall be a full-member company of the International Electrical Testing Association.
 - 1. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association or the National Institute for Certification in Engineering Technologies, to supervise on-site testing specified in Part 3 of this Section.
- B. Listing and Labeling: Provide wires and cables specified in this Section that are listed and labeled.
 - 1. The Terms *Listed and Labeled*: As defined in NFPA 70, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A *Nationally Recognized Testing Laboratory* as defined in OSHA Regulation 1910.7.

- C. Comply with NEMA/Insulated Cable Engineers Association (ICEA) Standards.
- D. Comply with NECA Standard of Installation.
- E. Comply with NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- F. American Society for Testing and Materials (ASTM): Comply with requirements of the following:
 - 1. B1: Standard Specification for Hard-Drawn Copper Wire
 - 2. B2: Standard Specification for Medium-Hard-Drawn Copper Wire
 - 3. B3: Standard Specification for Soft or Annealed Copper Wire
 - 4. B8: Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
 - 5. D753: Standard Specification for General Purpose Polychloroprene Jacket for Wire and Cable
- G. Electrical Testing Laboratories (ETL): Provide wiring, cabling and connector products which are ETL listed and labeled.
- H. Institute of Electrical and Electronics Engineers (IEEE): Comply with the following standards which apply to wiring systems:
 - 1. IEEE Standard 82: Test procedure for Impulse Voltage Tests on Insulated Conductors
 - 2. IEEE Standard 241: Recommended Practice for Electric Power Systems in Commercial Buildings
- I. NFPA: Comply with NFPA 70 requirements for construction, installation and color coding of electrical wire, cable and connections.
- J. National Electrical Manufacturer's Association (NEMA): Comply with requirements of the following:
 - 1. WC70: Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy
- K. UL: Provide material conforming to the following standards:
 - 1. UL 83 - Thermoplastic-Insulated Wires and Cables.

2. UL 486A - Wire Connectors and Soldering Lugs for Use with Copper Conductors

- L. UL Labels: Provide wiring, cabling and connector products which are UL listed and labeled.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wires and cables according to NEMA WC 26, *Binational Wire and Cable Packaging Standard*.
- B. Storage: Store wire and cable in a clean dry space in original containers. Protect products from weather, damaging fumes, construction debris and traffic.
- C. Handling: Handle wire and cable carefully to avoid abrading, puncturing and tearing wire and cable insulation and sheathing. Ensure that dielectric resistance integrity of wires/cables is maintained.

1.6 COORDINATION

- A. Coordinate layout and installation of cables with other installations.
- B. Revise locations and elevations from those indicated, as required to suit field conditions and as approved by Engineer and Architect.
- C. Determine required separation between cables and other work.
- D. Determine cable routing to avoid interference with other work.

1.7 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on the Drawings.
- B. Feeder conductor sizes are based on copper.
- C. Branch circuit conductor sizes are based on copper.
- D. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project Conditions.
- E. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Wires and Cables:
 - a. American Insulated Wire Corp.; Leviton Manufacturing Co.
 - b. BICC Brand-Rex Company.
 - c. General Cable.
 - d. Senator Wire & Cable Company.
 - e. Southwire Company.
 - f. Colonial Wire Company.

2. Connectors and Accessories for Wires and Cables:
 - a. AMP Incorporated.
 - b. Buchanan.
 - c. General Signal; O-Z/Gedney Unit.
 - d. Monogram Company; AFC.
 - e. NSI Industries, Inc.
 - f. Square D Company; Anderson.
 - g. 3M Company; Electrical Products Division.

3. Metal Clad (MC) Cable
 - a. Alcan Cable.
 - b. Atkore AFC Cable Systems.
 - c. Encore Wire Corporation.
 - d. General Cable.
 - e. Nexans.
 - f. Prysmian Cables and Systems.
 - g. Service Wire Company.
 - h. Southwire Company.

- i. United Copper Industries.

2.2 BUILDING WIRES AND CABLES

- A. UL-listed building wires and cables with conductor material, insulation type, cable construction and rating as specified herein.
- B. Building wires and cables shall be annealed (soft) copper, 600 volt, Type THHN/THWN (dual-rated) single conductors rated 90°C dry / 75°C wet, with a minimum conductivity of 98 percent at 20°C (68°F), or a maximum resistivity of 1.7 micro-ohms per centimeter.
- C. Conductors shall meet or exceed requirements of all applicable ASTM specifications, UL Standard 83, UL Standard 1581, NEMA WC 70, Federal Specification A-A-59544 and shall be RoHS/REACH Compliant.
- D. Conductors shall be solid for No. 10 AWG and smaller, and stranded for No. 8 AWG and larger.
- E. Building wire and cables shall be color-coded using colors factory impregnated throughout the insulation and jacket. The following color code convention(s) shall be used:
 1. 120/208-Volt, 3-Phase, 4-Wire System:
 - a. Phase A: Black
 - b. Phase B: Red
 - c. Phase C: Blue
 - d. Neutral: White
 - e. Ground: Green
 2. 277/480-Volt, 3-Phase, 4-Wire System:
 - a. Phase A: Brown
 - b. Phase B: Orange
 - c. Phase C: Yellow
 - d. Neutral: Gray
 - e. Ground: Green
- F. The following insulating material shall comply with NEMA WC 70:
 1. Rubber
 2. Thermoplastic
 3. Cross-linked Polyethylene
 4. Ethylene Propylene Rubber

2.3 CONNECTORS AND SPLICES

- A. UL-listed, factory-fabricated wiring connectors of size, ampacity rating, material, type, and class for application and service indicated. Comply with Project's installation requirements and as specified in Part 3 Article, "*Wire and Insulation Applications*".
- B. Split Bolt Connectors: Not acceptable.
- C. Solderless Pressure Connectors: High copper alloy terminal. May be used only for cable termination to equipment pads or terminals. Not approved for splicing.
- D. Spring Wire Connectors: Solderless spring type pressure connector with insulating covers for copper wire splices and taps. Use for conductor sizes 10 AWG and smaller.
- E. All wire connectors used in underground or exterior pull boxes shall be gel-filled twist connectors or a connector designed for damp and wet locations.
- F. Mechanical Connectors: Bolted type tin-plated; high conductivity copper alloy; spacer between conductors; beveled cable entrances.
- G. Compression (crimp) Connectors: Long barrel; seamless, tin-plated electrolytic high conductivity copper tubing, internally beveled barrel ends. Connector shall be clearly marked with the wire size and type and proper number and location of crimps.
- H. Heat shrinkable tubing shall meet the requirements of ANSI C119.1-1986 for buried connections to 90 degrees C and shall be material flame-retarded per IEEE 383 *Vertical Tray Flame Test*.
- I. Motor connection kits shall consist of heat-shrinkable, polymeric insulating material over the connection area and a high dielectric strength mastic to seal the ends against ingress of moisture and contamination. Motor connection kits shall accommodate a range of cable sizes for both in-line and stub-type configurations. Connection kits shall be independent of cable manufacturer's tolerances.
- J. Wire Nut Connectors:
 - 1. Wire nuts installed in wet locations, exterior, etc., shall be self-contained, waterproof and corrosion-proof units incorporating prefilled silicone grease to block out moisture and air.
 - 2. Connectors shall be UL listed and appropriately sized according to manufacturer's recommendation for the suitable wire sizes and voltage rating (600 volt minimum).
 - 3. Connector body shall have a color-coded outer shell.
 - 4. Connectors shall be as manufactured by King Innovation, Ideal Industries, 3M, or approved equal.
- K. Insulated Connectors:

1. Connectors insulated with high-dielectric strength plastisol, molded for precise fit and supplied with removable access plugs over the hex screws.
2. Wire entry ports on one or both sides of the connector as required.
3. Mounting holes at each end of the connector for direct isolated mounting to wiring trough, panel or wireway.
4. UV and cold temperature rated.
5. Dual rated for use with copper and/or aluminum cables.
6. Rated 600V, 90°C.
7. Insulated connectors shall be IPLM or IPLMD Series as manufactured by Polaris, or approved equal by ILSCO, Burndy, T&B, or other listed acceptable manufacturer.

2.4 METAL CLAD (MC) CABLE AND CONNECTORS

- A. Cable shall meet or exceed the requirements of UL Standard 83, UL Standard 1063, and UL Standard 1569 for Type MC cable, Federal Specification A-A59544 Vertical Cable Tray Flame Test and the National Electrical Code. Cable shall be listed for use in UL 1, 2, and 3 Hour Through-Penetration Firestop Systems.
- B. Cable shall be constructed with soft drawn copper, 600 volt, type THHN/THWN conductors rated 90°C dry/75°C wet, with a green insulated grounding conductor. Only cables with conductor sizes 12 AWG and 10 AWG shall be permitted. Conductors shall be cabled together with a binder tape bearing a print legend that is wrapped around the assembly. An aluminum interlocked armor shall be applied over the assembly. Conductors shall be protected by an anti-short bushing at each termination.
- C. Straight connectors shall be one-piece spring-steel, set screw design with nylon insulator. Provide cable Lok XC-73 series, as manufactured by Steel City, or approved equal.
- D. 90°C connectors shall be die cast zinc, clamp type with insulated throat. Provide XC-89 series as manufactured by Steel City, or approved equal.

2.5 DROP CORDS

- A. Description: Continuous length of cable with locking blade type connector body at lower end as indicated on Drawings. Secure cable at both ends with wire type stainless steel cable grips to prevent transmission of tension directly to conductors or terminal screws.
- B. Junction Box: Furnished and installed flush with ceiling anchored to building structure for fastening of upper cord grip.
- C. Cable: Type SO 600 volt flexible cord with three #12 AWG wires.
- D. Connector Body: Single 120 volt, grounding receptacle of twistlock type that grips on cable insulation and is manufactured for use with wire cable grips. Furnish and install drop cords in length required for a receptacle height of 6 feet 8 inches above the finished floor.

2.6 INSULATING TAPE, PUTTY, RESIN AND SUPPORTS

- A. Tape: Provide plastic electrical insulating tape which is flame-retardant, cold and weather-resistant. Tape for use in areas subject to temperatures 30 degrees C to 105 degrees C, or where the tape will be subjected to an oil splash, tape shall have a minimum thickness of 8.5 mils, and shall consist of an oil-resistant acrylic adhesive.
- B. Materials: Provide all insulating materials for splices and connections such as glass and synthetic tapes, putties, resins, splice cases, or compositions of the type approved for the particular use, location, voltage and temperature and apply and install in an approved manner, all in accordance with the manufacturer's recommendations.
- C. Supports: Provide cable supports of the wedge type which firmly clamp each individual cable and tighten due to the cable weight.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine raceways and building finishes to receive wires and cables for compliance with requirements for installation tolerances and other conditions affecting performance of wires and cables. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. By beginning work, the Contractor has accepted conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.2 PREPARATION

- A. Completely and thoroughly swab raceway before installing wire.

3.3 WIRE AND INSULATION APPLICATIONS

- A. No branch circuit wires smaller than #12 AWG shall be used unless otherwise indicated. Conductors shall be continuous from outlet to outlet and from terminal board to point of final connection, and no splice shall be made except within outlet or junction boxes. All conductors shall be of the size indicated. All wires #8 AWG and larger shall be stranded.
- B. Control wiring shall not be less than #14 AWG and shall be color coded using colors impregnated into the insulation. All wiring, contacts, and terminal blocks shall be suitably tagged for ease in identification and tracing of circuits. Identification tags shall be engraved fiber or plastic type, subject to acceptance. Wires shall be numbered and coded, using Brady *Quicklabels*, or equal.
 - 1. Wiring shall be tagged at terminations, in pull boxes, junction boxes, outlet boxes, panelboards, handholes, etc...

- C. All emergency wiring shall have the same color coding but shall clearly be identified as emergency in all outlets, fixtures, etc. All emergency wiring shall be installed in a dedicated conduit system.
- D. Switch leg wire shall be labeled with “S” tag.
- E. All control wiring shall be color coded with wires of colors different from those used to designate phase wires.
- F. Wiring for general 15 and 20 amp branch circuit work shall be as follows unless otherwise indicated:

HOME RUN LENGTH AND WIRE SIZE						CIRCUIT LENGTH AND WIRE SIZE					
120 Volt			277 Volt			120 Volt			277 Volt		
0 – 60 ' - #12			0 – 175 ' ° #12			0-100 ' - #12			0 – 200 ' - #12		
60 – 100 ' - #10			175 - 350' ° #10			100 & Up - #10			200 ' & Up - #10		
100' & Up - #8			350> & Up ° #8								

- G. Circuit length as given above shall be the wire length between the first and last outlet on the circuit. Home run length as given above shall be the wire length between the first outlet and the panelboard. In accordance with the above, where the size of branch circuit conductors is increased by the minimum required by the NEC for the branch circuit rating, ensure that the termination provisions of all equipment connected to such circuits are listed as suitable for the conductor sizes involved.
- H. Joints of #10 AWG and smaller shall be made with properly insulated solderless type pressure connectors. Where stranded conductors or multiple solid conductors are connected to terminals, solderless lugs manufactured by Thomas and Betts Company or equivalent shall be used.
- I. Joints of #8 AWG and larger in power and lighting circuits shall be of the type indented into the conductor by means of a hand or hydraulic pressure tool. Connectors shall be Burndy *Hy-dent*, T&B *Sta-Kon*, or equivalent. Connectors for control wiring shall be Burndy *Hy-Lug*, or equivalent.
- J. Branch circuits for lighting and power concealed above accessible ceilings and in drywall partitions may be accomplished by utilizing type MC (metal clad) cable. Cables shall be supported with appropriate hangers. Tie wire will not be accepted.
- K. All circuits for exterior electric work shall be #10 AWG (minimum) and contain an extra #10 AWG (minimum) copper grounding conductor. All exterior wiring shall be installed in conduit as specified above, unless otherwise noted on the Drawings.

3.4 INSTALLATION

- A. Install electrical cables, wires, and connectors as indicated in compliance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Wiring Methods, Standards for Installation", and in accordance with recognized industry practices.
- B. Pull Conductors: Use a UL-listed and manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway. Completely and thoroughly swab conduit system before installing conductors.
- D. Install exposed cables, parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 26, Section "Common Work Results for Electrical" and Division 26, Section "Hangers and Supports".
- F. Seal around cables penetrating fire-rated elements according to Division 26, Section "Electrical Firestopping".
- G. Identify wires and cables according to Division 26, Section "Electrical Identification".
- H. Conductors installed in parallel shall be of equal lengths.
- I. Wiring at Outlets: Install with at least 12 inches (300 mm) of slack conductor at each outlet.
- J. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL Standard 486A.
- K. The Contractor shall provide suitable installation equipment to prevent cutting and abrasion of conductor insulation. The Contractor shall use suitable cable guides, pulleys, and protective sleeving to prevent damage to cable during installation. Ropes used for pulling of wire and cable shall be made of polyethylene or other suitable non-metallic material. Pulling lines shall be attached to cable by means of either woven basket grips or pulling types attached directly to the conductors. Wire pulling lubricants, if used, shall conform to UL requirements applicable to the various insulations and raceway materials. The lubricants shall be certified by the manufacturer to be non-injurious to such insulation and materials.
- L. Each cable shall be labeled at terminals and at all accessible points in equipment and in pull boxes. Each control wire shall be labeled at both ends. Labels shall be self-sticking wire markers.

- M. Riser cables shall have cable supports as required by Code.
- N. Terminal lugs for wires #8 AWG and larger shall be T&B 54,000 Series or Burndy *HY-Dent*, compression type, unless noted otherwise. One-hole lugs for #4/0 AWG and smaller. Two-hole lugs for all sizes #250 kcmil AWG and larger.
- O. Install wires and cables using braided rope larger than the cable being pulled to keep twists to a minimum.
- P. Provide an insulated green equipment grounding conductor (EGC), sized per NEC, for all feeder and branch circuits, shown or not shown.
- Q. Coordinate cable and wire installation work with electrical raceway and equipment installation work, as necessary for proper interface.
- R. Conductors installed in runs within 6 inches of heating pipes or equipment shall be type Asbestos, Varnished-cambric insulation with an outer asbestos braid or glass (AVA).
- S. No conductors shall be drawn into conduit until all work, which may cause cable damage, is completed.
- T. All wiring in fluorescent fixture channels, over boilers and breechings, in Kitchen hoods, and in other high ambient temperature areas, shall be of types required by NEC.
- U. During installation, do not deform cable by improper bending, stretching, twisting, kinking, or pinching, nor do any other abusive handling. Any failure to observe these instructions will be detected and corrected during the demonstrations following completion of the installation. All cable runs shall contain *S* loops or other means to accommodate expansion or contraction as required. Cable bends will have a radius not less than the value recommended by the cable manufacturer. Cable connected to electronic equipment in the system shall be tagged to show its function and the location of its other end. All labels shall be of durable material and securely fastened to the cable.
- V. Wiring of different system voltages shall not be mixed at pull boxes enclosures, surface metal raceway, wiretrough, etc., unless a barrier (separator) is provided between the differing systems.

3.5 CONNECTIONS

- A. Conductor Splices: Keep to minimum.
- B. Install splices and taps that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.
- C. Use splice and tap connectors compatible with conductor material.

- D. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer.
- E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- F. Wire splices and taps shall be adequate to carry full current rating of wire.
- G. Splices and taps in wires up to #8 AWG shall be made with *Scotch-lok* or T&B PT Series or Ideal Wing Nut insulated electrical connectors. Wire nuts installed in wet location boxes shall be silicon gel-filled. For wires #8 AWG and larger, use copper solderless connectors covered with insulating molded body and then wrapped with electrical tape. Use twist-on wire connectors for connecting lighting fixtures and small motor leads up to #8 AWG wire.
- H. Conductors shall be continuous from outlet to outlet, and no splices shall be made except within outlet or junction boxes. Junction boxes may be utilized where required. Wire connectors of insulating material or solderless pressure connections, properly taped, shall be utilized for all splices in wiring.
- I. Splices in branch circuits and feeders shall be made where indicated or as required for the installation. All splices shall be accessible and made in enclosure approved for that purpose.
- J. For splices in branch circuits and feeders, provide connectors as follows;
 - 1. Wire Sizes #12 AWG to #10 AWG: Provide Ideal Model 74B or 76B or equivalent by T&B.
 - 2. Wire Sizes #8 AWG and Larger: Provide insulated connectors, as specified in Part 2 of this Section, which shall be securely fastened to enclosure via integral mounting holes.
- K. Thoroughly clean wiring prior to installing lugs or connectors.

3.6 IDENTIFICATION

- A. Interface with Other Work:
 - 1. Identify wire and cable using Thomas and Betts Type WM vinyl markers.
 - 2. Identify each phase and neutral conductor with its circuit number or other designation indicated on the Drawings in all junction, pull, terminal boxes, and cabinets.
- B. Provide identification tags on each conductor entering panelboard, switch, junction box, and pull box to identify conductor.
- C. Comply with the requirements of Division 26, Section "Electrical Identification".

- D. Feeder Identification: Securely fasten nonferrous identifying tags or pressure-sensitive labels to all cables, feeders, and power circuits in pull boxes, handholes, panelboards, and at termination of cables.
 - 1. Tags or labels shall be stamped or printed to correspond with markings on Contract Drawings or marked so that feeder or cable may be readily identified.
 - 2. If suspended type tags are provided, they shall be attached by approximately 55-pound test monofilament line or slip-free plastic cable lacing units.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing agency to perform field quality-control testing.
- B. Testing: On installation of wires and cables and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
 - 1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.3.2. Certify compliance with test parameters.
- C. Correct malfunctioning conductors and cables at Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.
- D. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.
- E. Verify continuity of each branch circuit conductor.
- F. Tests: Feeder circuit insulation shall be tested after installation, and before connection to fixtures and appliance.
 - 1. Tests shall be performed with a high voltage insulation tester at 1,000 volts, and conductors shall test free from short-circuits and grounds.
 - 2. Conductors shall be tested phase-to-phase and phase-to-ground.
 - 3. Furnish the instruments, materials, and labor required.
 - 4. Actual test readings shall be recorded.
 - 5. Submit all test reports to the Engineer for approval.
- G. Demonstration: Subsequent to wire and cable hook-ups, energize circuit and demonstrate functioning in accordance with requirements. Where necessary, correct malfunctioning units, and then retest to demonstrate compliance.

Woodbridge School District
New Woodbridge High School

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END OF SECTION

DIVISION 26
SECTION 260526
GROUNDING AND BONDING
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SECTION 260526– GROUNDING AND BONDING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Division 26, Section “Conductors and Cables” for conductor and cable requirements.

1.2 SUMMARY

- A. This Section includes grounding of electrical systems and equipment and basic requirements for grounding for protection of life, equipment, circuits, and systems. Grounding requirements specified in this Section may be supplemented in other Sections of these Specifications.
- B. Bond the electrical service system neutral at service entrance equipment to grounding electrodes and metallic water service as supplementary.
- C. Bond each separately-derived system neutral to nearest grounding system.
- D. Provide communications system grounding conductor at point of service entrance and connect to grounding system.
- E. Bond together system neutrals; service equipment enclosures; exposed non-current carrying metal parts of electrical equipment; metal raceway systems; grounding conductor in raceways; receptacle ground connectors; and plumbing systems.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.
- B. Product Data for grounding rods, conductors, connectors and connection materials, and grounding fittings. Submit ground system manufacturer's recommended installation procedure for review.
- C. Qualification data for firms and persons specified in *Quality Assurance* Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Field tests and observation reports certified by the testing organization and indicating and interpreting the test reports for compliance with performance requirements.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: A *Nationally Recognized Testing Laboratory* (NRTL) as defined in OSHA Regulation 1910.7, or a full member company of the International Electrical Testing Association (NETA).
 - 1. Testing Agency Field Supervision: Use persons currently certified by NETA or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Comply with NFPA 70 - National Electrical Code.
- C. Comply with UL 467 - UL Standard for Safety Grounding and Bonding Equipment.
- D. Comply with ANSI/IEEE C2 - National Electrical Safety Code.
- E. Comply with ANSI/IEEE 32 - Requirements, terms and test procedures for neutral grounding devices.
- F. Comply with IEEE Standard 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
- G. Comply with ANSI C33.8.
- H. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
 - 1. The Terms *Listed* and *Labeled*: As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A *Nationally Recognized Testing Laboratory* (NRTL) as defined in OSHA Regulation 1910.7.

1.5 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of grounding electrodes and all primary grounding locations (i.e., water piping connection, building steel, etc.)

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Erico Inc.; Electrical Products Group.
 - 2. Heary Brothers Lightning Protection Co.

3. Ideal Industries, Inc.
4. ILSCO.
5. O-Z/Gedney Co.
6. Raco, Inc.
7. Thomas & Betts, Electrical.

2.2 GROUNDING AND BONDING PRODUCTS

- A. Governing Requirements: Where types, sizes, ratings, and quantities indicated are in excess of National Electrical Code (NEC) requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.

2.3 WIRE AND CABLE GROUNDING CONDUCTORS

- A. Comply with Division 26, Section "Conductors and Cables". Conform to NEC Table 8, except as otherwise indicated, for conductor properties, including stranding.
- B. Equipment Grounding Conductors: Size as indicated on the Drawings, or as required by National Electrical Code (NEC, 2008 Edition) Table 250-122, whichever is larger. Insulated with green color insulation.
- C. Grounding Electrode Conductors: Size as indicated on the Drawings, in the Specifications, or as required by National Electrical Code (NEC, 2008 Edition) Table 250-66, whichever is larger. Insulated with green color insulation, unless installed in direct contact with earth, in which case conductors shall be bare.
- D. Underground Conductors: Bare, tinned, stranded, #4/0 AWG size minimum, except as otherwise indicated.
- E. Bare Copper Conductors: Conform to the following:
 1. Solid Conductors: ASTM B 3.
 2. Assembly of Stranded Conductors: ASTM B 8.
 3. Tinned Conductors: ASTM B 33.

2.4 MISCELLANEOUS CONDUCTORS

- A. Grounding Bus: Bare, annealed-copper bars of rectangular cross section, minimum size ¼-inch thick x 4-inches, length as required.
- B. Braided Bonding Jumpers: Copper tape, braided bare copper wire, terminated with copper ferrules.

- C. Bonding Straps: Soft copper, 0.05 inch (1 mm) thick and 2 inches (50 mm) wide, unless otherwise indicated.

2.5 CONNECTOR PRODUCTS

A. Mechanical Connectors

1. The mechanical connector bodies shall be manufactured from high strength, high conductivity cast copper ally material. Bolts, nuts, washers and lockwashers shall be made of silicon bronze and supplied as a part of the connector body and shall be of the two-bolt type.
2. Split bolt connector types are NOT allowed unless indicated on the Drawings.
3. The connectors shall meet or exceed UL 467 and be clearly marked with the catalog number, conductor size and manufacturer.

B. Compression Connectors

1. The compression connectors shall be manufactured from pure wrought copper. The conductivity of this material shall be no less than 99 percent by IACS Standards.
2. The connectors shall meet or exceed the performance requirements of IEEE 837, latest revision.
3. The installation of the connectors shall be made with a compression, tool and die system, as recommended by the manufacturer of the connectors.
4. The connectors shall be clearly marked with the manufacturer, catalog number, conductor size and the required compression tool settings.
5. Each connector shall be factory filled with an oxide-inhibiting compound.

- C. Exothermic Connections: Provide exothermic-weld kit selected per manufacturer's written instructions for specific types, sizes, and combinations of conductors and connected items.

2.6 GROUNDING ELECTRODES

A. Grounding Rods: Copper-clad rod with rigid steel core.

1. Size: 3/4 inch by 120 inches (19 by 3000 mm). Provide the number of rods required to obtain proper ground resistance.
2. Rods shall have a minimum of ten (10) mils of copper.
3. Ground rods shall be UL listed #467.

- B. Plate Electrodes: Copper, square or rectangular shape. Minimum 0.10 inch (3 mm) thick, size as indicated.

PART 3 EXECUTION

3.1 APPLICATION

- A. Equipment Grounding Conductors: Comply with NEC Article 250 for types, sizes, and quantities of equipment grounding conductors, except where specific types, larger sizes, or more conductors than required by NEC are indicated.
 - 1. Install Equipment Grounding Conductor (EGC) with circuit conductors for the items below in addition to those required by Code:
 - a. Feeder circuits.
 - b. Lighting branch circuits.
 - c. Receptacle branch circuits.
 - d. Single-phase motor or appliance branch circuits.
 - e. Three-phase motor or appliance branch circuits.
 - f. Flexible raceway runs.
 - g. Metal-clad cable (MC) runs.
 - 2. Busway Supply Circuits: Install separate equipment grounding conductor from the grounding bus in the switchboard or distribution panelboard to equipment grounding-bar terminal on busway.
 - 3. Computer Outlet Circuits: Install separate equipment grounding conductor in branch circuit runs from computer area power panels or power-distribution units.
 - 4. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.
 - 5. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 120 V and above, including air cleaners and heaters. Bond conductor to each unit and to air duct.
 - 6. Water Heater, Heat-Tracing, and Antifrost Heater Circuits: Install a separate equipment grounding conductor to each electric water heater, heat-tracing assembly, and antifrost heating cable. Bond conductor to heater units, piping, connected equipment, and components.

- B. Signal and Communications Systems: For telephone, alarm, voice and data, and other communications systems, provide a No. 4 AWG minimum insulated grounding conductor in raceway from grounding-electrode system, ground bus to each service location, terminal cabinet, wiring closet, and central equipment location.
 - 1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-inch by-2-inch by-12-inch (6-by-50-by-300-mm) grounding bus.
 - 2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
- C. Separately Derived Systems: Where NEC requires grounding, ground according to NEC Article 250-26.
- D. Metal Poles Supporting Outdoor Lighting Fixtures: Ground pole to a grounding electrode in addition to separate equipment grounding conductor run with supply branch circuit.

3.2 INSTALLATION

- A. General: Ground electrical systems and equipment according to NEC requirements, except where Drawings or Specifications exceed NEC requirements.
- B. Electrical Room Grounding Bus: Space 1 inch (25 mm) from wall and support from wall 6 inches (150 mm) above finished floor, except as otherwise indicated.
- C. Grounding Electrodes: Locate a minimum of 1-electrode length from each other and at least the same distance from any other grounding electrode.
 - 1. Drive until tops are 24 inches below finished floor or final grade, except as otherwise indicated.
 - 2. Interconnect with grounding-electrode conductors using exothermic welds, unless otherwise indicated. Make these connections without damaging copper coating or exposing steel.
- D. Grounding Conductors: Route along the shortest and straightest paths possible, except as otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- E. Underground Grounding Conductors: Use bare copper wire. Bury at least 24 inches (600 mm) below grade.
- F. Metal Water Service Pipe: Provide insulated copper grounding conductors, sized as indicated, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding-clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Do not install a grounding jumper across dielectric fittings. Bond grounding-conductor conduit to conductor at each end.

- G. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding-clamp connectors.
- H. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NEC Paragraph 250-50(c), using a minimum of 20 feet (6 m) of bare copper conductor not smaller than No. 4 AWG. Where base of concrete foundation is less than 20 feet (6 m) in length, coil excess conductor within base of concrete foundation. Bond grounding conductor to reinforcing steel to at least 4 locations, and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to a grounding electrode external to concrete.
- I. Grounding shall satisfy requirements of the applicable publications. All exposed noncurrent-carrying metallic parts of electrical equipment, metallic raceway systems, grounding conductor in nonmetallic raceways, and grounded conductors of the wiring system shall be grounded.
- J. The grounded conductor (neutral) of the wiring system shall be connected to the system grounding conductor at a single place in the system by removable bonding jumpers, sized according to the applicable provisions of the National Electrical Code. The grounded conductor (neutral) connection to the grounding conductor (ground) shall be located in the enclosure for the system's overcurrent protection or where otherwise indicated on the Drawings or Specifications.
- K. Ground buses and neutral buses in all distribution panelboards, switchboards, panelboards, and those provided in any equipment shall be isolated except where required to be connected as specified above for the service entrance and in transformer terminal compartments.
- L. Equipment grounding conductors shall be extended from the ground bus in the distribution equipment to the receptacle, fixture or device lugs where they are provided. When not provided, they shall be connected to equipment enclosures. The connections shall be arranged such that removal of receptacle, the equipment grounding conductors, or ground jumpers from ground bus, shall not affect the system ground.
- M. Ground bus shall be provided as indicated on the Drawings or as necessary to provide termination for equipment grounding conductor. Non-current carrying metal parts of electric equipment shall be effectively grounded by bonding to the bus. The ground bus shall be bonded to both the system neutral and the service ground.
- N. Raceways shall not be considered as a grounding conductor. Each power, lighting, or control raceway shall have a separate equipment grounding conductor installed. Receptacles shall have a separate grounding pole. All switchgear and bus duct shall be equipped with a grounding bus separate from the neutral bus.

3.3 CONNECTIONS

- A. General: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to assure high conductivity and to make contact points closer in order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 - 4. Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
 - 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- B. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections. Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- C. Equipment Grounding Conductor (EGC) Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- D. Non-Contact Metal Raceway Terminations: Where metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically non-continuous conduits at both entrances and exits with grounding bushings and bare grounding conductors, except as otherwise indicated.
- E. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. Where these requirements are not available, use those specified in UL 486A and UL 486B.
- F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by manufacturer of connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
- G. Moisture Protection: Where insulated grounding conductors are connected to grounding rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.4 UNDERGROUND DISTRIBUTION SYSTEM GROUNDING

- A. Grounding System: Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes.

3.5 FIELD QUALITY CONTROL

- A. Independent Testing Agency: Engage an independent electrical testing organization to perform tests described below.
- B. Tests: Subject the completed grounding system to a megger test at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than 2 full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests by the 2-point method according to IEEE 81.
- C. Maximum grounding to resistance values are as follows:
 - 1. Equipment Rated 500 kVA and Less: 10 ohms.
 - 2. Equipment Rated 500 to 1000 kVA: 5 ohms.
 - 3. Equipment Rated More than 1000 kVA: 3 ohms.
 - 4. Unfenced Substations and Pad-Mounted Equipment: 5 ohms.
 - 5. Manhole Grounds: 5 ohms.
- D. Excessive Ground Resistance: Where resistance to ground exceeds specified values, notify Owner promptly and include recommendations to reduce ground resistance and to accomplish recommended work.
- E. Report: Prepare test reports, certified by the testing organization, of ground resistance at each test location. Include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results. Submit all tests to the Architect for approval.

3.6 ADJUSTING AND CLEANING

- A. Restore surface features, including vegetation, at areas disturbed by work of this Section. Reestablish original grades, except as otherwise indicated. Where sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include top soiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Maintain restored surfaces. Restore disturbed paving as indicated.

END OF SECTION

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SECTION 260528 - ELECTRICAL FIRESTOPPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Through-penetration firestopping in fire rated construction.
 - 2. Through-penetration smoke-stopping in smoke partitions.
- B. Related items: Raceway seals and manufactured electrical devices: Refer to Division 26 Section, "Raceways and Boxes".

1.3 REFERENCES

- A. Underwriters Laboratories
 - 1. UL Fire Resistance Directory
 - a. Through-penetration firestop devices (XHCR)
 - b. Fire resistance rating (BXUV)
 - c. Through-penetration firestop systems (XHEZ)
 - d. Fill, void, or cavity material (XHHW)
- B. American Society for Testing and Materials Standards: ASTM E 814-88: Standard Test Method for Fire Tests of Through-Penetration Firestops.

1.4 DEFINITIONS

- A. Assembly: Particular arrangement of materials specific to given type of construction described or detailed in referenced documents.
- B. Barriers: Time-rated fire walls, smoke barrier walls, time rated ceiling/floor assemblies and structural floors.
- C. Firestopping: Methods and materials applied in penetrations and unprotected openings to limit spread of heat, fire, gasses and smoke.

- D. Penetration: Opening or foreign material passing through or into barrier or structural floor such that full thickness of rated materials is not obtained.
- E. System: Specific products and applications classified and numbered by Underwriters Laboratories, Inc. to close specific barrier penetrations.
- F. Sleeve: Metal fabrication or pipe section extended through thickness of barrier and used to permanently guard penetration. Sleeves are described as part of penetrating system in other Sections and may or may not be required.

1.5 SYSTEM DESCRIPTION

- A. Design Requirements
 - 1. Fire-rated construction: Maintain barrier and structural floor fire resistance ratings including resistance to cold smoke at all penetrations, connections with other surfaces or types of construction, at separations required to permit building movement and sound or vibration absorption.
 - 2. Smoke barrier construction: Maintain barrier and structural floor resistance to cold smoke at all penetrations, connections with other surfaces and types of construction and at all separations required to permit building movement and sound or vibration absorption.

1.6 SUBMITTALS

- A. Submit in accordance with Division 01, unless otherwise indicated.
- B. Product Data: Manufacturer's specifications and technical data including the following:
 - 1. Detailed specification of construction and fabrication.
 - 2. Manufacturer's installation instructions.
- C. Shop Drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, plus the following specific requirements.
 - 1. Details of each proposed assembly identifying intended products and applicable UL system number, or UL classified devices.
 - 2. Manufacturer or manufacturer's representative shall provide qualified engineering judgment and drawings relating to non-standard applications as needed.
- D. Quality control submittals: Statement of qualifications.
- E. Applicators' qualifications statement: List past projects indicating required experience.

1.7 QUALITY ASSURANCE

- A. Installer's qualifications: Firm experienced in installation or application of systems similar in complexity to those required for this project, plus the following:
 - 1. Acceptable to or licensed by manufacturer, State or local authority where applicable.
 - 2. At least 2 years experience with systems.
 - 3. Successfully completed at least 5 comparable scale projects using this system.
- B. Local and State regulatory requirements: Submit forms or acceptance for proposed assemblies not conforming to specific UL Firestop System numbers, or UL classified devices.
- C. Materials shall have been tested to provide fire rating at least equal to that of the construction.
- D. Manufacturer shall be a member of the International Firestop Council (IFC).

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Packing and shipping:
 - 1. Deliver products in original unopened packaging with legible manufacturer's identification.
 - 2. Coordinate delivery with scheduled installation date, allow minimum storage at site.
- B. Storage and protection: Store materials in a clean, dry, ventilated location. Protect from soiling, abuse, moisture and freezing when required. Follow manufacturer's instructions.

1.9 PROJECT CONDITIONS

- A. Existing conditions:
 - 1. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.
 - 2. Proceed with installation only after penetrations of the substrate and supporting brackets have been installed.
- B. Environmental requirements:
 - 1. Furnish adequate ventilation if using solvent.
 - 2. Furnish forced air ventilation during installation if required by manufacturer.

3. Keep flammable materials away from sparks or flame.
4. Provide masking and drop cloths to prevent contamination of adjacent surfaces by firestopping materials.

1.10 GUARANTEE

- A. Submit copies of written guarantee agreeing to repair or replace joint sealers which fall in joint adhesion, extrusion resistance, migration resistance, or general durability or appear to deteriorate in any other manner not clearly specified by submitted manufacturer's data as an inherent quality of the material for the exposure indicated. The guarantee period shall be two years from date of substantial completion unless otherwise noted.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:
 1. Hilti.
 2. 3M
 3. Nelson.

2.2 THROUGH-PENETRATION FIRESTOPPING OF FIRE-RATED CONSTRUCTION

- A. Systems of devices listed in the UL Fire Resistance Directory under categories XHCR and XHEZ may be used, providing that it conforms to the construction type, penetrate type, annular space requirements and fire rating involved in each separate instance, and that the system be symmetrical for wall applications. Systems or devices must be asbestos-free.
 1. Additional requirements: Withstand the passage of cold smoke either as an inherent property of the system, or by the use of a separate product included as a part of the UL system or device, and designed to perform this function.
 2. Acceptable manufacturers and products.
 - a. Those listed in the UL Fire Resistance directory for the UL System involved and as further defined in the "System and Applications Schedule" in Part 3 of this Section.
 - b. All firestopping products must be from a single manufacturer.

2.3 SMOKE-STOPPING AT SMOKE PARTITIONS

- A. Through-penetration smoke-stopping: Any system complying with the requirements for through-penetration firestopping in fire-rated construction, as specified in “The Systems and Applications Schedule” in Part 3 of this Section, is acceptable, provided that the system includes the specified smoke seal or will provide a smoke seal. The length of time of the fire resistance may be disregarded.

2.4 ACCESSORIES

- A. Fill, void or cavity materials: As classified under category XHHW in the UL Fire Resistance Directory.
- B. Forming materials: As classified under category XHKU in the UL Fire Resistance Directory.
- C. Sleeves: Minimum 24 MSG galvanized steel, 12-inch diameter or smaller steel pipe. Sleeve shall project ½-inch from each surface of the floor/wall. Size as recommended by firestop manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verification of conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
 - 1. Verify barrier penetrations are properly sized and in suitable condition for application of materials.
 - 2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean surfaces to be in contact with penetration seal materials of dirt, grease, oil, loose materials, rust, or other substances that may affect proper fitting, adhesion, or the required fire resistance.

3.3 INSTALLATION

- A. Install penetration seal materials in accordance with printed instructions of the UL Fire Resistance Directory and in accordance with manufacturer's instruction.
- B. Seal holes or voids made by penetrations to ensure an effective smoke barrier.
- C. Protect materials from damage on surfaces subject to traffic.
- D. When large openings are created in walls or floors to permit installation of conduits, cable tray, or other items, close unused portions of opening with firestopping materials tested for the application.

- E. Install smoke stopping as specified for firestopping.
- F. Provide sleeves the full thickness of the assembly being penetrated and cut sleeves to a length of 1-inch more than the over-all thickness of the penetration, or as recommended by the firestop manufacturer.

3.4 FIELD QUALITY CONTROL

- A. Examine penetration sealed areas to ensure proper installation before concealing or enclosing areas.
- B. Keep areas of work accessible until inspection by applicable code authorities.
- C. Perform under this section patching and repairing of firestopping caused by cutting or penetration by other trades.

3.5 ADJUSTING AND CLEANING

- A. Clean up spills of liquid components.
- B. Neatly cut and trim materials as required.
- C. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

3.6 SYSTEMS AND APPLICATION SCHEDULES*

PENETRATING ITEM	CONCRETE	GYPSUM	WOOD FLOOR/CEILING
Metal Pipe	CAJ1001 CP25S/L, CP25N/S CAJ1006 CS-195+, FS-195+ CAJ1007 FS-195+, 1-inch& 2-inch Wide CAJ1009 2000, 2000+, 2003 CAJ1010 2000, 2000+, 2003 CAJ1012 2000, 2000+, 2003 CAJ1013 2000, 2000+, 2003 CAJ1014 2000, 2000+, 2003 CAJ1015 2000, 2000+, 2003 CAJ1017 FD 150 CAJ1021 FD 150 CAJ1027 MPS-2+ CAJ1044 CP 25WB+ CAJ1052 CP 25S/L, CP 25N/S CAJ1058 2000, 2000+, 2003 CAJ1060 2000, 2000+, 2003 CAJ1063 2000, 2000+, 2003 CAJ1066 CP 25N/S,CP 25S/L, CP 25WB+ CAJ1091 CP 25N/S,CP 25S/L, CP 25WB+ CAJ1092 CP 25WB+ CAJ1112 FS-195+ CAJ1160 CP 25S/L, CP 25N/S CAJ1175 CP 25WB+ CAJ1176 CP 25WB+	WL1001 CP 25 WL1002 FS-195+ WL1003 CP 25WB+,CP 25N/S WL1008 2000+ WL1009 2000+ WL1010 2000+ WL1016 CP 25WB+ WL1017 CP 25WB+,CP 25N/S WL1032 CP 25WB+,CP 25N/S WL1036 FD 150 WL1037 CS-195+,FS-195+ WL1067 CP 25N/S WL1073 CP 25WB+ WL1080 MPS-2+ WL1082 2000+	FC1002 CP 25 FC1003 2000,2000+,20003 FC1006 CP 25WB+

PENETRATING ITEM	CONCRETE	GYPSUM	WOOD FLOOR/CEILING
	CAJ1188 2000+ CBJ1020 CS-195+, FS-195+ CBJ1021 CS-195+, MPS-2+ CBJ1031 2001 CBJ1032 2001 FA1002 CP 25WB+ WJ1010 CP 25WB+ WJ1023 2001		
Non-Metallic	CAJ2001 FS-195+, 1-inch& 2-inch WIDE, PPD'S CAJ2002 FS-195+ CAJ2003 CS-195+, FS-195+ CAJ2005 FS-195+ CAJ2006 FS-195+ CAJ2013 FS-195+ CAJ2019 2000, 2000+, 2003 CAJ2027 FS-195+, CP 25N/S, CP 25S/L, CP 25WB+ CAJ2028 FS-195, MPS-2+ CAJ2029 FS-195+, PPD'S CAJ2030 CS-195+, FS-195+ CAJ2040 FS-195+, CP 25WB+ CAJ2044 FS-195+, CP 25N/S, CP 25S/L CP 25 WB+ CAJ2090 FS-195+ CAJ2177 FS-195+, PPD'S FA2001 FS-195+, PPD'S FS2002 CS-195+, FS-195+, MPS-2+, PPD'S FA2011 FS-195+ WJ2012 FS-195+ 1-inch WIDE	WL2002 FS-195+, PPD'S WL2003 FS-195+ WL2004 FS-195+ WL2005 FS-195+ 4' WIDE WL2006 FS-195+ WL2013 FS-195+ WL2031 CS-195+, FS-195+ WL2032 CS-195+, FS-195+ WL2033 FS-195+ WL2073 FS-195+ 1-inch WIDE	FC2002 FS-195+, PPD'S FC2007 FS-195+, PPD'S FC2008 FS-195+ FC2009 FS-195+, PPD'S FC2024 FS-195+ FC2026 FS-195+ FC2028 FS-195+, 1' & 2-inch WIDE, PPD'S
Insulated Cable	CAJ3001 CP 25N/S, CP 25S/L CAJ3005 CS 195+, FS-195+ CAJ3007 2001 CAJ3009 2000, 2000+, 2003 CAJ3010 2000, 2000+, 2003 CAJ3011 2001 CAJ3014 FD 150 CAJ3015 FD 150 CAJ3021 MPS-2+ CAJ3029 2000, 2000+, 2003 CAJ3030 CP 25WB+ CAJ3031 CP 25N/S, CP 25S/L CAJ3041 2000, 2000+, 2003 CAJ3044 CS-195+, FS-195+ CAJ3058 FS-195+, MPS-2+ CAJ3071 CP 25N/S, CP 25S/L CAJ3074 CP 25N/S, CP 25S/L CAJ3075 2001 CAJ3080 CP 25WB+	WL3001 CP 25, MPS-2+ WL3008 2000+ WL3009 2000+ WL3015 CP 25WB+, CP 25N/S WL3022 2000+ WL3030 FS-195+ WL3031 MPS-2+ WL3032 CP 25WB+ WL3041 2000+ WL3051 CP 25N/S WL3056 CP25N/S WL3062 CP 25WB+	FC3001 CP 25S/L, CP 25N/S FC3002 2000+ FC3003 2000, 2000+, 2003 FC3007 CP 25WB+, MPS-2+ FC3008 FS-195+

PENETRATING ITEM	CONCRETE	GYPSUM	WOOD FLOOR/CEILING
	CBJ3016 CS-195+, FS-195+ CBJ3017 CS-195+, MPS-2+ FA3001 CP 25WB+ FB3004 CS-195+, MP WJ3015 2001 WJ3016 2001		
Mixed Penetrating Items Combos	CAJ8001 CS-195+ FS-195+ CAJ8003 2000, 2000+, 20003 CAJ8004 2000, 2000+, 20003 CAJ8006 2001 CAJ8013 FS-195+, CP 25 CBJ8004 CS-195, FS-195+ CBJ8005 CS-195+, MPS-2+ CBJ8008 2001 FA8001 FS-195+, CP 25WB+	WL8002 CS-195+, FS-195+	

* Underwriter's Laboratories, Inc., Fire Resistance Directory.

END OF SECTION

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HANGERS AND SUPPORTS
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SECTION 260529 – HANGERS AND SUPPORTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Requirements of the following Division 26 Sections apply to this Section:
 - 1. Division 26, Section “Common Work Results for Electrical” for general installation requirements.
 - 2. Division 26, Section “Electrical Firestopping” for requirements for firestopping at sleeves through walls and floors that are fire barriers.

1.2 SUMMARY

- A. This Section includes secure support from the building structure for electrical items by means of hangers, supports, anchors, sleeves, inserts, seals, and associated fastenings.
- B. Provide equipment supports consisting of curbs, concrete pads, cradles, structural members, hangers, rods, racks, and incidental materials.
- C. Provide all labor, supervision, and fabrication. Design and construct supporting structures of strength to safely withstand stresses to which they may be subjected and to properly distribute the load and impact over building areas. Provide all engineering and fabrication as required for installation of support system.
- D. Provide hangers, clamps, anchors, inserts, supports, supplementary steel framing, and hardware of the proper size and load capacity to support electrical equipment and raceways, whether indicated on the drawings or not.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with conditions of Contract and Division 01 Specification Sections.
- B. Product data for each type of product specified.
- C. Submit for review, shop/assembly drawings and layout drawings of curbs and equipment supports for major items of equipment.
- D. Submit structural calculations for approval. Calculations include stress and deflection analysis. Submit design criteria and selection calculation.

- E. Supporting devices and fastening methods shall be subject to the review and approval of the Structural Engineer.

1.4 QUALITY ASSURANCE

- A. Electrical Component Standard: Components and installation shall comply with NFPA 70 *National Electrical Code*.
- B. Electrical components shall be listed and labeled by UL, ETL, CSA, or other approved, nationally recognized testing and listing agency that provides third-party Certification follow-up services.
- C. Installation Standard: Installation shall meet or exceed the National Electrical Contractors Association (NECA) Standard of Installation.
- D. Manufacturer's Qualifications:
 - 1. The Manufacturer shall not have had less than ten years' experience in manufacturing Strut Support Systems.
 - 2. The Manufacturer must certify in writing all components supplied have been produced in accordance with an established quality assurance program.
- E. All Strut Support System components must be supplied by a single manufacturer.
- F. Standards:
 - 1. Work shall meet the requirements of the following standards:
 - a. Federal, State and Local Codes.
 - b. American Iron and Steel Institute (AISI) Specification for the Design of Cold-Formed Steel Structural Members - August 19, 1986 Edition, December 11, 1989 Addendum.
 - c. American Society for Testing and Materials (ASTM).
 - d. Underwriters Laboratories (UL).
 - e. National Electrical Code (NEC).

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. All material is to be delivered to the work site in original factory packaging to avoid damage to the finish.
- B. Upon delivery to the work site, all components shall be protected from the elements by a shelter or other covering.

1.6 GUARANTEE

- A. Separate guarantees shall be issued from the erector and manufacturer, valid for a period of one year against any defects that may arise from the installation or manufacture of the Strut Support System components.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Slotted Metal Angle and U-Channel Systems:
 - a. American Electric, Kindorf
 - b. Alstrut
 - c. Unistrut Diversified Products
 - d. Power-Strut
 - e. Thomas & Betts

2.2 COATINGS

- A. Coating: Supports, support hardware, and fasteners shall be protected with zinc coating or with treatment of equivalent corrosion-resistance using approved alternative treatment, finish, or inherent material characteristic. All products shall be hot-dip galvanized.

2.3 MANUFACTURED SUPPORTING DEVICES

- A. Raceway Supports: Clevis hangers, riser clamps, conduit straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps.
- B. Fasteners: Types, materials, and construction features, as follows:
 - 1. Expansion Anchors - Carbon steel wedge or sleeve type.
 - 2. Toggle Bolts - All steel springhead type.
 - 3. Power-Driven Threaded Studs - Heat-treated steel, designed specifically for the intended application.
- C. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for non-armored electrical cables in riser conduits.

Provide plugs with number and size of conductor gripping holes as required to suit individual risers. Construct body of malleable-iron casting with hot-dip galvanized finish.

- D. U-Channel Systems: Sixteen-gauge channels with 9/16-inch-diameter holes at a minimum of eight inches on center in top surface. Provide fittings and accessories that mate and match with U-channel and are of the same manufacturer.
- E. Concrete Equipment Pads:
 - 1. Refer to Division 26 Section "Common Work Results for Electrical" for installation requirements.
- F. Floor-Mounted Stands: Construct with structural steel members or steel pipe and fasten with flanges bolted to the floor.
- G. Ceiling Suspended Platforms: Construct with steel hangers. Brace and fasten to building structure.
- H. Wall-Mounted Platforms: Construct with steel brackets.

2.4 ANCHOR METHODS

- A. Hollow Masonry: Toggle bolts or plastic conical type expansion anchors.
- B. Solid Masonry: Lead expansion anchors or preset inserts.
- C. Metal Surfaces: Machine screws, bolts, or welded studs.
- D. Wood Surfaces: Wood screws.
- E. Concrete Surfaces: Self-drilling anchors or power-driven studs (non-seismic zones).

2.5 VIBRATION ISOLATION MOUNT TYPES

- A. Type DNP (Double Neoprene Pad)
 - 1. Neoprene pad isolators shall be formed by two layers of 1/4-inch to 1/16-inch thick ribbed or waffled neoprene, separated by a stainless steel or aluminum plate. Layers shall be permanently adhered together. Pads shall be sized so that they will be loaded within the manufacturer's recommended range.
 - 2. Type DNP isolators shall be formed from one of the following products or approved equal:
 - a. Type NR: Amber/Booth.
 - b. Type Korpad: Korfund Dynamics.

- c. Type WSW: Mason Industries.
- d. Type NPS: Peabody Noise Control.
- e. Series Shear Flex: Vibration Mountings and Control.]

PART 3 EXECUTION

3.1 EXAMINATION

- A. The installer shall inspect the work area prior to installation. If work area conditions are unsatisfactory, installation shall not proceed until satisfactory corrections are completed.

3.2 INSTALLATION

- A. Set Strut System components into final position true to line, level and plumb, in accordance with approved Shop Drawings.
- B. Anchor material firmly in place. Tighten all connections to their recommended torques.
- C. Install supporting devices to fasten electrical components securely and permanently in accordance with NEC requirements.
- D. Coordinate with the building structural system and with other electrical installation.
- E. Raceway Supports: Comply with the NEC and the following requirements:
 - 1. Conform to manufacturer's recommendations for selection and installation of supports.
 - 2. Strength of each support shall be adequate to carry present and future load multiplied by a safety factor of at least four. Where this determination results in a safety allowance of less than 200 pounds, provide additional strength until there is a minimum of 200 pounds safety allowance in the strength of each support.
 - 3. Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
 - 4. Support parallel runs of horizontal raceways together on trapeze-type hangers.
 - 5. Support individual horizontal raceways by separate pipe hangers. Spring steel fasteners may be used in lieu of hangers only for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings only. For hanger rods with spring steel fasteners, use 1/4-inch-diameter or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing.

6. Space supports for raceways in accordance with Table I of this Section. Space supports for raceway types not covered by the above in accordance with NEC.
 7. Support exposed and concealed raceway within one foot of an unsupported box and access fittings. In horizontal runs, support at the box and access fittings may be omitted where box or access fittings are independently supported and raceway terminations are not made with chase nipples or threadless box connectors.
 8. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports with no weight load on raceway terminations.
- F. **Miscellaneous Supports:** Support miscellaneous electrical components as required to produce the same structural safety factors as specified for raceway supports. Install metal channel racks for mounting disconnects, light fixtures, and other devices.
- G. In open overhead spaces, cast boxes threaded to raceways need not be supported separately except where used for fixture support; support sheet metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to the raceways on opposite sides of the box and support the raceway with an approved type of fastener not more than 24 inches from the box.
- H. **Fastening:** Unless otherwise indicated, fasten electrical items and their supporting hardware securely to the building structure, including, but not limited to conduits, raceways, boxes, disconnect switches, and control components in accordance with the following:
1. Fasten by means of toggle bolts on hollow masonry units, concrete inserts or expansion bolts on concrete or solid masonry, and machine screws, welded threaded studs, or spring-tension clamps on steel. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts and machine screws. Do not weld conduit, pipe straps, or items other than threaded studs to steel structures.
 2. Holes cut to depth of more than 1-1/2 inches in reinforced concrete beams or to depth of more than 3/4-inch in concrete shall not cut the main reinforcing bars. Fill holes that are not used.
 3. Ensure that the load applied to any fastener does not exceed 25 percent of the proof test load. Use vibration-and shock-resistant fasteners for attachments to concrete slabs.
 4. Concrete (New): Iron or steel inserts. Expander type anchors, specified for existing may be used provided concrete is clear of conduit for drilled depth.
 5. Precast Concrete Plank: Drill hole through plank; bolt hanger rod to 4" x 4" x 1/8" steel plate on top of plank.

- I. Tests: Test pull-out resistance of one of each type, size, and anchorage material for the following fastener types:
 - 1. Expansion anchors.
 - 2. Toggle bolts.
 - 3. Power-driven threaded studs.

- J. Provide all jacks, jigs, fixtures, and calibrated indicating scales required for reliable testing. Obtain the structural Engineer's approval before transmitting loads to the structure. Test to 90 percent of rated proof load for fastener. If fastening fails test, revise all similar fastener installations and retest until satisfactory results are achieved.

- K. General Supporting Installations:
 - 1. Provide appropriate concrete anchors for hanger rods. Rods shall be screwed into or extended through frame construction (with washer and nut). Supports shall secure conduit in place, and shall prevent vibration, provide for expansion and contraction and shall make neat appearance. Strap hangers or chains are not permitted.
 - 2. Electrical raceways (conduit and EMT) 1-1/2-inches and smaller shall be secured with 1-hole malleable iron straps or brackets to walls. Trapeze supports shall be used for groups or parallel raceways with raceways secured to trapeze with approved clamps. Individual runs of raceways 2-inches and larger shall be supported by Clevis type hangers.
 - 3. Provide all steel supports including roof curbs for all equipment provided under this Section.
 - 4. Electrical raceway supports to be spaced on the following maximum centers, unless otherwise required by the NEC:
 - a. 3/4-inch to 1-inch conduit - 8 feet
 - b. 1-1/4-inch and larger conduit - 10 feet
 - 5. Provide additional hangers or steel members to distribute the load among two or more structural members when required or directed.
 - 6. Drilling of new concrete slabs will not be permitted. Anchors and inserts shall be cast in the concrete slabs.

- L. Locations:
 - 1. Anchor bolts, sleeves, inserts, hangers, and supports required for the electrical work shall be furnished and installed under Division 26.

2. Coordinate with other trades the location of anchors, sleeves, inserts, and supports and insure that they are properly installed.
3. Openings and sleeves shall be set true to line, level, plumb, and position and shall be set true to line, level, plumb, and position and shall be so maintained during construction. Where sleeves and openings are provided in poured concrete, inspect same during and after concrete is poured to insure proper position and correct any deviation.

M. Hangers and Supports:

1. Provide hangers, angles, channels, and other supports required by field conditions to install items of electrical equipment. Design of supports and methods of fastening to building structure shall be acceptable to the Owner.
2. Use of power-actuated fasteners and devices is permitted in the vertical surfaces of the building only with the following requirements.
 - a. For fastening conduits 1-1/2-inch and smaller and lighting fixtures 50 lbs or less.
 - b. Load capacity per manufacturers' recommendations.
 - c. Fasteners shall be located in the thickest part of the slab.
 - d. Devices shall comply with OSHA requirements.
3. Use of lead shield expansion anchors is not permitted.
4. No electrical items shall rest on, or depend for support on suspended ceiling media (tiles, lath, plaster, splines, etc.).
5. In suspended ceilings, support conduits directly from structural slabs, decks (or framing members). Do not support conduits on ceiling suspension members.
6. Support surface or pendant lighting fixtures:
 - a. From an outlet box by means of an interposed metal strap, where weight is less than 5 lbs.
 - b. From an outlet box by means of a hickey or other direct threaded connection, where weight is from 5 to 50 lbs.
 - c. Directly from structural slab, deck or framing member, where weight exceeds 50 lbs.

7. In addition to the above, provide cushioned, swivel type hangers with appropriate outlet boxes for pendant fixtures in mechanical areas. Such hangers shall have a support rating at least twice that of the load supported.
8. Support recessed lighting fixtures directly from structural slab, deck, or framing members. Refer to Division 26 Section "Interior Lighting" for additional installation requirements.
9. Provide weight-distribution facilities, where required so as not to exceed the load bearing capabilities of floor or walls that bear the weight of, or support, electrical items.
10. For point-of-attachment weight of 100 lbs. or less, fasten items as follows:
 - a. On wood, use wood screws.
 - b. On concrete and solid masonry that is already in place, use self-drilling concrete anchors or expansion bolt and couplings.
 - c. On hollow construction, use toggle bolts.
 - d. On structural steel, use beam clamps.
11. For point-of-attachment weights from 100 lbs. to 300 lbs., provide supports as follows:
 - a. At cast-in-place concrete slabs, use concrete inserts in bottom of slab, with 8" slip-through steel rods set transverse to the reinforcing steel.
 - b. At concrete slab already in place, uses 16-inches x 8-inches x ½-inch steel plates at the top of the slab, with through-bolts welded in place. The plates shall be chased in and grouted flush, where no fill is to be applied.
12. For point-of-attachment weights over 300 lbs., provide supports as follows: At cast-in-place concrete slabs, uses 16-inch x 8-inch x ½-inch steel plate, with through bolts welded in place. Top of the plate shall be 1-1/2-inches below the top of the slab or on top of the slab where a fill slab is to be installed.
13. Hangers and supports shall be hot dipped galvanized, unless noted otherwise.
14. Equipment shall not be held in place by its own dead weight. Provide base anchor fasteners in each case.
15. Trapeze type hangers may be used where several conduits are to be installed at the same elevation. The spacing of such trapeze hangers shall be in accordance with the NEC for the smallest conduit in the run.

16. Vertical conduits shall be supported by heavy wrought iron clamps or collars anchored to construction at each floor.

N. Inserts:

1. Inserts for suspended items in poured concrete construction shall be malleable-iron concrete inserts, adjustable type with insert nut. Items manufactured by Barrett, Crawford, Elcen, or Grinnell shall be used where applicable.
2. Inserts for surface-mounted items shall be suitable for the composition of the slab, wall, or structure on which installation is to be made.

O. TABLE I: SPACING FOR RACEWAY SUPPORTS

TABLE 1: SPACING FOR RACEWAY SUPPORTS			
Raceway Size (Inches)	No. of Conductors in Run	Location	EMT (Ft.)
		HORIZONTAL RUNS	
1/2, 3/4	1 or 2	Flat ceiling or wall.	5
1/2, 3/4	1 or 2	Where it is difficult to provide supports except at intervals fixed by the building construction.	7
1/2, 3/4	3 or more	Any location.	7
1/2 - 1	3 or more	Any location.	
1 & larger	1 or 2	Flat ceiling or wall.	6
1 & larger	1 or more	Where it is difficult to provide supports except at intervals fixed by the building construction.	10
1 & larger	3 or more	Any location.	10
Any	---	Concealed.	10
		VERTICAL RUNS	
1/2, 3/4	---	Exposed.	7
1, 1-1/4	---	Exposed.	8
1-1/2 & larger	---	Exposed.	10

TABLE 1: SPACING FOR RACEWAY SUPPORTS			
Raceway Size (Inches)	No. of Conductors in Run	Location	EMT (Ft.)
		HORIZONTAL RUNS	
Up to 2	---	Shaftway.	10
2-1/2	---	Shaftway.	10
3 & larger	---	Shaftway.	10
Any	---	Concealed.	10
Abbreviations:	EMT	Electrical Metallic Tubing	

3.3 CLEANUP

- A. Upon completion of this Section of work, remove all protective wraps and debris. Repair any damage due to installation of this section of work.

3.4 PROTECTION

- A. During installation, protect this work from damage.
- B. Upon completion of this scope of work, it shall become the responsibility of the General Contractor to protect this work from damage during the remainder of construction on the project and until substantial completion.

END OF SECTION

DIVISION 26
SECTION 260533
RACEWAYS AND BOXES
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SECTION 260533 - RACEWAYS AND BOXES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Division 26, Section "Electrical Firestopping" for requirements for firestopping at penetrations through walls and floors that are fire barriers.
- C. Division 26, Section "Hangers and Supports" for raceways and box supports.
- D. Division 26, Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.
- E. Division 27, Section "Voice/Data/Video Systems" for raceways and box requirements for communication cabling.

1.2 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
 - 1. Raceways include the following:
 - a. EMT.
 - b. FMC.
 - c. IMC.
 - d. LFMC.
 - e. PVC.
 - f. PVC externally coated, rigid steel conduits.
 - g. RGS.
 - h. RMC.
 - i. RNC
 - j. Wireways.
 - 2. Boxes, enclosures, and cabinets include the following:

- a. Device boxes.
- b. Floor boxes.
- c. Outlet boxes.
- d. Pull and junction boxes.
- e. Cabinets and hinged-cover enclosures.

3. Miscellaneous Products include the following:

- a. Expansion/Deflection fittings.
- b. Bushings.

1.3 DEFINITIONS

- A. EMT: Electrical Metallic Tubing.
- B. FMC: Flexible Metal Conduit.
- C. IMC: Intermediate Metal Conduit.
- D. LFMC: Liquidtight Flexible Metal Conduit.
- E. PVC: Rigid Polyvinyl Chloride Conduit.
- F. RGS: Rigid Galvanized Steel Conduit.
- G. RMC: Rigid Metal Conduit.
- H. RNC: Rigid Nonmetallic Conduit.

1.4 SUBMITTALS

- A. Product Data: For raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: Include layout drawings showing components and wiring for nonstandard boxes, enclosures, and cabinets.

1.5 QUALITY ASSURANCE

- A. Listing and Labeling: Provide raceways and boxes specified in this Section that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100

2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.
- B. Comply with NECA's "Standard of Installation" and NECA 101 "Recommended Practice for Installing Steel Conduits".
- C. Comply with NFPA 70.

1.6 COORDINATION

- A. Coordinate layout and installation of raceways and boxes with other construction elements to ensure adequate headroom, working clearance, and access.
- B. Verify routing and termination locations of conduits and boxes prior to rough-in.
- C. Conduit routing shown on Drawings is only approximate and diagrammatic. Route conduits as required for a complete conduit and wiring system.
- D. Coordinate locations and mounting heights of outlet boxes thoroughly with approved casework shop drawings.
- E. Coordinate locations of floor boxes with Architect to ensure coordination with furniture systems.

1.7 PROJECT RECORD DOCUMENTS:

- A. Accurately record routing of all concealed conduits. Record actual routing of all exposed conduits/larger than 1 inch. Indicate actual locations and mounting heights of outlet boxes, pull and junction boxes, branch circuits, arrangements, etc.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Metal Conduit and Tubing:
 - a. Allied Tube & Conduit Corporation.
 - b. Anamet, Inc.; Anaconda Metal Hose.
 - c. AFC/Monogram Company.
 - d. Carol Cable Co., Inc.

- e. Cole-Flex Corp.
 - f. Electri-Flex Co.
 - g. Flexcon, Inc.; Coleman Cable Systems, Inc.
 - h. Grinnell Co.; Allied Tube and Conduit Div.
 - i. Monogram Co.; AFC.
 - j. Spiraduct, Inc.
 - k. Triangle PWC, Inc.
 - l. Wheatland Tube Co.
2. Nonmetallic Conduit and Tubing:
- a. Anamet, Inc.; Anaconda Metal Hose.
 - b. Arnco Corp.
 - c. Breeze-Illinois, Inc.
 - d. Cantex Industries; Harsco Corp.
 - e. Certainteed Corp.; Pipe & Plastics Group.
 - f. Cole-Flex Corp.
 - g. Condux International; Electrical Products.
 - h. Electri-Flex Co.
 - i. George-Ingraham Corp.
 - j. Hubbell, Inc.; Raco, Inc.
 - k. Lamson & Sessions; Carlon Electrical Products.
 - l. R&G Sloan Manufacturing Co., Inc.
 - m. Spiraduct, Inc.
 - n. Thomas & Betts Corp.
3. Conduit Bodies and Fittings:

- a. American Electric; Construction Materials Group.
 - b. Crouse-Hinds; Div. of Cooper Industries.
 - c. Emerson Electric Co.; Appleton Electric Co.
 - d. Hubbell, Inc.; Killark Electric Manufacturing Co.
 - e. Lamson & Sessions; Carlon Electrical Products.
 - f. O-Z/Gedney; Unit of General Signal.
 - g. Scott Fetzer Co.; Adalet-PLM.
 - h. Spring City Electrical Manufacturing Co.
 - i. Thomas & Betts Corporation.
4. Metal Wireways:
- a. Hoffman Engineering Co.
 - b. Keystone/Rees, Inc.
 - c. Square D Co.
5. Boxes, Enclosures, and Cabinets:
- a. American Electric; FL Industries.
 - b. Butler Manufacturing Co.; Walker Division.
 - c. Crouse-Hinds; Div. of Cooper Industries.
 - d. Electric Panelboard Co., Inc.
 - e. Erickson Electrical Equipment Co.
 - f. Hoffman Engineering Co.; Federal-Hoffman, Inc.
 - g. Hubbell Inc.; Killark Electric Manufacturing Co.
 - h. Hubbell Inc.; Raco, Inc.
 - i. Lamson & Sessions; Carlon Electrical Products.
 - j. O-Z/Gedney; Unit of General Signal.

- k. Parker Electrical Manufacturing Co.
 - l. Robroy Industries, Inc.; Electrical Division.
 - m. Scott Fetzer Co.; Adalet-PLM.
 - n. Spring City Electrical Manufacturing Co.
 - o. Thomas & Betts Corp.
 - p. Woodhead Industries, Inc.; Daniel Woodhead Co.
6. Floor Boxes:
- a. Crouse Hinds.
 - b. Hubbell.
 - c. Square D.
 - d. Wiremold.

2.2 METAL CONDUIT AND TUBING

- A. Rigid Galvanized Steel Conduit: ANSI C80.1 and UL 6.
- B. IMC: ANSI C80.6.
- C. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1.
- D. Plastic-Coated IMC and Fittings: NEMA RN 1.
- E. EMT and Fittings: ANSI C80.3, galvanized tubing.
 - 1. Fittings: Compression type, NEMA FB1.
- F. FMC: Zinc-coated steel.
- G. LFMC: Flexible steel conduit with PVC jacket.
- H. Fittings: NEMA FB 1; compatible with conduit/tubing materials.

2.3 NONMETALLIC CONDUIT AND TUBING

- A. PVC: NEMA TC 2, Schedule 40 or 80.
- B. PVC Fittings: NEMA TC 3; match to conduit or conduit/tubing type and material.

2.4 METAL WIREWAYS

- A. Material: Sheet metal sized and shaped as indicated.
- B. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- C. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.
- D. Wireway Covers: Screw-cover type.
- E. Finish: Manufacturer's standard enamel finish.

2.5 OUTLET AND DEVICE BOXES

- A. Sheet Metal Boxes: NEMA OS 1, galvanized flat-rolled sheet steel.
- B. Cast-Metal Boxes: NEMA FB 1, Type FD, cast box, deep type, with gasketed cover, and threaded hubs.
- C. Outlet Box Accessories: Provide outlet box accessories as required for each installation, including corrosion-resistant screws, mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps, and metal straps for supporting outlet boxes which are compatible with outlet boxes being used and fulfilling requirements of individual wiring situations.
- D. Nonmetallic: NEMA OS2.

2.6 PULL AND JUNCTION BOXES

- A. Small Sheet Metal Boxes: NEMA OS 1.
- B. Sheet metal boxes over 12" in any dimension shall comply with the requirements of Article "Enclosures and Cabinets" of this Section.
- C. Boxes for Outdoor and Wet Locations: Flat flanged, surface-mounted, UL listed as raintight, galvanized cast iron box and cover with neoprene gasket and stainless steel cover screws.
- D. Boxes for Buried Flush Grade Locations: NEMA 250, Type 6, flat flanged, UL listed as watertight, galvanized cast iron, aluminum or PVC box.
 - 1. Cover: Nonskid cover with neoprene gasket and stainless steel cover screws.
 - 2. Cover Legend: "Electric" or "Communications" as appropriate.

2.7 BOX EXTENSIONS

- A. Prohibited on new construction.
- B. Where more than one box is needed to flush out installation, provide a large (i.e., 6" x 6") box to flush out the existing box and nipple over to a new box.

2.8 FLOOR BOXES (INDIVIDUAL)

- A. Individual, floor-mounted power, microphone, telephone, data, CATV, etc., outlets per plans. For multiple floor devices, combine outlets or jacks in common divided box with single, multi-gang coverplate.
- B. General:
 - 1. Flush-mounted, rectangular boxes: 1, 2, or 3 gang.
 - 2. Carpet trim ring for devices in carpeted areas. Provide carpet insert.
 - 3. For tile, wood, or other hard floors, provide flush trim and coverplates, with no projections above the floor surface.
 - 4. Single or multi-gang coverplates as required.
- C. Construction:
 - 1. Cast iron for on-grade applications.
 - 2. Formed steel for above grade applications.
 - 3. 1, 2, or 3 divided compartments.
 - 4. Fully adjustable prior to concrete pour.
 - 5. UL listed for protection against scrub water
 - 6. Walker Omnibox 880CS Series, or equal.
- D. Activation Kits:
 - 1. Textured polycarbonate adjusting trim and cover plates.
 - 2. Microphone outlets on stage:
 - a. Completely flush with no raised edges.
 - b. Brass cover with duplex flip-lid type covers.

c. Walker #828PR.

E. Receptacles, jacks and connectors: Provide receptacles, data, telephone, CATV and other connectors and wiring as indicated on the Drawings.

2.9 MULTI-SERVICE FLOOR BOXES (RECTANGULAR):

A. Complete in-floor multi-service box consisting of floor box housing, flush removable cover, and wiring devices, as specified, all fittings, materials and labor.

B. Make adjustments in leveling and placement during rough-in to accommodate structural and architectural elements, and other equipment. Coordinate exact locations with Owner prior to concrete pour.

C. Construction:

1. Cast iron for on-grade applications and formed steel at all above grade levels unless otherwise noted on the Drawings.

2. Galvanized steel per ASTM 525 G-60.

3. Concrete-tight for in-floor use.

4. Adjustable legs for leveling and adjustment prior to pour.

5. Knockouts for conduit entry and feed-through use.

6. Four (4) wiring compartments, individually sectionalized.

a. Two (2) duplex 5-20R power receptacles.

b. Two (2) duplex data RJ45 jacks, Category 5.

7. UL listed, with separation of power and low voltage.

8. Hinged, completely flush cover with cable ports. Lid to have provisions for carpet insert (Walker #RAKMII option).

D. Walkerbox Resource RFB Multi-Service steel recessed floor boxes, or approved equal, by American Electric or Hubell.

2.10 RECESSED POKE-THROUGH DEVICES

A. Description: Recessed pre-wired poke-through devices for use in a 6" diameter cored hole in an above-grade concrete floor to provide power, communication and/or audio/visual (A/V) outlets.

- B. Make adjustments in placement during rough-in to accommodate structural and architectural elements, and other equipment. Field-coordinate exact locations with Architect prior to concrete pour.
- C. Poke-Through Assembly:
 - 1. Insert Body:
 - a. Body shall consist of an intumescent fire stop material to maintain the fire rating of the floor slab. The intumescent material shall be held in place in the insert body and shall not have to be adjusted to maintain fire rating of the unit and the floor slab.
 - b. Insert body shall recess the devices a minimum of 2-3/4" [69mm] and have a polyester based backing enamel finished interior (ivory).
 - c. Insert shall have retaining feature that holds the device in the floor slab without additional fasteners.
 - d. Insert shall consist of three (3) wiring compartments, internally sectionalized to provide complete separation of power and communications services.
 - e. Insert shall be equipped with a 3/4" trade size conduit stub that is connected to the insert body and a 24.5 cubic inch [402ml] stamped steel junction box for wire splices and connections. Junction box shall contain necessary means to electrically ground the poke-through device to the system ground.
 - f. Insert shall be equipped with a 1-1/4" trade size conduit housing assembly for communications cabling entry into the center compartment.
 - 2. Activation Covers:
 - a. Shall be manufactured of die-cast aluminum alloy with a powder-coated gray or black finish, or plated in brass, nickel or bronze finish.
 - b. Covers shall have two (2) spring-loaded slide egress doors, which lock in position when opened and automatically close around cables.
 - c. Covers shall have gasket under the trim flange to maintain scrub water tightness.
 - d. Covers shall be surface-mounted type.
 - 3. Power Devices:
 - a. Assemblies shall be pre-wired with two (2) 20A, 125V NEMA 5-20R duplex receptacles, one in each side compartment.

4. Communications Devices:

- a. Assemblies shall be provided with mounting plates to mount up to eight (8) keystone connectors, or up to eight (8) Ortronics TracJack devices, or up to four (4) Ortronics Series II dual modular inserts in the center compartment.

D. Accessories:

1. Provide non-metallic pre-pour poke-through sleeve with end caps and thumb screws for leveling, which attaches to structural decking and maintains cast in core hole.

E. Listings:

1. UL Fire Rated for up to 2-hour rated floors
2. UL514A and UL514C Listed for scrub water exclusion.

F. Basis-of Design: Wiremold/Legrand Evolution Series Poke-Thru Devices, Catalog No. 6ATCP, or approved equal by acceptable manufacturer.

2.11 FURNITURE FEED POKE-THROUGH DEVICES

A. Description: Recessed furniture feed assembly for use in 6" diameter cored hole in an above-grade concrete floor.

B. Make adjustments in placement during rough-in to accommodate structural and architectural elements, and other equipment. Field-coordinate exact locations with Architect prior to concrete pour.

C. Poke-Through Assembly:

1. Insert Body:

- a. Body shall consist of an intumescent fire stop material to maintain the fire rating of the floor slab. The intumescent material shall be held in place in the insert body and shall not have to be adjusted to maintain fire rating of the unit and the floor slab.
- b. Insert body shall recess the devices a minimum of 2-3/4" [69mm] and have a polyester based backing enamel finished interior (ivory).
- c. Insert shall have retaining feature that holds the device in the floor slab without additional fasteners.
- d. Insert shall consist of three (3) wiring compartments, internally sectionalized to provide complete separation of power and communications services.

- e. Insert shall be equipped with a 3/4" trade size conduit stub that is connected to the insert body and a 24.5 cubic inch [402ml] stamped steel junction box for wire splices and connections. Junction box shall contain necessary means to electrically ground the poke-through device to the system ground.
 - f. Insert shall be equipped with a 1-1/4" trade size conduit housing assembly for communications cabling entry into the center compartment.
2. Activation Covers:
- a. Shall be manufactured of die-cast aluminum alloy with a powder-coated gray or black finish, or plated in brass, nickel or bronze finish.
 - b. Covers shall have one (1) 3/4" trade size opening for power and one (1) 1-1/4"/ 2" combination trade size opening for communications.
 - c. Covers shall have gasket under the trim flange to maintain scrub water tightness.
 - d. Covers shall be surface-mounted type.
- D. Accessories:
- 1. Provide non-metallic pre-pour poke-through sleeve with end caps and thumb screws for leveling, which attaches to structural decking and maintains cast in core hole.
- E. Listings:
- 1. UL Fire Rated for up to 2-hour rated floors
 - 2. UL514A and UL514C Listed for scrub water exclusion.
- F. Basis-of Design: Wiremold/Legrand Evolution Series Poke-Thru Devices, Catalog No. 6ATCFF, or approved equal by acceptable manufacturer.

2.12 ENCLOSURES AND CABINETS

- A. Hinged-Cover Enclosures: NEMA 250, Type 1 in dry locations, and Type 4 in wet or damp locations, with continuous hinge cover and flush latch.
- 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
- B. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage, and include accessory feet where required for freestanding equipment.

2.13 EXPANSION / DEFLECTION FITTINGS

- A. Provide an expansion/deflection fitting in each concealed or exposed electrical run crossing a building expansion joint. Fittings shall be complete with bronze end couplings, neoprene sleeves, tinned copper braid integral bonding jumper and stainless steel bands. Expansion/deflection fittings shall be suitable for the size and type of conduit run they connect. Bonding jumper shall comply with NEC and UL requirements.
- B. Expansion/deflection fitting shall accommodate the following movements without collapsing or fracturing the conduit and damaging the wires it contains:
 - 1. Axial expansion or contraction up to 3/4-inch.
 - 2. Angular misalignment of the axes of the conduits up to 30 degrees in all directions.
 - 3. Parallel misalignment of the axes of the conduits up to 3/4-inch in all directions.
- C. Expansion/Deflection fitting shall be OZ/Gedney Type "DX" or approved equal by Crouse Hinds (Type XD).

2.14 BUSHINGS

- A. Bushings for 1-inch conduit and smaller shall be self-extinguishing thermoplastic type - 150°C temperature rating.
- B. Bushings for 1-1/4" conduit and larger shall be malleable iron body with 150 degrees C insulating ring. Insulating material shall be locked in place and non-removable.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of raceway installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 RACEWAY AND BOX REQUIREMENTS

- A. Conduit Application Schedule:

Application	Conduit Type	Remarks
In or under concrete slab	RGS, RNC	
Exposed exterior locations.	RGS	Use threaded or rain-tight fittings.
Wet interior locations.	RGS	Use threaded or rain-tight fittings.
Exposed dry interior locations up to 7'-0" AFF.	RGS	
Exposed dry interior locations above	EMT	

7'-0" AFF.		
Exterior Underground	RNC (Sched. 40 PVC)	RGS Elbows/Sweeps
Equipment connections in dry interior locations.	FMC (e.g. Greenfield)	Short lengths only (maximum 6 feet).
Equipment connections in wet interior locations.	LFMC (e.g. Sealtite)	Short lengths only (maximum 6 feet). Use threaded or rain-tight fittings.
Equipment connections in exterior locations.	LFMC (e.g. Sealtite)	Short lengths only (maximum 6 feet). Use threaded or rain-tight fittings.
Concealed in dry wall construction.	EMT, IMC, RGS, MC Cabling	
Concealed above suspended ceilings.	EMT, IMC, RGS, MC Cabling	
Concealed in masonry walls.	EMT	

1. Provide hot-dip Rigid Galvanized Steel Conduit (RGS) for embedded interior work in concrete, and for all raceways 2-1/2 inch size and larger.
2. Provide hot-dip Rigid Galvanized Steel Conduit (RGS), galvanized Intermediate Metal Conduit (IMC) or galvanized Electrical Metallic Tubing (EMT) for concealed work above suspended ceilings and within interior partitions and for exposed interior work above 7'-0".
3. Provide Flexible Metal Conduit (FMC), e.g. Greenfield, in short lengths (maximum 6 feet) for the connection of lighting fixtures, dry type transformers and any vibrating equipment in dry interior locations. The flexible connections to recessed fixtures and equipment shall be sufficient slack to permit removal of fixture.
4. Provide Liquidtight Flexible Metal Conduit (LFMC), e.g. Sealtite, in short lengths (maximum 6 feet) for the connection of exterior equipment, motors and equipment in damp or wet locations as defined in Division 26 Section "Common Work Results for Electrical".
5. Provide hot-dip Rigid Galvanized Steel Conduit (RGS) with bonded PVC jacket (Plastic-Bond or Kor-Kap) for work not completely encased in concrete but laid directly in or in contact with ground or on a vapor barrier and additionally, as directed.
6. Aluminum conduit is prohibited.
7. Where indicated on the drawings, Rigid Non-metallic Conduit may be used as permitted in Article 352 of the NEC, with or without concrete encasement. Where rigid non-metallic conduit is exposed, it shall be Schedule 40 PVC, with all provisions for thermal expansion/contraction as recommended by the Manufacturer.

8. Conduits for exterior underground electric work shall be rigid steel, galvanized and sherardized, leaving the building and to points 5 feet beyond footings. Beyond 5 feet of building, underground conduits shall be non-metallic Schedule 40 PVC plastic, Type II.
 9. PVC conduits for electric and telephone services shall be encased in 3 in. concrete envelope. Conduits shall be rigid same as above and beyond 5 feet of the building shall be non-metallic PVC equal to Carlon Type EB encased in concrete.
 10. All steel conduits from outside terminations to service entrance equipment shall be painted with two heavy coats of asphaltum.
 11. Conduits shall slope from entrance equipment toward outside of building.
- B. Fittings:
1. All fittings to match conduit material and to be suitable for the purpose intended. Join conduit with fittings designed and approved for the purpose and make joints tight.
 2. Provide UL listed compound filled sealing fittings for NEC-required locations, for conduits passing from interior to exterior, and at the interface of widely different space temperatures such as refrigeration or cold storage rooms where conduits pass from warm locations to cool locations, such as the boundaries of air conditioned spaces and non-conditioned air spaces. For concealed conduits, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.
 3. Provide expansion fittings with bonding jumpers where conduits cross expansion joints or where otherwise required to compensate for thermal expansion and contraction. Provide expansion fittings in each straight uninterrupted run of surface-mounted conduit, both horizontal and vertical, in excess of 200 feet. Distance between fittings shall not exceed 200 linear feet. The Contractor shall refer to the Architectural Drawings for expansion joint locations.
 4. Fasten rigid steel conduit with threaded galvanized steel fittings, double locknuts, and insulated bushings. Insulated bushings shall be OZ/Gedney type "B", or equal.
 5. Fasten EMT conduit with "Concretight" or "Raintight" compression fittings made from galvanized steel or malleable iron. Fittings using set screw or indentations as a means of attachment or made from cast "white metal" are prohibited. All connectors shall have insulated throats.
 6. Fasten liquid-tight conduit with fittings incorporating a threaded ferrule, nylon sealing ring, and steel or malleable iron compression nut and body. Furnish Crouse Hinds metallic liquid-tight fittings, or equal.

7. Fasten Flexible Metallic Conduit (FMC) with Thomas & Betts (T&B) "Tite-Bite" insulated connectors, or equal.
 8. Watertight fittings shall use a copper base anti-corrosive conductive compound. Provide watertight fittings in conduits exposed to weather, in wet locations, in underground locations, and in slabs.
- C. Box Locations:
1. Electrical boxes shall accommodate wire pulling, splices, taps, equipment connections and Code compliance.
 2. Coordinate access doors as required to provide access to boxes in hard ceilings and similar inaccessible areas.
 3. Provide cast box (with threaded hubs) in exterior enclosures, and high traffic areas (surface installations), as specified.
- D. Outlet Boxes:
1. Outlet boxes for concealed work shall be zinc-coated or cadmium-plated sheet steel boxes suitable for the service and type outlet. Boxes and conduit fittings for outdoor and exposed work shall be NEMA 4 cast-aluminum, cast steel or cast iron type with threaded hubs for conduit entrance. Boxes and conduit fittings for outdoor work shall have gasketed cover plates. Extra large boxes shall be provided in accordance with the National Electrical Code where necessary to prevent crowding of wire in the box. Plastic boxes and cast "white metal" boxes classified as NEMA 4 will not be acceptable.
 2. Outlet boxes in unplastered brick or block walls shall be provided with deep square-cut device covers. They shall be set so that the brick or block can be cut and fitted closely to the cover opening and so that the standard wall plate will cover the joint between the brick or block and the box.
 3. All outlet boxes used for supporting fixtures shall be furnished with malleable iron fixture studs of "no-bolt" type secured by locknut. Provide support for boxes occurring in suspended ceilings. Outlets in ceilings directly on bottom of joists shall be supported independent of ceiling construction. Outlets in suspended ceilings shall not be supported from ceiling construction.
 4. All boxes, whether outlet, junction, pull, or equipment, shall be furnished with appropriate covers.
 5. No sectionalized boxes shall be used.
 6. Back-to-back outlet boxes are not permitted. Separate boxes a minimum of 6" in standard walls and a minimum of 2 feet in acoustical walls.

7. Provide knockout closures for unused openings.
 8. Provide blank coverplates for all unused boxes.
 9. For multiple device installations, provide multi-gang boxes. Sectional boxes are not permitted. Provide barrier separation of different voltage conductors in the same box.
 10. Thoroughly coordinate mounting heights of boxes with casework and backsplash heights.
 11. Provide recessed outlet boxes in finished areas, supported from interior partition studs. Supports are to be stamped steel stud bridges for hollow stud walls and adjustable steel channel fasteners for flush ceiling outlet boxes.
 12. Provide back supports for boxes in metal stud walls.
- E. Junction and Pull Boxes:
1. Junction and pull boxes shall be furnished and installed as shown or where required to facilitate pulling of wires or cables. Such boxes shall be installed in accessible locations. All boxes for concealed work shall be constructed of 12 gauge USS galvanized sheet steel minimum, unless otherwise specified or indicated and provided with mounting brackets and flat screw covers secured in position by round head brass or stainless steel 300 grade machine screws. Boxes for exterior work shall be cast aluminum or galvanized cast iron type with threaded hubs unless otherwise directed. Gasketed cover plates shall be furnished for outdoor installation.
 2. Provide barrier (separators) where different system voltage share the same box.
 3. Wherever possible, locate pull and junction boxes above accessible ceilings in finished areas.
 4. Pull or junction boxes shall be supported independently of conduit.
 5. In flush grade outdoor applications, unit shall be adequately supported against settling or tipping. Where heavy traffic or poor soil compaction exists, cast box in a concrete base which provides 6" of cover around and under the box.

3.3 INSTALLATION OF RACEWAYS

- A. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.
- B. Furnish and install a separate and independent raceway system as shown on the Drawings for each of the various wiring systems including, but not limited to, the following:

Communications System
Control Wiring
Fire Alarm System
Incoming Telephone Service
Incoming Electric Service
Incoming CATV System
Lighting
Power 120/208 volt
Power 277/480 volt
Security System
Telephone Wiring

1. All raceway systems shall be completely wired as specified herein, shown on drawings and/or required for satisfactory operation of the various systems.
 2. Raceways, generally, shall be concealed conduit as specified herein. Where wiring troughs are required or used to facilitate the wiring installation, they shall be equal to Square D Company's Square-Duct and fittings, with hinged cover arranged for total removal, all finished in baked enamel and all components U/L listed. The gutters shall be of ample size to accommodate conductors therein and as required by the NEC.
 3. Underground conduits for services outside of building and entrance into building shall be as specified herein.
 4. Support all conduit not embedded in concrete or masonry such that strain is not transmitted to outlet boxes and pull/junction boxes, etc. Supports to be sufficiently rigid to prevent distortion of conduits during wire pulling.
- C. Minimum Raceway Size: 3/4-inch trade size (DN21).
- D. Conceal conduit and EMT, unless otherwise indicated, within finished walls, ceilings, and floors.
- E. Electrical Metallic Tubing (EMT) shall be used for the following unless otherwise indicated:
1. Branch circuits for lighting, receptacles, and power concealed in:
 - a. Dry wall construction.
 - b. Suspended ceilings.
 - c. Masonry walls.
 2. Exposed in equipment room areas as needed to serve fixed equipment.
 3. Circuits for communication and signaling concealed in:

- a. Dry wall construction.
 - b. Suspended ceilings.
- F. Rigid Galvanized Steel Conduit (RGS) shall be used for the following, unless otherwise indicated:
- 1. Branch circuits and feeders for lighting, receptacle and power, installed exposed in areas subject to physical damage.
 - 2. Circuits for communication and signaling exposed in areas subject to physical damage.
- G. Wiring above ceiling shall be plenum rated cable, where required by Code.
- H. Wiring installed concealed above hard ceilings and exposed in areas with no ceilings shall be installed in conduit.
- I. Conduit shall be run concealed wherever possible, within walls, ceilings, or floors, unless otherwise indicated or specified. Where exposed conduits runs are shown or required, they shall be run parallel to building construction and shall be suitably supported at required intervals.
- J. Conduit may be run exposed in Mechanical Equipment rooms, Electrical rooms, and where necessary in Storage rooms and unfinished areas. Where conduit is run exposed, it shall be run as close as possible to walls and ceilings and shall not interfere with equipment, ductwork and piping.
- K. Keep raceways at least 12 inches (300 mm) away from parallel runs of flues, steam or hot-water pipes and other hot surfaces above 77 degrees F. Install horizontal raceway runs above water and steam piping.
- L. Install raceways level and square and at proper elevations. Provide adequate headroom.
- M. Complete raceway installation before starting conductor installation.
- N. Support raceways as specified in Division 26 Section "Hangers and Supports". Arrange supports to prevent misalignment during wiring installation.
- O. Use capped bushings or "push-penny" plugs to prevent foreign matter from entering the conduit system during construction. Clean and plug or cap all conduits left empty for future use.
- P. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab. Conduit stub-ups and stub-downs shall be arranged in a neat and orderly manner and shall emerge at right angles to floors or ceilings.

- Q. Make bends and offsets so the inside diameter is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.
- R. Use raceway fittings compatible with raceways and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings, unless otherwise indicated.
- S. Run concealed raceways, with a minimum of bends, in the shortest practical distance considering the type of building construction and obstructions, unless otherwise indicated.
- T. Conduits shall not be installed in elevated concrete floor slabs so that composite action between the slab and beams is not affected. Conduits may be installed in grade level concrete floor slab with the following limitations:
1. Maximum size - 1-1/4".
 2. Minimum concrete cover – 1.0", above and below.
 3. Minimum spacing between conduits - 6" on center.
 4. Conduit outside diameter - 1/3 of slab thickness.
 5. Installed between bottom and top reinforcing, and centerline of conduit at the mid-depth of the slab.
 6. Secured to prevent possible change in position, sagging, or shifting as concrete is poured.
 7. Water or damp-proofing integrity of slab is not disturbed.
- U. Conduits larger than 1-1/4" may be installed in concrete floor slabs only with the specific permission of the Engineer, or as specifically indicated on the drawings, all in accordance with the above limitation.
- V. Conduits in close proximity to each other at panelboards, etc., shall be located and wrapped with wire mesh to prevent cracking of slab.
- W. Transition non-metallic tubing to rigid steel conduit before rising above the floor.
- X. Space raceways laterally to prevent voids in the concrete.
- Y. Run conduit parallel to or at right angles to main reinforcement. When at right angles to reinforcement, place conduit close to slab support.
- Z. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much as practical.
- AA. Run parallel or banked raceways together, on common supports where practical.

- BB. Make bends in parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- CC. Join raceways with fittings designed and approved for the purpose and make joints tight.
 - 1. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.
 - 2. Use insulating bushings to protect conductors.
- DD. Tighten set screws of threadless fittings with suitable tools.
- EE. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of the pull wire.
- FF. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches (150 mm) above the floor. Install screwdriver-operated, threaded flush plugs flush with floor for future equipment connections.
- GG. Install nonferrous conduit or tubing for circuits operating above 60 Hz.
- HH. Do not install aluminum conduit embedded in or in contact with concrete.
- II. Lubricants for pulling wires shall be approved for use with the types of wire and conduit installed.
- JJ. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.
- KK. Install hinged-cover enclosures and cabinets plumb. Support at each corner.
- LL. Use conduit hubs or sealing lock nuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
- MM. Install no more than equivalent of three 90° bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2 inches (50 mm) in size.
- NN. Avoid moisture traps; provide junction box with drain fittings at low points in conduit system.
- OO. Die-cast fittings of pot metal will not be accepted.
- PP. Conduits shall be free of any burrs, foreign objects, and water prior to conduit installation.

- QQ. Conduit placed against concrete or masonry above ground shall be fastened to the concrete or masonry with pipe straps or one screw clamp attached to the concrete by means of expansion screw anchors and screws. "Caddy Clip" type hangers or straps will be permitted only in non-exposed areas and restricted to 1/2 " to 3/4" conduit.
- RR. Where conduits turn up out of concrete slabs and are not concealed by wall construction, bends shall be carefully made so that no portion of the radius is above the floor.
- SS. Rigid conduit or Electrical Metallic Tubing (EMT) shall not be strapped or fastened to equipment subject to vibration or mounted on shock-absorbing bases.
- TT. Conduit shall be installed in such manner as to insure against the collection of trapped condensation, and runs of conduit shall be without traps wherever possible. Drill 1/8" diameter weep holes where necessary.
- UU. Conduits run to and from cabinets shall be run neatly, in accurate manner and shall emerge from the floors and ceilings at right angles thereto.
- VV. Provide wall flanges and gasketing on conduits entering fan housings to minimize air leakage at points of penetration of housing.
- WW. Conduit risers shall be rigidly supported on the building structure, using appropriate supports only.
- XX. In equipment spaces, such as fan rooms, plenums, etc., conduits and outlets may be exposed, but shall avoid interference with ventilating ducts, piping, etc.
- YY. Exposed conduit installed on or adjacent to ventilating ducts shall be installed after the ducts are in place, and shall be run from ceiling or wall junction boxes in such manner as to retain accessibility to junction box covers and to permit future removal or replacement of ducts.
- ZZ. Conduits and other electrical items shall not be fastened to, or supported from ventilating ducts but shall be separately supported. The method of supporting and details of the supporting members shall be reviewed by the Owner's Representative. In no case shall screws penetrate the sheet metal of the ducts.
- AAA. Exposed conduit run on surface shall be supported according to Code and within three feet of each outlet, junction box, or cabinet, by galvanized malleable conduit clamps and clamp backs. Suspended conduits shall be supported every five feet by conduit hangers and round rods, or where two or more conduits are run parallel, by trapeze hangers suitably braced to prevent swaying.
- BBB. Screws for all exposed work shall be stainless steel, unless otherwise noted.
- CCC. Zinc coated galvanized steel screws may be used for interior dry locations only.
- DDD. No running threads shall be cut or used.

- EEE. Conduits which are installed at this time and left empty for future use and which are five feet or more in length, including all telephone and communication conduits shall have a non-ferrous, 600 lb. tensile strength drag line left in place for future use. All empty conduits including conduit stubs shall be tagged at all exposed ends with tags identifying the location of the end of the conduit.
- FFF. In all instances where flush-mounted type panelboards are installed, provide spare (empty) conduits in accordance with schedule in Division 26 Section "Panelboards", Paragraph "Provision for Future Circuits at Flush-Mounted Panelboards". These conduits shall extend between the panelboard cabinet and a junction box located above accessible ceiling construction.

3.4 FLEXIBLE CONNECTIONS

- A. Use maximum of six (6) feet (1830 mm) of UL listed Flexible Metal Conduit (FMC) for recessed and semi-recessed fluorescent lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use Liquidtight Flexible Metal Conduit (LFMC) in wet or damp locations, as defined per NEC. Flexible conduits shall not be used for indoor HID lighting fixture connections.
- B. Grounding conductors with green colored insulation shall be extended through all flexible connections including fixture "whips", and fastened to terminals within the first junction boxes on either side of the flexible length.
- C. Flexible connections shall be sized per the Contract Drawings, or as required in accordance with Code; the more stringent requirement shall apply.

3.5 INSTALLATION OF TERMINATIONS

- A. Where raceways are terminated with lock nuts and bushings, align the raceway to enter squarely, and install the lock nuts with dished part against the box. Where terminations cannot be made secure with one lock nut, use two lock nuts, one inside and one outside of the box.
- B. Where terminating in threaded hubs, screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the raceway so the coupling is square to the box, and tighten the chase nipple so no threads are exposed.
- C. Open ends shall be capped with approved manufactured conduit seals as soon as installed and kept capped until ready to pull in conductors.
- D. Where conductors No. 10 AWG or larger enter a raceway, cabinet, pull box, and junction box, the conductors shall be protected by an insulated bushing providing a smoothly rounded surface.
- E. Double lock nuts shall be used at termination of rigid conduit in knock-out openings.

- F. Ends of conduits shall be equipped with insulating bushings for 1" and smaller, and insulated metallic bushings for 1-1/4" and larger. Ends of conduit shall be temporarily capped prior to installation and during construction to exclude foreign material.

3.6 INSTALLATION OF BOXES

- A. Provide grounding connections for raceway, boxes, and components as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors.
- B. Set floor boxes level and adjust to finished floor surface.
- C. Provide junction boxes, pull boxes, cable support boxes, and wireways as required for proper installation of the electrical work. Covers shall be accessible. Small junction boxes shall be similar to outlet boxes. Provide barriers (separators) where different system voltage wires share the same box.
- D. Pull boxes, cable support boxes, and large junction boxes for indoor use shall be made of Code gauge steel or no less than 12 gauge. Covers shall be held in place with zinc-coated galvanized steel screws. Paint interior and exterior surfaces with rust-inhibitive paint. (Pull boxes and covers shall be hot-dipped galvanized.)
- E. Boxes located outdoors and in damp or wet locations shall be cast metal or alloy, fitted with screw-fastened covers and gaskets, and with threaded conduit connections. Fasteners shall be stainless steel.
- F. Pull boxes shall be installed at all necessary points to prevent injury to the insulation or other damage that might result from pulling resistance or for other reasons necessary for proper installation. Pull box locations shall be approved by the Owner's representative prior to installation.
- G. Where boxes are used in connection with exposed conduit, plain covers attached to the box with a suitable number of countersunk flat head machine screws shall be used.
- H. Pull boxes with barriers shall have a single cover plate and the barriers shall be of the same gauge as the pull box.
- I. Exposed pull boxes will not be permitted in finished spaces.
- J. Location of pull boxes shall be coordinated with piping, ductwork, and other equipment so as to permit sufficient clearance for maintenance and access.
- K. Pull boxes recessed in walls or partitions shall be provided with flanged type covers.
- L. Outlet boxes and covers shall be sheet steel knockout type, zinc-coated, or cadmium-plated and shall be of proper Code size for the number of wires of conduits passing through or terminating therein, but in no case shall any box be less than 4" square, or boxes at end of a

run and containing a single device may be of the "handy box" type. Covers for flush outlets shall finish flush with plaster or other finished surface. Approved factory-made knockout seals shall be used in all boxes where knockouts are not intact. Boxes in concrete shall be a type which will allow the placing of conduit without displacing the reinforcing bars. Additional pull boxes shall be installed as required to facilitate pulling of wires.

- M. Outlet boxes for lighting fixtures shall be equipped with fixture supporting devices.
- N. Outlet boxes for switches shall be of the gang type.
- O. Each circuit in each pullbox shall be marked with a tag guide denoting panels to which they connect.
- P. Boxes shall be separated to prevent sound transmission. Back-to-back boxes shall not be used.
- Q. Outlet boxes shall be provided with suitable plaster rings and covers or plates.
- R. Unused knockout holes shall remain closed and those opened by error shall be closed with snap-in blanks.
- S. Outlet boxes shall not be smaller than required by Code for the number and size of wires to be installed.
- T. Outlet boxes installed in plenum ceilings shall be in accordance with applicable codes.
- U. Outlet boxes shall be installed true and plumb so that the covers or plates will be level and at uniform elevations for the types of outlets contained.
- V. Outlet boxes for toggle switches and pilot lights at doorways shall be located at the strike side of the door as finally hung.
- W. Outlet box locations as indicated shall be considered to be approximate only. Determine exact locations from architectural details or from field instructions and coordinate outlet box locations with the work of other trades.
- X. Install junction and pull boxes to be accessible.
- Y. Locations of junction and pull boxes requiring access panels shall be reviewed by the Owner's Representative.

3.7 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to Manufacturer and Installer that ensure coatings, finishes, and cabinets are without damage or deterioration at the time of Substantial Completion.
- B. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

- C. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.
- D. Steel conduit: Conduit that shows corrosion within the guarantee period shall be replaced.

3.8 CLEANING

- A. On completion of installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.
- B. After conduits and accessories have been installed, and concreting operations completed, conduit runs shall be satisfactorily cleared of obstructions and foreign matter. Defects which might damage cable upon installation shall be corrected. Where new conduits installed are connected to new conduits installed by others, the entire run to the nearest box or other termination point shall be cleaned.

END OF SECTION

DIVISION 26
SECTION 260553
ELECTRICAL IDENTIFICATION
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SECTION 260553 - ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes electrical identification materials and devices required to comply with ANSI C2, NFPA 70, OSHA standards, and authorities having jurisdiction.
- B. This section includes labeling of all terminations and related subsystems; including, but not limited to, nameplates, stenciling, wire and cable markers, labeling and identification of cables, equipment and other products.

1.3 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Schedule of Nomenclature: An index of electrical equipment and system components used in identification signs and labels. Provide a schedule of nameplates and stenciling.
- C. Samples: Prior to installation, submit samples for each type of label and sign to illustrate color, lettering style, and graphic features of identification products. These samples shall include examples of the lettering to be used. Samples shall be mounted on 8-1/2-inch x 11-inch sheets annotated, explaining their proposed use.

1.4 QUALITY ASSURANCE

- A. Comply with ANSI C2.
- B. Comply with NFPA 70.
- C. Comply with ANSI A13.1 and NFPA 70 for color-coding.
- D. Comply with applicable EIA/TIA Standards.
- E. Comply with OSHA Standards.

1.5 DEFINITIONS

- A. Emergency systems include, but are not limited to, generator circuits and systems, fire alarm systems, exit sign circuits, emergency lighting circuits, etc.

PART 2 PRODUCTS

2.1 RACEWAY AND CABLE LABELS

- A. Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
 - 1. Color: Black letters on orange field.
 - 2. Legend: Indicates voltage and service.
- B. Adhesive Labels: Preprinted, flexible, self-adhesive vinyl with legend, overlaminated with a clear, weather- and chemical-resistant coating.
- C. Pretensioned, Wraparound Plastic Sleeves: Flexible, preprinted, color-coded, acrylic band sized to suit the diameter of the line it identifies and arranged to stay in place by pretensioned gripping action when placed in position.
- D. Colored Adhesive Tape: Self-adhesive vinyl tape not less than 3 mils thick by 3/4 inch wide, in appropriate colors for system voltage and phase.
- E. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.
- F. Aluminum, Wraparound Marker Bands: Bands cut from 0.014-inch- (0.4-mm-) thick aluminum sheet, with stamped or embossed legend, and fitted with slots or ears for permanently securing around wire or cable jacket or around groups of conductors.
- G. Plasticized Card-Stock Tags: Vinyl cloth with preprinted and field-printed legends. Orange background, unless otherwise indicated, with eyelet for fastener.
- H. Aluminum-Faced, Card-Stock Tags: Weather-resistant, 18-point minimum card stock faced on both sides with embossable aluminum sheet, 0.002 inch (0.05 mm) thick, laminated with moisture-resistant acrylic adhesive, punched for fasteners, and preprinted with legends to suit each application.
- I. Brass or Aluminum Tags: 2 by 2 by 0.05-inch (51 by 51 by 1.3-mm) metal tags with stamped legend, punched for fastener.

2.2 NAMEPLATES AND SIGNS

- A. Safety Signs: Comply with 29 CFR, Chapter XVII, Part 1910.45.
- B. General Nameplate Requirements:
 - 1. Use colors prescribed by ANSI A13.1, NFPA 70 and as follows:
 - a. Normal Power System: White lettering on black background.
 - b. Emergency Power System: White lettering on red background, unless otherwise required by the Authority Having Jurisdiction (AHJ).

2. Backed with adhesive material formulated for the type of surface, intended use and installed location. 1/4-inch grommets in corners for mounting with self-tapping, stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.
- C. Nameplates for Dry, Interior Locations:
1. Engraving stock, melamine 3-layer plastic laminate.
 2. Minimum 1/16-inch (1.6-mm) thick for signs up to 20 sq. inches (129 sq. cm)
 3. Minimum 1/8-inch (3.2-mm) thick for signs larger than 20 sq. inches.
- D. Nameplates for Damp/Wet Interior and Exterior Locations:
1. Weather-resistant, non-fading, pre-printed, cellulose-acetate butyrate.
 2. Minimum 1/8-inch thick with 0.0396-inch (1-mm) galvanized steel backing.
- E. Refer to Contract Drawings for typical nameplate details.
- F. Refer to Paragraph "Equipment Identification Labels" under Part 3 of this Section for installation requirements.

2.3 UNDERGROUND LINE WARNING TAPE

- A. Non-biodegradable, polyethylene tape, 8 mil thick and a minimum of 6 inches wide with detectable metallic foil. Provide warning labels on 3 foot centers and be colored as follows:
1. Electrical ducts, piping or cable (600V and below) - Yellow tape with black printed labeling: CAUTION-BURIED ELECTRICAL LINE BELOW.
 2. Telephone conduits or cable - Orange tape with black printed labeling: CAUTION -BURIED TELEPHONE LINE BELOW.
 3. Fiber Optic conduits or cable - Orange tape with black printed labeling: CAUTION -BURIED FIBER OPTIC LINE BELOW.
 4. Cable TV(CATV) conduits or cable - Orange tape with black printed labeling: CAUTION-BURIED CABLE TV LINE BELOW.
- B. Where two (2) or more services share a common ductbank, i.e. telephone and fiber optic, warning tape for each service shall be installed above each service's respective conduit(s).
- C. Bury marker tape 12-inches below grade above every ductbank and buried conduit.

2.4 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking, Type 6/6 nylon cable ties.

1. Minimum Width: 3/16 inch (5 mm).
 2. Tensile Strength: 50 lb (22.3 kg) minimum.
 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
 4. Color: According to color-coding.
- B. Paint: Formulated for the type of surface and intended use.
1. Primer for Galvanized Metal: Single-component acrylic formulated for galvanized surfaces.
 2. Primer for Concrete Masonry Units: Heavy-duty-resin block filler.
 3. Primer for Concrete: Clear, alkali-resistant, binder-type sealer.
 4. Enamel: Silicone-alkyd or alkyd urethane as recommended by primer manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION

- A. General:
1. Where mixed voltages are used in one building (e.g., 480 volts, 208 volts), each switch,, junction box, equipment, etc., on each system must be labeled for voltage in addition to other requirements listed herein.
 2. All branch circuit panelboards must be identified with the same designation used in the circuit directory in the Main Distribution Panelboard Main Switchboard and in Distribution Panelboards.
 3. Before attaching labels, clean all surfaces with the label manufacturer's recommended cleaning agent.
 4. Install all labels firmly, as recommended by the label manufacturer.
 5. Labels attached to receptacle and switch shall be installed plumb and neatly on all equipment.
 6. Install nameplates parallel to equipment lines.
 7. Secure nameplates to equipment fronts using screws or rivets. Secure nameplate to inside of recessed panelboards in finished locations.
 8. Embossed tape will not be permitted for any application.

9. Labels: All labels shall be permanent and be machine-generated. NO HANDWRITTEN OR NON-PERMANENT LABELS SHALL BE ALLOWED.
 10. Label size shall be appropriate for the wiring method i.e. conductor, cable, outlet faceplate layout design. All labels to be used shall be self-laminating, white/transparent vinyl and be wrapped around the wire or cable sheath. Flag type labels are not allowed. The labels shall be of adequate size to accommodate the circumference of the cable being labeled and properly self-laminated over the full extent of the printed area of the label.
- B. Panelboard Circuit Directories:
1. Panelboards shall be equipped with equipment nameplates as specified in paragraph "Equipment Identifications Labels" in this Section.
 2. Panelboards shall have an accurate typed index indicating exactly what each added branch circuit serves.
 3. The Contractor shall provide up to date circuit directories in new panelboards, indicating all deletions and additions, and to note the date of all changes on the directory.
 4. The circuit directory shall reflect the actual room numbers and exact circuit designations. Reference room numbers indicated on Contract Drawings shall not be used in directories.
 5. If at anytime after occupancy the circuit directory is found to be incorrect due to negligence by the installer, then the Contractor shall trace out circuits, and correct the directory at no additional cost to the Owner.
- C. Miscellaneous Identification:
1. Individual circuit breakers, switches, and motor starters in panelboards and switchboards: 1/4-inch (6 mm); identify circuit and load served, including location.
 2. Individual circuit breakers, enclosed switches, and motor starters: 1/4-inch (6 mm); identify load served.
 3. Junction boxes: 1/2-inch (13 mm); identify system source(s) and load(s) served.
- D. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
- E. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract Documents or with those required by codes and standards. Use consistent designations throughout Project.

- F. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.
- G. Self-Adhesive Identification Products: Clean surfaces before applying.
- H. Install painted identification according to manufacturer's written instructions and as follows:
 - 1. Clean surfaces of dust, loose material, and oily films before painting.
 - 2. Prime surfaces using type of primer specified for surface.
 - 3. Apply one intermediate and one finish coat of enamel.
- I. Color Code Banding and Painting of Raceways, Boxes, and Cables: Band all exposed and concealed accessible raceways, pull boxes, and junction boxes of the systems listed below:
 - 1. Bands: Pre-tensioned, wraparound plastic sleeves; colored adhesive tape; or a combination of both. Make each color band 2 inches (51 mm) wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.
 - 2. Band Locations: At changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
 - 3. Junction boxes, pull boxes, and their covers shall be distinctively painted to identify their service.
 - 4. Apply the following colors to the systems listed below:
 - a. Fire Alarm System: Red.
 - b. Fire-Suppression Supervisory and Control System: Red and yellow.
 - c. Combined Fire Alarm and Security System: Red and blue.
 - d. Security System: Blue.
 - e. CCTV System: Green and yellow.
 - f. Mechanical and Electrical Supervisory System: Green and blue.
 - g. Telecommunication System: Green.
 - h. CATV System: Violet.
 - i. Computer Data: Blue.

- j. 120/208 V (or 120/240 V) Power and Lighting System: Yellow.
 - k. 480/277 V Power and Lighting System: Black.
 - l. Standby/Emergency Power System: Orange.
 - m. Any other system, with system type (such as *Sound System*) marked on covers in black letters with white covers.
- J. Caution Labels for Indoor Boxes and Enclosures for Power and Lighting: Install pressure-sensitive, self-adhesive labels identifying system voltage with black letters on orange background. Install on exterior of door or cover. Install label on inside face of door or cover in finished spaces.
- K. Circuit Identification Labels on Boxes: Install labels externally.
- 1. Exposed Boxes: Pressure-sensitive, self-adhesive plastic label on cover.
 - 2. Concealed Boxes: Plasticized card-stock tags.
 - 3. Labeling Legend: Permanent, waterproof listing of panel and circuit number or equivalent.
- L. Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground line warning tape located directly above line at 12 inches (150 to 200 mm) below finished grade. Where width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches (400 mm) overall, use a single line marker. Install line marker for underground wiring, both direct-buried cables and cables in raceway.
- M. Secondary Service, Feeder, and Branch-Circuit Conductors: Color-code throughout the secondary electrical system. Refer to Division 26 Section "Conductors and Cables" for additional requirements.
- N. Power-Circuit and Control Wire Identification: Metal tags or aluminum, wraparound marker bands for each conductor, cables, feeders, and power circuits in vaults, panelboard gutters, outlet boxes, junction boxes, pullboxes, junction boxes, manholes, switchboard rooms, and at load connections. Identify with branch circuit or feeder number for power and lighting circuits and with control wire number as indicated on equipment manufacturer's shop drawings for control wiring.
- 1. Legend: 1/4-inch- (6.4-mm-) steel letter and number stamping or embossing with legend corresponding to indicated circuit designations.
 - 2. Tag Fasteners: Nylon cable ties.
 - 3. Band Fasteners: Integral ears.

- O. Apply identification to conductors as follows:
1. Conductors to be Extended in the Future: Indicate source and circuit numbers.
 2. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color-coding to identify circuits' voltage and phase.
 3. Multiple Control and Communication Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color-coding, or cable marking tape.
- P. Apply warning, caution, and instruction signs as follows:
1. Warnings, Cautions, and Instructions: Install to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
 2. Emergency Operation: Install engraved laminated signs with white legend on red background with minimum 3/8-inch- (9-mm-) high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.
- Q. Equipment Identification Labels: Install on each unit of equipment, including central or master unit of each system. This includes power, lighting, communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Unless otherwise noted, labels/nameplates shall identify equipment designation(s), voltage rating, and source (including source locations). Labels for enclosed disconnect switches, motor starters, etc..., shall indicate the designation of the load served as the "equipment designation". In general, labels requiring one or two lines of text shall be 1-1/2 inches high. Labels requiring three lines of text shall be 2 inches high. The first line of text, which shall indicate equipment designation/load served, shall utilize 1/2 inch high lettering. Remaining lines of text, which shall indicate voltage ratings and source information shall utilize 1/4 inch high lettering. Refer to the Drawings for labeling examples. Apply labels to each unit of the following categories of equipment:
1. Panelboards.
 2. Switchboards.
 3. Transformers.
 4. Enclosed Disconnect Switches.
 5. Enclosed Circuit Breakers.
 6. Motor Starters.

7. Push-Button Stations.
 8. Contactors.
 9. Electrical Cabinets and Enclosures.
 10. Control Devices.
 11. Fire Alarm Master Station or Control Panel.
 12. Security-Monitoring Master Station or Control Panel.
 13. Access Doors and Panels for Concealed Electrical Items.
 14. Automatic Transfer Switch(es)
- R. Conduits Containing Electrical Feeders:
1. All conduits containing electrical feeders shall be identified with W.H. Brady B-500 vinyl cloth pipe markers or equivalent. Systems shall be identified as follows:
 - a. Labels shall be applied whenever a conduit enters or leaves a switchboard, panelboard, or a junction or pull box, and at each side of penetrations of walls or floors.
 - b. Apply Y-35 series individual numbers and letters to indicate feeder number followed by feeder voltage.
 - c. At each end of the above series of markers provide a pipe banding tape around the conduit. Refer to paragraph "Color Code Banding and Painting of Raceways, Boxes, and Cables" in part 3 of this Section for banding requirements.
- S. Communication Conduit and Cables:
1. Cables shall be identified with Brady B-500 vinyl cloth markers or equivalent by L.E.M., Stranco, or Panduit wire markers. Conduit shall be identified with Brady Vinyl Cloth B-500 pipe markers or equivalent. Systems shall be identified as follows:
 - a. Each cable shall be identified at each point of entrance to or exit from a conduit or enclosure and at 50-foot intervals in the tray. All identification at 50-foot intervals shall be at the same location in the tray. Each cable shall be identified at control panels, junction boxes, and terminal boards.
 - b. Conduit shall be identified exiting an enclosure or panel at junction or pull boxes, and at each side of penetrations of walls, partitions, or floors, within 1-foot of penetration, to identify service type, i.e. "TELEPHONE", "DATA", "CATV", etc...

- T. Fire Alarm: Junction box covers shall be painted red. Wiring color code shall be as follows:
1. Red - Smoke Detector - Common.
 2. Black - Smoke Detector - Power.
 3. Yellow - Smoke Detector - Alarm.
 4. Orange - Heat Detector - Alarm.
 5. Pink - Flow Switch.
 6. Tan - Valve Tamper Switch.
 7. Purple - Bells.
 8. Grey - Audio/Visual Devices.
 9. Light Blue - Manual Stations.
- U. Provide NEC, ANSI, and OSHA-approved *DANGER - HIGH VOLTAGE* warning signs on all doors of dedicated electrical rooms or closets. Where doors are located in finished areas, locate sign on the inside of the door. Coordinate mounting requirements with the Engineer. Minimum sign dimension shall be 15-inch x 11-inch.
- V. Surfaces shall be cleaned and painted, if specified, before applying markings.
- W. Place markings so that they are visible from the floor.
- X. Protect finished identification to insure that markings are clear and legible when project is turned over to the Owner.

END OF SECTION

DIVISION 26
SECTION 262726
WIRING DEVICES
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SECTION 262726 - WIRING DEVICES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Division 26, Section "Electrical Identification" for label requirements.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Straight-blade receptacles and associated device plates.
 - 2. GFCI receptacles.
 - 3. Locking receptacles.
 - 4. Isolated Ground receptacles.
 - 5. Tamper-Resistant receptacles.
 - 6. Weather-Resistant receptacles.
 - 7. Toggle switches.
 - 8. Wall-box dimmer switches.
 - 9. Pendant cord connector devices.
 - 10. Cord and plug sets.
 - 11. Emergency pushbuttons.

1.3 DEFINITIONS

- A. EMI: Electromagnetic Interference.
- B. GFCI: Ground-Fault Circuit Interrupter.
- C. IG: Isolated-Ground.
- D. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- E. RFI: Radio-Frequency Interference.
- F. UTP: Unshielded Twisted Pair.
- G. TR: Tamper-Resistant.
- H. WR: Weather-Resistant.

1.4 SUBMITTALS

- A. Product Data: For each product specified, indicating configurations, finishes, dimensions, and manufacturer's instructions.
- B. Shop Drawings: Legends for receptacles and switch plates.
- C. Samples: For devices and device plates for color selection and evaluation of technical features.
- D. Maintenance Data: For materials and products to include in maintenance manuals specified in Division 01.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- B. Comply with NFPA 70.
- C. Comply with NECA Standard of Installation.
- D. Codes: Provide wiring devices conforming to the following:
 - 1. American National Standards Institute (ANSI): Provide lugs and receptacle devices constructed in accordance with ANSI C73, *Attachment Plugs and Receptacles, Dimensions of*.
 - 2. Institute of Electrical and Electronics Engineers (IEEE): Construct and install wiring devices in accordance with requirements of IEEE 241, *Recommended Practice for Electric Power Systems in Commercial Buildings*.
 - 3. National Electrical Manufacturers Association (NEMA): Provide wiring devices constructed and configured in accordance with the requirements of
 - a. WD1: General Requirements for Wiring Devices
 - b. WD2: Semiconductor Dimmers for Incandescent Lamps
 - c. WD5: Special Purpose Wiring Devices
 - d. WD6: Wiring Devices - Dimensional Requirements.
 - 4. National Fire protection Association (NFPA): Comply with NFPA 70, *National Electrical Code*, as applicable to construction and installation of electrical wiring devices.
 - 5. Underwriters Laboratories, Inc. (UL): Provide wiring devices which are UL listed and comply with the requirements of:

- a. 20: General-Use Snap Switches.
- b. 498: Attachments, Plugs and Receptacles
- c. 514A: Metallic Outlet Boxes.
- d. 514B: Fittings for Conduit and Outlet Boxes.
- e. 514C: Non-Metallic Outlet Boxes, Flush-Device Boxes, and Covers
- f. 943: Ground-Fault Circuit Interrupters

1.6 COORDINATION

- A. Receptacles for Owner-Furnished Equipment: Match plug configurations.
 1. Cord and Plug Sets: Match equipment requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Wiring Devices:
 - a. Hubbell, Inc.; Wiring Devices Div.
 - b. Pass & Seymour/Legrand; Wiring Devices Div.
 - c. Leviton Manufacturing Co., Inc.
 - d. Cooper Wiring Devices
 2. Multioutlet Assemblies:
 - a. Airey-Thompson Co.
 - b. Wiremold.
 - c. Hubbell Inc. Wiring Devices
 - d. American Electric
 3. Retractable Cord Reels

- a. Appleton Electric Company
 - b. Reelcraft
 - c. Ericson Manufacturing Company
 - d. Hubbell Wiring Devices – Kellems
4. Emergency Pushbuttons
- a. Safety Technology International, Inc. (STI)

2.2 STRAIGHT BLADE RECEPTACLES

A. General Requirements

1. Straight blade receptacles shall have the following basic features:
 - a. One-piece brass mounting strap with integral ground for low resistance of fault currents.
 - b. Auto-ground clip to assure positive ground.
 - c. Impact-resistant nylon/thermoplastic face and base housing.
 - d. #10 large head brass terminal and ground screws.

B. Duplex Convenience Receptacles

1. Duplex convenience receptacles shall be extra heavy-duty, specification grade, 20A, 125V.
2. Comply with NEMA WD-1, NEMA WD-6 configuration 5-20R, UL 498 and Federal Specification W-C-596.
3. Hubbell HBL5362, Pass & Seymour 5362A, or approved equal by acceptable manufacturer.

C. Tamper-Resistant Duplex Convenience Receptacles

1. Tamper-resistant duplex convenience receptacles shall be extra heavy-duty, specification grade, 20A, 125V, with the following features:
 - a. Thermoplastic dual mechanism shutter system to help prevent insertion of foreign objects.
2. Comply with NEMA WD-1, NEMA WD-6 configuration 5-20R, UL 498 and Federal Specification W-C-596.
3. Hubbell HBL5362TR, Pass & Seymour TR63, or approved equal by acceptable manufacturer.

D. Weather-Resistant Duplex Convenience Receptacles

1. Weather-resistant duplex convenience receptacles shall be extra heavy-duty, specification grade, 20A, 125V, with the following features:
 - a. "WR" marking on face as required by UL Standard.
 - b. UV-resistant nylon face for longer life under adverse environmental conditions.
2. Comply with NEMA WD-1, NEMA WD-6 configuration 5-20R, UL 498, Federal Specification W-C-596 and 2011 NEC 406.9.
3. Hubbell HBL5362WR, Pass & Seymour WR5362, or approved equal by acceptable manufacturer.

E. Isolated Ground Duplex Convenience Receptacles

1. Isolated ground duplex convenience receptacles shall be extra heavy-duty, specification grade, 20A, 125V, with the following features:
 - a. Green grounding screw connected directly to the grounding contacts.
 - b. Insulation barrier construction to isolate ground contacts from the mounting strap.
 - c. "IG" triangle on the face of the receptacle.
2. Comply with NEMA WD-1, NEMA WD-6 configuration 5-20R, UL 498 and Federal Specification W-C-596.
3. Hubbell IG5362, Pass & Seymour IG5362, or approved equal by acceptable manufacturer.

F. Tamper-Resistant Isolated Ground Duplex Convenience Receptacles

1. Tamper-resistant isolated ground duplex convenience receptacles shall be extra heavy-duty, specification grade, 20A, 125V, with the following features:
 - a. Thermoplastic dual mechanism shutter system to help prevent insertion of foreign objects.
 - b. Green grounding screw connected directly to the grounding contacts.
 - c. Insulation barrier construction to isolate ground contacts from the mounting strap.
 - d. "IG" triangle on the face of the receptacle.
2. Comply with NEMA WD-1, NEMA WD-6 configuration 5-20R, UL 498 and Federal Specification W-C-596.

3. Hubbell IG5362TR, Pass & Seymour TRIG5362, or approved equal by acceptable manufacturer.
- G. Weather-Resistant Isolated Ground Duplex Convenience Receptacles
1. Weather-resistant isolated ground duplex convenience receptacles shall be extra heavy-duty, specification grade, 20A, 125V, with the following features:
 - a. "WR" marking on face as required by UL Standard.
 - b. UV-resistant nylon face for longer life under adverse environmental conditions.
 - c. Green grounding screw connected directly to the grounding contacts.
 - d. Insulation barrier construction to isolate ground contacts from the mounting strap.
 - e. "IG" triangle on the face of the receptacle.
 2. Comply with NEMA WD-1, NEMA WD-6 configuration 5-20R, UL 498, Federal Specification W-C-596 and 2011 NEC 406.9.
 3. Hubbell IG5362WR, or approved equal by acceptable manufacturer.
- H. Single Convenience Receptacles
1. Single convenience receptacles shall be extra heavy-duty, specification grade, 20A, 125V.
 2. Comply with NEMA WD-1, NEMA WD-6 configuration 5-20R, UL 498 and Federal Specification W-C-596.
 3. Hubbell HBL5361, Pass & Seymour 5361, or approved equal by acceptable manufacturer.
- I. Tamper-Resistant Single Convenience Receptacles
1. Single convenience receptacles shall be extra heavy-duty, specification grade, 20A, 125V, with the following features:
 - a. Thermoplastic dual mechanism shutter system to help prevent insertion of foreign objects.
 2. Comply with NEMA WD-1, NEMA WD-6 configuration 5-20R, UL 498 and Federal Specification W-C-596.
 3. Hubbell HBL5361, Pass & Seymour 5361, or approved equal by acceptable manufacturer.
- J. Weather-Resistant Single Convenience Receptacles

1. Single convenience receptacles shall be extra heavy-duty, specification grade, 20A, 125V, with the following features:
 - a. "WR" marking on face as required by UL Standard.
 - b. UV-resistant nylon face for longer life under adverse environmental conditions.
2. Comply with NEMA WD-1, NEMA WD-6 configuration 5-20R, UL 498 and Federal Specification W-C-596.
3. Hubbell HBL5361, Pass & Seymour 5361, or approved equal by acceptable manufacturer.

K. Special Purpose Receptacles

1. Special purpose receptacles shall have ratings and NEMA configurations as indicated on the Drawings, or as required to match equipment plug configuration, and shall be black with device plate to match outlet type.

2.3 GFCI RECEPTACLES

A. General Requirements

1. GFCI receptacles shall have the following basic features:
 - a. Solid-state ground-fault sensing and signaling.
 - b. Trip time of 0.025 seconds (nominal).
 - c. Trip threshold of +/- 5mA.
 - d. Indicator light that is lighted when device is tripped.
 - e. Auto-ground clip to assure positive ground.
 - f. Impact-resistant nylon/thermoplastic face and base housing.
 - g. #10 large head brass terminal and ground screws.

B. Duplex GFCI Receptacles

1. Duplex GFCI receptacles shall be extra heavy-duty, specification grade, 20A, 125V.
2. Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, UL 498 and Federal Specification W-C-596.
3. Hubbell GF20LA, Pass & Seymour 2095, or approved equal by acceptable manufacturer.

C. Tamper-Resistant Duplex GFCI Receptacles

1. Tamper-resistant duplex GFCI receptacles shall be extra heavy-duty, specification grade, 20A, 125V with the following features:

- a. Thermoplastic dual mechanism shutter system to help prevent insertion of foreign objects.
 2. Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, UL 498 and Federal Specification W-C-596.
 3. Hubbell, Pass & Seymour 2095TRS, or approved equal by acceptable manufacturer.
- D. Weather-Resistant Duplex GFCI Receptacles
1. Weather-resistant duplex GFCI receptacles shall be extra heavy-duty, specification grade, 20A, 125V with the following features:
 - a. "WR" marking on face as required by UL Standard.
 - b. UV-resistant nylon face for longer life under adverse environmental conditions.
 2. Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, UL 498 and Federal Specification W-C-596.
 3. Hubbell GFTR20, Pass & Seymour 2095TRWR, or approved equal by acceptable manufacturer.
- E. Tamper- and Weather-Resistant Duplex GFCI Receptacles
1. Weather-resistant duplex GFCI receptacles shall be extra heavy-duty, specification grade, 20A, 125V with the following features:
 2. Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, UL 498 and Federal Specification W-C-596.
 3. Hubbell GFTR20, Pass & Seymour 2095TRWR, or approved equal by acceptable manufacturer.
- 2.4 LOCKING RECEPTACLES
- A. Single Convenience Receptacles
1. Single convenience receptacles shall be extra heavy-duty, specification grade, 20A, 125V: Comply with NEMA WD1, NEMA WD6 configuration L5-20R, UL 498 and Federal Specification W-C-596.
- B. Special Purpose Receptacles
1. Special purpose receptacles shall have ratings and NEMA configurations as indicated on the Drawings, or as required to match equipment plug configuration, and shall be black with device plate to match outlet type.

2.5 SWITCHES

A. General Requirements

1. Switches shall have the following basic features:
 - a. Heavy-gauge one-piece copper alloy contact arm.
 - b. Fast "make" and positive "break" to minimize arcing.
 - c. Heavy-duty bumper pads for quiet operation.
 - d. High strength thermoplastic polycarbonate toggle.
 - e. Oversized silvery alloy contacts for long life and heat dissipation.
 - f. Nickel-plated steel strap with integral ground.
 - g. Auto-ground clip to assure positive ground.

B. Toggle Switches

1. Toggle switches shall be quiet-type, extra heavy-duty, horsepower-rated, industrial grade, 120/277V, 20A: Comply with NEMA WD 1, UL 20 and Federal Specification W-S-896.
2. Hubbell HBL1221 (single-pole), HBL1222 (two-pole), HBL1223 (three-way), HBL1224 (four-way), Pass & Seymour PS20AC1 (single-pole), PS20AC2 (two-pole), PS20AC3 (three-way), PS20AC4 (four-way), or approved equal by acceptable manufacturer.

C. Pilot Lighted Switches

1. Pilot lighted switches shall be quiet-type, extra heavy-duty, horsepower-rated, industrial grade, 120/277V, 20A with the following features:
 - a. Red lighted toggle, lit when switch is "on".
2. Comply with NEMA WD 1, UL 20 and Federal Specification W-S-896.
3. Hubbell PS1221PL (single-pole), HBL1222PL (two-pole), HBL1223PL (three-way), Pass & Seymour PS20AC1RPL (single-pole), PS20AC2RPL (two-pole), PS20AC3RPL (three-way), or approved equal by acceptable manufacturer.

D. Key (Locking) Switches

1. Key (locking) switches shall be quiet-type, extra heavy-duty, horsepower-rated, industrial grade, 120/277V, 20A with the following features:
 - a. Furnished with key for locking switch.
2. Comply with NEMA WD 1, UL 20 and Federal Specification W-S-896.

3. Hubbell HBL1221L (single-pole), HBL1222L (two-pole), HBL1223L (three-way), HBL1224L (four-way), Pass & Seymour PS20AC1L (single-pole), PS20AC2L (two-pole), PS20AC3L (three-way), PS20AC4L (four-way), or approved equal by acceptable manufacturer.

2.6 WALL-BOX TIMER SWITCHES

A. Digital Preset Timer

1. Description: Electronic automatic shut-off wall timer.
2. Features:
 - a. Adjustable Time Delay: 15, 30, 60 minutes/2, 4 hours.
 - b. Single button timer selection
 - c. LED indication
 - d. Silent operation
 - e. Requires neutral conductor
 - f. cULus listed.
 - g. Conforms to NEMA WD-1 and WD-6.
3. Ratings:
 - a. 0-1800W, 1/4HP at 120 VAC, 60 Hz.
4. Loads:
 - a. Lighting: Incandescent, fluorescent, compact fluorescent (CFL), magnetic low-voltage (MLV), electronic low-voltage (ELV).
 - b. Motors: Up to 1/4 horsepower.
5. Basis of Design: Intermatic Catalog No. EI215 (finish to match other wiring devices specified herein).

2.7 FINISHES

- A. Wiring device catalog numbers in Section text do not designate device color. Device colors shall be as follows, unless otherwise indicated elsewhere in the Specifications and Drawings or as required by NFPA or device listing:
 1. Wiring Devices connected to Normal Power System: Selected by Architect.
 2. Wiring Devices connected to Computer Power System: Gray.
 3. Wiring Devices connected to Emergency Power System: Red.
 4. Special Receptacles: Black

2.8 DEVICE PLATES

- A. Device plates shall be provided for all switches and receptacles. Device plates shall be as manufactured to fit each type of single device, to fit devices which are ganged together, and they shall be same manufacturer as wiring devices with finish as follows:
1. Material for Finished Spaces: 0.04-inch-thick, Type 302, satin-finished stainless steel, except as otherwise indicated.
 2. Material for Unfinished Spaces: Galvanized steel.
 3. Color: Matches wiring device, except as otherwise indicated.
 4. Plate-Securing Screws: Metal with heads colored to match plate finish.
- B. Material for Damp Locations: Heavy-duty die-cast zinc/aluminum construction listed and labeled for use in "wet locations." All components shall have baked-on electrostatic, polyester, power paint finish for superior corrosion resistance. Covers for receptacles shall be equipped with one or more lift cover(s) equipped with stainless steel springs. Covers for toggle switches shall be equipped with actuating levers and shall mount directly over the switch. Covers for receptacles shall comply with 2011 NEC Article 406.9(A). Covers for switches shall comply with 2011 NEC Article 404.4.
1. Duplex Receptacle, 2 Self-Closing Lids – Pass & Seymour Model No. CA8GH or approved equal
 2. GFCI Receptacle, 1 Self-Closing Lid – Pass & Seymour Model No. CA26GH (Horizontal) and Pass & Seymour Model No. CA26GV (Vertical), or approved equal.
 3. Toggle Switch – Pass & Seymour Model No. CA1GL or approved equal.
 4. Toggle switch, lockable cover – Crouse-Hinds Model No. DS185, or approved equal.
- C. Material for Wet Locations: Heavy-duty die-cast zinc/aluminum construction with gasketed, hinged lockable lid, designed to be weatherproof while the device is in use, and listed and labeled for use in "wet locations." All components shall have baked-on electrostatic, polyester, power paint finish for superior corrosion resistance. Covers for receptacles shall be self-closing per UL514C42.3, be equipped with stainless steel springs, and shall have a cam action latch for secure closure. Covers for toggle switches shall be equipped with actuating levers and shall mount directly over the switch. Covers for receptacles shall comply with 2011 NEC Article 406.9(B). Covers for switches shall comply with 2011 NEC Article 404.4.
1. Duplex/GFCI Receptacle - Pass & Seymour Model No. WIUCAST1 or approved equal.
 2. Toggle switch – Pass & Seymour Model No. CA1GL, or approved equal.
 3. Toggle switch, lockable cover – Crouse-Hinds Model No. DS185, or approved equal.

- D. Device plates shall be factory labeled to clearly identify receptacles which are on emergency circuits.
- E. Device plates for receptacles on emergency circuits shall be a red finish.
- F. Provide jumbo size plates for outlets installed in masonry walls.

2.9 PROTECTIVE WIRE GUARDS

- A. Provide protective wireguards over devices subject to physical damage. All devices installed in the gymnasium, in mechanical and electrical rooms shall be provided with protective guards. Protective guards shall be manufacturer's recommended product for the device being protected or a suitable guard as manufactured by American Time & Signal Company (800-328-8996), Safety Technology International (STI) (800-888-4784), or Institutional Systems Services Corporation (800-524-0537).
- B. Devices to be provided with protective guards include, but are not limited to, the following:
 - 1. Lighting Fixtures
 - 2. Clocks
 - 3. Bells
 - 4. Fire Alarm Pull Stations
 - 5. Thermostats
 - 6. Smoke/Heat Detectors
 - 7. Speakers
 - 8. Fire Alarm Audio/Visual Devices (Strobe, Horn, etc...)
 - 9. Exit Signs
 - 10. Emergency Lights
 - 11. Telephones
 - 12. Data Outlets
 - 13. Security Devices/Motion Detectors
 - 14. Wiring Devices
 - 15. Emergency Shut-Off Stations

16. Other Devices as required by Owner

17. Gymnasium Lighting Fixtures

- C. Guard shall be fabricated from ¼-inch (9-gauge) cold-rolled steel rods, welded together with mounting tabs. Guard shall be finished with a powder-based epoxy to protect against corrosion. Finish color shall match the finishes for the area being installed, except guards for fire alarm devices shall be red finish color.
- D. Protective Devices shall be considered incidental to the product installed in an area subject to damage as indicated on the drawings and shall be provided at no additional cost to the Owner.

2.10 PENDANT CORD/CONNECTOR DEVICES

- A. Description: Matching, locking type, plug and receptacle body connector, NEMA WD 6, Configurations L5-20P and L5-20R, Heavy-Duty grade.
1. Body: Nylon with screw-open cable-gripping jaws and provision for attaching external cable grip.
 2. External Cable Grip: Woven wire-mesh type made of high-strength galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.11 CORD AND PLUG SETS

- A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.
1. Cord: Rubber-insulated, stranded-copper conductors, with type SOW-A jacket. Green-insulated grounding conductor, and equipment-rating ampacity plus a minimum of 30 percent.
 2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.12 SWITCH RATED PLUGS AND RECEPTACLES

- A. Description: Switch and horsepower rated plugs and receptacles for quick, safe equipment change-outs and for connecting motors and welders.
- B. Construction and Features:
1. Fiberglass reinforced thermoplastic polyester casing with hinged lid.
 2. Off button to provide circuit disconnection.
 3. Dead front safety shutter to prevent user access to live parts.

4. Pad-lockable pawl to allow plug to be locked out and tagged.
5. Solid silver-nickel contact surfaces for superior conductivity and corrosion resistance.
6. Spring loaded butt-style contacts to ensure optimal contact force and electrical performance.
7. Spring assisted screw terminals.
8. Color-coded gasket on plug (inlet) and receptacle to identify voltage and polarity.

C. General Ratings:

1. Amperage: 20-200A.
2. Voltage: 600 VAC, 250 VDC Max
3. Frequency: 50-400 Hz.
4. Polarity: 1-3P.
5. Horsepower: ½ to 25 HP.
6. Short-Circuit (Make & Withstand): 65-100kA
7. Environmental: NEMA 3R, IP54/IP55, NEMA 4X optional
8. Temperature: -40°F (min) to 140°F (max)

D. Specific Ratings: Refer to the Contract Drawings.

E. Listings: UL 1682, CSA C22.2 No. 182.1 and IEC 60309-1.

F. Accessories:

1. Metal junction box with 1" NPT fittings, top and bottom.
2. Nylon 30° angle with adapter plate for receptacle.
3. Nylon handle for plug (inlet).
4. Finger drawplates (set of two).

G. Basis of Design: Meltric Decontactor (DS) Series

2.13 RETRACTABLE CORD REEL WITH TRIPLE RECEPTACLE OUTLET

A. Description: Factory-fabricated retractable cord reel with receptacle connector body and the following features:

1. Cord: Type "SJTW" cord with three (3) #12 AWG conductors.
2. Receptacle connector body: Nylon body with three (3) NEMA 5-15R grounded receptacles.
3. High-impact resistant composite frame.
4. Factory-assembled, modular type collector ring and brush block assembly.

5. Lifetime lubricated bearings.
6. Removable cover(s) for access to springs and ring/brush assembly.
7. Adjustable cable stop.
8. Built-in cord locking ratchet to hold cord at desired length.

2.14 EMERGENCY PUSHBUTTONS

A. General:

1. Emergency pushbuttons shall be Stopper Station with Bopper Stopper cover, as manufactured by Safety Technology International, Inc. (STI), or approved equal.

B. Features:

1. Button activation shall be Push-to-Activate, Turn-to-Reset.
2. Interchangeable or replaceable Normally Open (N.O.) or Normally Closed (N.C.), Single-Pole, Single-Throw (SPST) gold-plated contact blocks rated for three (3) amps at 600 VAC or one (1) amp at 250VDC.
3. Standard switch shall include one N.O. and one N.C. contact.
4. Switch shall hold up to three (3) sets of isolated contacts.

C. Construction:

1. Housing shall be molded of polycarbonate rated for temperature range of -40 degrees to 250 degrees Fahrenheit.
2. Housing color shall be yellow, unless otherwise indicated.
3. Pushbutton shall be provided with stainless steel backplate and matching polycarbonate spacer (as required), both having a 5VA flammability rating.

D. Labeling:

1. Pushbuttons shall be provided with a vinyl label that is customized to suit each application, including, but not limited to the following:
 - a. "Emergency Power Off"
 - b. "Water Heater Shut-Down"
 - c. "Boiler Shut-Down"
 - d. "Emergency Utilities Off" (used when shutting off multiple utilities, i.e. power, air, water, and/or gas)

E. Cover

1. Pushbutton covers shall have the following features:
 - a. Molded from thick clear polycarbonate material.
 - b. UV stabilized.
 - c. 94V-2 flammability rating.
 - d. Stainless steel torsion spring to maintain cover in a closed position.
 - e. Mounting hardware and gasket.
 - f. Lifetime guarantee against breakage of polycarbonate from normal use.

F. Quality Assurance

1. Pushbuttons shall be tested and approved or listed by:
 - a. Underwriter Laboratories (UL) and Canadian Underwriter Laboratories No. S7255.
 - b. Complies with UL 2017.
 - c. UL listed for indoor and outdoor use, when used with appropriate weather cover.
2. Pushbuttons shall be ADA Compliant.

G. Warranty

1. Pushbuttons shall be provided with lifetime guarantee against breakage of polycarbonate in normal use.
2. Pushbuttons shall be provided with one year guarantee on electro-mechanical and electronic components.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verification of existing conditions before starting work.
- B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
 1. Verify that outlet boxes are installed at proper height.
 2. Verify that wall openings are neatly cut and will be completely covered by wall plates.
 3. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

- C. By beginning Work, accepts conditions and assume responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.2 INSTALLATION

- A. Install devices and assemblies plumb, level, and secure.
- B. Install wall plates when painting is complete.
- C. Install wall dimmers to achieve indicated rating after derating for ganging as instructed by manufacturer.
- D. Do not share neutral conductor on load side of dimmers.
- E. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on top or as required by the local Authority Having Jurisdiction. Exception: Mount exterior GFCI weatherproof duplex receptacles horizontally with grounding terminals on the left, or as required by the local Authority Having Jurisdiction. Group adjacent switches under single, multi-gang wall plates.
- F. Protect devices and assemblies during painting.
- G. Adjust locations at which floor service outlets are installed to suit arrangement of partitions and furnishings.
- H. Coordinate cord and plug connected equipment for type and ratings required.
- I. Emergency shut-down toggle switches for boilers shall be provided at all means of egress from rooms in which boilers are installed. Boiler shut-down switches shall be clearly identified and shall be equipped with illuminated red toggle.
- J. Receptacles on emergency circuits shall be clearly identified, with a circuit label indicating panelboard and circuit number.
- K. All 15 ampere and 20 ampere, 125 volt and 250 volt, non-locking type receptacles installed in damp or wet locations shall be listed weather-resistant type in accordance with 2011 NEC Article 406.9(A) and 406.9(B) and shall be installed within an enclosure that is weather proof when an attachment plug is inserted.
- L. All 15 ampere and 20 ampere, 125 volt, single-phase, non-locking type receptacles installed in the following locations shall have GFCI protection for personnel, in accordance with 2011 NEC Article 210.8(B).
 - 1. Bathrooms/Toilet Rooms
 - 2. Kitchens
 - 3. Rooftops
 - 4. Outdoors
 - 5. Within six (6) feet (1.8m) of sinks, plumbing fixtures and water piping.

6. Indoor wet locations.
 7. Locker rooms with associated showering facilities.
 8. Garages, service bays, and similar areas where electrical hand tools or portable lighting equipment are to be used.
- M. Where multiple receptacles are indicated on the Contract Drawings as GFCI type receptacles, each device must be a GFCI type receptacle. Protecting standard receptacles downstream from one GFCI receptacle is not acceptable unless written approval is obtained from the Engineer.
- N. All non-locking type, 125 volt, 15 ampere and 20 ampere receptacles installed in childcare facilities shall be listed tamper-resistant receptacles in accordance with 2011 NEC Article 406.14. Refer to Division 26 Section "Common Work Results for Electrical" for the definition of Childcare Facilities.
- O. Switches shall be located as indicated on the drawings, arranged singular or in gangs within 18" of the door jam on the strike side of the door openings. Verify the door swings with the Architectural Drawings prior to rough-in.
- P. Install life safety system switches separate from the normal power switches. Do not include in the multiple gang configuration.
- Q. Switch and receptacle combinations shall be as above in a 2-gang box where both are of the same voltage. Provide separate boxes where different voltages are present.
- R. All switches in Mechanical Rooms, Electrical Rooms and other such places shall be a lighted handle, single-pole light switch(es) as required.
- S. Install receptacles with ground pole in position top unless otherwise required by local authority having jurisdiction.

3.3 IDENTIFICATION

- A. Comply with Division 26 Section "Electrical Identification".
1. Switches: Where three or more switches are ganged, and elsewhere as indicated, identify each switch with approved legend engraved on wall plate. Light switches shall be labeled as to lights controlled and with circuit number and panel identification.
 2. Receptacles: Identify panelboard and circuit number from which served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on face of plate and durable wire markers or tags within outlet boxes. Protect label from damage during construction. Replace all damaged and unclear labels.
 3. Mark all conductors with the panel and circuit number serving the device at the device.

4. Mark the panel and circuit number serving the device on the back side of the device plate with a permanent marking system, machine-generated, that does not show through the front of the plate.

3.4 CONNECTIONS

- A. Connect wiring device grounding terminal to outlet box with bonding jumper.
- B. Connect wiring device grounding terminal to branch-circuit equipment grounding conductor.
- C. Isolated-Ground Receptacles: Connect to isolated-ground conductor routed to designated isolated equipment ground terminal of electrical system.
- D. Tighten electrical connectors and terminals according to manufacturers published torque-tightening values. If manufacturers torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

- A. Test wiring devices for proper polarity, continuity, short circuits, and ground continuity. Operate each device at least six times.
- B. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
- C. Replace damaged or defective components.

3.6 CLEANING

- A. Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

END OF SECTION

DIVISION 27
SECTION 270500
COMMON WORK RESULTS FOR COMMUNICATIONS
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SECTION 270500 - COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Documents:
 - 1. Division 26 Section "Electrical Firestopping"

1.2 SUMMARY

- A. Section Includes:
 - 1. Communications equipment coordination and installation.
 - 2. Sleeves for raceways and cables.
 - 3. Sleeve seals.
 - 4. Foam Duct Sealant.
 - 5. Grout.
 - 6. Common communications installation requirements.
- B. Provide all labor, materials, equipment, and services necessary for and incidental to the complete installation and operation of all communications work.
- C. Unless otherwise specified, all submissions shall be made to, and acceptances and approvals made by the Architect and the Engineer.
- D. Contract Drawings are generally diagrammatic and all offsets, fittings, transitions and accessories are not necessarily shown. Furnish and install all such items as may be required to fit the work to the conditions encountered. Arrange conduits, equipment, and other work generally as shown on the Contract Drawings, providing proper clearance and access. Where departures are proposed because of field conditions or other causes, prepare and submit detailed shop drawings for approval in accordance with Article "Submittals" specified below. The right is reserved to make reasonable changes in location of equipment, boxes, conduit/wiring, and devices, up to the time of rough-in or fabrication.
- E. Conform to the requirements of all rules, regulations and codes of local, state and federal authorities having jurisdiction.
- F. Coordinate the work under Division 27 with the work of all other construction trades.
- G. Be responsible for all construction means, methods, techniques, procedures, and phasing sequences used in the work. Furnish all tools, equipment and materials necessary to properly perform the work in first class, substantial, and workmanlike manner, in accordance with the full intent and meaning of the Contract Documents.

- H. Arrange conduit, wiring, equipment, and other work generally as shown, providing proper clearances and access. Carefully examine all Contract Drawings and fit the work in each location without substantial alteration. Where departures are proposed because of field conditions or other causes, prepare and submit detailed shop drawings for approval in accordance with Article "Submittals" as hereinafter specified. The right is reserved to make reasonable changes in location of equipment, conduit, wiring, and devices up to the time of rough-in or fabrication.

1.3 PERMITS AND FEES

- A. Obtain all permits and pay taxes, fees and other costs in connection with the work. File necessary plans, prepare documents, give proper notices and obtain necessary approvals. Deliver inspection and approval certificates to Owner prior to final acceptance of the work.
- B. Permits and fees shall comply with Division 01 Section, *General Requirements*.
- C. Notify Inspection Authorities to schedule inspections of work.
- D. Notify Architect and Engineer in advance of scheduled inspections.
- E. A foreman, superintendent or other supervisor shall be in attendance for all scheduled inspections

1.4 EXAMINATION OF SITE

- A. Examine the site, determine all conditions and circumstances under which the work must be done, and make all necessary allowances for same. No additional cost to the Owner will be permitted for Contractor's failure to do so.
- B. Examine and verify specific conditions described in individual Specifications sections.
- C. Verify that utility services are available, of the correct characteristics, and in the correct locations.

1.5 INTERPRETATION OF DOCUMENTS

- A. Any discrepancies between Drawings, Specifications, Drawings and Specifications, or within Drawings and Specifications shall be promptly brought to the attention of the Owner during the bidding period. No allowance shall subsequently be made by reason of failure to have brought said discrepancies to the attention of the Owner during the bidding period or of any error on the Bidder's part.
- B. The locations of products shown on Drawings are approximate. Place the devices to eliminate all interference with above-ceiling ducts, piping, etc. Where any doubt exists, the exact location shall be determined by the Owner.
- C. All general trades and existing conditions shall be checked before installing any devices, equipment, wiring, etc.

- D. Equipment sizes shown on the Drawings are estimated. Before installing any wire or conduit, obtain the exact equipment requirements and install wire, conduit, or other item of the correct size for the equipment actually installed. However, wire and conduit sizes shown on the Drawings shall be taken as a minimum and shall not be reduced without written approval from the Owner.
- E. Where variances occur between the Drawings and Specifications or within either document itself, the item or arrangement of better quality, greater quality, or higher cost shall be included in the Contract Price. The Engineer will decide on the item and manner in which the work shall be installed.
- F. Contract Drawings are generally diagrammatic and all offsets, fittings, transitions, and accessories are not necessarily shown. Furnish and install all such items as may be required to fit the work to the conditions encountered. Arrange conduits, equipment, and other work generally as shown on the Contract Drawings, providing proper clearance and access. Where departures are proposed because of field conditions or other causes, prepare and submit detailed Shop Drawings for approval in accordance with Article "Submittals" as herein after specified. The right is reserved to make reasonable changes in location of equipment, conduit/wiring, and devices, up to the time of rough-in or fabrication.
- G. Work not specifically outlined, but reasonably incidental to the completion of the work, shall be included without additional compensation from the Architect, Engineer, and Owner.
- H. Perform the work in a first-class, substantial and workmanlike manner. Any materials installed which do not present an orderly and neat workmanlike appearance shall be removed and replaced when so directed by the Engineer, at the Contractor's expense.
- I. The complete set of Architectural, Civil, Structural, Theatrical, Food Service, Mechanical, and Electrical Drawings and Specifications apply to this work. The successful Bidder shall familiarize himself with all other related documents.

1.6 MATERIALS AND EQUIPMENT

- A. Materials and equipment installed as a permanent part of the project shall be new, unless otherwise indicated or specified, and of the specified type and quality.
- B. Where material or equipment is identified by proprietary name, model number and/or manufacturer, furnish named item, or its equal, subject to approval by Engineer. Substituted items shall be equal or better in quality and performance and must be suitable for available space, required arrangement, and application. Submit all data necessary to determine suitability of substituted items, for approval.
- C. The suitability of named item only has been verified. Where more than one item is named, only the first named item has been verified as suitable. Substituted items, including items other than first named shall be equal or better in quality and performance to that of specified items, and must be suitable for available space, required arrangement and application. Contractor, by providing other than the first named manufacturer, assumes responsibility for all necessary adjustments and modifications necessary for a satisfactory installation. Adjustments and modifications shall include but not be limited to electrical, structural, support, and architectural work.

- D. Substitution will not be permitted for specified items of material or equipment where noted.
- E. All items of equipment furnished shall have a service record of at least five (5) years.

1.7 FIRE SAFE MATERIALS

- A. Unless otherwise indicated, materials and equipment shall conform to UL, NFPA and ASTM standards for fire safety with smoke and fire hazard rating not exceeding flame spread of 25 and smoke developed of 50.

1.8 REFERENCED STANDARDS, CODES AND SPECIFICATIONS

- A. Specifications, Codes and Standards listed below are included as part of this Specification, latest edition:

- 1. ADA - Americans with Disabilities Act
- 2. ANSI - American National Standards Institute
- 3. ASTM - American Society for Testing and Materials
- 4. CSA - Canadian Standards Association
- 5. DNREC - Delaware Department of Natural Resources and Environmental Control
- 6. EPA - Environmental Protection Agency
- 7. FM - Factory Mutual
- 8. IBC - International Building Code
- 9. IEEE - Institute of Electrical and Electronics Engineers
- 10. NEC - National Electrical Code
- 11. NECA - National Electrical Contractors Association
- 12. NEMA - National Electrical Manufacturers Association
- 13. NFPA - National Fire Protection Association
- 14. OSHA - Occupational Safety and Health Act
- 15. UL - Underwriters' Laboratories

- B. The application standards of the local communications utility company(ies).

- C. Electrical construction materials shall, where a listing is normal for the particular class of material, be listed in *Electrical Construction Materials List* of the Underwriters' Laboratories, Inc. (U.L.) and shall bear the listing label. Electrical equipment shall, where a listing is normal for the particular class of equipment, be listed in the *Electrical Appliance and Utilization Equipment List* of the Underwriters' Laboratories, Inc. (U.L.) and shall bear the listing label. Materials and equipment listed and labeled as "approved for the purpose" by other nationally recognized testing laboratory, inspection agency or approved organization (such as E.T.L. or Factory Mutual) shall be acceptable.

1.9 SUBMITTALS

- A. Product Data: For items specified in Part 2 of this Section.

1.10 SUBMITTALS, REVIEW AND ACCEPTANCE

- A. Equipment, materials, installation, workmanship and arrangement of work are subject to review and acceptance. No substitution will be permitted after acceptance of equipment or materials except where such substitution is considered by the Engineer, to be in best interest of Owner.
- B. After acceptance of Material and Equipment List, submit eight (8) copies, or more as required under the General Conditions, of complete descriptive data for all items. Data shall consist of specifications, data sheets, samples, capacity ratings, performance curves, operating characteristics, catalog cuts, dimensional drawings, wiring diagrams, installation instructions, and any other information necessary to indicate complete compliance with Contract Documents. Edit submittal data specifically for application to this project.
- C. Thoroughly review and stamp all submittals to indicate compliance with contract requirements prior to submission. Coordinate installation requirements and any electrical requirements for equipment submitted. Contractor shall be responsible for correctness of all submittals.
- D. Submittals will be reviewed for general compliance with design concept in accordance with Contract Documents, but dimensions, quantities, or other details will not be verified.
- E. Identify submittals, indicating intended application, location and service of submitted items. Refer to specification sections or paragraphs and drawings where applicable. Clearly indicate exact type, model number, style, size and special features of proposed item. Submittals of a general nature will not be acceptable. For substituted items, clearly list on the first page of the submittal all differences between the specified item and the proposed item. The Contractor shall be responsible for corrective action and maintaining the specification requirements if differences have not been clearly indicated in the submittal.
- F. Submit actual operating conditions or characteristics for all equipment where required capacities are indicated. Factory order forms showing only required capacities will not be acceptable. Call attention, in writing, to deviation from contract requirements.
- G. Acceptance will not constitute waiver of contract requirements unless deviations are specifically indicated and clearly noted. Use only final or corrected submittals and data prior to fabrication and/or installation.
- H. For any submittal requiring more than two (2) reviews by the Engineer (including those caused by a change in subcontractor or supplier) the Owner will withhold Contractor's funds by a change order to the contract to cover the cost of additional reviews. One review is counted for each action including rejection or return of any reason.

1.11 SHOP DRAWINGS

- A. Prepare and submit Shop Drawings for all electrical equipment, specially fabricated items, modifications to standard items, specially designed systems where detailed design is not shown on the Contract Drawings, or where the proposed installation differs from that shown on Contract Drawings.
- B. Submit Product Data and Shop Drawings including but not limited to the list below, in addition to provisions of the paragraph above. Identify all shop drawings by the name of the item and system and the applicable Specification paragraph number and Drawing number.

- C. Every submittal including, but not limited to the list below, shall be forwarded with its own transmittal as a separate, distinct shop drawing. Grouping of items/systems that are not related shall be unacceptable.

Items and Systems

1. Access Doors
 2. Audio/Video Cable
 3. Audio/Video Equipment
 4. Cable Management Devices
 5. Cable Ties
 6. Cable Tray
 7. Coaxial Cable
 8. Coaxial Cable Connectors
 9. Conduit and Raceway
 10. Equipment Racks
 11. Fiber Optic Cable
 12. Fiber Optic Cable Connectors
 13. Fiber Optic Cable Patch Cords/Cross-Connects
 14. Fiber Optic Patch Panels
 15. Firestopping Materials
 16. Grounding Products
 17. Hangers and Supports
 18. Identification Products
 19. Innerduct
 20. Network Switches
 21. Operation and Maintenance Manuals
 22. Plywood Backboards
 23. Power Strips
 24. Power-over-Ethernet (PoE) Switches
 25. Record Drawings
 26. Sleeve Seals
 27. Sleeves
 28. Software
 29. Speakers
 30. System Labeling Schedules
 31. Telecommunications Outlets/Connectors
 32. Testing Agency Qualifications
 33. Tests and Reports
 34. UPS Systems & Batteries
 35. UTP Cable
 36. UTP Cable Connecting Blocks
 37. UTP Cable Device Jacks and Assemblies
 38. UTP Cable Patch Cords
 39. UTP Cable Patch Panels
 40. Wireless Access Points and Enclosures
 41. Wiring Diagrams
- D. Submittals shall include, but not be limited to, the following information: size, type, functional characteristics, compliance with standards in Division 27, required service access which shall be

suitable for intended location and use, electrical service connections and requirements, and deviations from Contract Document requirements.

- E. Submit for approval any other shop drawings as required by the Architect, Engineer, or Owner. No item listed above shall be delivered to the site, or installed, until approved. After the proposed materials have been approved, no substitution will be permitted except where approved by the Engineer.
- F. Submit for approval schematic diagrams of each electrical system installed in the building. Diagrams shall indicate device location, service, type, make, model number and the identification number of each device in the particular system. Following approval by all authorities, the diagrams shall be framed, mounted under glass and hung in each Main Equipment Room. Deliver the tracing or sepia from which the diagrams were reproduced to the Owner.
- G. Submittals shall include Riser Diagrams and Schematic Wiring Diagrams, complete conduit and wire requirements, outlet and junction box sizes and power requirements, for the following systems:
 - 1. Audio/Video Systems
 - 2. Cable Television (CATV) System
 - 3. Data System
 - 4. Paging/Intercom System
 - 5. Telephone System
- H. For any shop drawing requiring more than two (2) reviews by the Engineer (including those caused by a change in subcontractor or supplier) the Owner will withhold Contractor's funds by a change order to the contract to cover the cost of additional reviews. One review is counted for each action including rejection or return for any reason.
- I. Prepare and submit a detailed schedule of values indicating the Contract costs for the major work items. Provide additional detail and information as requested by the Engineer.

1.12 DEFINITIONS

- A. *Approve*: To permit use of material, equipment or methods conditional upon compliance with contract documents requirements.
- B. *Building Line*: Exterior wall of building.
- C. *Concealed*: Hidden from sight in chases, formed spaces, shafts, hung ceilings, embedded in construction.
- D. *Conduits* include conduit, all fittings, identification, and other accessories relative to such conduit.
- E. *Contractor*: The electrical contractor and any of his subcontractors, vendors, suppliers, or fabricators.
- F. *EPDM*: Ethylene-propylene-diene terpolymer rubber

- G. *Exposed*: Not installed underground or *concealed* as defined above.
- H. *Finished Spaces*: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceiling, unexcavated spaces, crawl spaces, and tunnels.
- I. *Furnish and install* or *provide*: To supply, erect, install, and connect to complete for readiness for regular operation, the particular work referred to.
- J. *Location, Damp*: Locations protected from water and not subject to saturation with water or other liquids, but subject to moderate degrees of moisture. Examples of such locations include interior locations such as basements, crawlspaces, attics, cold-storage rooms, etc...
- K. *Location, Dry*: A location not normally subject to dampness or wetness. A dry location may temporarily be subject to dampness or wetness during building construction.
- L. *Location, Wet*: Locations subject to saturation with water or other liquids, locations exposed to weather, and installations underground or in concrete slabs or masonry in direct contact with the Earth. Examples of such locations include all exterior locations (including those under canopies, roofed open porches, etc...) commercial kitchens, and vehicle washing areas.
- M. *NBR*: Acrylonitrile-butadiene rubber.
- N. *Review*: Limited observation or checking to ascertain general conformance with design concept of the work and with information given in contract documents. Such action does not constitute a waiver or alteration of the contract requirements.

1.13 RECORD DRAWINGS

- A. Upon completion of the electrical installations, the Contractor shall deliver to the Architect one complete set of prints of the electrical Contract Drawings which shall be legibly marked in red pencil to show all changes and departures of the installation as compared with the original design. They shall be suitable for use in preparation of Record Drawings.
- B. Contractor shall incorporate all sketches, addendums, value engineering, change orders, etc., into Record Drawings prior to delivering the same to the Architect.

1.14 WARRANTY

- A. Contractor's attention is directed to warranty obligations contained in the General Conditions.
- B. The above shall not in any way void or abrogate equipment manufacturer's guarantee or warranty. Certificates of equipment manufacturer's warranties shall be included in the operations and maintenance manuals.
- C. The Contractor guarantees for a two year period from the time of final acceptance by the Owner:

1. That the work contains no faulty or imperfect material or equipment or any imperfect, careless, or unskilled workmanship.
2. That all work, equipment, machines, devices, etc. shall be adequate for the use to which they are intended, and shall operate with ordinary care and attention in a satisfactory and efficient manner.
3. That the Contractor will re-execute, correct, repair, or remove and replace with proper work, without cost to the Owner, any work found to be deficient. The contractor shall also make good all damages caused to their work or materials in the process of complying with this section.
4. That the entire work shall be water-tight and leak-proof.

1.15 OPERATIONS AND MAINTENANCE MANUALS

- A. The Contractor shall have prepared six (6) copies of the Operations and Maintenance Manuals and deliver these copies of the Manuals to the Owner. The Manuals shall be as specified herein. The Manuals must be approved and will not be accepted as final until so stamped.
- B. The Manuals shall be bound in a three-ring loose-leaf binder similar to National No. 3881 with the following title lettered on the front: *Operations and Maintenance Manuals – New Woodbridge High School - Communications*. No sheets larger than 8-1/2 inches x 11 inches shall be used, except sheets that are neatly folded to 8-1/2 inches x 11 inches and used as a pull-out. Provide divider tabs and table of contents for organizing and separating information.
- C. Provide the following data in the Manual:
 1. As first entry, an approved letter indicating the starting/ending time of Contractor's warranty period.
 2. Maintenance operation and lubrication instructions on each piece of equipment furnished.
 3. Complete catalog data on each piece of electrical equipment furnished including approved Shop Drawing/Submittal with Engineer's Comments (if any).
 4. Manufacturer's extended limited warranties on equipment.
 5. Provide sales and authorized service representatives names, address, and phone numbers of all equipment and subcontractors.
 6. Provide supplier and subcontractor's names, address, and phone number.
 7. Catalog data of all equipment, devices, etc. shall include wiring diagrams, parts list and assembly drawing.
 8. Access panel charts with index illustrating the location and purpose of access panels.
 9. Approved Inspection Certificates.

10. Start-up reports for equipment.
- D. Submit Operations and Maintenance Manuals prior to anticipated date of Substantial Completion for Engineer review and approval. Substantial Completion requires that Operations and Maintenance Manuals be reviewed and approved.
- E. Post one (1) copy of all instructions, lists, charts and diagrams at the equipment mounted under glass or approved plastic cover.
- F. Deliver all instruction materials to the Owner prior to the formal instruction period.
- G. Upon completion of all work, thoroughly instruct the Owner's representatives in the proper operation and maintenance of all electrical equipment and systems.
- H. Instructions shall be done only after completed systems have been put into operation and tested for proper operation and performance.
- I. Instructions shall be given only by experts in the equipment or system and shall include descriptions and demonstrations of procedures of operation, data record keeping, etc.
- J. Furnish the necessary technicians, skilled workers, and helpers to operate the electrical systems and equipment of the entire project for one 8-hour day.
- K. Where specified in technical sections, provide longer periods required for specialized equipment.
- L. Instruct the Owner or designated personnel in operation, maintenance, lubrication, and adjustment of systems and equipment.
- M. The Operations and Maintenance Manuals shall be available at the time of the instruction period(s), for use by Instructors and Owner personnel.
- N. Schedule the general and specialized instruction periods for a time agreed upon by the Owner and Engineer.

1.16 INSTALLATION AND COORDINATION DRAWINGS

- A. Prepare, submit and use composite installation and coordination drawings to assure proper coordination and installation of the work. Drawings shall include, but not be limited to the following:
 1. Telecommunications Equipment Rooms (TERs) and Telecommunications Closets (TCs) indicating equipment racks, wall-mounted communications equipment/devices, floor-mounted communications equipment/devices, UPS equipment, conduits and raceways, cable trays, sleeves and penetrations, etc.
 2. Where telecommunications equipment is installed in shared spaces with mechanical and/or electrical equipment, Installation & Coordination Drawings shall indicate mechanical equipment, ductwork and piping, electrical equipment (e.g. panelboards,

transformers) and conduits/raceways, in addition to telecommunications equipment/devices as described above.

- B. Draw plans to a scale not less than ¼ inch equals one foot. Include plans, sections and elevations of the proposed work, showing all equipment (mechanical, plumbing and electrical), conduit and wiring in the areas involved. Fully dimension all work, horizontally and vertically. Show coordination with other work including piping, ductwork and other mechanical work, walls, doors, ceilings, columns, beams, joists and other architectural and structural work.
- C. Identify all equipment and devices on wiring diagrams. Where field connections are shown to factory-wired terminals, furnish manufacturer's literature showing internal wiring of equipment.
- D. Prepare, submit, and use scaled layout drawings indicating dimensions, clearances, and actual equipment dimensions. Layout Drawings shall include, but not be limited to the following:
 - 1. Telecommunications Equipment Racks
- E. Prepare scaled coordination drawings in accordance with the Specifications. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:
 - 1. Indicate the proposed locations of cable tray system, technology racks, and sound racks. Include the following:
 - a. Working space and dedicated space clearances per the NEC.
 - b. Clearances for equipment disassembly required for periodic maintenance.
 - c. Fire-rated wall and floor penetrations.
 - d. Equipment connections and support details.
 - 2. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction, including, but not limited to, the following: Fiber optic cables and network switches.
 - 3. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
 - 4. The successful Bidder shall check all trades' Drawings, including Civil, Architectural, Structural, Theatrical, Plumbing, Mechanical and Electrical, to avoid possible demolition and installation conflicts.

PART 2 PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:

- a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
- b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. Advance Products & Systems, Inc.
- b. Calpico, Inc.
- c. Metraflex Co.
- d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM, interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.

3. Pressure Plates: Stainless Steel. Include two for each sealing element.

4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.4 FOAM DUCT SEALANT

A. Description: Two-part, high-expansion foam duct sealant to keep water, acids, dust, gases, insects and rodents out of ducts (conduits).

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. American Polywater Corporation

C. Basis of Design: FST Foam Sealant by American Polywater Corporation.

- D. The foam duct sealant shall be a two-part "blown" urethane foam with 98% closed cell content.
- E. The foam duct sealant shall have a compressive strength of 300 pounds (ASTM D1691), a tensile strength of 250 pounds (ASTM D1623), and a flexural strength of 450 pounds (ASTM D790).
- F. The foam duct sealant shall be compatible with common cable jacket materials. The cured foam shall be an inert solid that does not affect jacket materials.
- G. The foam duct sealant shall withstand temperatures from -20 degrees Fahrenheit to 200 degrees Fahrenheit and shall not lose function in direct sunlight.
- H. The foam duct sealant shall be chemically resistant to gasoline, oils, dilute acids and bases, and most unsaturated hydrocarbons.
- I. The foam duct sealant shall foam and react in five to ten minutes at 70 degrees Fahrenheit.
- J. When installed, the sealant shall be capable of holding 7.25 psi air pressure continuously (equivalent of 16.4 feet water-head pressure).

PART 3 EXECUTION

3.1 COMMON REQUIREMENTS FOR COMMUNICATIONS INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- F. Include any and all items required by the National Electrical Code and/or field conditions for the proper connection and installation of each piece of equipment.
- G. Right of Way: Give to piping systems installed at a required slope.
- H. Coordinate communications work with architectural items and equipment by others. Typical equipment refers to, but is not limited to, the following:
 - 1. Countertops, Casework and Cabinets.

- a. Do not install outlets, etc., behind casework, cabinets, etc.
- b. Data, phone, and other low voltage system outlets shall be mounted above the counter tops to match power outlets in the same areas.
- c. Coordinate counter top outlets with drilling of casework/counters.
- d. Coordinate outlets above and below counters with approved casework shop drawings to avoid conflicts with sinks and other appurtenances.

3.2 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

- A. General: Engage a qualified videographer to record demonstration and training video recordings. Record each training module separately.
 1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- B. Video Recording Format: Provide high-quality color video recordings with menu navigation in format acceptable to Engineer
- C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.
- D. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed.
- E. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

3.3 SLEEVE INSTALLATION FOR COMMUNICATIONS PENETRATIONS

- A. Communications penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.
- G. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements of Division 26 Section "Electrical Firestopping".
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements of Division 26 Section "Electrical Firestopping".
- K. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- L. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals. Seal interior of each raceway with Foam Duct Sealant as specified herein.
- M. Cut sleeves to length for mounting flush with both surfaces of walls.

3.4 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.5 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for communications installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 26 Section "Electrical Firestopping".

3.6 SUPPORTS, HANGERS AND FOUNDATIONS

- A. Provide supports, hangers, braces, attachments and foundations required for the work. Support and set the work in a thoroughly substantial and workmanlike manner without placing strains on materials, equipment, or building structure, submit shop drawings for approval. Coordinate all work with the requirements of the structural division.
- B. Supports, hangers, braces, and attachments shall be standard manufactured items or fabricated structural steel shapes. All interior hangers shall be galvanized or steel with rust inhibiting paint. All exterior hangers shall be constructed of stainless steel utilizing stainless steel rods, nuts, washers, bolts, etc.

1. Determine exact location of all equipment, and supports after Shop Drawings of equipment have been approved.

3.7 PROVISIONS FOR ACCESS

- A. The Contractor shall provide access panels and doors for all concealed equipment, and other devices requiring maintenance, service, adjustment or manual operation.
- B. Where access doors are necessary, furnish and install manufactured painted steel door assemblies consisting of hinged door, key locks, and frame designed for the particular wall or ceiling construction. Properly locate each door. Door sizes shall be a 12 inches x 12 inches for hand access, 18 inches x 18 inches for shoulder access and 24 inches x 24 inches for full body access where required. Review locations and sizes with Architect prior to fabrication. Provide U.L. approved and labeled access doors where installed in fire rated walls or ceilings. Doors shall be Milcor Metal Access Doors as manufactured by Inland-Ryerson, Mifab, or approved equal.
 1. Acoustical or Cement Plaster: Style B
 2. Hard Finish Plaster: Style K or L
 3. Masonry or Dry Wall: Style M
- C. Where access is by means of liftout ceiling tiles or panels, mark each ceiling grid using small color-coded and numbered tabs. Provide a chart or index for identification. Place markers within ceiling grid not on ceiling tiles.
- D. Access panels, doors, etc. described herein shall be furnished under the section of specifications providing the particular service and to be turned over to the pertinent trade for installation. Coordinate installation with installing contractor. All access doors shall be painted in baked enamel finish to match ceiling or wall finish.
- E. Submit shop drawings indicating the proposed location of all access panels/doors. Access doors in finished spaces shall be coordinated with air devices, lighting and sprinklers to provide a neat and symmetrical appearance.
- F. Provide sufficient access and working space for repair and maintenance about all lighting and electrical equipment to permit ready and safe operation and maintenance of such equipment OSHA 29 CFR 1910 Subpart D and 1910.303(g).

3.8 PAINTING AND FINISHES

- A. Provide protective finishes on all materials and equipment. Use coated or corrosion-resistant materials, hardware and fittings throughout the work. Paint bare, untreated ferrous surfaces with rust-inhibiting paint. All exterior components including supports, hangers, nuts, bolts, washers, vibration isolators, etc. shall be stainless steel.
- B. Clean surfaces prior to application of insulation, adhesives, coatings, paint, or other finishes.
- C. Provide factory-applied finishes where specified. Unless otherwise indicated factory-applied paints shall be baked enamel with proper pretreatment.

- D. Protect all finishes and restore any finishes damaged as a result of work under Division 26 to their original condition.
- E. The preceding requirements apply to all work, whether exposed or concealed, as defined herein.
- F. Remove all construction marking and writing from exposed equipment, ductwork, piping and building surfaces. Do not paint manufacturer's labels or tags.
- G. All exterior equipment and conduits shall be painted in color as selected by Architect.
- H. All exposed conduit, equipment, etc. in finished spaces shall be painted. Colors shall be as selected by the Architect and conform to ANSI Standards.

3.9 COLOR SELECTION

- A. Color of finishes shall be as selected by the Architect.

3.10 PROTECTION OF WORK

- A. Protect work, material and equipment from weather and construction operations before and after installation. Properly store and handle all materials and equipment.
- B. Cover temporary openings in conduits and equipment to prevent the entrance of water, dirt, debris, or other foreign matter. Deliver conduits with factory applied end caps.
- C. Cover or otherwise protect all finishes.
- D. Replace damaged materials, devices, finishes and equipment.
- E. Protect stored conduits from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, where stored inside.

3.11 OPERATION OF EQUIPMENT

- A. Clean all systems and equipment prior to initial operation for testing, or other purposes. Lubricate, adjust, and test all equipment in accordance with manufacturer's instructions. Do not operate equipment unless all proper safety devices or controls are operational. Provide all maintenance and service for equipment that is authorized for operation during construction.
- B. Where specified, or otherwise required, provide the services of the manufacturer's factory-trained servicemen or technicians to start up the equipment. Where factory start-up of equipment is not specified, provide field start-up by qualified technician.
- C. Submit factory start-up sheets or field start-ups sheets for all equipment prior to the commencement of testing.
- D. Do not use communications systems for temporary services or during construction, unless approved by Owner in writing. Refer to Division 01 Section "Temporary Facilities and Controls".

- E. Upon completion of work, clean and restore all equipment to new conditions; replace expendable items.

3.12 TESTING AND ADJUSTMENT

- A. Perform all tests which are specified or required to demonstrate that the work is installed and operating properly. Where formal tests are required, give proper notices and perform all necessary preliminary tests to assure that the work is complete and ready for final test.
- B. Adjust all systems, equipment and controls to operate in a safe, efficient and stable manner.
- C. On all circuits, 600 volts or less, provide circuits that are free from ground faults, short circuits and open circuits.
- D. Other tests of a specific nature for special equipment shall be as specified under the respective equipment.
- E. Submit all test results to the Architect/Engineer for approval.

3.13 WALL AND FLOOR PENETRATIONS

- A. All penetrations of walls, ceilings, roofs and floors under Division 27 shall be sleeved, sealed, and caulked airtight for sound and air transfer control. Penetrations of walls, ceilings, and floors shall be as specified in Division 27.
- B. All penetrations of fire rated assemblies shall be sleeved, sealed, caulked and protected to maintain the rating of the wall, roof, or floor. Fire Marshal approved U.L. assemblies shall be utilized. See Division 26 Section, "Electrical Firestopping".
- C. Where penetrating through exterior walls or below grade, provide waterproof pipe penetration seals, as specified in another division of these specifications.
- D. Provide conduit escutcheons for all exposed conduit penetrations in finished interior spaces and all exposed exterior penetrations. Escutcheons shall match those provided under Division 23.
- E. Conduit sleeves:
 - 1. Galvanized steel pipe, standard weight where pipes are exposed and roofs and concrete and masonry walls. On exterior walls provide anchor flange welded to perimeter.
 - 2. Twenty-two (22) gauge galvanized steel elsewhere.

3.14 EQUIPMENT BY OTHERS

- A. This Contractor shall make all system connections required to equipment furnished and installed under other divisions or furnished by the Owner. Connections shall be complete in all respects to render this equipment functional to its fullest intent.

- B. It shall be the responsibility of the supplier of the equipment to furnish complete instructions for connections. Failure to do so will not relieve the Contractor of any responsibility for improper equipment operation.

3.15 OUTAGES

- A. Provide a minimum of fourteen (14) days notice to schedule outages. The Contractor shall include in their bid outages and/or work in occupied areas to occur on weekends, holidays, or at night. Coordinate and get approval of all outages with the Owner.
- B. Submit *Outage Request Form*, attached at the end of this Section, to Owner for approval.

3.16 CUTTING AND PATCHING

- A. Accomplish all cutting and patching necessary for the installation of work under Division 26. Damage resulting from this work to other work already in place, shall be repaired at Contractor's expense. Where cutting is required, perform work in neat and workmanlike manner. Restore disturbed work to match and blend with existing construction and finish, using materials compatible with the original. Use mechanics skilled in the particular trades required.
- B. Do not cut structural members without approval from the Architect or Engineer.

3.17 PENETRATION OF WATERPROOF CONSTRUCTION

- A. Coordinate the work to minimize penetration of waterproof construction, including roofs, exterior walls, and interior waterproof construction. Where such penetrations are necessary, furnish and install all necessary curbs, sleeves, flashings, fittings and caulking to make penetrations absolutely watertight.
- B. Where conduits penetrate roofs, flash pipe with Stoneman *Stormtite*, Pate or approved equal, roof flashing assemblies with skirt and caulked counter flashing sleeve.
- C. Furnish and install pitch pockets or weather tight curb assemblies where required.
- D. Furnish and install curbs, vent assemblies, and sleeves specifically designed for application to the particular roof construction, and install in accordance with the manufacturer's instructions. The Contractor shall be responsible for sleeve sizes and locations. All roof penetrations shall be installed in accordance with manufacturer's instructions, the National Roofing Contractors Association, SMACNA, and as required by other divisions of these specifications.
- E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

3.18 COORDINATION

- A. Coordinate arrangement, mounting, and support of electrical equipment:
 - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.

2. To allow right of way for piping and conduit installed at required slope.
 3. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
 4. To provide working space and dedicated space clearances per NEC.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- C. Coordinate location of access panels and doors for technology items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in this Section, Article "Provisions for Access".
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 26 Section "Electrical Firestopping".

END OF SECTION

OUTAGE REQUEST

DATE APPLIED: _____ BY: _____

DATE FOR OUTAGE: _____ FIRM: _____

START OUTAGE-TIME: _____ DATE: _____

END OUTAGE - TIME: _____ DATE: _____

AREAS AND ROOMS: _____

FLOOR(S): _____

AREA(S): _____

ROOM(S): _____

WORK TO BE PERFORMED: _____

SYSTEM(S): _____

REQUEST APPROVED BY: _____
(FOREMAN OR OTHER PERSON IN CHARGE)

(FOR OWNER'S USE ONLY):

APPROVED: _____

YES ___ NO ___ BY: _____ DATE: _____

DATE/TIME-AS REQUESTED: _____ OTHER : _____

OWNER'S PRESENCE REQUIRED: _____

YES: ___ NO: ___ NAME: _____

POINT OF CONTACT: _____ PHONE: _____

DIVISION 27 - ELECTRICAL
SECTION 272000
COMMUNICATIONS EQUIPMENT AND CABLING
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SECTION 272000 - COMMUNICATIONS EQUIPMENT AND CABLING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections:
 - 1. Section 270500 *Common Work Results for Communications.*
 - 2. Section 260519 *Conductors and Cables.*
 - 3. Section 260526 *Grounding and Bonding.*
 - 4. Section 260553 *Electrical Identification.*
 - 5. Section 260528 *Electrical Firestopping.*

1.2 ALTERNATES

- A. Refer to Division 01 Section "Alternates" for description of work under this Section affected by Alternates.

1.3 SCOPE OF WORK

- A. Furnish and install all equipment, accessories, and materials in accordance with these specifications and drawings to provide complete functional Electronic Communication Systems consisting of the following sub-systems:
 - 1. A complete and operable Network System.
- B. TIA/EIA Cat 6 cabling system. The rough-in shall provide all conduit paths, outlet boxes, plaster rings, pull strings, backboards, grounding conductors and grounding bus-bars, as indicated on the Construction Documents to accommodate the detailed installation.
- C. Provide a complete telecommunication system, fully operational, capable of operating at 1000 Mbps or better, ready for the occupants to use both voice and data outlets as indicated. The installation shall include all accessories, devices, and cut-over from the point of demarcation required to provide a complete and functioning system. Any materials and devices not specifically mentioned in these Specifications or indicated on the Contract Drawings that are required for a finished and operating system installation shall be furnished and installed at no additional cost to the Owner.
- D. Provide responsibility for providing a complete, functional system including all necessary components, whether included in this specification or not. Quantities indicated on the

Drawings and in these Specifications are for reference purposes only. It is the responsibility of the Contractor to provide appropriate quantities of materials and equipment to provide a complete functional system. In the event any item(s) is(are) not specified, but is (are) needed to complete the work properly, provide the needed item(s) at no additional charge.

- E. If mention has been omitted herein of any items of the work or materials usually furnished for, or necessary to, the completion of the cabling work, or if there are conflicting points in the Specifications, provide responsibility to call the Engineer's attention to such an item or items in sufficient time for a formal addendum to be issued. Any and all conflicting points in the Specifications and/or drawings which are not questioned by the successful bidder and clarified prior to opening of bids shall be subject to the interpretation of the Owner after award of the contract, and its interpretation shall be binding upon the successful bidder.
- F. Provide all labor, materials, equipment, software tools, and services necessary for, incidental to, installation and testing of data cable and equipment for a building-wide network. The data network is to be a star topology 1000 Base-T Ethernet and 1000 Base-T Sub-Networks. The Network shall have 10GbE fiber optic point-to-point connections between switches.
- G. A reasonable shifting in location of outlets, and cabling (up to 20 feet in any direction) shall be expected in order to meet field conditions; and this work shall be provided at no increased cost to the Owner.
- H. Installation of all systems specified herein, unless otherwise noted, requires coordination with Owner and Delaware Department of Technology and Information (DTI). Installation must comply with DTI's specifications for the School to obtain future support by DTI.
- I. Coordinate with Owner and DTI prior to procuring components for installation.
- J. Request switch naming prior to labeling equipment.

1.4 DEFINITIONS

- A. BICSI: Building Industry Consulting Service International.
- B. Consolidation Point: A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.
- C. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
- D. EMI: Electromagnetic interference.
- E. IDC: Insulation displacement connector.
- F. LAN: Local area network.

- G. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.
- H. Racking: Installing rack mountable equipment in compliant EIA-310 (latest revision) equipment/relay racks. Installation shall include all required hardware and support components/material to securely fasten the equipment being installed.
- I. RCDD: Registered Communications Distribution Designer.
- J. UTP: Unshielded twisted pair.
- K. WAP: Wireless Access Point

1.5 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate layout and installation of telecommunications cabling with Owner's telecommunications and LAN equipment and service suppliers.
- B. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For backbone and horizontal cable, include the following installation data for each type used:
 - a. Nominal OD.
 - b. Minimum bending radius.
 - c. Maximum pulling tension.
- B. Shop Drawings:
 - 1. System Labeling Schedules: Electronic copy of labeling schedules, in spreadsheet format, i.e. Excel (.xlsx).
 - 2. System Labeling Schedules: Electronic copy of labeling schedules that are part of the cabling.
 - 3. Cabling administration drawings and printouts.
 - 4. Wiring diagrams to show typical wiring schematics, including the following:
 - a. Cross-connects
 - b. Patch panels
 - c. Patch cords
 - 5. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.

- C. Samples: For workstation outlets, jacks, jack assemblies, in specified finish, one for each size and outlet configuration.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.
- B. Source quality-control reports.
- C. Field quality-control reports.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For splices and connectors to include in maintenance manuals.

1.9 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Patch-Panel Units: (1) of each type.
 - 2. Category 6 Patch Cords: (30) of each color.
 - 3. Fiber Patch Cords: (10)
 - 4. Connecting Blocks: (1) of each type.
 - 5. Device Plates: (1) of each type.

1.10 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
 - 1. Layout Responsibility: Preparation of Shop Drawings, Cabling Administration Drawings, and field testing program development by an RCDD.
 - 2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician, who shall be present at all times when Work of this Section is performed at Project site.
 - 3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.
- B. Standards and Codes: All work performed under this contract shall be done in accordance with the most recent issue and latest revisions of the following codes, standards, and guidelines. All materials and equipment shall be UL listed for the intended application.
 - 1. Delaware Department of Technology and Information, *Delaware State-wide Information Technology and Architecture Standards*.
 - 2. Americans with Disabilities Act (ADA), and the ADA Accessibility Guidelines (ADAAG).
 - 3. American National Standard Institute (ANSI).
 - 4. ANSI A117.1-1980.

5. ASTM E 814 - American Society for Testing Materials, Fire Tests of Through-Penetration Firestops.
 6. BISCI Building Industry Consulting Service International Telecommunications Distribution Methods Manual (TDMM).
 7. BISCI Cabling Installation Manual.
 8. Building Officials and Code Administrators (BOCA) National Building Code.
 9. EIA-455-171-D Standard Test Procedures for Fiber Optic Cables.
 10. Federal Communications Commission (FCC) Rules (including FCC 47 CFR 68) The Code of Federal Regulations.
 11. ICEA S-80-576, Communications Wire and Cable for Wiring of Premises.
 12. ICEA S-90-661. Indoor Wiring Standard.
 13. IEEE 1100 (Latest Edition) - Recommended Practice for Powering and Grounding Sensitive Electronic Equipment.
 14. Local Codes.
 15. NFPA National Fire Protection Association, including NFPA 70 National Electrical Code, NFPA 75 Protection of Electronic/Data Processing Equipment, NFPA 101 Life Safety Code, and NFPA 780 Lightning Protection Code.
 16. Requirements of the Fire Marshal.
 17. TIA/EIA-455-61. FOTP-61, Measurement of Fiber or Cable Attenuation Using an OTDR.
 18. TIA/EIA-568-B Electronics Industries Association/Telecommunications Industry Association Commercial Building Telecommunications Cabling Standard.
 19. TIA/EIA-569-B Electronic Industries Association/Telecommunications Industry Association Commercial Building Standard for Telecommunications Pathways and Spaces.
 20. TIA/EIA-TSB-36. Technical Systems Bulletin Additional Cable Specifications for Unshielded Twisted-Pair Cables.
 21. TIA/EIA-TSB-40 Technical Systems Bulletin: Additional Transmission Specifications for Unshielded Twisted Pair Connecting Hardware.
 22. TIA/EIA-TSB-53.
 23. TIA/EIA-TSB-67. EIA/TIA Telecommunications Systems Bulletin, Additional Transmission Specifications for Unshielded Twisted-Pair Connecting Hardware.
 24. TIA/EIA-TSB-75. Technical Systems Bulletin - Additional Horizontal Cabling Practices for Open Offices.
 25. Underwriter's Laboratories (UL) Twisted-Pair Certification Program.
 26. UL Fire Resistance Directory, Volumes 1 and 2.
 27. UL 486A - Wire Connectors and Soldering Lugs for Use with Copper Conductors.
 28. UL 910 - Test for Flame Propagation and Smoke Density Values for Electrical and Optical Fiber Cables Used in Spaces Transporting Environmental Air.
 29. UL 1479 - Fire Tests of Through-Penetration Firestops.
 30. Video Electronics Standards Association (VESA).
 31. If local regulations or codes are more stringent, then those stipulations shall govern.
- C. Testing Agency: Engage a qualified testing agency to evaluate cables.
- D. Factory test UTP and optical fiber cables on reels according to TIA/EIA-568-B.1.
- E. Factory test UTP cables according to TIA/EIA-568-B.2.

- F. Factory test multimode optical fiber cables according to TIA-526-14-A and TIA/EIA-568-B.3.
- G. Cable will be considered defective if it does not pass tests and inspections.
- H. Prepare test and inspection reports.

1.11 WARRANTY

- A. Warranty shall meet or exceed the basis of design manufacturer's standard warranty for each product provided.
- B. The Manufacturer's warranty shall not relieve the Division 27 Contractor of any obligations for complying with the (2) year warranty required for State contracts.
- C. Warranties shall be registered in the Owner's.
- D. All documentation relating to the warranty coverage, period of coverage, etc. shall be provided to Owner.

1.12 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
- B. Wireless Access Point:
 - 1. Provide extra units equaling 10% of the total units indicated on the drawings rounded up to the nearest whole number.
- C. Switches:
 - 1. Provide (1) Cisco 4500-X core switch.
 - 2. Provide (2) Cisco 2960S 48- port, PoE, 10GbE uplink switches.
 - 3. Provide (2) Cisco 2960S 48- port, 10GbE uplink switches.
- D. VoIP:
 - 1. Provide (3) Cisco Unified IP Phone 896X series
 - 2. Provide (5) Cisco Unified IP Phone 390X series.

PART 2 PRODUCTS

2.1 BACKBONE CABLING

- A. Manufacturers: Subject to compliance with requirements, provide product by, but not limited to, one of the following:
 - 1. Hubbell Premise Wiring (Basis of Design)

2. Corning Cable System
3. Berk-Tek

B. Intra-Building Structured Cable Description – Multi-mode

1. Fiber optic cables shall be designed for routing between communication closets as intra-building backbone cabling.
2. Cable assembly shall provide 12 fiber strands.
3. Fiber type shall be 50/125-micro meters capable of multi-mode operation.
4. Cabling shall be classified as (OM4).
5. Cable construction to utilize nonconductive, tight buffered fibers surrounded by yarn strength members with a flexible thermoplastic outer jacket.
6. Jacket Color: Aqua for 50/125-micrometer cable.
7. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-C.
8. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches (1000 mm).

C. Intra-Building Structured Cable Description – Single-mode

1. Fiber optic cables shall be designed for routing between communication closets as intra-building backbone cabling.
2. Cables shall be installed for future support of up to 100 GbE.
3. Cable assembly shall provide 12 fiber strands.
4. Fiber type shall be 8.2/125-micro meters capable of single-mode operation.
5. Cable construction to utilize nonconductive, tight buffered fibers surrounded by yarn strength members with a flexible thermoplastic outer jacket.
6. Jacket Color: Yellow for single-mode cable.
7. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-C.
8. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches (1000 mm).

D. Extra-Building Structured Cable Description – Multi-mode

1. Fiber optic cables shall be designed for routing in inner duct between buildings as extra-building backbone cabling.
2. Cable assembly shall provide 12 fiber strands.
3. Fiber type shall be 50/125-micro meters capable of multi-mode operation.
4. Cabling shall be classified as (OM4).
5. Loose tube gel-free design shall fully block water via water-swellaable materials for easy internal cable access; requiring no clean for contamination from gel type materials. Poly ethylene jacket shall be rugged, durable and easy to grip.
6. Jacket Color: Black
7. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-C.
8. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches (1000 mm).

E. Extra-Building Structured Cable Description – Single-mode

1. Fiber optic cables shall be designed for routing in inner duct between buildings as extra-building backbone cabling.
2. Cables shall be installed for future support of up to 100 GbE.
3. Cable assembly shall provide 12 fiber strands.
4. Fiber type shall be 8.2/125-micro meters capable of multi-mode operation.
5. Loose tube gel-free design shall fully block water via water-swellable materials for easy internal cable access; requiring no clean for contamination from gel type materials. Poly ethylene jacket shall be rugged, durable and easy to grip.
6. Jacket Color: Black
7. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-C.
8. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches (1000 mm).

F. Cable shall adhere to applicable standards and performance criteria below:

1. Retain first subparagraph below for indoor cable. ICEA standard for outside plant is ICEA S-87-640.
2. Comply with ICEA S-83-596 for mechanical properties.
3. Comply with TIA/EIA-568-B.3 for performance specifications.
4. Retain first option in first subparagraph below for 50/125-micrometer cable; retain second for 62.5/125-micrometer cable.
5. Comply with TIA-492AAAB for detailed specifications.
6. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:
 - a. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262
 - b. Riser Rated, Nonconductive: Type OFNR, complying with UL 1666.
7. Maximum Attenuation: 3.50 dB/km at 850 nm; 1.5 dB/km at 1300 nm.
8. Minimum Modal Bandwidth: 1500 MHz-km at 850 nm; 500 MHz-km at 1300 nm.

2.2 HORIZONTAL CABLING

A. Manufacturers: Subject to compliance with requirements, provide product comparable product by, but not limited to, one of the following:

1. Hubbell Premier Wiring, NEXTSPEED Series (Basis of Design)
2. Belden Inc.
3. Berk-Tek
4. Systemax

B. Structured Cabling

1. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room.
2. Cable assembly shall provide 100 ohm, unshielded, (4) twisted pairs (UTP).
3. Cable construction to utilize unshielded, plenum grade insulation with flame retardant PVC jacket.

4. Jacket Color: Blue.
 5. Imprinted with conductor count, gauge, and plenum rating at regular intervals not to exceed 40 inches (1000 mm).
- C. Cabling and its connecting hardware are called a "permanent link," a term that is used in the testing protocols shall adhere to the following or requirements.
1. TIA/EIA-568-B.1 requires that a minimum of two telecommunications outlet/connectors be installed for each work area.
 2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
 3. Bridged taps and splices shall not be installed in the horizontal cabling.
- D. A work area is approximately 100 sq. ft. (9.3 sq. m), and includes the components that extend from the telecommunications outlet/connectors to the station equipment.
- E. The maximum allowable horizontal cable length is 295 feet (90 m). This maximum allowable length does not include an allowance for the length of 16 feet (4.9 m) to the workstation equipment or in the horizontal cross-connect.
- F. Structured cabling shall conform to the applicable standards below:
1. Comply with ICEA S-90-661 for mechanical properties.
 2. Comply with TIA/EIA-568-B.1 for performance specifications.
 3. Comply with TIA/EIA-568-B.2, Category 6.
 4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
 - a. Communications, General Purpose: Type CM or CMG.
 - b. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
 - c. Communications, Riser Rated: Type CMR, complying with UL 1666.
 - d. Communications, Limited Purpose: Type CMX.

2.3 EQUIPMENT RACK/CABLE MANAGEMENT

- A. Manufactures: Subject to compliance with requirements, provide product by, but not limited to, one of the following:
1. B-Line, Copper Manufacturing.
 2. Or approved equal.
- B. Equipment rack(s) shall be provided for the telecommunication system. The rack shall be upright, floor standing steel. Equipment racks shall conform to EIA Standard RS-310C for 19-inch x 84-inch racks, capable of supporting up to 600 pounds, with Type B universal mounting rail hole pattern, and shall be complete with all mounting hardware. All un-used rack space shall be blanked off with matching steel panels.

1. Racks shall be mounted on an isolation pad and utilize non-conductive washers with appropriate sized lag screws to secure the rack to the floor. Racks shall be secured to the floor with four screws per rack. Floor-mounted open racks shall be secured from the top rail to the backboard in the room with a length of cable runway to prevent movement. All racks shall be grounded to the isolated ground bar within the Main Distribution Frame (MDF) rooms and Intermediate Distribution Frame (IDF) rooms using a standard ground lug and #6 AWG jacketed green cable in accordance with 007 portion of TIA/EIA Standards unless otherwise required NEC.
 2. Provide horizontal and vertical cable management organizers as specified in this section. Provide a minimum of four (4) rows of 5 count split front AD@ ring horizontal cable management panels per rack. Provide power outlet strips in the equipment racks as shown on the Drawings.
- C. Wall mounted cabinet(s) shall be designed to hold 19" rack mounted equipment and shall be EIA-310-D compliant. Construction shall be 16 gauge steel (minimum). Two-piece shall be fully welded consisting of a rear section mounted to the wall. Front section containing mounting angles and door assembly that can be installed in left or right. The enclosure shall have a load rating of 200 pounds (minimum) when the equipment is evenly distributed and the enclosure is anchored to an adequate surface. Enclosure shall have provisions for concentric knockouts for conduit or bushing connection or a foam gland plate option for installing pre-terminated patch panels. Cabinet shall be UL listed to the Information Technology and Communications Equipment Cabinet, Enclosure and Rack Systems standard in the US.
- D. Provide a 12-inch ladder rack for all vertical and horizontal bulk cable management within MDF and IDF rooms. Acceptable Parts: B-Line, 4-inch (h) x 12-inch (w) steel, 9-inch Ladder Series, or approved equivalent.
- E. Install 2" x 6" x 10" wire mesh flextray above ceiling where necessary to facilitate proper cable management outside MDF or IDF rooms.
1. Install cable management system at locations specified. Coordination with other trades will be absolutely necessary in this installation. Any major corrections of the path should be brought to the attention of the Owner and the Engineer.
- F. Provide wall-mounted, split-front ADC-type wire management rings above, below, and between each wall-mounted termination panel.
- G. Provide bridle rings and supporting hardware.
- H. Cable Ties:
1. Provide Velcro-type cable ties. Velcro-type cable ties shall be used exclusively for cable management within the racks in the telecommunications closets. The contractor shall supply the quantity necessary.
 2. Provide plastic zip tie wraps. Zip tie wraps shall be used for general cable management throughout the areas outside the telecommunications closets. The Contractor shall supply the quantity necessary.

2.4 UNINTERRUPTABLE POWER SUPPLY

- A. Manufacturer: APC Smart-UPS 1500VA LCD RM 2U 120V. No other manufacturer shall be acceptable.
- B. UPS provides clean and reliable power to critical network equipment. Designed to be extremely efficient low, medium, and high load levels. Mounting option allows UPS to be directly mounted in the rack. NMC slot allows for installation of UPS Network Management Card for monitoring of system.
- C. Features:
 - 1. 1500 VA rated.
 - 2. 120 volt output.
 - 3. UPS Network Management Card.
 - 4. Two-post mounting rail kit.
 - 5. 6 integral NEMA 5-15R or 5-20R configuration.

2.5 RACK AUTOMATIC TRANSFER SWITCH

- A. Manufacturer: APC Rack Automatic Transfer Switch AP7750A. No other manufacturer shall be acceptable.
- B. Rack automatic transfer switch provides reliable, redundant power. Dual input power cords supplying power to the connected load. Provides primary power from the primary AC source. Interruption of the primary AC source, initiates a seamless power transfer to the secondary source without interrupting critical loads.
- C. Features:
 - 1. Current Metering
 - 2. On-Unit Display
 - 3. Robust out-of-phase switching capability

2.6 SWITCHES AND ACCESSORIES (ALTERNATE)

- A. Manufacturer: Cisco Catalyst series. No other manufacturer shall be acceptable.
 - 1. 40-port Core switch: Cisco Catalyst 4500-X, 10G IP-BASE, model WS-C450X-40-port, SFP+. Provide quantities capable of serving a minimum of 140 ports.
 - 2. 48-port PoE switch: Cisco Catalyst 2960 48-port, PoE, 2X10G SFP Base, model WS-C2960S-48FPD-L.
 - 3. 24-port PoE switch: Cisco Catalyst 2960 24-port, PoE, 4X SFP LAN Base, model WS-C2960S-48PS-L.
 - 4. 48-port data switch: Cisco Catalyst 2960 48-port, 2X10G SFP LAN Base, model WS-C2960S-48TD-L.
 - 5. 48-port data switch: Cisco Catalyst 2960 48-port, GIGE 4X SFP LAN Base, model WS-C2960S-48TS-L.

6. 24-port data switch: Cisco Catalyst 2960 24-port, GIGE 4X SFP LAN Base, model WS-C2960S-24TS-L.

B. Small Form-Factor Pluggable (SFP)

1. Multi-mode SX SFP - fiber, model SFP-10G-SR-X.
2. 1000Base-T SFP – copper, model GLC-T.

C. Stacking Module

1. Catalyst 2960S Flexstack Stacking Module, model C2960S-STACK.

2.7 CATEGORY 6 PATCH PANELS

- A. Manufacturers: Subject to compliance with requirements, provide product by, but limited to, one of the following:

1. Hubbell Premise Wiring P6E series(Basis-of-Design)
2. Ortronics
3. Panduit
4. Systemax

- B. Panels shall contain the number of TIA/EIA 568B verified Category 6 termination ports necessary to connect all data jacks shown on the drawings plus 15 percent spare capacity. Panels shall comply with TIA/EIA 568B and 606 and be UL verified. Patch Panels shall meet or exceed all EIA/TIA Specifications, including TSB 40 worst case pair requirements. DC resistance shall be less than 100 milli-ohms.

- C. The patch panel shall support the appropriate Category 6 applications, including 1000 Mbps TP-PMD and 155 Mbps ATM, and facilitate cross connection and inter connection using modular patch cords.

- D. All Modular jack panels shall be wired to EIA/TIA 568B and meet the following specifications:

1. Electrical Requirements:

- a. Near End Cross Talk (NEXT):

Frequency	NEXT (dB) Pair to Pair	NEXT (dB) Power Sum
1.0 MHZ	83.7	80.4
4.0 MHZ	73.7	70.3
8.0 MHZ	67.1	64.2

Frequency	NEXT (dB) Pair to Pair	NEXT (dB) Power Sum
10.0 MHZ	65.1	62.3
16.0 MHZ	60.9	58.3
20.0 MHZ	58.8	56.2
25.0 MHZ	56.8	54.3
31.25 MHZ	54.8	52.3
62.50 MHZ	47.9	45.7
100.0 MHZ	42.5	40.5

b. Attenuation:

Frequency	Attenuation (dB)
1.0 MHZ	.03
4.0 MHZ	.03
8.0 MHZ	.03
10.0 MHZ	.03
16.0 MHZ	.03
20.0 MHZ	.03
25.0 MHZ	.03
31.25 MHZ	.04
62.50 MHZ	.06
100.0 MHZ	.13

c. Structural Return Loss:

Frequency	Return Loss (dB)
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Frequency	Return Loss (dB)
1.0 MHZ	51
4.0 MHZ	50
8.0 MHZ	45
10.0 MHZ	42
16.0 MHZ	38
20.0 MHZ	37
25.0 MHZ	35
31.25 MHZ	33
62.50 MHZ	28
100.0 MHZ	24

- d. Provide horizontal and vertical patch cord organizers for each patch panel for proper management of patching system and cable strain relief. Cable Management shall be the same manufacturer of patch panels.

2.8 CATEGORY 6 PATCH CORDS

- A. Manufacturers: Subject to compliance with requirements, provide product by, but limited to, one of the following:
 - 1. Hubbell Premise Wiring series HC6 series(Basis-of-Design)
 - 2. Ortronics
 - 3. Panduit
 - 4. Systemax
- B. Provide Category 6 Modular Patch Cords for each assigned port on the patch panel. All cords shall conform to the requirements of EIA/TIA 568B Commercial Building Telecommunications Cabling Standard, Horizontal Cabling Section, and be part of the UL7 LAN Certification and Follow-up Program. Cords shall be equipped with a 8 pin modular connector (RJ45 Style) on each end and shall conform to the length(s) specified on the detailed drawing or as directed. Field-fabricated (hand pressed) plugs shall not be allowed.
- C. All Category 6 cordage shall be round, and consist of 24-AWG copper, stranded conductors, tightly twisted into individual pairs and shall meet or exceed the electrical specifications listed below:

DC Resistance per lead	9.4Ω/100m (328 ft), maximum
DC resistance unbalance	5 percent, Maximum
Mutual Capacitance	6.6 nF/100m (328 ft), maximum
Characteristic Impedance	100Ω +/- 15 percent from 1 to 100 MHZ

1. Worst Pair Near-End Crosstalk, Power Sum NEXT, attenuation and Structural Return Loss (SRL), dB/100 m [328 ft.]:

Frequency	Pair-To-Pair NEXT (Max.)	Power Sum* NEXT	Attenuation (Max.) dB/100 m	SRL
1.00 MHZ	76.0 dB	73.0 dB	1.9 dB	36 dB
4.00 MHZ	64.0 dB	61.0 dB	3.9 dB	36 dB
8.00 MHZ	60.2 dB	57.0 dB	5.5 dB	30 dB
10.00 MHZ	59.0 dB	56.0 dB	6.3 dB	30 dB
16.00 MHZ	56.0 dB	53.0 dB	8.0 dB	31 dB
20.00 MHZ	55.0 dB	52.0 dB	8.9 dB	29 dB
25.00 MHZ	54.0 dB	51.0 dB	10.0 dB	30 dB
31.25 MHZ	52.0 dB	49.0 dB	11.2 dB	31 dB
62.50 MHZ	48.0 dB	45.0 dB	16.1 dB	27 dB
100.00 MHZ	45.0 dB	42.0 dB	20.7 dB	25 dB

2. Category 6 patch cord shall incorporate the "cross-over lead" concept. The patch cord shall have built in exclusion features to prevent accidental polarity reversals and split pairs.
 - a. UL7 Verified for EIA/TIA 568B Electrical Performance
 - b. UL7 Listed 1863 and c (UL7) Listed for Fire Safety
 - c. ISO 9001 Certified Manufacturer
 - d. Austel Approved
 - e. FCC Compliant
3. Provide patch cords in lengths of 12 inches for all patch panel to distribution switch connections in the IDF and MDF racks.

2.9 FIBER ENCLOSURES

- A. Manufacturers: Subject to compliance with requirements, provide product by, but limited to, one of the following:
 - 1. Hubbell Premise Wiring series FCR series(Basis-of-Design)
 - 2. Ortronics
 - 3. Panduit
 - 4. Systemax
- B. Provide fiber enclosure, including all mounting and support hardware, to serve fiber splicing and inter-connects in IDF and MDF equipment racks.
- C. Enclosures shall be suitable for installation in 19" equipment rack complying with EIA-310.E. Mounting brackets provide with enclosure shall accommodate recessed, flush, or protruding racking options.
- D. Enclosure shall be provide with all components required for a complete assembly. Components shall include, but not limited to, the following:
 - 1. Enclosure providing protection from dust, debris, and physical damage when tray is locked in the closed position.
 - 2. Fiber clips, both front and rear, shall be provided to accommodate securing fibers.
 - 3. Label holders to allow identification of fiber connections.
 - 4. Built-in adapter receiver accommodating insertion and removal of various adapter plates to serve the requirements of the network.
 - 5. Adapter plates shall be provided to with pre-installed LC fiber adapters.
- E. Enclosure shall comply with the following standards:
 - 1. EIA-310 (latest edition), *Cabinets, Racks, Panels, and Associated Equipment*
 - 2. TIA-568-C.3 (Bending Radius), *Fiber Cabling Components*
 - 3. TIA-606-B, *Administration Standard Telecommunications Infrastructure*
 - 4. TIA-569-C, *Telecommunications Pathways and Spaces*
 - 5. BiCSi-607 (latest Edition), *Standard for Telecommunications Bonding and Grounding*

2.10 FIBER OPTIC PATCH CORDS

- A. Manufacturers: Subject to compliance with requirements, provide product by, but limited to, one of the following:
 - 1. Hubbell Premise Wiring series FCR series(Basis-of-Design)
 - 2. Ortronics
 - 3. Panduit
 - 4. Systemax
- B. Provide fiber optic patch cords, as required, to provide end-to-end inter-connect for all fibers installed as part of the working network.
- C. Cords shall be supplied with factory installed dual SC connectors.

- D. Cords shall support 10GbE.
- E. Core shall support multimode transmissions with 50 micron core optical fiber.
- F. Cords shall comply with the following:
 - 1. IEEE 802.3 standard.
 - 2. TIA-568-B.3 (Annex A), *Fiber Cabling Components*

2.11 SURGE PROTECTION

- A. Manufacturer: Tripp Lite. No other manufacturer shall be acceptable.
- B. Provide transient surge protection on the AC power feeds to all equipment, on all station/central office lines leaving or entering the main building and other campus buildings (as applicable). This protection shall include equipment with switches, hubs, and similar devices.
- C. Surge protection devices shall be grounded as required by the equipment manufacturers and comply with UL, ANSI, NEC, State and local agencies.
- D. Wall mounted equipment cabinets shall have 1U rack mounted surge suppressor in each rack to serve all equipment contained within the rack.
- E. Unit shall provide a minimum of 12 receptacles:
 - 1. (2) NEMA 5-15P
 - 2. (10) NEMA 5-20P

2.12 BACKBOARDS

- A. Backboards: Plywood, A/C grade, fire-retardant treated, ¾" x 48" x 96" (19 x 1220 x 2440 mm).
- B. Provide each fire-retardant-treated plywood backboard two feet off the floor to top. Secure backboard with a minimum of eight (8) screws. Plywood backboard shall have one side with exterior glue and one finished smooth side. Mark all backboards and cabinets with appropriate legends (i.e., "COMM").
- C. Verify with local codes or AHJ prior to painting fire-retardant-treated plywood backboard with stamped fire rating labels. If allowed by code, paint fire-retardant-treated plywood backboard with durable white enamel (or other finish color as selected by the Owner).

2.13 OPTICAL FIBER CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Hubbell Premise Wiring (Basis of Design)
 2. Corning
 3. Berk-Tek
- B. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.
1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.
- C. Patch Cords: Factory-made, dual-fiber cables with SC connectors on each end.
- D. Cable Connecting Hardware:
1. Comply with Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA-604-2-B, TIA-604-3-B, and TIA/EIA-604-12. Comply with TIA/EIA-568-B.3.
 2. Quick-connect, simplex and duplex, Type LC connectors. Insertion loss not more than 0.75 dB.
 3. Type SFF connectors may be used in termination racks, panels, and equipment packages.

2.14 INFORMATION OUTLET

- A. Manufacturers: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Hubbell Premise Wiring (Basis of Design)
 2. Ortronics
 3. Panduit
 4. Systemax
- B. For each data jack location designation, provide a non-keyed RJ45, 8 pin, 8 conductor, Category 6 modular jack with compatible faceplate. All data jacks shall be T568B wiring pin-pair configuration. Jack shall be compatible for use with Unshielded Twisted Pair (UTP) cable. Provide cover caps to complete the termination and provide for a reliable connection for the UTP cable. All data jacks shall be bright orange color with matching icon for uniformity in facility. All data jacks shall be as follows:
1. Category 6 Outlets: All Category 6 outlets shall conform to TIA/EIA 568B Commercial Building Telecommunications Cabling Standard, Horizontal Cable Section, and be part of the UL7 LAN Certification and Follow-up Program, and shall meet or exceed the following electrical and mechanical specifications:
 2. Electrical Specifications:
 - a. TIA/EIA 568B Category 6 minimum requirements
 - b. Insulation resistance: 500 ohms minimum

- 1) Dielectric withstand voltage 1,000 VAC RMS, 60 Hz minimum, contact-to-contact and 1,500 VAC RMS, 60 Hz minimum from any contact to exposed conductive surface.
- c. Contact resistance: 20 ohms maximum
 - 1) Current rating: 1.5 A at 68 degrees F(20 degrees C) per IEC Publication 512-3, Test 5b.

3. Worst pair NEXT (maximum):

Frequency	Pair-To-Pair	Power Sum **
1.00 MHZ	85 dB	87 dB
4.00 MHZ	74 dB	75 dB
8.00 MHZ	68 dB	69 dB
10.00 MHZ	66 dB	67 dB
16.00 MHZ	62 dB	63 dB
20.00 MHZ	60 dB	61 dB
25.00 MHZ	58 dB	58 dB
31.25 MHZ	56 dB	56 dB
62.50 MHZ	50 dB	49 dB
100.00 MHZ	42 dB	42.9 dB

4. Attenuation (maximum) (dB):

Frequency	Pair-to-Pair	Power Sum **
1.00 MHZ	0.02 dB	0.02 dB
4.00 MHZ	0.02 dB	0.02 dB
8.00 MHZ	0.02 dB	0.02 dB
10.00 MHZ	0.02 dB	0.02 dB
16.00 MHZ	0.03 dB	0.03 dB
20.00 MHZ	0.03 dB	0.03 dB

Frequency	Pair-to-Pair	Power Sum **
25.00 MHZ	0.03 dB	0.03 dB
31.25 MHZ	0.05 dB	0.04 dB
62.50 MHZ	0.14 dB	0.08 dB
100.00 MHZ	0.25 dB	0.17 dB

5. Mechanical Performance:

- a. Plug Insertion Life: 750 insertions minimum.
- b. Plug/jack contact force: 100 grams minimum.
- c. Contact Force: 3.5 oz (99.2 g) minimum using FCC-Approved modular plug.
- d. Plug Retention Force: 30 lb (133 N) minimum between modular plug and jack.
- e. Temperature Range: -40 degrees to 150 degrees F (-40 degrees to 66 degrees C).

6. UL® Verified Category 6 Electrical Performance.

7. Comply with FCC Part 68.

8. ISO 9001 Certified Manufacturer.

- C. Stainless steel face plates shall be provided. A molded or engraved label, with color coded, user-friendly symbols or icons, shall be provided with each faceplate to identify it as a data jack or a combination of voice and data jacks. All face plates shall be provided with four (4) ports. All unused ports and icon slots shall be filled with ivory color blanks. Where stainless steel faceplates are specified, provide a receptacle color matching duplex mounting strap w/flush data jacks. All jacks shall be installed flush with mounting plates. Gravity feed style faceplates shall be provided.

COLOR CODING		
CABLE COLOR	PATCH CORD COLOR / JACK COLOR / ICON COLOR	SYSTEM SERVED
Blue	Blue	Data
Grey	Grey	Voice
Yellow	Yellow	Video

- D. Each jack and its associated termination at the MDF room or IDF room shall be machine labeled according to TIA/EIA 606 and the following scheme:
1. Room Number: Position in room clockwise from main door. Example: The third from the door, clockwise, in Room 311 shall be: 311-C.
 2. Prefix identifier as to system connection: Example for data system: D-311-C. Example for telephone (voice) system: V-311-C.
 3. Termination/Patch panels shall be identically numbered by the connection to respective jack and shall be arranged in sequential ascending order from left to right and top to bottom.
 4. Labeling scheme shall be submitted for review.
- E. Refer to drawings for outlet type details and quantities.

2.15 VOICE OVER IP (VOIP)

- A. Manufacturer: Cisco. No other manufacturer shall be acceptable.
- B. Provide complete and operational VoIP system to serve the Main Building and Remote Building located on the School grounds.
- C. Coordinate with DTI and Owner as required.
- D. Features shall include, but not limited to, the following:
1. Automated Call Distribution (ACD): The system shall be capable of distributing inbound calls between available specified locations within the system.
 2. Automated Attendant: The system shall provide menus and/or interactive voice response (IVR) for call transfers without operator intervention. Provide zero (0) option for bypassing or opting out of menu for connection to a live operator or receptionist.
 3. Do Not Disturb (DND): All handsets connected to the VoIP network shall have the option to enable Do Not Disturb mode. Analog sets shall have a Feature Access Code (FAC) to initiate and terminate DND.
 4. Message Only Mailboxes: The voicemail system shall support voice mailboxes with outgoing messages only.
 5. General Delivery Mailboxes: The voicemail system shall allow for voice mailboxes that are not assigned to a physical phone to be used with hunt groups.
 6. Voicemail: System shall provide voicemail allocation for all users. Users should be able to manage and retrieve their voicemail remotely. A PC interface as well as voice interface should be available for users.
 7. Voicemail to E-mail Integration: Voicemail shall interface with Microsoft Exchange mail system via Outlook or Outlook Web Access. System shall support iOS and Android formats.
 8. Interface: Communications system should have an interface available to conduct all moves, additions, and changes by Owner's staff. Full access, including all passwords, shall be turned over to Owner upon completion of installation, testing, and demonstration.

9. Flexible main greetings: Greetings used for auto attendants shall be easily changed to new messages or canned messages for emergency situations.
10. After hour greeting with automated menus.
11. Reporting Software: Provide reporting capabilities for the entire system and for subdivisions within the system including ACD queues.
12. Alerts: The system should provide means for alerting Owner's staff when Owner defined calls are attempted from the School's VoIP system. This notification shall be real-time. Notification sequence shall be coordinated with Owner.
13. Call Forwarding: Provide call forwarding to internal and external numbers should be possible. Safe guards shall be included to restrict call forwarding by non-administration personnel.
14. Single Number Reach (SNR): System shall support user defined simultaneous ring feature allowing multiple phones to ring when designated extension is called.
15. Ad Hoc Conferencing: System shall feature internal conference calling for up to 8 attendees from separate handsets within the School's VoIP system.
16. Meet Me Conferencing: Provide dedicated conference call extensions to allow outside calls to establish a conference call. Coordinate number of dedicated extensions with Owner.
17. Connectivity to PTSN: The system shall support T1 PRI, T1 CAS, SIP and POTS lines.
18. The system shall support wireless handsets either natively or through third party solutions. These handsets shall maintain texting functions.
19. The system shall be capable of supporting a limited number of analog phones and Fax Machines. Coordinate with Owner.

E. Administrative Equipment:

1. Administrative phones shall be standard IP executive type phones, such as the Cisco Unified IP Phone 8961 series. These instruments shall operate as administrative telephones and shall be used as secondary answering points for incoming telephone calls. IP phones shall employ soft key-activated features, pixel-based display, calling information plus Power over Ethernet (PoE) capable.
2. Features shall include, but not limited to, the following:
 - a. 24-bit color display, 640 x 480
 - b. 5 feature/call session buttons
 - c. Indicating LEDs
 - d. Applications
 - e. Directories
 - f. Voicemail
 - g. Conference
 - h. Transfer
 - i. Hold
 - j. Volume Up/Down
 - k. Speakerphone
 - l. Headset
 - m. End call
 - n. 5-Way Navigation Pad

3. IP phones shall work seamlessly with Owner network IP system. Phones shall connect with minimum effort to RJ45 voice jacks provide adjacent to teaching desk.
4. Provide one (1) administrative IP phone per administrative office, unless indicated otherwise on Drawings. Coordinate all locations to be served by administrative IP phones with Owner.
5. Provide phone line cord with two (2) RJ45 connectors to extend from wall jack to administration desk.
6. Multi-Line Operation (internal lines; i.e., telephone to provide user with the capability of placing current call-conversation on hold and contact another extension within the system. The user may return to the original conversation by depressing the appropriate line button, without any re-dialing.
7. The system shall provide for Personal identification Number (PIN) Codes for all staff members and administrators. By dialing their PIN Code at any system telephone, the staff member/administrator shall have access to the same capabilities assigned to their office telephone or authorization level, regardless of the restrictions on the phone on which they are dialing. System shall be capable of supporting a minimum of two-hundred and fifty (250) individual PIN codes of four (4) digits in length.

F. Classroom Equipment:

1. Classroom phones shall be standard IP grade phones with built-in network and fully operational ringers, such as the Cisco Unified IP Phone 390X series. IP phones shall employ soft key-activated features, monochrome display, calling information plus the Power over Ethernet (PoE) compatible.
2. Features shall include, but not limited to, the following:
 - a. Graphical monochrome 128x32 pixel display.
 - b. Full-duplex speaker.
 - c. Buttons shall include:
 - 1) Select
 - 2) Back
 - 3) Two-Way Navigation
 - 4) Redial
 - 5) Transfer
 - 6) Hold/Resume
 - d. Volume control for sound adjustment of the handset, speaker, and ringer.
3. Provide one (1) standard IP grade phone per classroom, unless indicated otherwise on Drawings. Coordinate all locations to be served standard IP grade phones with Owner.
4. Provide phone line cord with two (2) RJ45 connectors to extend from wall jack to teaching desk.

G. Training Room Equipment:

1. Provide Training Rooms serving school administration areas with IP grade conference stations, such as Unified IP Conference Station 793X series. Station shall provide

superior voice quality, digitally tuned speaker and three microphones allowing for mobility while conversing via the conference station.

2. Features shall include, but not limited to, the following:
 - a. Support call hold
 - b. Call transfer
 - c. Call release
 - d. Mute
 - e. Conference (impromptu and meet me)
 - f. Park
 - g. Pick up
 - h. Convenient volume control buttons
 - i. 360-degree coverage for small to medium-sized conference rooms.
 - j. Integrated keypad.
3. Software upgrades for future expansion and system capabilities.
4. Automatic address configuration on the IP Network.

2.16 WIRELESS ACCESS POINT (WAP)

- A. Manufacturer: Aerohive AP330, model AH-AP-330-N-FCC Access Point . No other manufacturer shall be acceptable.
- B. Access Point Features:
 1. Wireless access point shall provide high performance dual concurrent 802.11n-based 3x3 multiple-input multiple-output (MIMO) technology.
 2. Dual frequencies consisting of 2.4 GHz and 5 GHz.
 3. Features:
 - a. Power over Ethernet compatible
 - b. RJ45 connection port
 - c. Ceiling tile clips for mounting for attaching to the ceiling grid
- C. Provide a complete and operational wireless access system providing complete coverage throughout the areas designated on the Drawings.
- D. Contractor shall provide all necessary inputs, initial programming, data entry, and set up to furnish a complete and functional data communications wireless access point network.
- E. The Contractor shall configure WAPs with the existing configuration parameters used at 307 Law Street to provide seamless integration with the same. Coordinate required configuration parameters with Owner.
- F. Prior to procuring WAP's, verify location and design with an Aerohive Certified Engineer.
- G. All licenses and support contracts shall be provided and registered to Woodbridge School District. Provide the following license and support contracts as follows.
 1. Each device provided shall include the following:

- a. Provide Aerohive HiveManager license for each device. Aerohive sku # AH-HM-LIC-1AP.
 - b. Provide Aerohive 8x5 Paid Technical Support Plan. Aerohive sku # AH-S-SYS-8x5-5YR-300.
2. Provide (1) of the following :
- a. Provide Aerohive ID Manager for 5 years for 50 concurrent users support. Aerohive sku # AH-IDM-BASE-50-N-5YR.
 - b. Provide Aerohive ID Manager directory integration add-on to enable employee sponsorship of guest accounts for 5 years. Aerohive sku # AH-IDM-DIR-N-5YR.
3. Provide (4) of the following:
- a. Aerohive sku # AH-TNG-AEWC-FCC-NEW.
 - b. Aerohive sku # AH-TNG-AAWC-FCC-NEW.

H. Each WAP must have a unique name.

1. Labeling scheme shall be submitted for review.
2. Labeling scheme shall comply with the following format:
 - a. Line one: WHS-001-APA4C0.
 - 1) First group of characters shall be Building. (WHS)
 - 2) Second group of characters shall be Room Number or Name. (001)
 - 3) Third group of character shall be Access (A), Point (P), Last four digits of mac address (A4C0)
 - b. Line two: 40:18:B13B:A4:C0.
 - 1) Line shall constitute the Access Point Mac Address.
3. White non-removable adhesive labels with 3/8" high black lettering are required on all wireless access points.

2.17 GROUNDING

- A. Comply with requirements in Section 260526 Grounding and Bonding for grounding conductors and connectors.
- B. Comply with J-STD-607-A.

2.18 IDENTIFICATION PRODUCTS

- A. Comply with TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- B. Comply with requirements in Section 260553 Electrical Identification.

PART 3 EXECUTION

3.1 GENERAL

- A. Install and connect all appliances and equipment as specified and shown on the contract drawings in accordance with the manufacturer's instructions and recommendations.
- B. Machine label switches, connectors, jacks, receptacles, conduits, outlets, cables, and cable terminations, clearly, logically, and permanently.
- C. Program system per instructions of the Owner.
- D. Execute, without claim for payment, moderate moves or changes necessary to accommodate other equipment or cabinetry to assure symmetry and pleasing appearance.
- E. The system must be matched. All major electronic equipment must be furnished, assembled, installed and tested and by the Audio/video Contractor.
- F. Final appearance and finishes are subject to the Owner's approval.
- G. Cabling types shall be installed per manufacturer's recommendations as required and as indicated on the drawings and in the specifications.
- H. Cabling shall be terminated neatly and logically. All connectors shall be as recommended by the manufacturer or as indicated in the specifications or drawings.
- I. Co-ordinate and submit to the Owner a proposed work schedule chart indicating starting time from notice to proceed, job progression and completion/closeout schedule. Notify the contract administrator immediately for if changes to the schedule are required.
- J. Facility occupation and availability: the Owner will make all reasonable attempts to provide access to the facility At the end of each workday leave the occupied areas of the facility in a safe and ready condition for faculty and student use.

3.2 CABLE ROUTING

- A. All horizontal cables shall not exceed 90 m (295 ft) from the telecommunications outlet in the work area to the horizontal cross connect. The combined length of jumpers, or patch cords and equipment cables in the telecommunications closet and the work area should not exceed 10m (33 feet) total, including 3 m (10 feet) at the station and 6 m (20 feet) at the closet. Every effort will be made to route cables so as not to exceed 90 meters in length. Identify any cable runs exceeding 90 meters from proposed MDF/IDF location and shall provide solution to meet the 90 meter requirement.
- B. Horizontal pathways shall be installed or selected such that the minimum bend radius of horizontal cables is kept within manufacturer specifications both during and after installation. Cable bends shall be no less than four (4) times the cable outer diameter or 1.00-inches.

- C. In open ceiling cabling, cable supports shall be provided by means that are structurally independent of the suspended ceiling, its framework, or supports. These supports shall be spaced no more than 1.2 m (4 feet) apart.
- D. Data/Voice pathways, spaces and metallic cables which run parallel with electric power cables or lighting cables shall be installed with a minimum clearance of 300 mm (12 inches). Audio/Video cables shall not be run parallel with electric power cables for more than 10 m (33 feet) if their separation is less than 300 mm (12 inches). Maintain minimum distances of voice and data cables from the following items:

ITEM	MINIMUM SEPARATION
Parallel with electric power and lighting cables	300 mm (12 inches)
Fluorescent Light Fixtures	300 mm (12 inches)
Heat-Generating Devices Ductwork Radiators Heaters	300 mm (12 inches)
Transformers Motors	1.2 m (48 inches)
Minimum Distance Above Ceilings	75 mm (3 inches)
Exterior Wall	1.2 m (48 inches)

- E. For data or voice applications, UTP cables shall be run using a star topology from the telecommunications closet on each floor to every individual information outlet. All cable routes shall be approved by the customer prior to installation of the cabling.
- F. The Contractor shall observe the bending radius and pulling strength requirements of the UTP and fiber optic cable during handling and installation.
- G. Each run of UTP cable between horizontal portion of the cross-connect in the telecommunication closet and the information outlet shall not contain splices.
- H. In the telecommunications closet where cable racking are used, the contractor shall provide appropriate means of cable management such as reusable color-coded hook and loop cable managers (ties) to create a neat appearing and practical installation.
- I. In a false ceiling environment, a minimum of 3 inches (75 mm) shall be observed between the cable supports and the false ceiling.

- J. Continuous conduit runs installed by the contractor should not exceed 30.5 m (100 ft) or contain more than two (2) 90 degree bends without utilizing appropriately sized pull boxes.
- K. Cable pathways shall be designed and installed to meet applicable local and national building and electrical codes or regulations.
- L. Grounding/earthing and bonding of cable pathways shall comply with applicable codes and regulations.
- M. Cable pathways shall not have exposed sharp edges that may come into contact with telecommunications cables.
- N. The number of cables placed in a pathway shall not exceed manufacture specifications, nor will the geometric shape of a cable be affected.
- O. Pathways shall not be located in elevator shafts.
- P. Horizontal distribution cables shall not be exposed in the work area or other locations with public access.
- Q. Cables routed in a suspended ceiling shall not be draped across the ceiling tiles. Cable supports shall be mounted a minimum of 75 mm (3 in) above the ceiling grid supporting the tiles.
- R. Minimum separation of 300 mm (12 in) shall be provided in areas where power or electric light circuits, which are equal to or less than 480 Vrms, and audio/video cabling coexist.
- S. No exposed wiring will be accepted unless approved in writing by the construction manager. Cabling shall be in the wall, above the ceiling, or where exposed, enclosed within raceway.
- T. Plenum-rated cable to be provided by Contractor where required by Code. Contractor should be familiar with NEC Article 300-22 and provide appropriate plenum-rated cable. **CONTRACTOR SHALL PROVIDE PLENUM-RATED CABLING THROUGHOUT THE PROJECT.**
- U. Exposed EMT conduit will be accepted as an installation method in mechanical equipment rooms ten feet above finished floor. These areas will still be treated like classrooms for the final installation and termination.
- V. In unheated spaces install the cable at least four (4) feet from the exterior wall mounted securely to the slab or structure. Any cable support installation must attach securely to the deck.
- W. System wiring and equipment installation shall be in accordance with good engineering practices as established by ANSI, EIA and NEC. Wiring shall meet all state and local electrical codes. All wiring shall test free from all grounds and shorts. All voice and data cabling shall be installed to ANSI EIA/TIA 568B and 569 Standards, and ISO/IEC 11801 (International) Generic Cabling for Customer Premise Standard.

- X. All cabling furnished under this specification shall be installed in a neat and workmanlike manner and to the satisfaction of the Owner.
 - Y. All cabling must be installed with extreme care. Cables must not be cinched, subjected to sharp bends in excess of the manufacturer's recommended bending radius or anything else that would change the specified characteristics of the cables. Comply with ANSI/EIA/TIA 568-B.
 - Z. Cables run exposed above accessible ceilings shall be run in bundles of a size for installation. Bundle by use of cable ties, taking care not to cinch cables. Cable shall be supported from roof structures, joists and other appropriate structural members by means of "J" hooks. "J" hooks shall not exceed spacing of four (4) feet. In no case shall any cable be supported from below by contact with the ceiling system. The data, telecommunication and video cabling systems shall be separated into bundles and separated by a minimum of 12-inch. Provide cable ties to secure cables to each "J" hook. Avoid cinching cables.
3. All backbone and horizontal cabling installed above suspended ceilings shall be supported by 2-inch "J" hooks spaced at a maximum of 48-inches. For support of high density (>50 cables) bulk cable where 48-inch spacing results in the bowing of cable, the Contractor shall divide bulk cable into smaller parallel streams or decrease the spacing of the J hooks sufficiently to adequately support the cable.
 4. Where category 6 wiring is supported by "J" hooks, wire shall be run neatly bundled with tie wraps. Tie wraps shall be spaced randomly between 6-inches and 10-inches apart, 8-inches on the average. Tie wraps shall be snug, but capable of being easily rotated about the cable bundle so as to secure the cable without damaging it. Cable deflection shall be less than 5-inches.
 5. Fiber optic and Category 6 UTP backbone cable shall be run separately from the horizontal distribution cable. This shall be accomplished by running said cable parallel to horizontal distribution cabling supported on the back-side of the "J" hooks used for the horizontal cabling by supporting the backbone cable separately from the horizontal. In either case, the backbone cabling shall not be tie wrapped together with the horizontal distribution cable.
 6. "J" hooks shall be supported directly by the building structure. "J" hooks shall be supported on minimum 3/8-inch threaded rod anchored to the side hallway walk, or to the slab above.
 7. "J" hooks shall not be attached to or supported by ceiling supports, piping or piping supports, or duct work or duct work supports.
 8. Install cabling below or to the side of the ductwork, just above the suspended ceiling. Extend "J" hooks down to support the cabling at that level.
 9. Where cable trays or conduit are not provided, Category 6 "J" hooks shall be installed. The "J" hooks shall be attachable to a floor slab through the use of a pre-threaded lead insert, which is suitable of installation of a 3/8-inch "all-thread" rod in a pre-drilled 1/2-inch hole. The threads of the closure bolt on the pipe hanger shall be covered by 3/8-inch copper or aluminum tubing to protect the cabling sheaths.
 10. Cables placed in hangers in the plenum ceiling area shall be routed high and away from all other electrical and mechanical systems so as to avoid contact with light fixtures, ventilation ducts, sprinkler systems or plumbing piping, motors, or any other electrical

devices. The cable shall not be run in parallel with any high voltage electrical wiring. The maximum separation between support points for all cabling shall be four (4) feet. Lay-in pipe hangers shall be installed so as to accommodate these maximum distance spacings. Hangers shall be installed at directional bend points so as to provide a maximum bend angle of 45 degrees for the supported cabling.

- AA. Cables passing through fire/smoke containment walls shall be sleeved. Where these wall penetrations are required, said sleeves shall be fireproofed to maintain the integrity of the wall rating.
- BB. Cables shall be installed in metal conduit raceways on walls, below ceilings, where exposed and wherever it may be accessible or may be subject to physical damage.
- CC. The cable and conduit routes used should avoid water pipes, fluorescent lighting and other utilities which may adversely affect the system's performance or result in damage to the cable. If cable must be placed close to such utilities, keep it separate and protect with approved barriers and/or insulation.
- DD. Do not run cable or conductor in hangers used for pipes, electric conduits or ceiling hangers, nor support it in any way by attachments to pipes, conduits, HVAC ducts or ceiling grid hangers.
- EE. All cable shall be continuous runs with no splicing permitted.
- FF. Cabling types shall be plenum construction as required by applicable electrical codes and as specified. Contractor shall provide plenum-rated cabling throughout the project.
- GG. Refer to project descriptions and/or drawings all cabling systems.
- HH. In existing structures place distribution cabling following the same basic route of the existing wiring, except where conduits are full or the route is not easily accessible, or newly installed, distribution media.
- II. In suspended ceiling areas where cable trays or conduit are not available, station wiring with plastic cable ties at appropriate distances. The cable bundling shall be supported via the existing building structure and framework.
- JJ. Conceal horizontal distribution wiring internally above ceiling and in wiremold on walls.
- KK. Provide responsibility for removing all ceiling tiles required for the installation of the wiring. Contractor shall provide new ceiling tiles for any ceiling tiles damaged.
- LL. Run cables above hung ceilings suspended from surfaces above with approved devices, or in cable trays, using convenient run sizes secured with properly tensioned plastic cable ties. Comply with NFPA requirements for exposed cable. Route cable runs to clear electrical devices above ceilings by not less than 12 inches.
- MM. Cable lubricants: Lubricants specifically designed for installing communications cable shall be used to reduce pulling tension for all cable pulls in conduit, ducts, or innerducts.

Use not less than three (3) gallons per kilometer of cable. After installation, exposed cable and other surfaces must be cleaned free of lubricant residue. Twisted pair cable lubricant shall be Dyna-Blue, American Polywater, or approved equal. Optical fiber cable lubricant shall be Optic-Lube, Ideal, or approved equal.

- NN. All conduits with less than a 50 percent fill ratio shall have a 3/32-inch 200 pound polyethylene pull cord approximately secured and labeled at each end.

3.3 EQUIPMENT ROOMS/CLOSETS

- A. The Equipment Subsystem consists of shared (common) electronic communications equipment in the equipment room or telecommunications closet and the transmission media required to terminate this equipment on distribution hardware.
- B. Communication grounding / earthing and bonding shall be in accordance with applicable codes and regulations. It is recommended that the requirements of IEC 1000-5-2, ANSI/TIA/EIA-607, or both, be observed throughout the entire cabling system. Provide 12-inch ground bus bars and #6 solid copper ground wires from the ground bus bars to the building ground. Provide #6 ground from the ladder cable rack to the ground bus bars.
1. All metallic conduit and raceways shall be appropriately grounded as specified in the National Electric Code. An AWG #6 ground wire will be installed in both vertical risers from the basement to the top floor. This ground shall be attached to the building's approved grounding point used for the building electrical service at one (1) point only. A ground buss shall be provided in each TC bonded to the communications ground system.
- C. A minimum of two dedicated duplex or two dedicated simplex electrical outlets each on a separate circuit, shall be provided for equipment power. Additional convenience duplex outlets should be placed at 1.8 m (6 ft) intervals around the perimeter walls. Provide Lock Dog Breaker Locks, on panelboard circuit breakers serving outlets, to prevent inadvertent shut-down of power.
- D. Provide each fire-retardant-treated plywood backboard two feet off the floor to top. Secure backboard with a minimum of eight (8) screws. Plywood backboard shall have one side with exterior glue and one finished smooth side. Mark all backboards and cabinets with appropriate legends (i.e., "COMM").
- E. Verify with local codes or AHJ prior to painting fire-retardant-treated plywood backboard with stamped fire rating labels. If allowed by code, paint fire-retardant-treated plywood backboard with durable white enamel (or other finish color as selected by the Owner)
- F. Cable installation in the Equipment Room and Communications Closet must conform to the Project Drawings. All cabling shall be routed so as to avoid interference with any other service or system, operation, or maintenance purposes such as access boxes, ventilation mixing boxes, network equipment-mounting access hatches to air filters, switches or electrical outlets, electrical panels, and lighting fixtures. Avoid crossing areas horizontally just above or below any riser conduit. Lay and dress cables to allow other cables to enter the conduit/riser without difficulty at a later time by maintaining a working

distance from these openings. Use a minimum of 36 inches for a service loop to the patch panel.

- G. Cable shall be routed as close as possible to the ceiling, floor, or other corners to ensure that adequate wall or backboard space is available to current and future equipment and for cable terminations. Cables shall not be tie-wrapped to existing electrical conduit or other equipment. The minimum bend radius shall be observed.
- H. Lay cables via the shortest route directly to the nearest edge of the backboard from the mounted equipment or block. Lace or tie-clamp all similarly routed cables together and attach by means of clamps screwed to the outside edge(s) of the backboard vertically and/or horizontally, then route via square corners over a path that will offer minimum obstruction to future installations of equipment, backboards, or other cables.
- I. Provide rack and jack panel hardware as required for all data station wiring. Provide the following for each equipment rack:
 - 1. Racks shall be installed in accordance with the Manufacturer's pre-printed instructions. Racks shall be anchored to the building structure at the base and top of each rack.
 - 2. Racks shall be installed perpendicular to the wall on which the data jack panels are installed. Racks shall be spaced at least 6-inches from the wall (at the side) and have a minimum of 36-inch clearance in front and behind.
 - 3. Subsequent to rack installation, provide wire management hardware, power strips, and grounding on racks as noted herein.
 - 4. Install cable management channel the entire height of the rack, on both sides.
 - 5. Install split front D-ring panels below patch panels for cable management.
 - 6. Install an uninterruptible power supply into each rack at the bottom of the rack and plug-in the power cord where directed by the Owner to fully charge the batteries.
 - 7. Hardware shall be installed plumb and level on the equipment racks. Appropriate distribution rings shall be installed so that jumper and cross connect wires can be installed in a neat and orderly fashion.
- J. Provide a 12-inch wide ladder rack from the backboard wall to each equipment rack, 7'-inch AFF. All cables shall be routed across the ladder rack. Provide angle iron and attach securely to the wall and to the rack.
- K. Provide 6-inch cable tray to completely circle the ceiling perimeter of communication rooms to facilitate cable management. Cable tray shall be center-hung. Cable tray will be GS Metals, or equivalent. Appropriate quantities of J-hooks shall support horizontal cable distribution beyond the communication rooms.

3.4 SITE SURVEY

- A. Prior to placing any cable pathways or cable, survey the site to determine job conditions will not impose any obstructions that would interfere with the safe and satisfactory placement of the cables, and to arrange the removal of any obstructions with the Project Manager accordingly.

- B. The Drawings provided are diagrammatic and generally representative of the existing conditions, but not necessarily accurate in all aspects. Verify all field conditions and make field measurements as required.
- C. Visit the site before submitting bid and check location of existing utilities, check conditions, verify dimensions and locations shown on the plans, and verify over-all costs and work herein described or shown.
- D. Take measurements necessary for this work and be responsible for their accuracy. Necessary pull boxes and junction boxes as required to accomplish distribution shall be provided.

3.5 BEND RADIUS

- A. The maximum cable bend radii shall not exceed manufacturer's specifications.
- B. In spaces with UTP cable terminations, the maximum bend radius for 4-pair cable shall not exceed four times the outside diameter of the cable and ten times for multi-pair cable. This shall be done unless this violates manufacturer specifications.
- C. During the actual installation, bend radius on 4-pair cable shall not exceed eight times the outside diameter of the cable and ten times for multi-pair cable. This shall be done unless this violates manufacturer specifications.

3.6 SLACK

- A. In the work area, a minimum of 300 mm (12 inches) should be left at outlets, while 1 m (3 feet) be left at the backboard or rack, and 6 m (20 feet) in the closet area.
- B. In MDF and IDF rooms shall have a minimum of 6 m (20 feet) of slack should be left for all cable types. This slack must be neatly managed on trays or other support types.
- C. All unused cables shall be properly terminated, as specified, with 10 m (33 feet) extra cable neatly coiled and tie-wrapped at the workstation end of cable in the ceiling space.
- D. Single-node cable installed for future use shall extend to the furthest point in the MDF or IDF room plus an additional (10) feet. Single-node cable shall be loop in accordance with the manufacturer's bend radius, capped and secure neatly on the ladder rack or a minimum of 84" AFF.

3.7 CABLE TIE WRAPS

- A. Tie wraps shall be used at appropriate intervals to secure cable and to provide strain relief at termination points. These wraps shall not be over tightened to the point of deforming or crimping the cable sheath. Tie wraps shall be attached with screws to walls, backboards, and other structures. Tie wraps shall be spaced between 6-inches and 10-inches apart, 8-inches on the average.

- B. Hook cable managers should be used in the closet where reconfiguration of cables and terminations may be frequent. Cable Managers shall be Polygon Softcinch Series, or approved equal.
- C. No stick-on cable wraps, raceways, or terminal devices are acceptable.

3.8 FIRE STOP

- A. Provide properly installed firestop systems to prevent or retard the spread of fire, smoke, water, and gases through the building. This requirement applies to openings designed for telecommunications use that may or may not be penetrated by cables, wires, or raceways. Contractor shall seal all floor, ceiling, and wall penetrations.
- B. Provide fire and smoke stopping in accordance with all applicable codes.
- C. Contractor shall provide firestopping protection that meets NFPA Life Safety Code 101, 6-2.3.6, Penetrations and Miscellaneous Openings and Fire Barriers and the NEC 300.21 Fire Stopping Regulations and Standards.
- D. All vertical penetrations consisting of conduit, sleeves, or chases shall be firestopped at the bottom of the penetration.
- E. All horizontal penetrations consisting of conduit, sleeves of chases, shall be firestopped on both sides of the penetration.
- F. Individual cable penetrations in plenum air return areas not enclosed in conduit shall be firestopped.
- G. Openings made in concrete floors shall be UL approved. Thickness or depth of firestop materials shall be as recommended by the material manufacturer and backed by formal ASTM E-814 tests.
- H. Plenum air return ceiling penetrations for conduit and cables shall be sealed with a system appropriate for the substrate and level of protection required.
- I. All metal conduits designed for communications with or without wire/cable inside shall be firestopped to restrict transfer of smoke.
- J. Comply with the requirements of Section 16090 Electrical Firestopping.
- K. Provide fire-rated seals for all penetrations through fire-rated floors and walls. Provide UL listed fire sealant, Dow Corning Silicon foam, or approved equal. Provide UL listed expanding fire barrier and expanding type grout.

3.9 WORKMANSHIP

- A. All work shall be done in a workman like fashion of the highest standards in the telecommunications industry. All equipment and materials are to be installed in a neat and

secure manner, while cables are to be properly dressed. Workers must clean any debris and trash at the close of each workday.

- B. The installation shall be in strict accordance with all applicable codes and standards, the respective manufacturer's written instructions, contract drawings, and these Specifications. All materials, equipment, and devices shall be new and unused, of current manufacture of the highest grade, free from defects. Workmanship shall be of the highest grade in accordance with modern practice. The installed system shall be neat, clean, and well organized in appearance. Provide working clearances for normal system operation, reconfiguration, and repair.
- C. The Owner reserves the right to reject all or a portion of the work performed, either on technical or aesthetic grounds.
- D. Replace any damaged ceiling tiles that are broken during cable installation.
- E. Replace or rework cables showing evidence of improper handling, including stretches, kinks, short radius bends, over-tightened bindings, loosely twisted and over-twisted pairs at terminals, and cable sheath removed too far (over 1-1/2 inches), at no additional cost to the Owner.

3.10 LABELING

- A. Horizontal cables shall be labeled at each end, 1-inch from end of the sheath. The cable or its label shall be marked with its identifier.
- B. A unique identifier shall be marked on each faceplate to identify it as connecting hardware.
- C. Each port in the faceplate shall be labeled with its identifier.
- D. A unique identifier shall be marked on each piece of connecting hardware to identify it as connecting hardware.
- E. Each port on the connecting hardware shall be labeled with its identifier.
- F. Each patch panel in the building shall be given a letter designation. Each data jack served by a particular patch panel shall be numbered with the patch panel jack number feeding the work station jack to the closet in which the patch panel is located, using the patch panel designation as a prefix (i.e., C-21).
- G. Tag all cables, terminal blocks, outlets, and other components for which tests have been satisfactorily completed.
- H. Identify terminals at terminal strips, telecommunications outlets, and pull-and junction boxes with approved designations.
- I. All trunk cables linking the wire closets together shall be logically designated to industry standards.

- J. Labeling requirement: Generally, all wiring shall be labeled consistent with ANSI/TIA/EIA-606, and include the following:
1. Adhesive labels shall meet the legibility, defacement, and adhesion requirements specified in UL 969 for indoor use. Cable labels shall have a durable substrate, such as vinyl, suitable for wrapping. Labeling practices shall be consistent across the installation.
 2. Data and communications voice outlets. The outlet faceplate shall be provided with a permanently affixed machine label that provides the distribution frame location, the rack field location and the position of the connection within the rack field. For example: 1-A-01 would refer to the other end of the termination being IDF 1, Rack Field A, Position 01. The cable run shall be machine labeled with Mylar wrap wire markers within 1-inch of termination. Final termination at the distribution frame is also to be appropriately tagged. All cabling and fiber optics are to be tagged in a consistent manner.
 3. All rack fields, devices, components, etc., shall be provided with plates, labeled with appropriate designations on the front and rear of the equipment. All devices are to be installed and labeled in a sequential, logical order. (For example: A, D, C, B will be retagged and reterminated to A, B, C, D). Provide engraved phenolic plates with 5/32-inch high white lettering on a black background.
 4. Distribution Frame Connecting Hardware: All connecting hardware shall be adequately tagged with a similar nomenclature to the above.
 5. Cross-connecting Cable: All cross-connecting cable shall be adequately tagged with a similar nomenclature to the above with tags of to and from.
 6. Equipment ports shall be adequately tagged with a similar nomenclature to the above.
 7. Patch Cords shall be color-coded. Each Cabinet is to be designated with a number and associated color. Incoming patch cords are to be color-coded from each cabinet at the MDF. Outgoing patch cords are to be similarly color-coded. Patch cords shall be color-coded consistently with one single color per system. All patch cords shall be by the same Manufacturer.
 8. A label is to be provided for each Ethernet Switch corresponding to each labeled patch panel.
 9. No handwritten labels shall be accepted.
 10. All labels shall be machine-printed on clear or opaque tape, stenciled onto adhesive labels, or typewritten onto adhesive labels. The font shall be at least one-quarter inch (1/4-inch) in height, block characters, and legible. The text shall be of a color contrasting with the label such that it may be easily read. If labeling tape is utilized, the font color shall contrast with the background. Patch panels shall exhibit workstation numbers, in sequential order, for all workstations served by the wiring closets (MDF or IDF).
 11. Each fiber optics cable segment shall be labeled at each end with its respective IDF identifier. Each fiber interconnect device shall be labeled with its respective IDF identifier. Each telecommunications outlet shall be labeled with its respective workstation number (machine labels only). Each workstation cable shall be neatly labeled, at each end with its respective workstation number. Each copper backbone cable shall be machine labeled at each end with its respective IDF number. Each binder group shall be tied off with its respective identifying ribbon at each break-out point.

12. Warning Tags: At each location where the fiber cable is exposed to human intrusion, it shall be marked with warning tags. These tags shall be yellow or orange in color, and shall contain the warning: CAUTION FIBER OPTIC CABLE. The text shall be permanent, black, block characters, and at least 3/16-inch high. A warning tag shall be permanently affixed to each exposed cable or bundle of cables, at intervals of not less than five (5) feet. Any section of exposed cable which is less than five (5) feet in length shall have at least one warning tag affixed to it.
13. Brady Labeling Systems, Panduit Pan-Mark Labeling Systems, or approved equal shall be used.
14. Single-mode cabling shall be labeled as "Single-mode" at each IDF and MDF room and at each wall mounted rack not contained with a dedicated IDF or MDF room.
15. Single-mode cabling shall be labeled for "Future Use" at each IDF and MDF room and at each wall mounted rack not contained with a dedicated IDF or MDF room.

3.11 DOCUMENTATION:

- A. A comprehensive installation, operation, programming and instruction manual shall be supplied as part of the system. The manual shall provide complete service information, including schematics, layout drawings, and interconnecting diagrams showing the location of all the outlets, cable taps, cable routes, and other installed components. Include final revised one-line system drawings. Include for this particular project parts lists to permit quick and efficient maintenance and repair of the equipment by qualified technicians. Manuals shall include 8 ½-inch x 11-inch device location/cabling route drawings provided in CADD format (Autodesk - AutoCad 2007 or later) on CD. Manuals shall include a copy of the operations manuals listed in Section 270500 Common Work Results for Communications. Manuals shall be indexed and placed in a hard-cover three ring binder. Three (3) copies of this manual shall be provided to the Owner upon project completion. Retain a minimum of one (1) copy for their permanent records. Provide one copy of Manual and CD(s) in the Main Equipment Rack.

3.12 DRAWINGS

- A. As-built drawing shall be provided in compliance with EIA ANSI/TIA/EIA-606, showing the locations of and identifiers for all:
 - a. Horizontal cable routing and terminations
 - b. Telecommunications outlets/connectors, Telco System interfaces
- B. Cable penetration details, schematic riser diagrams, and equipment closet layouts.
- C. Provide as-built drawings to include cabling routing, details of station, station labeling, and hardware locations, etc. Provide as-built drawings on Compact Disks (CD) or USB flash Drives in AutoCAD Version 2007 (or later) format and in Portable Document Format (PDF). Contractor will have access to drawings provided with this specification where they are in electronic form.
- D. Provide a set of As-Built Drawings encased in a plastic sheet protector. Turn As-Built Drawings over to Owner.

- E. At the completion of the project shall bring the system wiring diagrams fully up to date with the actual field installation, showing all field-made changes for deviations from the approved shop drawings. Accurately record location of service entrance conduit, termination backboards and cabinets, outlet boxes, messenger cable raceways and cable trays, pull boxes and equipment. Room names and numbers shall be updated to indicate actual field-assigned room numbers. They may not necessarily be the room names and numbers shown on the Contract Drawings.

3.13 RECORDS

- A. All records shall be created by the installation contractor and turned over at the completion of work. The format shall be computer based and both soft copies and hard copies shall be part of the As-built package. The minimum requirements include:
 - 1. Cable records shall contain a complete listing of the identifier, cable type, length, pair status, pair assignment, termination positions at both ends, manufacturer, and part number.
 - 2. Connecting hardware records shall contain the identifier, type of hardware and the amount of positions.
 - 3. Connecting hardware positions records shall contain the identifier, type of position, and the cable identifier attached to it.
 - 4. Test documentation on all cable types shall be included as part of the As-built package. Only signed copies of test reports shall be acceptable.
 - 5. Outlet Records: Provide a database of outlet designations capable of being exported to a cable management software system.
- B. Provide a complete Owner's Manual including full documentation of system paths and components to allow for plug and play operating cable management, cable maintenance, and cable modifications. Commercial off-the-shelf manuals shall be furnished for operation, installation, configuration, and maintenance for all products provided as a part of this section.
- C. Provide a complete database indicating the location of each outlet and corresponding port on wire closet equipment.

3.14 REPORTS

- A. All reports shall be generated from the computer based program used to create the records above. These reports should include but not limited to:
 - 1. Cable Reports
 - 2. Cross-connect Reports
 - 3. Connecting Hardware Reports
- B. Reports shall include cable schedules fully documenting length, path, and conductivity test results for each cable.
- C. Provide 8-1/2-inch by 11-inch floor plans identifying all room outlet numbers and locations.

D. Labeling Reports:

1. Provide Owner with complete labeling report indicating all wired and wireless devices specified in this Section.
2. Coordinate Labeling Report format with Owner for information required for each equipment/device type.
3. Provide Labeling Report in spreadsheet format using Excel (.xlsx) on Compact Disk or USB Flash Drive.
4. Provide (2) hard copies of the information and format type indicate in 3.14(D).

- E. Provide Owner with formatted spreadsheet, in hard copy and electronic format, itemizing each component provided under this Section. The spreadsheet shall be provided as a hard copy and electronic format, i.e. Excel (.xlsx).

3.15 TRAINING:

- A. Include sixteen (16) hours (per building) in four (4) four-hour on-site training sessions, or as required, of startup and training assistance during cutover and Owner installation of equipment to ensure a fully functional system. This training may also be used for system configuration during initial system startup or other services as required at the Owner's request.
- B. Training shall include a walk-through of the system for location and labeling orientation, a discussion of overall system concepts and configuration, specific instruction in system reconfiguration using patch cords in the wiring closets, a review of the as-built drawings, a review of the system testing and acceptance documentation, and guidelines for basic trouble-shooting of the structured cabling system. The instruction shall be presented in an organized and professional manner by a person who is thoroughly familiar with the installation.
- C. Provide key personnel at each training session, as required by the Owner, at no additional cost to the Owner. Key personnel include an RCDD on Contractor's staff, manufacturer's representative, and manufacturer's specialists.

END OF SECTION

DIVISION 27
SECTION 274100
AUDIO-VIDEO SYSTEMS
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SECTION 274100 AUDIO-VIDEO SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of the contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section.
- B. Related Sections:
 - 1. Division 26, Section *Common Work Results for Electrical*
 - 2. Division 26, Section *Electrical Identification*
 - 3. Division 26, Section *Electrical Firestopping*
 - 4. Division 26, Section *Raceways and Boxes*
 - 5. Division 26, Section *Grounding and Bonding*

1.2 GENERAL

- A. All bids shall be based on the Audio/Video (AV) systems as specified herein and as indicated on the Drawings. A single manufacturer / allied-manufacturer solution to the network design across the entire link shall be provided.
- B. Bidders shall provide submittals as required in General Provisions and as specified herein. Bidder shall provide a demonstration of the proposed system, if requested.
- C. The Owner reserves the right to determine the final approval of the system at the time of scheduled job completion. Failure to meet the installation schedule or provide the precise functional equivalent shall result in the removal of the system at the Contractor's expense.

1.3 SCOPE OF WORK

- A. Furnish and install all equipment, accessories, and materials in accordance with these specifications and drawings to provide complete functional Audio/video Systems consisting of the following sub-systems:
 - 1. A complete and operable Audio/Video Classroom Presentation System as specified herein.
 - 2. A complete and operable Audio/Video Conference/Training Room Presentation System as specified herein.
 - 3. A complete and operable Audio/Video Cafeteria/Multimedia Presentation System as specified herein.
 - 4. A complete and operable Network Video Distribution System as specified herein.
- B. The Audio/video Presentation System includes all audio/video cabling, audio/video modules, face plates, jacks, and appurtenances for TIA/EIA Category 6 data cabling system.

- C. The Network Video Distribution System includes all auditorium camera(s), AV studio camera(s), distributed media engine, encoding audio video module, multi-format self-boosting set top box (STB), and technical support.
- D. The rough-in shall be installed under Division 26.
- E. Provide complete Audio/Video Presentation Systems for classrooms, conference/training rooms, and cafeteria/multipurpose rooms that are fully operational, fully tested, and ready for the occupants to use as indicated. The installation shall include all accessories and devices required to provide a complete and functioning system. Any materials and devices not specifically mentioned in these Specifications or indicated on the Contract Drawings that are required for a finished and operating system the installation of the required material or devices shall be furnished and installed at no additional cost to the Owner.
- F. Provide a complete Network Video Distribution System that is fully operational, fully tested, and ready for the occupants to use as indicated. The installation shall include all accessories and devices required to provide a complete and functioning system. Any materials and devices not specifically mentioned in these Specifications or indicated on the Contract Drawings that are required for a finished and operating system the installation of the required material or devices shall be furnished and installed of the required material or devices at no additional cost to the Owner. Coordinate installation of activation modules with Horizontal Cabling Contractor.
- G. Audio/Video Contractor shall provide a complete, functional system including all necessary components, whether included in this specification or not. Quantities indicated on the Drawings and in these Specifications are for reference purposes only. It is the responsibility of the Contractor to provide appropriate quantities of materials and equipment to provide a complete functional system. In the event any item(s) is(are) not specified, but is (are) needed to complete the work properly, provide the needed item(s) at no additional charge.
- H. If mention has been omitted herein of any items of the work or materials usually furnished for, or necessary to, the completion of the cabling work, or if there are conflicting points in the Specifications, the Bidder shall notify the Engineer via the Construction Manager of such an item or items in sufficient time for a formal addendum to be issued. Any and all conflicting points in the Specifications and/or drawings which are not questioned by the successful bidder and clarified prior to opening of bids shall be subject to the interpretation of the Architect, Engineer, Owner or Owner's Representative after award of the contract, and the interpretation shall be binding upon the successful bidder.
- I. Provide all labor, materials, equipment, software tools, and services necessary for, incidental to, installation, testing, and operating a Audio/Video and Network Video Distribution System. The Contractor shall provide computer, test equipment, and other accessories required to prove each Audio/Video presentation system.
- J. Provide a complete structured cabling system consisting of the following sub-systems:
 - 1. Audio/Video Classroom Presentation Systems.

2. Audio/Video Conference Room Presentation Systems.
3. Audio/Video Cafeteria Presentation System.
4. Network Video Distribution system.

1.4 SUBMITTALS

- A. Original specification sheets or clear copies of same shall be submitted on all items. Manufacturers name, make and model number shall appear on each sheet. Submittals shall be bound in booklet form with cover sheet and index, and presented in a neat and logical order in a binder. Submittals shall contain installation, operation and programming manuals of the system to provide the Engineer complete information as to system features, functions and capabilities.
- B. Submit product data on each product specified in this section, including, but not limited to the cabinets and cabinet components, cabling, and cabling components, Category 6 UTP cable, cable end connectors, outlets, cable management, splitters, amps, taps, hubs, switches, electronic hardware, and associated components, jacks, etc. Provide copies as specified in Division 01 of the specification data. Each item proposed should be highlighted, tagged with a star, an arrow, etc.
- C. Wiring and systems certification shall be provided in electronic format readable on Adobe Reader or AutoCAD. Contractor to provide cable routing information on CAD drawings and electronic files. CAD drawings shall show installation locations of equipment, product quantities and types.
- E. Submit dimensional outline drawings showing relative position and size of all major components and equipment involving dimensions, elevations, and terminations. Each drawing shall indicate all equipment with its manufacturer and model number shown.
- F. Submittal shall contain a complete schedule of manufacturer's part numbers and quantity listings of all supplied components.
- G. Submit Certifications and lists as required in Quality Assurance below.
- H. Submit wiring diagrams showing typical connections for all systems and equipment. Include detailed one-line drawings of each system. Each system drawing shall show proposed circuit numbers for all cables and terminal connections. Provide typical wiring termination details for all devices.
- I. Submit Shop Drawings of each proposed system (Audio/Video Presentation Systems and Network Video Distribution System) indicating the proposed system configuration and all specified requirements. Shop Drawing shall indicate proposed cable routing, detail installation locations of equipment, cable quantities, cable types, and terminal block locations. All Shop Drawings shall be Contractor's original drawings. Submission of Engineer's Contract Drawings as Shop Drawings is not permitted. A detailed set of floor plans for the complete building shall be furnished showing the locations of all equipment and devices and their required interconnections. The interconnections shown shall indicate the number, size, and type of wires as described in this Specification. The Shop Drawing shall indicate installation details, cable routing and system configuration. Shop Drawings shall indicate all deviations from or additions to the Contract Documents.

- J. A copy of testing procedures including proposed equipment, manufacturer's recommendations, test report forms, and test report format.
- K. Cable Certification Test Results is included in this contract; testing and certification of all components of the AV structured and AV jumper cabling shall be provided. All relevant test data including documentation of failed tests, the corrective procedures performed, and the results of re-tests, are to be documented and submitted to the Owner in both printed hard copy and electronic format within five (5) working days of test completion. Unless otherwise noted, all raw test data will be provided to the Owner in a printed format and electronic format using Excel (.xlsx).
- L. Submit a certificate of completion of installation and service training from the systems' Manufacturers. The system installer shall have attended the Manufacturer's installation and service schools. Certificates of this training shall be provided within the Contractor's submittal.
- M. Audio/Video Contractor shall submit a list to include at least five (5) of installations of similar size and complexity to the proposed system which have been in satisfactory operation for a minimum period of two (2) years. The list shall also include a minimum of five (5) AV system references that have been in satisfactory operation for a minimum period of two (2) years.
- N. Submittals not containing complete documentation of specification items shall be automatically rejected before further review.
- O. Where model number or name of one manufacturer is followed in specifications by one or more other manufacturer's name, design has been based on the first product named, and shall be considered to be the specified product or manufacturer, named alternates may require minor deviations. Contractor shall indicate deviations in submittals/shop drawings.
- P. Manufacturer's model and catalog numbers, which are given for convenience of identifications only, change frequently and may not necessarily include specified or required features and may not insure compatibility with supporting systems or intended application. Contractor shall insure that material and equipment delivered to job site is suitable for the intended application and indicated connections. Review of shop drawings shall not include review and verification of submitted catalog numbers or quantities required.
- Q. Review of and noted comments on submitted shop drawings do not constitute a change order or a waiver of contract requirements. In the event of conflict between submittals or shop drawings and contract documents, the latter shall govern. If waiver of particular requirement is requested a formal written request shall be made to Owner as per General Conditions.
- R. When directed provide samples of material or equipment.
- S. Shop Drawings and submittals shall bear the General Contractor's review and approval stamp prior to submission to the Engineer.

- T. Manufacturer's Drawings, sketches, and instructions shall supplement, but not supersede, Contract Drawings and Specifications.
- U. Submit installation, operation, and maintenance instructions.

1.5 SUBSTITUTES AND ALTERNATES

- A. Under base bid, furnish equipment and material specified or named alternates. Products submitted shall be equal in quality to products of the specified manufacturer and shall include the standard features of the specified product and also optional features or necessary changes specified herein. Substitutes shall not be accepted for products designated as sole source items. Submittal of alternates shall include all cabling, activation modules, face plates, external cabling, and components or accessories required for satisfactory and intended operation. Engineer shall be final judge of equivalence.
- B. Substitute equipment submitted shall include a price change or advantage to the Owner, if accepted, at the time of submission. Product and performance requirements of substitute items shall be the same as named alternates.
- C. Receive approval in writing from the Owner for each item of substitution prior to commencing work. Items to be considered for substitution must be clearly indicated as a substitute item at the time of submission. No substitutions shall be allowed without written approval.

1.6 SERVICE, MAINTENANCE AND WARRANTIES

- A. A two (2) year Extended Product Warranty and System Assurance Warranty for systems, as specified herein, shall be provided by the Manufacturer as follows.
 - 1. System Assurance: The System Assurance shall cover the failure of the wiring system to support the application which it was designed to support, as well as additional application(s) introduced in the future by recognized standards or user forums that use the TIA/EIA 568B or ISO/IEC IS 11801 component and link/channel specifications for cabling, for a fifteen (15) year period.
 - 2. Extended Product Warranty: The Extended Product Warranty and the System Assurance shall cover the replacement or repair of defective product(s) and labor for the replacement or repair of such defective product(s).
 - 3. System Certification: Upon successful completion of the installation and subsequent inspection, the customer shall be provided with a numbered certificate, from the manufacturing company, registering the installation.
- C. The system manufacturer shall maintain engineering and service departments capable of rendering advice regarding installation and final adjustment of the system.
- D. Respond to a trouble call within twenty-four (24) hours or less, after receipt of such a call.

- E. Pre-register this project with the Manufacturer for the Warranty Period, in accordance with the Manufacturer's requirements.
- F. Provide responsibility for and pay for damages caused by or resulting from defects in workmanship.
- G. The Contract unconditionally guarantees, for a minimum of two (2) years, as set forth in the General Conditions, all materials, workmanship, and installation. During this period, adjust, repair, or replace at no cost to the Owner any item of equipment or workmanship found to be defective.
- H. Telephone support services for one year as a first line of service in resolving technical support problems shall be provided.
- I. Warranty shall meet or exceed the basis of design manufacturer's standard warranty for each product provided.
- J. The Manufacturer's warranty shall not relieve Division 27 of any responsibility for complying with the (2) year warranty required for State contracts.
- K. Warranties shall be registered in the Owner's.
- L. All documentation relating the warranty coverage, period of coverage, etc. shall be provided to Owner.

1.7 QUALITY ASSURANCE

- A. All items of equipment, including wire and cable, shall be designed by the manufacturer to function as a complete system and shall be accompanied by the manufacturer's complete service notes and drawings detailing all connections.
- B. Only bidders who have been pre-approved by the Owner will be issued bidding documents. To be added to the pre-approved bidders' list, you must submit in writing evidence of having performed satisfactory work in other installations and being able to meet all criteria described in this document. Failure to meet these qualifications shall preclude the Bidder from being awarded the Contract to perform this project.
- C. The Bidder shall be an established communications and electronics installer that has had, and currently maintains, a locally run and operated business for at least five (5) years. The contractor shall be a duly authorized distributor of the equipment supplied with full manufacturers' warranty and service privileges.
- D. Show satisfactory evidence, upon request, that he maintains a fully equipped service organization capable of furnishing adequate inspection and service to the system. Maintain at his facility the necessary spare parts in the proper proportion as recommended by the manufacturers to maintain and service the equipment being supplied. However, maintain in house, at a minimum, the spare parts necessary to completely repair three (3) systems.

- E. Factory-certification, training, and authorized installer of all equipment to be installed is required. Certification shall occur prior to award of contract. All installers shall be trained by a factory representative for both copper and fiber optic applications.
- F. Standards and Codes: All work performed under this contract shall be done in accordance with the most recent issue and latest revisions of the following codes, standards, and guidelines. All materials and equipment shall be UL listed for the intended application.
1. Delaware Department of Technology and Information, *Delaware State-wide Information Technology and Architecture Standards*.
 2. Americans with Disabilities Act (ADA), and the ADA Accessibility Guidelines (ADAAG).
 3. American National Standard Institute (ANSI).
 4. ANSI A117.1-1980.
 5. ASTM E 814 - American Society for Testing Materials, Fire Tests of Through-Penetration Firestops.
 6. BISCI Building Industry Consulting Service International Telecommunications Distribution Methods Manual (TDMM).
 7. BISCI Cabling Installation Manual.
 8. Building Officials and Code Administrators (BOCA) National Building Code.
 9. EIA-455-171-D Standard Test Procedures for Fiber Optic Cables.
 10. Federal Communications Commission (FCC) Rules (including FCC 47 CFR 68) The Code of Federal Regulations.
 11. ICEA S-80-576, Communications Wire and Cable for Wiring of Premises.
 12. ICEA S-90-661. Indoor Wiring Standard.
 13. IEEE 1100 (Latest Edition) - Recommended Practice for Powering and Grounding Sensitive Electronic Equipment.
 14. Local Codes.
 15. NFPA National Fire Protection Association, including NFPA 70 *National Electrical Code*, NFPA 75 *Protection of Electronic/Data Processing Equipment*, NFPA 101 *Life Safety Code*, and NFPA 780 *Lightning Protection Code*.
 16. Requirements of the Fire Marshal.
 17. TIA/EIA-455-61. FOTP-61, Measurement of Fiber or Cable Attenuation Using an OTDR.
 18. TIA/EIA-568-B Electronics Industries Association/Telecommunications Industry Association Commercial Building Telecommunications Cabling Standard.
 19. TIA/EIA-569-B Electronic Industries Association/Telecommunications Industry Association Commercial Building Standard for Telecommunications Pathways and Spaces.
 20. TIA/EIA-TSB-36. Technical Systems Bulletin Additional Cable Specifications for Unshielded Twisted-Pair Cables.
 21. TIA/EIA-TSB-40 Technical Systems Bulletin: Additional Transmission Specifications for Unshielded Twisted Pair Connecting Hardware.
 22. TIA/EIA-TSB-53.
 23. TIA/EIA-TSB-67. EIA/TIA Telecommunications Systems Bulletin, Additional Transmission Specifications for Unshielded Twisted-Pair Connecting Hardware.

24. TIA/EIA-TSB-75. Technical Systems Bulletin - Additional Horizontal Cabling Practices for Open Offices.
 25. Underwriter's Laboratories (UL) Twisted-Pair Certification Program.
 26. UL Fire Resistance Directory, Volumes 1 and 2.
 27. UL 486A - Wire Connectors and Soldering Lugs for Use with Copper Conductors.
 28. UL 910 - Test for Flame Propagation and Smoke Density Values for Electrical and Optical Fiber Cables Used in Spaces Transporting Environmental Air.
 29. UL 1479 - Fire Tests of Through-Penetration Firestops.
 30. Video Electronics Standards Association (VESA).
 31. If local regulations or codes are more stringent, then those stipulations shall govern.
- G. The firm shall be experienced regularly engaged in the layout and installation of structured cabling systems of similar size and complexity as required for this installation. Factory-certification for all of the products installed.
- H. Successful performance with at least five (5) projects of similar size and scope, within two years of the date of this bid. Proof of performance shall be in the form of reference sheets which shall include a brief description of the project, the beginning and ending contract price, the project foreman, or superintendent's name, and the name, address, and telephone number of a project contact.
- I. Provide a list of their technical support staff, together with their working experience and certification(s).
- J. State if their support staff are trained in the manufacturer's factory, on-site training, or other means (college courses, etc.).
- K. State their nearest branch office and dealer's office in relation to the proposed site of the structured building cabling system. If none, the location of the main office shall be stated.
- L. Provide evidence of being factory-authorized to design, engineer, install, and maintain the proposed AV systems.
- M. Enclose letters of commendations from previous customers, if any.
- N. List all sub-contractors and provide information as required in this section for each sub-contractor. Information shall be submitted with bid forms and is due at time of bid opening. The Owner retains the right to request a substitution if in the Owner's opinion, the sub-contractor is not qualified. If an acceptable sub cannot be identified, we retain the right for rejection.
- 1.8 SINGLE SOURCE RESPONSIBILITY AND ACCEPTABLE MANUFACTURERS
- A. Except where specifically noted otherwise, all equipment and products for each subsystem: (AV systems and Network Video Distribution system), shall be the standard products of a single manufacturer of known reputation and experience in the industry. Integration of various manufacturers' products within each subsection in an attempt to

meet the specifications shall be deemed in direct conflict with this specification and shall be automatically rejected.

- B. Any potential substitute manufacturer shall be judged against the manufacturer of the highest quality and more stringent specifications for all the manufacturers listed in this specification.
- C. Although multiple manufacturers have been listed and cited, along with specific part numbers, this does not indicate pre-approved products. Listing and citations of manufacturer's name and product part numbers is for the purpose of establishing quality and performance criteria.
- D. For purposes of determining equality, technical and general information set forth on the respective data sheets by manufacturers named in this section for each specified item shall be considered as part of these Specifications and binding herein. Any proposed equal item offered shall be substantiated fully to prove equality. The Architect, Engineer, and Owner reserves the right to require a complete sample of any proposed equal item and may, if necessary, request a sample tested by and a copy of the test results from an independent testing laboratory to prove equality. The decision of the Owner or Owner's Representative regarding equality of proposed equal items will be final.
- E. Provide appropriate quantities of materials to provide a complete, functional system.
- F. All specified items, functions, and quantities are critical to the operation of the School and must be provided exactly as specified. The Architect, Engineer, Owner's representative and Owner reserve the right to determine if alternate equipment and means of operations meet the requirements of the Project.
- G. As this is a performance-based specification, all functions, components and quantities of the system will be reviewed in detail for total compliance. Manufacturers and installer shall also fully comply with the provisions specified in this section.
- H. The intent is to establish a standard of quality, function, and features. It is the responsibility of the bidder to insure that the proposed product meets or exceeds every standard set forth in these specifications.
- I. All equipment shall be new and shall be the latest product of a manufacturer of established reputation and experience of quality electronic equipment.

1.9 SAFETY / COMPLIANCE TESTING

- A. All equipment used for normal daily activities/operation by staff and/or students shall be mounted at ADA required heights (for example, sound enhancement system cabinets).
- B. All data and video system active components shall be UL listed.
- C. All materials and equipment shall be installed and completed in a high quality and workmanlike manner and in accordance with the best modern methods and practice. The Contractor shall be certain that all installation work areas are secure and made safe in accordance with Occupational Safety and Health Administration (OSHA) regulations.

1.10 IN SERVICE TRAINING

- A. Provide a minimum of sixteen (16) hours in four (4) four-hour sessions of in service on-site training with these systems. The training sessions shall be divided into segments which will facilitate the instruction of individuals in the operation of the systems. Operations Manuals and Users Guides shall be provided at the time of this training.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. All supplies and/or materials shall be held by the Installer until needed at the site, unless they can be stored in the area in which the work is to be done and that area has been closed to occupant usage.
- B. Obtain the permission of the Construction Manager regarding any needed storage of materials and equipment. Such storage shall be done in such a manner as not to interfere with the building schedule. Provide responsibility for any and all accidents caused by negligence from this source. The Owner does not accept responsibility for losses of material or equipment, regardless of approval to store, in any institution's facilities or grounds.
- C. All deliveries shall be scheduled, received and will be the responsibility of the Contractor; and deliveries by "Drop Shipment" from other sources will not be accepted by the Owner.
- D. Delivery: Make all arrangements to unload and transport delivered materials and equipment to the job site. Equipment and materials shall be received at the site in new condition and shall be maintained in new condition throughout the installation process.
- E. Cable reels shall not be rolled or stored without an appropriate underlay.

1.12 PROJECT/SITE CONDITIONS

- A. Expect that other Contractors from other trades and Contracts may be working in the building at the same time while this Contract is in progress. Fully cooperate with all those working in the building. Work shall be done as described in the General Conditions.
- B. Meet with the appointed representative of the Owner prior to the start of installation work, to determine phasing and timing of planned installation. Prior to starting the installation, the assigned supervisor or lead technician, shall participate in a walk-through of the project with the Owner to review the engineering/installation documentation and verify all installation methods and cable routes.
- C. Examine the site and observe the conditions under which the work will be done or other circumstances which will affect the work before submitting his bid. No subsequent allowance will be made for errors or omissions in connection with this examination.
- D. Obtain and pay for any and all certificates and permits required for the work to be performed.

- E. Materials installed which do not present an orderly and reasonably neat or workmanlike appearance or are not installed in accordance with these specifications or the Contract Drawings shall be removed and replaced at the Contractor's expense when so directed by the Construction Manager or Owner.
- F. Drawings shall be considered schematic in nature and shall represent a completed product. Contractor is responsible for installation of equipment and methods of achieving a satisfactory and intended installation. Locations of devices are intended to show a general arrangement and intended function. Coordinate with all Contract Documents and existing conditions. Coordinate with other trades.
- G. Where there exists a conflict between Drawings and Specifications, the Engineer shall be contacted to determine the intent. In all circumstances, the final Contract Document interpretation shall provide compliance with all codes.
- H. Wiring devices shall be located uniformly with respect to building structure and other work. Locations shall be coordinated. Should there be any interference between electrical wiring and other trades, notify the Engineer via the Construction Manager so that proper location may be decided upon.
- I. If mention has been omitted herein of any items (installation tools) of the work or materials usually furnished for, or necessary to the completion of the cabling work (screws, anchors, clamps, tie wraps, distribution rings, miscellaneous grounding and support hardware) or if there are conflicting points in the Specifications, the Construction Manager's attention should be called to such an item or items in sufficient time for a formal addendum to be issued. Any and all conflicting points in the Specifications and/or Drawings which are not questioned by the successful bidder and clarified prior to opening of bids shall be subject to the interpretation of the Engineer, Architect, or Owner after award of the contract, and its interpretation shall be binding upon the successful bidder.

1.13 WARRANTY

- A. Warranty shall meet or exceed the basis of design manufacturer's standard warranty for each product provided.
- B. The Manufacturer's warranty shall not relieve Division 27 of any responsibility for complying with the (2) year warranty required for State contracts.
- C. Warranties shall be registered in the Owner's.
- D. All documentation relating the warranty coverage, period of coverage, etc. shall be provided to Owner.

1.14 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Sound Enhancement System:
 - a. (5) complete sound enhancement systems.
2. Wall Mounted Projector:
 - a. (5) Wall mounted projectors.
 - b. (20) Projector lamps.
3. SMART Boards
 - a. (5) SMART Boards.
4. Jumper Cabling Kit.
 - a. (5) Interactive Whiteboard jumper cabling kit.
 - b. (5) Teacher-Projector Drop jumper cabling kit.

PART 2 PRODUCTS

2.1 CABLING – STRUCTURED AND JUMPERS

A. Structured Cabling Performance:

1. Provide complete cabling system from source face plate assembly to destination face plate assembly. Cables shall be provided in quantity and quality to provide transmission of all audio and video components as indicated on Drawings.
2. Installation of cables shall adhere to, but not limited to previous guidelines and codes cited under Article “Quality Assurance” in this Section.
3. Testing shall ensure all cables are free of shorts and opens. Testing shall prove cables are operational and free from interference. Systems producing video or audio distortion shall be analyzed to determine the source. Corrective action shall be taken to correct, remove, or provide additional EMI shielding to eliminate the distortion of the audio or video signal.

B. Structured Cabling:

1. Category 6 cabling:
 - i. Category 6 cable shall feature: (4) twisted pairs, 23 AWG insulated solid conductors, ripcord, surrounded by a tight outer jacket. Cables shall have an UL plenum rating.
 - ii. Cable shall be adequate length to extend from point-to-point without introducing strain on the conductors.
 - iii. Terminate per manufacturer’s instruction.
2. Plenum rated speaker cabling:
 - i. Commercial Audio Cables shall be unshielded, plenum rated, (2) 16 AWG stranded bare copper conductors with low smoke polyvinyl chloride insulation,

- and low smoke polyvinyl chloride jacket. Cables shall have an UL plenum rating.
 - ii. Insulated conductors coloring shall be (1) red and (1) black along entire length of cable.
 - iii. Cable assembly shall provide outer jacket rip cord along entire length of cable.
3. Multipurpose AV Cabling:
- i. Cabling shall feature compact connector at each end suitable for pulling through $\frac{3}{4}$ " conduit.
 - ii. Cabling system shall feature connectors capable of repeated mating with various AV modules.
 - iii. Cable design shall provide transparent video and flawless audio.
 - iv. Cable assembly shall be made to length.
- A. Jumper Cabling Performance:
- 1. Provide complete cabling system from face plate assembly to electronic equipment. Cables shall be provided in quantity and quality to provide transmission of all audio and video components as indicated on Drawings.
 - 2. Testing shall ensure all cables are free of shorts and opens. Testing shall prove cables are operational and free from interference. Systems producing video or audio distortion shall be analyzed to determine the source. Corrective action shall be taken to correct, remove, or provide additional EMI shielding to eliminate the distortion of the audio or video signal.
 - 3. Length for each installation shall be verified prior to procuring. Cable shall be adequate length to extend from point-to-point without introducing strain on the conductors. Cables shall be neatly bundle and secure with Velcro type wraps. Installation shall not require excessive cable bundling.
 - 4. Cable management system shall provide adequate strain relief to prevent damage to connectors and attachment plugs. The system shall provide adequate strain relief at the serving furniture to prevent damage to the jumper cables.
- B. Jumper Cables:
- 1. Audio Cable, 3.5mm-to-(2) RCA connector type:
 - i. Audio cable shall feature: (2) 27 AWG oxygen-free copper conductors, drain wire, aluminum foil shield, and fully molded, gold-plated connectors.
 - ii. Connector gender shall be male for each.
 - 2. Audio Cable, 3.5mm- to-3.5mm connector type:
 - i. Audio cable shall feature: (2) copper conductors, drain wire, braided shield, and fully molded, nickel-plated connectors.
 - ii. Connector gender shall be male for each.
 - 3. Audio Cable, (2) RCA-to-(2) RCA connector type:

- i. Audio cable shall feature: nitrogen-injected dielectric material, 6-cut RCA connectors, split-tip center, gold plating, flexible PVC jacket, and molded connector with integral strain relief.
 - ii. Connector gender shall be male for each.
4. Video Cable, RCA-to-RCA connector type:
 - i. Audio cable shall feature: silver plated copper conductor, 6-cut RCA connectors, split-tip center, gold plating, flexible PVC jacket, 75 ohm impedance and molded connector with integral strain relief.
 - ii. Connector gender shall be male for each.
5. Video Cable, VGA, HD-15 to HD-15 connector type:
 - i. Video cable shall feature: mini-coax (RGB) and paired video wire construction, gold plated contacts, gold plated connectors, foil and braid for double shielding, and molded connectors for integral strain relief.
 - ii. Connector gender shall be male for each.
6. Video Cable, VGA, HD-15 to HD-15 connector type:
 - i. Video cable shall feature: mini-coax (RGB) and paired video wire construction, gold plated contacts, gold plated connectors, foil and braid for double shielding, and molded connectors for integral strain relief.
 - ii. Connector gender shall be (1) male and (1) female.
7. Category 6 patch cable:
 - i. Category 6 Patch cable shall feature: (4) pairs, 24 AWG 7/32 tinned copper stranded conductors, each insulated with polyethylene, polyester coated aluminum foil outer wrap, and overall jacket with UL flame-retardant PVC.
8. HDMI Cable:
 - i. HDMI cable shall feature (2) 28 AWG silver-plated conductors, quad-shielding, precision-formulated dielectric material and fully molded connectors.
 - ii. Connector gender shall be male for each.
 - iii. Cable finish shall be black.
9. Data Cable, USB, USB Type A to USB Type B connector type:
 - i. USB cable shall support data transfer rate of 1.5 to 480 Mbps for low and high speed devices.
 - ii. Cable shall feature twisted 28/20 AWG conductors, double-shield with tin copper braid and aluminum mylar foil, and gold plated connectors with molded strain relief.
 - iii. Connector gender shall be male for each.
10. VGA Splitter:
 - i. 2 Port VGA video splitter capable providing bandwidth support at 350 MHz.
 - ii. Splitter shall be capable of displaying one video presentation on (2) separate VGA monitors.
 - iii. Manufacturer shall test and certify external power supply for use with splitter as noise-free power source.
 - iv. Connector gender shall be (2) standard VGA HD-15 female and (1) standard VGA HD-15 male.

11. USB Ethernet Adapter:
 - i. USB adapter shall provide USB over Cat 6 connection.
 - ii. Kit shall support communications between host computer and peripherals for a minimum of 150 feet.
 - iii. Units shall be bus powered.
 - iv. Local Unit: (1) Connector USB A (M), (1) RJ45 (F)
 - v. Remote Unit: (1) Connector USB A (F), (1) RJ45 (F)

12. Surge Suppressor:
 - i. AC surge suppression and power conditioning unit for various electronic equipment.
 - ii. Unit shall feature (7) outlets with NEMA 5-15P configuration.
 - iii. Clamping level threshold shall be 150 volts with EMI/RFI noise filtration of 20 dB.

2.2 AUDIO/VIDEO CLASSROOM PRESENTATION SYSTEMS

- A. Provide a complete and operational Audio/video Classroom Presentation System in each space designated as a classroom. Each system shall consist of the following:
 1. Interactive Whiteboard with Projector
 2. Sound Enhancement System
 3. Document Camera
 4. Interactive Whiteboard Cabling Kit
 5. Sound Enhancement Cabling Kit
 6. Teacher-Projector Drop
 7. Concealed Cabling

- B. AV modules in the teacher projector drop, sound enhancement drop, and interactive white board drop shall provide a means for receiving and distributing data, voice, audio, and video signals as indicated.

- C. Interactive Whiteboard with Projector:
 1. Provide SMART Board 885ix interactive whiteboard system with the following equipment.
 - a. SMART Board
 - b. SMART Projector

 2. Provide jack or module arrangement in face plate as indicated on Drawings.

 3. Provide Interactive Whiteboard face plate with required modules. Schedule provided is for reference. Face plate modules shall be coordinated with Detail on Drawings and with Manufacturer prior to procuring.

INTERACTIVE WHITE BOARD DROP - FACE PLATE - SCHEDULE				
Qty.	Description	Basis-of-Design	Available Manufacturers	
1	IMF Stainless Steel Face plate - 3 Gang	Hubbell	Ortronics	Panduit
2	(3) RCA Composite (Y,R,W) + 3.5mm	Hubbell	Ortronics	Panduit
1	2U HDMI Extender Module, Display	Hubbell	Ortronics	Panduit
1	3.5mm to 110 Termination - Audio	Hubbell	Ortronics	Panduit
1	1U Module Unloaded - 2 Port	Hubbell	Ortronics	Panduit
1	1U Module Unloaded - 1 Port	Hubbell	Ortronics	Panduit
1	1U Module Unloaded - HD15	Hubbell	Ortronics	Panduit
1	VGA, P-n-P, 15-Pin (F)	Hubbell	Ortronics	Panduit
2	1U Blank	Hubbell	Ortronics	Panduit
2	Category 6 Module	Hubbell	Ortronics	Panduit

4. Interactive Whiteboard Structured Cabling:

INTERACTIVE WHITE BOARD DROP - STRUCTURED CABLING - SCHEDULE				
Qty.	Description	Basis-of-Design	Available Manufacturers	
4	Plug-n-Play Horizontal Cable Run	Hubbell	Ortronics	Panduit
3	Category 6 Cable	Hubbell	Belden	Berk-Tek

5. Interactive Whiteboard Jumper Cabling:

INTERACTIVE WHITE BOARD DROP - CABLING KIT - SCHEDULE					
Qty.	Description	Basis-of-Design	Available Manufacturers		Length (Min.)
1	High Speed HDMI Cable (M-M)	Tripp Lite	Belkin	Belden	24"
1	RCA Composite Video (M-M)	Tripp Lite	Belkin	Belden	24"
1	(2) RCA (L/R) (M-M)	Tripp Lite	Belkin	Belden	24"
3	3.5mm Audio Cable (M-M)	Tripp Lite	Belkin	Belden	24"
2	Category 6 Patch Cable	Tripp Lite	Belkin	Belden	24"
1	VGA, HD-15 to HD-15 (M-M)	Tripp Lite	Belkin	Belden	24"
2	USB Cat 5e/6 Adapters	Tripp Lite	Belkin	Ultra	--
--	Velcro type One-wrap Ties	Velcro	Or Equal		As Req'd

D. Sound Enhancement System:

1. Provide Pro Digital 940R.
2. System shall include the following:
 - a. Digital Receiver.
 - b. Pendant Microphone

- c. Charging station
 - e. (4) Ceiling Speakers (Typical)
 - f. Wall Mount Cabinet:
5. Provide Sound Enhancement System face plate with required modules. Schedule provided is for reference. Face plate modules shall be coordinated with Detail on Drawings and with Manufacturer prior to procuring.

SOUND ENHANCEMENT DROP - FACE PLATE - SCHEDULE				
Qty.	Description	Basis-of-Design	Available Manufacturers	
1	IMF Stainless Steel Face plate - 1 Gang	Hubbell	Ortronics	Panduit
1	3.5mm to 110 Termination - Audio	Hubbell	Ortronics	Panduit
2	1U Blank	Hubbell	Ortronics	Panduit

6. Classroom Sound Enhancement Structured Cabling :

SOUND ENHANCEMENT DROP - STRUCTURED CABLING - SCHEDULE					
Qty.	Description	Basis-of-Design	Available Manufacturers		Length (Min.)
2	Category 6 Cable	Hubbell	Belden	Berk-Tek	As Req'd
Refer to Manufacturer for recommended cables serving IR Sensor and Speakers.					

- a. Provide cabling from wall mounted audio modules at Control Unit to wall mounted audio modules at Interactive White Board.
- b. Coordinate cabling to interface with Public Address System for school-wide broadcasting.

6. Classroom Sound Enhancement Jumper Cabling :

SOUND ENHANCEMENT DROP - CABLING KIT - SCHEDULE					
Qty.	Description	Basis-of-Design	Available Manufacturers		Length (Min.)
1	3.5mm to (2) RCA (M-M)	Tripp Lite	Belkin	Belden	As Req'd
--	Velcro type One-wrap Ties	Velcro	Or Equal		As Req'd

7. Wall Mount Cabinet:

- a. Product Description:
 - i. Provide a wall mount steel cabinet by Arasco or approved equal.
 - ii. Construction shall be fabricated with a minimum of 18 gauge cold rolled steel with a powder coat for maximum durability. Cabinet back shall be solid, box brace reinforcement type construction, and fixed bottom. Doors shall be hinged with non-locking latch.

- iii. Dimensions: 24" x 18" x 15"
- iv. Finish shall be selected by Architect from manufacturer's standard options.
- v. Cabinet shall provide perforations for adequate ventilation.s

D. Document Camera:

- 1. Provide SMART Document Camera™, model 450.

E. Teacher-Projector Drop (TP):

- 1. Provide Teacher-Projector Drop face plate with required modules. Schedule provided is for reference. Face plate modules shall be coordinated with Details on Drawings and with Manufacturer prior to procuring.

TEACHER-PROJECTOR DROP - FACE PLATE - SCHEDULE				
Qty.	Description	Basis-of-Design	Available Manufacturers	
1	IMF Stainless Steel Face plate - 3 Gang	Hubbell	Ortronics	Panduit
2	(3) RCA Composite (Y,R,W) + 3.5mm	Hubbell	Ortronics	Panduit
1	2U HDMI Extender Module, Source	Hubbell	Ortronics	Panduit
3	1U Module Unloaded - 2 Port	Hubbell	Ortronics	Panduit
1	1U Module Unloaded - HD15	Hubbell	Ortronics	Panduit
1	VGA, P-n-P, 15-Pin (F)	Hubbell	Ortronics	Panduit
6	Category 6 Module	Hubbell	Ortronics	Panduit

2. Teacher-Projector Drop Structured Cabling:

TEACHER-PROJECTOR DROP - STRUCTURED CABLING - SCHEDULE					
Qty.	Description	Basis-of-Design	Available Manufacturers		
3	Plug-n-Play Horizontal Cable Run	Hubbell	Ortronics	Panduit	
7	Category 6 Cable	Hubbell	Belden	Berk-Tek	

3. Teacher-Projector Drop Jumper Cabling Kit:

TEACHER-PROJECTOR DROP - CABLING KIT - SCHEDULE					
Qty.	Description	Basis-of-Design	Available Manufacturers		Length (Min.)
1	High Speed HDMI Cable (M-M)	Tripp Lite	Belkin	Belden	As Req'd
1	RCA Composite Video (M-M)	Tripp Lite	Belkin	Belden	As Req'd
1	(2) RCA (L/R) (M-M)	Tripp Lite	Belkin	Belden	As Req'd
1	3.5mm Audio Cable (M-M)	Tripp Lite	Belkin	Belden	As Req'd
3	Category 6 Patch Cable	Tripp Lite	Belkin	Belden	As Req'd
2	VGA, HD-15 to HD-15 (M-M)	Tripp Lite	Belkin	Belden	As Req'd
1	VGA, HD-15 to HD-15 (M-F)	Tripp Lite	Belkin	Belden	As Req'd
2	USB Cat 5e/6 Adapters	Tripp Lite	Belkin	Ultra	--
1	VGA 2-Port Splitter	Tripp Lite	Blackbox	StarTech	--
1	Surge Suppressor	Tripp Lite	--	--	--
1	Wall Mounted Saddle Tie	Velcro	Or Equal		As Req'd
--	Velcro type One-wrap Ties	Velcro	Or Equal		As Req'd

4. Under Desk Cable Tray:

- a. Wire tray type cable management system with (3) built-in screw mounting holes.
- b. Fully welded, powder coated steel construction for long service life.
- c. Wire tray shall measure 3”(H) x 5”(W). Length shall be minimum of 36”.
- d. Attached wire tray to desk per manufacturer’s instructions.
- e. Provide Velcro type wrap to secure data and power cables from wall to wire tray.

2.3 AUDIO/VIDEO TRAINING ROOMS PRESENTATION SYSTEM

- A. Provide a complete and operational Audio/Video Conference/Training Room Presentation System in each designated space in the Administration Area. Each system shall consist of the following:
 1. Interactive Whiteboard with Projector
 2. Sound Enhancement System
 3. Document Camera
 4. Training Room Drop
 5. Interactive Whiteboard Cabling Kit
 6. Sound Enhancement Cabling Kit
 7. Training Room Cabling Kit
 8. Concealed Cabling
- B. Refer to 2.1.B “Interactive White Board with Projector” for additional information.
- C. Refer to 2.1.C “Sound Enhancement System” for additional information.
- D. Refer to 2.1.D “Document Camera” for additional information.
- E. Training Room Projector Drop:

1. Provide Training Room Projector Drop face plate with required modules. Schedule provided is for reference. Face plate modules shall be coordinated with Manufacturer prior to procuring.

TRAINING ROOM DROP - FACE PLATES - SCHEDULE				
Qty.	Description	Basis-of-Design	Available Manufacturers	
1	(3) RCA Composite (Y,R,W) + 3.5mm	Hubbell	Ortronics	Panduit
1	2U HDMI Extender Module -Source	Hubbell	Ortronics	Panduit
1	1.5Unit Blank	Hubbell	Ortronics	Panduit
1	1U Blank	Hubbell	Ortronics	Panduit
1	Blank Plate	Hubbell	Ortronics	Panduit
1	1.5 Unit Blank	Hubbell	Ortronics	Panduit
2	3-Unit I-Station Plate	Hubbell	Ortronics	Panduit
1	3-Port Decora Frame for (3) Modules	Hubbell	Ortronics	Panduit
1	Decora Plate for ISF3-- Frame	Hubbell	Ortronics	Panduit
3	Category 6 Modules	Hubbell	Ortronics	Panduit

2. Training Room Projector Drop Structured Cabling:

TRAINING ROOM DROP - STRUCTURED CABLING - SCHEDULE				
Qty.	Description	Basis-of-Design	Available Manufacturers	
1	Plug-n-Play Horizontal Cable Run	Hubbell	Ortronics	Panduit
3	Category 6 Cable	Hubbell	Belden	Berk-Tek

3. Recessed Work Surface Portal:
 - a. Recessed work surface portal shall be installed to provide a flush mounted installation in Training Room table. Coordinate location and orientation with Owner.
 - b. Portal shall provide modules to match those specified under this Section, 2.3(E).
 - c. Provide Pre-Wired Work Surface Elite series by Hubbell, or approved equal.
4. Training Room Projector Drop Jumper Cabling Kit.

TRAINING ROOM PROJECTOR DROP - CABLING KIT - SCHEDULE					
Qty.	Description	Basis-of-Design	Available Manufacturers		Length (Min.)
1	High Speed HDMI Cable (M-M)	Tripp Lite	Belkin	Belden	10'
1	RCA Composite Video (M-M)	Tripp Lite	Belkin	Belden	10'
1	(2) RCA (L/R) (M-M)	Tripp Lite	Belkin	Belden	10'
1	3.5mm Audio Cable (M-M)	Tripp Lite	Belkin	Belden	10'
3	Category 6 Patch Cable	Tripp Lite	Belkin	Belden	10'
1	VGA, HD-15 to HD-15 (M-F)	Tripp Lite	Belkin	Belden	10'
1	USB Cat 5e/6 Adapters	Tripp Lite	Belkin	Ultra	--
--	Velcro type One-wrap Ties	Velcro	Or Equal		As Req'd

2.4 AUDIO/VIDEO CAFETERIA/MULTIPURPOSE PRESENTATION SYSTEM

- A. Provide a complete and operational Audio/video Cafeteria/Multipurpose Presentation System in each space designated as a conference room. Each system shall consist of the following:
1. Ceiling Mounted Projector
 2. Projector – Suspended Ceiling Mounting Hardware
 3. Cafeteria Sound System
 4. Cafeteria/Multipurpose Projector Drop
 5. Cafeteria/Multipurpose Projector Drop Cabling Kit
 5. Cafeteria/Multipurpose Ceiling Mounted Projector Drop
 6. Cafeteria/Multipurpose Ceiling Mounted Projector Drop Cabling Kit
 7. Concealed Cabling
- B. Refer to Article “Scope of Work”, for additional information.
- C. Refer to Division 11 Section “Projection Screen” for additional information.
- D. Provide ceiling mounted projector system by Panasonic PT-DZ570U1 series, InFocus IN5312 series, or approved equal, subject to compliance with the following requirements.
1. Features shall be suitable for space being served, including, but not limited to, throw distance, aspect ratio, lumen output, input and output connections, remote control, and computer capability.
 2. Throw ratio: 1.86
 3. Aspect ratio: 4:3
 4. Lumen output: 4000 (minimum)
 5. Connections:
 - a. HDMI
 - b. VGA
 - c. RCA Component Video
 - d. RCA (R&L)
 - e. S-Video
 - f. DVI-I

- g. Network – 10Base-T, 100Base-TX
- 6. Remote Control

E. Projector - Suspended Ceiling Mounting Hardware

- 1. Provide suspended ceiling mounting kit complete with 2'x2' mounting plate, universal projector mounting frame, adjustable hollow pole, and required hardware. Install safety cables from mounting plate and adjustable hollow pole to structure.
- 2. 2'x2' suspended ceiling mounting plate shall be rigidly fastened to the structure using threaded rod or u-channel support to provide secure installation.
- 3. Adjustable hollow pole shall provide raceway for audio, video, and power cables from connections at ceiling to projector. Pole shall be rated for minimum of 50 pounds.
- 4. Mounting plate shall have provisions mounting outlet boxes for power and AV and data. Receptacle installation in suspended ceiling mounting plate serving projector shall be provided under Division 26.
- 5. Universal projector mounting frame shall provide provisions to install the projector in an upside down position and terminate to adjustable hollow pole.

F. Cafeteria Sound System

- 1. Coordinate audio connections with Cafeteria Sound System installer. Refer to Division 27, Section "Gymnasium and Cafeteria Sound System".

G. Cafeteria/Multipurpose (C/M) Projector Drop (CP)

- 1. Drop shall include AV modules and category 6, RJ45 modules to connect computer to structure cabling for transmission and reception of audio/video and data. One category 6, RJ45 modules shall be provide for VoIP.
- 2. Provide Cafeteria/Multipurpose Projector Drop face plate with required modules. Schedule provided is for reference. Face plate modules shall be coordinated with Detail on Drawings and with Manufacturer prior to procuring.

C/M PROJECTOR DROP - FACE PLATE - SCHEDULE				
Qty.	Description	Basis-of-Design	Available Manufacturers	
1	IMF Stainless Steel Face plate - 2 Gang	Hubbell	Ortronics	Panduit
1	(3) RCA Composite (Y,R,W)	Hubbell	Ortronics	Panduit
1	3.5 mm 110 termination	Hubbell	Ortronics	Panduit
1	2U HDMI Extender Module	Hubbell	Ortronics	Panduit
1	1U Module Unloaded - 2 Port	Hubbell	Ortronics	Panduit
2	1U Module Unloaded - 1 Port	Hubbell	Ortronics	Panduit
2	1U Blank Module	Hubbell	Ortronics	Panduit
3	Category 6 Module	Hubbell	Ortronics	Panduit

H. Cafeteria/Multipurpose Projector Drop Structured Cabling:

1. Structured cabling shall be run from C/M Projector Drop to C/M Ceiling Mounted Projector Drop and Cafeteria Sound System Drop as required. Schedule provided is for reference. Cables and cable lengths shall be coordinated with Drawings and with Manufacturer prior to procuring.

C/M PROJECTOR DROP - STRUCTURED CABLING - SCHEDULE						
Qty.	Description	Basis-of-Design	Available Manufacturers			Length (Min.)
2	Plug-n-Play Horizontal Cable Run	Hubbell	Ortronics	Panduit	--	As Req'd
6	Category 6 Cable	Hubbell	Belden	Berk-Tek		As Req'd

I. Cafeteria/Multipurpose Projector Drop Cabling Kit:

1. Provide cabling as required for a complete kit. Refer to schedule for additional information.
2. Cabling kit shall be turned over to Owner for storage.

CAFETERIA/ MULTIPURPOSE PROJ. DROP - CABLING KIT - SCHEDULE					
Qty.	Description	Basis-of-Design	Available Manufacturers		Length (Min.)
1	High Speed HDMI Cable (M-M)	Tripp Lite	Belkin	Belden	15'
1	RCA Composite Video (M-M)	Tripp Lite	Belkin	Belden	15'
1	(2) RCA (L/R) (M-M)	Tripp Lite	Belkin	Belden	15'
1	3.5mm Audio Cable (M-M)	Tripp Lite	Belkin	Belden	15'
3	Category 6 Patch Cable	Tripp Lite	Belkin	Belden	15'
1	VGA, HD-15 to HD-15 (M-F)	Tripp Lite	Belkin	Belden	15'
--	Velcro type One-wrap Ties	Velcro	Or Equal		As Req'd

J. Cafeteria/Multipurpose Ceiling Mounted Projector Drop (AVP):

1. Drop shall include AV modules to connect structure cabling to overhead projector via HDMI and component video. Drop shall provide means for connecting to the network via category 6, RJ45 connector.
2. Provide Cafeteria/Multipurpose Ceiling Mounted Projector Drop face plate with required modules. Schedule provided is for reference. Face plate modules shall be coordinated with Detail on Drawings and with Manufacturer prior to procuring.

C/M CEILING MOUNTED PROJECTOR DROP- FACE PLATE - SCHEDULE				
Qty.	Description	Basis-of-Design	Available Manufacturers	
1	IMF Stainless Steel Face plate - 1 Gang	Hubbell	Ortronics	Panduit
1	2U HDMI Extender Module	Hubbell	Ortronics	Panduit
1	VGA, P-n-P, 15-Pin (F)	Hubbell	Ortronics	Panduit
2	1U Module Unloaded - 1 Port	Hubbell	Ortronics	Panduit
1	1U Blank Module	Hubbell	Ortronics	Panduit
1	Category 6 Module	Hubbell	Ortronics	Panduit
1	RCA Composite Video	Hubbell	Ortronics	Panduit

K. Cafeteria/Multipurpose Ceiling Mounted Projector Drop - Structured Cabling:

1. Provide structured cabling as required from the Cafeteria/Multipurpose Ceiling Mounted Projector Drop to Cafeteria/Multipurpose Projector Drop. Refer to C/M Projector Drop – Structure Cabling for additional information in this section.

L. Cafeteria/Multipurpose Ceiling Mounted Projector Drop Cabling Kit:

1. Provide cabling as required for a complete kit. Schedule provided is for reference. Cables and cable lengths shall be coordinated with Drawings, Manufacturer, and Owner prior to procuring.

C/M CEILING MOUNTED PROJ. DROP - CABLING KIT - SCHEDULE					
Qty.	Description	Basis-of-Design	Available Manufacturers		Length (Min.)
1	High Speed HDMI Cable (M-M)	Tripp Lite	Belkin	Belden	As Req'd
1	RCA Composite Video (M-M)	Tripp Lite	Belkin	Belden	As Req'd
1	(2) RCA (L/R) (M-M)	Tripp Lite	Belkin	Belden	As Req'd
1	3.5mm Audio Cable (M-M)	Tripp Lite	Belkin	Belden	As Req'd
3	Category 6 Patch Cable	Tripp Lite	Belkin	Belden	As Req'd
1	VGA, HD-15 to HD-15 (M-F)	Tripp Lite	Belkin	Belden	As Req'd
--	Velcro type One-wrap Ties	Velcro	Or Equal		As Req'd

2.5 STUDIO BROADCAST SYSTEM

A. Manufacturers: Subject to compliance with requirements, products by, but not limited to, one of the following:

1. Panasonic
2. JVC
3. Sony
4. Or approved equal

B. Schedule:

BROADCAST STUDIO EQUIPMENT - SCHEDULE					
Qty.	Description	Catalog No.	Basis-of-Design	Available Manufacturers	
2	12VDC, High Sensitivity, Image Camera	AW-E650	Panasonic	JVC	SONY
2	HD Lens f/2.3" Convertible Camera	AK-LZ20M85G	Panasonic	JVC	SONY
2	Studio camera system card	A-PB506A	Panasonic	JVC	SONY
1	4" B/W Viewfinder, 12VDC	AW-VF64	Panasonic	JVC	SONY
1	Lens Control Kit, Motor Driven Lenses	AW-LK30	Panasonic	JVC	SONY
2	Remote Control Unit, Camera Control	AW-RC600	Panasonic	JVC	SONY
2	Remote Control Unit, Cable (15 m)	AW-CA50A26	Panasonic	JVC	SONY
1	Editing VTR	AJ-SD755	Panasonic	JVC	SONY
1	Sub-compact HD/SD Live Switcher	AW-HS50N	Panasonic	JVC	SONY
2	Power Supply	AW-PS510A	Panasonic	JVC	SONY
2	DC power supply cable	AW-CA4T1	Panasonic	JVC	SONY

C. Professional Grade Broadcast Tripod:

1. Furnish professional grade broadcast tripod with fluid video head.
2. Tripod shall have 3-stage leg section with all-metal head suitable for professional compact HD video cameras.
3. Single bubble leveler with LED light
4. Die-cast aluminum construction.
5. Counterbalance mechanism.
6. Provide (2) DST-43 series tripods by Daiwa/Slik or approved equal.

D. Provide all cabling required for a complete and fully operational studio broadcast system.

E. Specified lens shall be suitable for long distant environment, i.e. Auditorium. Manufacturer shall confirm specified lens has the required performance parameters suitable for capturing images on the Auditorium stage from the Auditorium Lighting Platform above the control room.

F. Audio:

1. Provide 12 channel audio mixer with integral USB computer audio interface. The mixer shall include, but not limited to, the following.

- a. Signal processing:
 - i. Pre-amplification.
 - ii. Level adjustment.
 - iii. Mixing of effects.
 - iv. Frequency equalization.
 - b. Signal distribution:
 - i. Summing of signals.
 - ii. Distribution to one or several recording tracks, power amp(s), control room and 2-track output.
 - c. Mix:
 - i. Volume level.
 - ii. Frequency distribution.
 - iii. Level control.
 - d. Manufacturers:
 - i. Yamaha
 - ii. Peavey
 - iii. Or approved equal.
2. Provide (2) headphones designed for general listening and monitoring. Headphones shall be calibrated to match impedance, power handling, and sensitivity for connected equipment.
- a. Manufacturers:
 - i. Shure SRH series
 - ii. Audio-Technica ATH series
 - iii. Or approved equal
3. Provide a complete UHF wireless microphone system. System shall provide wireless portability, automatic frequency selection, automatic transmitter setup and synchronization, rugged and reliable.
- a. Provide (4) UHF lavalier microphones.
 - b. Manufacturers:
 - i. Shure
 - ii. Audio-Technica
 - iii. Or approved equal

2.6 NETWORK VIDEO DISTRIBUTION SYSTEM

- A. Provide a complete and operational Network Distribution System consisting of the following:
 1. VBrick Enterprise Media System Portal Software
 2. Distributed Media Engine

3. 9000 Series Education Appliance Enclosure
 4. Encoding Audio Video Module
 5. Multi-Format Set Top Box (STB)
 6. Studio Broadcast Camera System
 7. VBrick Technical Support Service
- B. System shall connect to network via data drops located in the AV Studio and Auditorium.
- C. Encoder shall connect to data drop provided. No special structured cabling shall be required.
- D. System shall provide full bandwidth streaming of live video and audio to all designed display equipment.
- E. Provide Set Top Box (STB) for all monitors requiring conversion streaming signal from Network Distribution System.

PART 3 EXECUTION

3.1 GENERAL

- A. Install and connect all appliances and equipment as specified and shown on the contract drawings in accordance with the manufacturer's instructions and recommendations.
- B. Machine label switches, connectors, jacks, receptacles, conduits, outlets, cables, and cable terminations, clearly, logically, and permanently.
- C. Program system per instructions of the Owner.
- D. Execute, without claim for payment, moderate moves or changes necessary to accommodate other equipment or cabinetry to assure symmetry and pleasing appearance.
- E. The system must be matched. All major electronic equipment must be furnished, assembled, installed and tested and by the Audio/video Contractor.
- F. Final appearance and finishes are subject to the Owner's approval.
- G. Cabling types shall be installed per manufacturer's recommendations as required and as indicated on the drawings and in the specifications.
- H. Cabling shall be terminated neatly and logically. All connectors shall be as recommended by the manufacturer or as indicated in the specifications or drawings.
- I. Co-ordinate and submit to the Owner a proposed work schedule chart indicating starting time from notice to proceed, job progression and completion/closeout schedule. Notify the contract administrator immediately for if changes to the schedule are required.

- J. Facility occupation and availability: the Owner will make all reasonable attempts to provide access to the facility. At the end of each workday leave the occupied areas of the facility in a safe and ready condition for faculty and student use.

3.2 CABLE ROUTING

- A. All audio and video horizontal cables shall not exceed 90 m (295 ft) from the telecommunications outlet in the work area to the horizontal cross connect. The combined length of jumpers, or patch cords and equipment cables in the telecommunications closet and the work area should not exceed 10m (33 feet) total, including 3 m (10 feet) at the station and 6 m (20 feet) at the closet. Every effort will be made to route cables so as not to exceed 90 meters in length. Identify any cable runs exceeding 90 meters from proposed MDF/IDF location and provide solution to meet the 90 meter requirement.
- B. Horizontal pathways shall be installed or selected such that the minimum bend radius of horizontal cables is kept within manufacturer specifications both during and after installation. Cable bends shall be no less than four (4) times the cable outer diameter or 1.00-inches.
- C. In open ceiling cabling installations, cable supports shall be provided by means that are structurally independent of the suspended ceiling, its framework, or supports. These supports shall be spaced no more than 1.2 m (4 feet) apart.
- D. Audio/Video pathways, spaces and metallic cables which run parallel with electric power cables or lighting cables shall be installed with a minimum clearance of 300 mm (12 inches). Audio/Video cables shall not be run parallel with electric power cables for more than 10 m (33 feet) if their separation is less than 300 m (12 inches). Maintain minimum distances of audio and video cables from the following items:

ITEM	MINIMUM SEPARATION
Parallel with electric power and lighting cables	300 mm (12 inches)
Fluorescent Light Fixtures	300 mm (12 inches)
Heat-Generating Devices Ductwork Radiators Heaters	300 mm (12 inches)

ITEM	MINIMUM SEPARATION
Transformers Motors	1.2 m (48 inches)
Minimum Distance Above Ceilings	75 mm (3 inches)
Exterior Wall	1.2 m (48 inches)

- E. For audio or video applications, UTP cables shall be run using a star topology from the telecommunications closet on each floor to every individual information outlet. All cable routes shall be approved by the customer prior to installation of the cabling.
- F. The Contractor shall observe the bending radius and pulling strength requirements of the UTP and fiber optic cable during handling and installation.
- G. Each run of UTP cable between horizontal portion of the cross-connect in the telecommunication closet and the information outlet shall not contain splices.
- H. In the telecommunications closet where cable racking are used, the contractor shall provide appropriate means of cable management such as reusable color-coded hook and loop cable managers (ties) to create a neat appearing and practical installation.
- I. In a false ceiling environment, a minimum of 3 inches (75 mm) shall be observed between the cable supports and the false ceiling.
- J. Continuous conduit runs installed by the contractor should not exceed 30.5 m (100 ft) or contain more than two (2) 90 degree bends without utilizing appropriately sized pull boxes.
- K. Cable pathways shall be designed and installed to meet applicable local and national building and electrical codes or regulations.
- L. Grounding/earthing and bonding of cable pathways shall comply with applicable codes and regulations.
- M. Cable pathways shall not have exposed sharp edges that may come into contact with telecommunications cables.
- N. The number of cables placed in a pathway shall not exceed manufacture specifications, nor will the geometric shape of a cable be affected.
- O. Pathways shall not be located in elevator shafts.

- P. Horizontal distribution cables shall not be exposed in the work area or other locations with public access.
- Q. Cables routed in a suspended ceiling shall not be draped across the ceiling tiles. Cable supports shall be mounted a minimum of 75 mm (3 in) above the ceiling grid supporting the tiles.
- R. Minimum separation of 300 mm (12 in) shall be provided in areas where power or electric light circuits, which are equal to or less than 480 Vrms, and audio/video cabling coexist.
- S. No exposed wiring will be accepted unless approved in writing by the construction manager. Cabling shall be in the wall, above the ceiling, or where exposed, enclosed within raceway.
- T. **CONTRACTOR SHALL PROVIDE PLENUM-RATED CABLING THROUGHOUT THE PROJECT.**
- U. Exposed EMT conduit will be accepted as an installation method in mechanical equipment rooms ten feet above finished floor. These areas will still be treated like classrooms for the final installation and termination.
- V. In unheated spaces install the cable at least four (4) feet from the exterior wall, mounted securely to the slab or structure. Any cable support installation must attach securely to the deck.
- W. System wiring and equipment installation shall be in accordance with good engineering practices as established by ANSI, EIA and NEC. Wiring shall meet all state and local electrical codes. All wiring shall test free from all grounds and shorts. All voice and data cabling shall be installed to ANSI EIA/TIA 568B and 569 Standards, and ISO/IEC 11801 (International) Generic Cabling for Customer Premise Standard.
- X. All cabling furnished under this specification shall be installed in a neat and workmanlike manner and to the satisfaction of the Owner.
- Y. All cabling must be installed with extreme care. Cables must not be cinched, subjected to sharp bends in excess of the manufacturer's recommended bending radius or anything else that would change the specified characteristics of the cables. Comply with ANSI/EIA/TIA 568-B.
- Z. Cables run exposed above accessible ceilings shall be run in bundles of a size for installation. Bundle by use of cable ties, taking care not to cinch cables. Cable shall be supported from roof structures, joists and other appropriate structural members by means of J-hooks. J-hooks shall not exceed spacing of four (4) feet. In no case shall any cable be supported from below by contact with the ceiling system. The data, telecommunication and video cabling systems shall be separated into bundles and separated by a minimum of 12-inch. Provide cable ties to secure cables to each J-hook. Avoid cinching cables.

1. All audio and video cables installed above suspended ceilings shall be supported by 2-inch J-hooks spaced at a maximum of 48-inches. For support of high density (>50 cables) bulk cable where 48-inch spacing results in the bowing of cable, the Contractor shall divide bulk cable into smaller parallel streams or decrease the spacing of the *J* hooks sufficiently to adequately support the cable.
 2. Where audio and video wiring is supported by J-hooks, wire shall be run neatly bundled with tie wraps. Tie wraps shall be spaced randomly between 6-inches and 10-inches apart, 8-inches on the average. Tie wraps shall be snug, but capable of being easily rotated about the cable bundle so as to secure the cable without damaging it. Cable deflection shall be less than 5-inches.
 3. Fiber optic and Category 6 UTP backbone cable shall be run separately from the horizontal distribution cable. This shall be accomplished by running said cable parallel to horizontal distribution cabling supported on the back-side of the J-hooks used for the horizontal cabling by supporting the backbone cable separately from the horizontal. In either case, the backbone cabling shall not be tie wrapped together with the horizontal distribution cable.
 4. J-hooks shall be supported directly by the building structure. J-hooks shall be supported on minimum 3/8-inch threaded rod anchored to the side hallway walk, or to the slab above.
 5. J-hooks shall not be attached to or supported by ceiling supports, piping or piping supports, or duct work or duct work supports.
 6. Install cabling below or to the side of the ductwork, just above the suspended ceiling. Extend J-hooks down to support the cabling at that level.
 7. Where cable trays or conduit are not provided, J-hooks shall be installed. The J-hooks shall be attachable to a floor slab through the use of a pre-threaded lead insert, which is suitable of installation of a 3/8-inch "all-thread" rod in a pre-drilled 1/2-inch hole. The threads of the closure bolt on the pipe hanger shall be covered by 3/8-inch copper or aluminum tubing to protect the cabling sheaths.
 8. Cables placed in hangers in the plenum ceiling area shall be routed high and away from all other electrical and mechanical systems so as to avoid contact with light fixtures, ventilation ducts, sprinkler systems or plumbing piping, motors, or any other electrical devices. The cable shall not be run in parallel with any high voltage electrical wiring. The maximum separation between support points for all cabling shall be four (4) feet. Lay-in pipe hangers shall be installed so as to accommodate these maximum distance spacings. Hangers shall be installed at directional bend points so as to provide a maximum bend angle of 45 degrees for the supported cabling.
- AA. Cables passing through fire/smoke containment walls shall be sleeved. Where these wall penetrations are required, said sleeves shall be fireproofed to maintain the integrity of the wall rating.

- BB. Cables shall be installed in metal conduit raceways on walls, below ceilings, where exposed and wherever it may be accessible or may be subject to physical damage.
- CC. The cable and conduit routes used should avoid water pipes, fluorescent lighting and other utilities which may adversely affect the system's performance or result in damage to the cable. If cable must be placed close to such utilities, keep it separate and protect with approved barriers and/or insulation.
- DD. Do not run cable or conductor in hangers used for pipes, electric conduits or ceiling hangers, nor support it in any way by attachments to pipes, conduits, HVAC ducts or ceiling grid hangers.
- EE. All cable shall be continuous runs with no splicing permitted.
- FF. Cabling types shall be plenum construction as required by applicable electrical codes and as specified. Contractor shall provide plenum-rated cabling throughout the project.
- GG. Refer to project descriptions and/or drawings all cabling systems.
- HH. In existing structures place distribution cabling following the same basic route of the existing wiring, except where conduits are full or the route is not easily accessible, or newly installed, distribution media.
- II. In suspended ceiling areas where cable trays or conduit are not available, station wiring with plastic cable ties at appropriate distances. The cable bundling shall be supported via the existing building structure and framework.
- JJ. Conceal horizontal distribution wiring internally above ceiling and in wiremold on walls.
- KK. Provide responsibility for removing all ceiling tiles required for the installation of the wiring. Contractor shall provide new ceiling tiles for any ceiling tiles damaged.
- LL. Run cables above hung ceilings suspended from surfaces above with approved devices, or in cable trays, using convenient run sizes secured with properly tensioned plastic cable ties. Comply with NFPA requirements for exposed cable. Route cable runs to clear electrical devices above ceilings by not less than 12 inches.
- MM. Cable lubricants: Lubricants specifically designed for installing communications cable shall be used to reduce pulling tension for all cable pulls in conduit, ducts, or innerducts. Use not less than three (3) gallons per kilometer of cable. After installation, exposed cable and other surfaces must be cleaned free of lubricant residue. Twisted pair cable lubricant shall be Dyna-Blue, American Polywater, or approved equal. Optical fiber cable lubricant shall be Optic-Lube, Ideal, or approved equal.
- NN. All conduits with less than a 50 percent io shall have a 3/32-inch 200 pound polyethylene pull cord approximately secured and labeled at each end.

3.3 SLEEVES

- A. Where wire and cable penetrate walls or other structural elements or pass above inaccessible areas of the building, install EMT sleeves sized to accept sizes of run. Refer to Division 27, Section *Common Work Results for Communications* for additional information.
- B. Where cables penetrating exceed specified capacity of a single sleeve, install multiple sleeves. Where sleeves penetrate fire-rated Construction, install with fire-stopping. Refer to Division 26, Section *Electrical Firestopping* for additional information.
- C. Size sleeves to accept number of conductors or cables in run, plus ten percent for future expansion.
- D. Conduit sleeves shall be four (4) inch trade size minimum with a minimum of three (3) sleeves which shall connect the Telecommunications Closets (TC's) vertically. Sleeves shall be rigid galvanized steel for penetrations of concrete slabs, concrete walls, and CMU walls. Sleeves for penetrations of stud walls shall be EMT. All sleeves shall be rigidly installed using appropriate fittings and all masonry penetrations shall be grouted. Sleeves shall project a minimum of six (6) inches beyond wall or floor surface. All penetrations of fire-rated construction shall be firestopped with fire-stopping as specified in this Section to equal or exceed fire rating of the penetrated material. Sleeves for penetration of walls and floors shall have one hundred percent (100 percent) capacity, and shall be firestopped as per Code. All spare sleeves shall be capped on both sides.
- E. Sleeves or conduit entering equipment spaces from outlets shall penetrate the closet walls at a height above the plywood panels and extend only far enough to install bushings. Sleeves shall provide access of the Communication Rooms from all sides, if possible.

3.4 EQUIPMENT ROOMS/CLOSETS

- A. The Equipment Subsystem consists of shared (common) electronic communications equipment in the equipment room or telecommunications closet and the transmission media required to terminate this equipment on distribution hardware.
- B. Communication grounding /earthing and bonding shall be in accordance with applicable codes and regulations. It is recommended that the requirements of IEC 1000-5-2, ANSI/TIA/EIA-607, or both, be observed throughout the entire cabling system. Provide 12-inch ground bus bars and 6 AWG solid copper ground wires from the ground bus bars to the building ground. Provide 6 AWG ground from the ladder cable rack to the ground bus bars.
 - 1. All metallic conduit and raceways shall be appropriately grounded as specified in the National Electrical Code.
- C. A minimum of two dedicated duplex receptacle outlets each on a separate circuit, shall be provided for equipment power. Additional convenience duplex outlets should be placed at 1.8 m (6 ft) intervals around the perimeter walls. Provide *Lock Dog* Breaker Locks, on panelboard circuit breakers serving outlets, to prevent inadvertent shut-down of power.
- D. Provide each fire-retardant-treated plywood backboard two feet off the floor to top. Secure backboard with a minimum of eight (8) screws. Plywood backboard shall have

one side with exterior glue and one finished smooth side. Mark all backboards and cabinets with appropriate legends (i.e., "COMM").

- E. Verify with local codes or AHJ prior to painting fire-retardant-treated plywood backboard with stamped fire rating labels. If allowed by code, paint fire-retardant-treated plywood backboard with durable white enamel (or other finish color as selected by the Owner)
- F. Cable installation in the Equipment Room and Communications Closet must conform to the Project Drawings. All cabling shall be routed so as to avoid interference with any other service or system, operation, or maintenance purposes such as access boxes, ventilation mixing boxes, network equipment-mounting access hatches to air filters, switches or electrical outlets, electrical panels, and lighting fixtures. Avoid crossing areas horizontally just above or below any riser conduit. Lay and dress cables to allow other cables to enter the conduit/riser without difficulty at a later time by maintaining a working distance from these openings. Use a minimum of 36 inches for a service loop to the patch panel.
- G. Cable shall be routed as close as possible to the ceiling, floor, or other corners to ensure that adequate wall or backboard space is available to current and future equipment and for cable terminations. Cables shall not be tie-wrapped to existing electrical conduit or other equipment. The minimum bend radius shall be observed.
- H. Lay cables via the shortest route directly to the nearest edge of the backboard from the mounted equipment or block. Lace or tie-clamp all similarly routed cables together and attach by means of clamps screwed to the outside edge(s) of the backboard vertically and/or horizontally, then route via *square* corners over a path that will offer minimum obstruction to future installations of equipment, backboards, or other cables.
- I. Provide rack and jack panel hardware as required for all data station wiring. Provide the following for each equipment rack:
 - 1. Racks shall be installed in accordance with the Manufacturer's pre-printed instructions. Racks shall be anchored to the building structure at the base and top of each rack.
 - 2. Racks shall be installed perpendicular to the wall on which the data jack panels are installed. Racks shall be spaced at least 6-inches from the wall (at the side) and have a minimum of 36-inch clearance in front and behind.
 - 3. Subsequent to rack installation, provide wire management hardware, power strips, and grounding on racks as noted herein.
 - 4. Install cable management channel the entire height of the rack, on both sides.
 - 5. Install split front D-ring panels below patch panels for cable management.
 - 6. Install an uninterruptible power supply into each rack at the bottom of the rack and plug-in the power cord where directed by the Owner to fully charge the batteries.

7. Hardware shall be installed plumb and level on the equipment racks. Appropriate distribution rings shall be installed so that jumper and cross connect wires can be installed in a neat and orderly fashion.
- J. Provide a 12-inch wide ladder rack from the backboard wall to each equipment rack, 7 feet 2 inches AFF. All cables shall be routed across the ladder rack. Provide angle iron and attach securely to the wall and to the rack.
 1. Provide 6-inch cable tray to completely circle the ceiling perimeter of communication rooms to facilitate cable management. Cable tray shall be center-hung. Cable tray will be GS Metals, or equivalent. Appropriate quantities of J-hooks shall support horizontal cable distribution beyond the communication rooms.

3.5 SITE SURVEY

- A. Prior to placing any cable pathways or cable, survey the site to determine job conditions will not impose any obstructions that would interfere with the safe and satisfactory placement of the cables, and to arrange the removal of any obstructions with the Project Manager accordingly.
- B. The Drawings provided are diagrammatic and generally representative of the existing conditions, but not necessarily accurate in all aspects. Verify all field conditions and make field measurements as required.
- C. Visit the site before submitting bid and check location of existing utilities, check conditions, verify dimensions and locations shown on the plans, and verify over-all costs and work herein described or shown.
- D. Take measurements necessary for this work and be responsible for their accuracy. Necessary pull boxes and junction boxes as required to accomplish distribution shall be provided.

3.6 BEND RADIUS

- A. The maximum cable bend radii shall not exceed manufacturer's specifications.
- B. In spaces with UTP cable terminations, the maximum bend radius for 4-pair cable shall not exceed four times the outside diameter of the cable and ten times for multi-pair cable. This shall be done unless this violates manufacturer specifications.
- C. During the actual installation, bend radius on 4-pair cable shall not exceed eight times the outside diameter of the cable and ten times for multi-pair cable. This shall be done unless this violates manufacturer specifications.

3.7 SLACK

- A. In the work area, a minimum of 300 mm (12 inches) should be left at outlets, while 1 m (3 feet) be left at the backboard or rack, and 6 m (20 feet) in the closet area.

- B. In telecommunications closets a minimum of 6 m (20 feet) of slack should be left for all cable types. This slack must be neatly managed on trays or other support types.
- C. All unused cables shall be properly terminated, as specified, with 10 m (33 feet) extra cable neatly coiled and tie-wrapped at the workstation end of cable in the ceiling space.

3.8 CABLE TIE WRAPS

- A. Tie wraps shall be used at appropriate intervals to secure cable and to provide strain relief at termination points. These wraps shall not be over tightened to the point of deforming or crimping the cable sheath. Tie wraps shall be attached with screws to walls, backboards, and other structures. Tie wraps shall be spaced between 6-inches and 10-inches apart, 8-inches on the average.
- B. Hook cable managers should be used in the closet where reconfiguration of cables and terminations may be frequent. Cable Managers shall be Polygon Softcinch Series, or approved equal.
- C. No *stick-on* cable wraps, raceways, or terminal devices are acceptable.

3.9 FIRESTOPPING

- A. Provide properly installed firestop systems to prevent or retard the spread of fire, smoke, water, and gases through the building. This requirement applies to openings designed for telecommunications use that may or may not be penetrated by cables, wires, or raceways. Contractor shall seal all floor, ceiling, and wall penetrations.
- B. Provide fire and smoke stopping in accordance with all applicable codes.
- C. Contractor shall provide firestopping protection that meets NFPA *Life Safety Code 101, 6-2.3.6, Penetrations and Miscellaneous Openings and Fire Barriers* and the NEC 300.21 *Fire Stopping* Regulations and Standards.
- D. All vertical penetrations consisting of conduit, sleeves, or chases shall be firestopped at the bottom of the penetration.
- E. All horizontal penetrations consisting of conduit, sleeves of chases, shall be firestopped on both sides of the penetration.
- F. Individual cable penetrations in plenum air return areas not enclosed in conduit shall be firestopped.
- G. Openings made in concrete floors shall be UL approved. Thickness or depth of firestop materials shall be as recommended by the material manufacturer and backed by formal ASTM E-814 tests.
- H. Plenum air return ceiling penetrations for conduit and cables shall be sealed with a system appropriate for the substrate and level of protection required.

- I. All metal conduits designed for communications with or without wire/cable inside shall be firestopped to restrict transfer of smoke.
- J. Comply with the requirements of Division 26, Section *Electrical Firestopping*.
- K. Provide fire-rated seals for all penetrations through fire-rated floors and walls. Provide UL listed fire sealant, Dow Corning Silicon foam, or approved equal. Provide UL listed expanding fire barrier and expanding type grout.

3.10 WORKMANSHIP

- A. All work shall be done in a workman like fashion of the highest standards in the telecommunications industry. All equipment and materials are to be installed in a neat and secure manner, while cables are to be properly dressed. Workers must clean any debris and trash at the close of each workday.
- B. The installation shall be in strict accordance with all applicable codes and standards, the respective manufacturer's written instructions, contract drawings, and these Specifications. All materials, equipment, and devices shall be new and unused, of current manufacture of the highest grade, free from defects. Workmanship shall be of the highest grade in accordance with modern practice. The installed system shall be neat, clean, and well organized in appearance. Provide working clearances for normal system operation, reconfiguration, and repair.
- C. The Owner reserves the right to reject all or a portion of the work performed, either on technical or aesthetic grounds.
- D. Replace any damaged ceiling tiles that are broken during cable installation.
- E. Replace or rework cables showing evidence of improper handling, including stretches, kinks, short radius bends, over-tightened bindings, loosely twisted and over-twisted pairs at terminals, and cable sheath removed too far (over 1-1/2 inches), at no additional cost to the Owner.

3.11 LABELING

- A. Horizontal cables shall be labeled at each end, 1-inch from end of the sheath. The cable or its label shall be marked with its identifier.
- B. A unique identifier shall be marked on each face plate to identify it as connecting hardware.
- C. Each port in the face plate shall be labeled with its identifier.
- D. A unique identifier shall be marked on each piece of connecting hardware to identify it as connecting hardware.
- E. Each port on the connecting hardware shall be labeled with its identifier.

- F. Each patch panel in the building shall be given a letter designation. Each data jack served by a particular patch panel shall be numbered with the patch panel jack number feeding the work station jack to the closet in which the patch panel is located, using the patch panel designation as a prefix (i.e., C-21).
- G. Tag all cables, terminal blocks, outlets, and other components for which tests have been satisfactorily completed.
- H. Identify terminals at terminal strips, telecommunications outlets, and pull-and junction boxes with approved designations.
- I. All trunk cables linking the wire closets together shall be logically designated to industry standards.
- J. Labeling requirement: Generally, all wiring shall be labeled consistent with ANSI/TIA/EIA-606, and include the following:
 - 1. Adhesive labels shall meet the legibility, defacement, and adhesion requirements specified in UL 969 for indoor use. Cable labels shall have a durable substrate, such as vinyl, suitable for wrapping. Labeling practices shall be consistent across the installation.
 - 2. Data and communications voice outlets. The outlet face plate shall be provided with a permanently affixed machine label that provides the distribution frame location, the rack field location and the position of the connection within the rack field. For example: 1-A-01 would refer to the other end of the termination being IDF 1, Rack Field A, Position 01. The cable run shall be machine labeled with Mylar wrap wire markers within 1-inch of termination. Final termination at the distribution frame is also to be appropriately tagged. All cabling and fiber optics are to be tagged in a consistent manner.
 - 3. All rack fields, devices, components, etc., shall be provided with plates, labeled with appropriate designations on the front and rear of the equipment. All devices are to be installed and labeled in a sequential, logical order. (For example: A, D, C, B will be retagged and reterminated to A, B, C, D). Provide engraved phenolic plates with 5/32-inch high white lettering on a black background.
 - 4. Distribution Frame Connecting Hardware: All connecting hardware shall be adequately tagged with a similar nomenclature to the above.
 - 5. Cross-connecting Cable: All cross-connecting cable shall be adequately tagged with a similar nomenclature to the above with tags of *to* and *from*.
 - 6. Equipment ports shall be adequately tagged with a similar nomenclature to the above.
 - 7. Patch Cords shall be color-coded. Each Cabinet is to be designated with a number and associated color. *Incoming* patch cords are to be color-coded from each cabinet at the MDF. *Outgoing* patch cords are to be similarly color-coded.

Patch cords shall be color-coded consistently with one single color per system. All patch cords shall be by the same Manufacturer.

8. A label is to be provided for each Ethernet Switch corresponding to each labeled patch panel.
9. No handwritten labels shall be accepted.
10. All labels shall be machine-printed on clear or opaque tape, stenciled onto adhesive labels, or typewritten onto adhesive labels. The font shall be at least one-quarter inch (1/4-inch) in height, block characters, and legible. The text shall be of a color contrasting with the label such that it may be easily read. If labeling tape is utilized, the font color shall contrast with the background. Patch panels shall exhibit workstation numbers, in sequential order, for all workstations served by the wiring closets (MDF or IDF).
11. Each fiber optics cable segment shall be labeled at each end with its respective IDF identifier. Each fiber interconnect device shall be labeled with its respective IDF identifier. Each telecommunications outlet shall be labeled with its respective workstation number (machine labels only). Each workstation cable shall be neatly labeled, at each end with its respective workstation number. Each copper backbone cable shall be machine labeled at each end with its respective IDF number. Each binder group shall be tied off with its respective identifying ribbon at each break-out point.
12. Warning Tags: At each location where the fiber cable is exposed to human intrusion, it shall be marked with warning tags. These tags shall be yellow or orange in color, and shall contain the warning: *CAUTION FIBER OPTIC CABLE*. The text shall be permanent, black, block characters, and at least 3/16-inch high. A warning tag shall be permanently affixed to each exposed cable or bundle of cables, at intervals of not less than five (5) feet. Any section of exposed cable which is less than five (5) feet in length shall have at least one warning tag affixed to it.
13. Brady Labeling Systems, Panduit Pan-Mark Labeling Systems, or approved equal shall be used.

3.12 DOCUMENTATION:

- A. A comprehensive installation, operation, programming and instruction manual shall be supplied as part of the system. The manual shall provide complete service information, including schematics, layout drawings, and interconnecting diagrams showing the location of all the outlets, cable taps, cable routes, and other installed components. Include final revised one-line system drawings. Include for this particular project parts lists to permit quick and efficient maintenance and repair of the equipment by qualified technicians. Manuals shall include 8 1/2-inch x 11-inch device location/cabling route drawings provided in CADD format (Autodesk - AutoCad 2007 or later) and in Portable Document Format (PDF) on CD or USB flash drive. Manuals shall include a copy of the operations manuals listed in Section 270500 *Common Work Results for Communications*. Manuals shall be indexed and placed in a hard-cover three ring binder. Three (3) copies

of this manual shall be provided to the Owner upon project completion. Retain a minimum of one (1) copy for their permanent records. Provide one copy of Manual and disk(s) in the Main Equipment Rack.

3.13 DRAWINGS

- A. As-built drawing shall be provided in compliance with EIA ANSI/TIA/EIA-606, showing the locations of and identifiers for all:
 - 1. Horizontal cable routing and terminations.
 - 2. Telecommunications outlets/connectors, Telco System interfaces.
 - 3. Video cable routing and terminations and outlets.
 - 4. Cable penetration details, schematic riser diagrams, and equipment closet layouts.
- B. Provide as-built drawings to include cabling routing, details of station and hardware locations, etc. Provide as-built drawings on compact disk CD or USB flash drive in AutoCAD Version 2007 (or later) and in Portable Document Format (PDF). Contractor will have access to drawings provided with this specification where they are in electronic form.
- C. Provide a set of *As-Built* Drawings encased in a plastic sheet protector at backboard, in each wiring closet.
- D. At the completion of the project shall bring the system wiring diagrams fully up to date with the actual field installation, showing all field-made changes for deviations from the approved shop drawings. Accurately record location of service entrance conduit, termination backboards and cabinets, outlet boxes, messenger cable raceways and cable trays, pull boxes and equipment. Room names and numbers shall be updated to indicate actual field-assigned room numbers. They may not necessarily be the room names and numbers shown on the Contract Drawings.

3.14 RECORDS

- A. All records shall be created by the installation contractor and turned over at the completion of work. The format shall be computer based and both soft copies and hard copies shall be part of the As-built package. The minimum requirements include:
 - 1. Cable records shall contain a complete listing of the identifier, cable type, length, pair status, pair assignment, termination positions at both ends, manufacturer, and part number.
 - 2. Connecting hardware records shall contain the identifier, type of hardware and the amount of positions.
 - 3. Connecting hardware positions records shall contain the identifier, type of position, and the cable identifier attached to it.

4. Test documentation on all cable types shall be included as part of the As-built package. Only signed copies of test reports shall be acceptable.
 5. Outlet Records: Provide a database of outlet designations capable of being exported to a cable management software system.
- B. Provide a complete Owner's Manual including full documentation of system paths and components to allow for plug and play operating cable management, cable maintenance, and cable modifications. Commercial off-the-shelf manuals shall be furnished for operation, installation, configuration, and maintenance for all products provided as a part of this section.
- C. Provide a complete database indicating the location of each outlet and corresponding port on wire closet equipment.

3.15 REPORTS

- A. All reports shall be generated from the computer based program used to create the records above. These reports should include but not limited to:
1. Cable Reports
 2. Cross-connect Reports
 3. Connecting Hardware Reports
- B. Reports shall include cable schedules fully documenting length, path, and conductivity test results for each cable.
- C. Provide 8-1/2-inch by 11-inch floor plans identifying all room outlet numbers and locations.
- D. Labeling Reports:
1. Provide Owner with complete labeling report indicating all wired and wireless devices specified in this Section.
 2. Coordinate Labeling Report format with Owner for information required for each equipment/device type.
 3. Provide Labeling Report in spreadsheet format using Excel (.xlsx) on Compact Disk or USB Flash Drive.
 4. Provide (2) hard copies of the information and format type indicate in 3.14(D).
- E. Provide Owner with formatted spreadsheet, in hard copy and electronic format, itemizing each component provided under this Section. The spreadsheet shall be provided as a hard copy and electronic format, i.e. Excel (.xlsx).

3.16 TRAINING:

- A. Include sixteen (16) hours in four (4) four-hour on-site training sessions, or as required, of startup and training assistance during cutover and Owner installation of equipment to

ensure a fully functional system. This training may also be used for system configuration during initial system startup or other services as required at the Owner's request.

- B. Training shall include a *walk-through* of the system for location and labeling orientation, a discussion of overall system concepts and configuration, specific instruction in system reconfiguration using patch cords in the wiring closets, a review of the as-built drawings, a review of the system testing and acceptance documentation, and guidelines for basic trouble-shooting of the structured cabling system. The instruction shall be presented in an organized and professional manner by a person who is thoroughly familiar with the installation.
- C. Provide key personnel at each training session, as required by the Owner, at no additional cost to the Owner. Key personnel include an RCDD on Contractor's staff, manufacturer's representative, and manufacturer's specialists.

END OF SECTION

DIVISION 27 - ELECTRICAL
SECTION 275000
PUBLIC ADDRESS AND INTERCOM SYSTEMS
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SECTION 275000 – PUBLIC ADDRESS AND INTERCOM SYSTEMS

PART 1 GENERAL REQUIREMENTS

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of the contract, including general and supplementary conditions of Division 01, specification sections apply to this section.
- B. Related Sections:
 - 1. Section 270500 *Common Work Results for Communications.*
 - 2. Section 274100 *Audio-Video Systems.*
 - 3. Section 260553 *Electrical Identification.*
 - 4. Section 260528 *Electrical Firestopping.*
 - 5. Section 260533 *Raceways and Boxes.*
 - 6. Section 260526 *Grounding and Bonding.*

1.2 GENERAL

- A. Where applicable visit the site and be familiar with the working conditions, hazards, and local requirements involved; submission of bids shall be deemed evidence of such visit. All proposals shall take these existing conditions into consideration before bidding.
- B. All materials, unless otherwise specified, shall be new, free from any defects, and of the best quality of their respective kinds. All like materials used shall be of the same manufacturer, model, and quality, unless otherwise specified.
- C. Manufacturer's names are listed herein to establish a standard. The products of other manufacturers will only be acceptable if substitution proceed, as specified in Division 01, are obeyed. These products must be of a quality as good or better than the features specified herein, will serve with equal efficiency and dependability, and satisfy the purpose for which the items specified were intended.
- D. Outlet boxes and conduit shall be provided by Division 26. Division 27 shall provide all components, cabling, hangers, and supports required to provide a complete installation adhering to all local, State, and National codes applicable in the State of Delaware.
- E. System furnished to serve School shall be installed to include all components, devices, wiring, microphones, speakers, etc. to qualify as a complete and operational Public Address and Intercom System. Meaning, the Owner shall not be required to supply additional components to transmit and receive announcements, music, or other audio via the public address in spaces indicated on the Drawings

1.3 SUBMITTALS

- A. Submit the shop drawings, product data, and quality control submittals specified below at the same time as a package.

- B. Shop Drawings: Composite wiring and/or schematic diagrams of the complete system as proposed to be installed. Drawing shall include relative position of all major components, typical connections, field components, accessories, and cable types.
- C. Product Data: Include catalogue specification sheets, manufacturer's default specification, Users operation guide, and bill of materials.
- D. Quality control shall include the following:
 - 1. Name, address, and telephone number of the nearest fully equipped service organization.
 - 2. Submit a certificate of completion of installation and service training from the system manufacturer.
 - 3. Submit a list of comparable completed projects. Furnish the name, address, telephone number, and contact name of end user.

1.4 QUALITY ASSURANCE

- A. All items of equipment, including wire and cable, shall be designed by the manufacturer to function as a complete system and shall be accompanied by the manufacturer's complete service notes and drawings detailing all connections.
- B. Only bidders who have been pre-approved by the Owner will be issued bidding documents. To be added to the pre-approved bidders' list, you must submit in writing evidence of having performed satisfactory work in other installations and being able to meet all criteria described in this document. Failure to meet these qualifications shall preclude the Bidder from being awarded the Contract to perform this project.
- C. The Bidder shall be an established communications and electronics installer that has had, and currently maintains, a locally run and operated business for at least five (5) years. The contractor shall be a duly authorized distributor of the equipment supplied with full manufacturers' warranty and service privileges.
- D. Show satisfactory evidence, upon request, that he maintains a fully equipped service organization capable of furnishing adequate inspection and service to the system. Maintain at his facility the necessary spare parts in the proper proportion as recommended by the manufacturers to maintain and service the equipment being supplied. However, maintain in house, at a minimum, the spare parts necessary to completely repair three (3) systems.
- E. Factory-certification, training, and authorized installer of all equipment to be installed is required. Certification shall occur prior to award of contract. All installers shall be trained by a factory representative for both copper and fiber optic applications.
- F. Standards and Codes: All work performed under this contract shall be done in accordance with the most recent issue and latest revisions of the following codes, standards, and guidelines. All materials and equipment shall be UL listed for the intended application.
- G. Americans with Disabilities Act (ADA), and the ADA Accessibility Guidelines

(ADAAG).

1. American National Standard Institute (ANSI).
2. ANSI A117.1-1980.
3. ASTM E 814 - American Society for Testing Materials, Fire Tests of Through-Penetration Firestops.
4. BISCI Building Industry Consulting Service International Telecommunications Distribution Methods Manual (TDMM).
5. BISCI Cabling Installation Manual.
6. Building Officials and Code Administrators (BOCA) National Building Code.
7. ICEA S-80-576, Communications Wire and Cable for Wiring of Premises.
8. ICEA S-90-661. Indoor Wiring Standard.
9. IEEE 1100 (Latest Edition) - Recommended Practice for Powering and Grounding Sensitive Electronic Equipment.
10. Local Codes.
11. NFPA 70, *National Electrical Code*.

1.5 SINGLE SOURCE RESPONSIBILITY AND ACCEPTABLE MANUFACTURERS

- A. Except where specifically noted otherwise, all equipment and products shall be the standard products of a single manufacturer of known reputation and experience in the industry. Integration of various manufacturers' products within each subsection in an attempt to meet the specifications shall be deemed in direct conflict with this specification and shall be automatically rejected.
- B. Any potential substitute manufacturer shall be judged against the manufacturer of the highest quality and more stringent specifications for all the manufacturers listed in this specification.
- C. Although multiple manufacturers have been listed and cited, along with specific part numbers, this does not indicate pre-approved products. Listing and citations of manufacturer's name and product part numbers is for the purpose of establishing quality and performance criteria.
- D. For purposes of determining equality, technical and general information set forth on the respective data sheets by manufacturers named in this section for each specified item shall be considered as part of these Specifications and binding herein. Any proposed equal item offered shall be substantiated fully to prove equality. The Owner reserves the right to require a complete sample of any proposed equal item and may, if necessary, request a sample tested by and a copy of the test results from an independent testing

laboratory to prove equality. The decision of the Owner regarding equality of proposed equal items will be final.

- E. Provide appropriate quantities of materials to provide a complete, functional system.
- F. All specified items, functions, and quantities are critical to the operation of the School and must be provided exactly as specified. The Architect, Engineer, Owner's Representative, and Owner reserve the right to determine if alternate equipment and means of operations meet the requirements of the Project.
- G. As this is a performance-based specification, all functions, components and quantities of the system will be reviewed in detail for total compliance. Manufacturers and installer shall also fully comply with the provisions specified in this section.
- H. The intent is to establish a standard of quality, function, and features. It is the responsibility of the bidder to insure that the proposed product meets or exceeds every standard set forth in these specifications.
- I. All equipment shall be new and shall be the latest product of a manufacturer of established reputation and experience of quality electronic equipment.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. All supplies and/or materials shall be held by the Installer until needed at the site, unless they can be stored in the area in which the work is to be done and that area has been closed to occupant usage.
- B. Obtain the permission of the using institution's representative regarding any needed storage of materials and equipment. Such storage shall be done in such a manner as not to interfere with the building schedule. Provide responsibility for any and all accidents caused by negligence from this source. The Owner does not accept responsibility for losses of material or equipment, regardless of approval to store, in any institution's facilities or grounds.
- C. All deliveries shall be scheduled, received and will be the responsibility of the Contractor; and deliveries by "Drop Shipment" from other sources will not be accepted by the Owner.
- D. Delivery: Make all arrangements to unload and transport delivered materials and equipment to the job site. Equipment and materials shall be received at the site in new condition and shall be maintained in new condition throughout the installation process.
- E. Storage: Designated telecommunication rooms may be used with the Construction Manager's approval for material storage. Materials shall be new. Damaged or deteriorated equipment and material will not be acceptable.
- F. Cable reels shall not be rolled or stored without an appropriate underlay.

1.7 MAINTENANCE SERVICE

- A. The bidder supplying the equipment shall show satisfactory evidence that they maintain a fully equipped service organization capable of furnishing adequate inspection and service to the system, including replacement parts. The bidder shall be prepared to offer a service contract for the maintenance of the system after the guarantee period. The bidder shall produce evidence that they have had a fully experienced and established service organization for at least five (5) years and proven satisfactory installations during that time.
- B. Furnish service, maintenance, and labor of communications systems for two (2) years from Date of Substantial Completion.

1.8 WARRANTY

1.9 Warranty shall meet or exceed the basis of design manufacturer's standard warranty for each product provided.

- A. The Manufacturer's warranty shall not relieve the Division 27 Contractor of any obligations for complying with the (2) year warranty required for State contracts.
- B. Warranties shall be registered in the Owner's.
- C. All documentation relating the warranty coverage, period of coverage, etc. shall be provided to Owner.
- D. All documentation relating the warranty coverage, period of coverage, etc. shall be provided to Owner.

PART 2 PRODUCTS

2.1 Manufacturers:

- A. Manufacturers: Subject to compliance with requirements, provide product comparable product by, but not limited to, one of the following:
 - 1. Telecor XL series (basis-of-design)
 - 2. Bogen Quantum
 - 3. Rauland Telecenter

2.2 SYSTEM DESCRIPTION

- A. Supply and install a complete microprocessor based Public Address and Intercom system supporting speakers and horns. Cabling to each classrooms shall be furnished, installed, and connected to Sound Enhancement System for muting Classroom Sound Enhancement System audio when Public Address system is active. Refer to Section *Audio-Video Systems* for additional information regarding Sound Enhancement System.
- B. Each system shall consist of a Central Control Unit, Administrative Control Console with Microphone, Speakers, Horns, Master Clock for bell tones, Room Control enclosures and Panels, call switches, and all other necessary auxiliary devices.

- C. The systems shall be capable of multiple open voice intercom paths used for intercom, paging, program distribution, or emergency paging. Each system shall be initially equipped with circuitry to support a minimum of two intercom speech paths, and have the ability of providing priority all-call announcements from either a microphone or an administrative telephone. The system will be capable of providing separate and simultaneous functions.
- D. Provide a separate circuit for each classroom and office so each room can be individually addressed.
- E. The Public Address and Intercom system's clock shall be synchronized with the Master Clock System to provide automatic bell schedules.

2.3 PUBLIC ADDRESS AND INTERCOM FEATURES

- A. The system shall provide two-way communication .
- B. The central control unit shall have the capacity for expanding the system, as required.
- C. It shall be complete with circuitry for accomplishing all functions for signaling and communications to all stations, and page zones. The unit shall contain all required electronics on modular, plug-in type boards for ease of service and future expansion.
- D. All programmable functions shall be stored in a non-volatile EEPROM memory and shall not be lost in event of a power failure.
- E. The system shall provide an RS-232 interface for PC programming, performing diagnostics, or logging transactions either on or off-site.
- F. Programming functions shall be accomplished through the use of a standard Windows Internet browser. Any PC connected to the School's network and provided with the proper authorization shall have multi-level access to the system for programming. Any off-site PC shall have multi-level access to the system through the use of the public Internet, provided that they have been granted proper authorization by the school.
- G. Diagnostic functions shall be accomplished through any PC connected to the School's network and provided with the proper authorization and diagnostic software. Any off-site PC shall have access to the system for diagnostics through the use of the public Internet, provided that they have been granted proper authorization and have been provided diagnostic software.
- H. The audio channel(s) shall be priority driven allowing for the highest priority signal type access to a voice channel. The system shall be user programmable to allocate, upon demand, either of the channel(s) to facilitate simultaneous intercom conversations, pages, program distributions, or combination thereof.
 - 1. Facilities for up to 6 call-in priority levels.
 - 2. Every point shall support a programmable priority level.
- I. The Central Control Unit shall provide a 0 dB signal for connections to an external

amplifier for distribution of program audio, time signals and paging announcements.

- J. The system shall be capable of multiple open voice intercom paths used for intercom, paging, program distribution, or emergency paging.
- K. These paths shall be global, non-blocking circuitry. Systems offering multiple-speech paths, which are restricted to a single speech path per group of room stations or circuit card, due to hardware constraints, will not be accepted.
- L. The system shall support direct-dialing, two-way communications between all locations equipped with Administrative Control Consoles or telephones to any location equipped with a speaker.
 - 1. The system shall provide full duplex communications between telephone and public address/ intercom system. Systems providing broadcast only and are not capable of listening to rooms are not acceptable.
- M. Call switches shall be programmable and capable of routing incoming calls from classrooms to a specific control console or specific group of consoles. Every point shall be individually programmed. Up to 16 different console groups can be assigned.
 - 1. Calls may be answered from any annunciating control console, administrative telephone, attendant console, and single-line telephone associated with a console display unit. When calls are routed to multiple consoles or console display units simultaneously, once answered, the call shall be automatically cancelled from all other consoles or displays.
 - 2. The system shall support both "normal calls" and "emergency calls" from a single call switch. Merely depressing the call switch repetitively 3 times or flashing the hook-switch of the room telephone 3 times shall initiate emergency calls. Call switches may also be programmed to initial an emergency call by pressing and holding the button for three seconds. Coordinate emergency operation with Owner prior to installation.
- N. If an emergency call is not answered within a maximum 2 minutes the call will automatically call all other Administrative Control Consoles in the system.
- O. Facilities to prevent monitoring of classrooms whose call switch is in the "privacy" position.
- P. The system shall be capable of monitoring supervised call-in lines. Any supervised line shall alert the control console if the line is cut. The system can be checked daily from the control console for damaged lines.
- Q. All call switches shall be associated with a speaker assembly.
- R. Pre-announce tones will alert the classroom of incoming calls with distinct tones for each priority level.
 - 1. To prevent unauthorized monitoring, the tone will sound whenever the classroom

is being monitored, and will repeat at regular intervals. Facilities shall also be provided to defeat the tone repeat function from the administrative console if it is not desired.

- S. Provide automatic gain control on intercom speech to assure constant speech level.
- T. The system shall be integrated with the telephone system allowing any phone on the system to page and conduct hands-free open voice intercom with any speaker in the system. Telephone system phones shall be capable of the following features:
 - 1. Allow for direct dial selection of classrooms or paging zones. Selectively calling intercom speakers and establishing open voice communications.
 - 2. Establish 2 way hands-free open voice intercom communications between any intercom speaker.
 - 3. Initiate paging announcements from any telephone on the telephone system to all or 32 selective areas of the building.
 - 4. Initiate system tones.
 - 5. Distribute program material to all zones or individual zones within the facility.
- U. Capabilities of interfacing with local Gym, Cafeteria, or Auditorium Sound System, providing automatic bridging of the local system, whenever it is accessed from the console. The system shall automatically track the local system, controlling the audio program as programmed from the control console.
- V. Provide emergency and All Call paging through All Call and a minimum of 32 zones of group paging. The paging zones shall be independent of the time tone and audio program distribution zones. Systems sharing zones for both paging and time tone shall not be acceptable.
 - 1. Eight different sections of the building can be monitored either on or off the premises from a control console or telephone.
 - 2. Each System shall support up to 5 low-impedance microphones, which can be individually programmed to announce in any individual room or assigned to any of the 32 paging zones. The microphone(s) shall be software programmable for control and distribution thus eliminating the need to go to the central electronics for set-up. 3. Emergency announcements shall have the highest priority over any other system function.
 - 3. System shall support general announcements made from a conventional microphone to facilitate reading a script and the participation of multiple announcers.
 - 4. Keying the microphone shall automatically mute all other audio programs at a lower priority in the system and transmit the microphone audio to All Rooms or specific speaker zones, as programmed into the system software.
- W. The system must have the capability of distributing audio program sources from any administrative control console, telephone system phone or intercom system DTMF phone. Program distribution shall be accomplished on an all rooms basis, selected rooms basis or an individual room.
 - 1. Inputs shall be provided from at least 3 different line level sources and 5 different

- low impedance sources. Available inputs include microphones, tuners, tape players, or auxiliary sources.
2. The program source (AM/FM Tuner) shall be located remotely from the central electronics so that the customer does not have to go to the communications closet to select the program.
 3. The control console shall be able to selectively monitor program sources being distributed.
 4. Any area of the building shall be software programmable into 32 zones for easy selection of receiving audio programs. These zones shall be independent from the page and time tone zones. Individual rooms shall also be included or excluded independently from receiving audio programs.
 5. Systems whose only method of distributing an audio program is by the use of mechanical switch banks shall not be accepted.
 6. Systems, which cannot support the distribution of program material by at least two separate methods, will not be acceptable.
- X. The system shall support the automatic distribution of user programmable, class change time signals (Bell Schedule) to all selected areas:
1. The system shall support a minimum of 1536 events and 16 schedules.
 2. Building time zones shall be used to select which areas receive the tone. They must be totally independent from page zones and program zones.
 3. Ability to produce 8 different tone signals for classroom time changes or emergency signals selected from a combination of over 500 tones.
 4. All time signal programming shall be accomplished from a control console or a PC utilizing a standard web browser program.
 5. Facilities for displaying console clock in 24-hour or 12-hour format, selectable at the control console.
 6. The duration of the tone, as well as frequency, burst length and output level shall be software programmable from the console or a web browser.
 7. The system shall support running all time schedules concurrently.
 8. All system tones shall be user programmable for the following durations in seconds: 2, 3.5, 5, 6, 8, 10, 12.
 9. The system shall provide the ability to have music on class change allowing any source to be distributed to specific program zones.
- Y. System shall be provided with desk top public address type microphone for making announcements when other acceptable means is not provided. Location of console and microphone shall be coordinated with the Owner or Architect.

2.4 EQUIPMENT CABINETS

- A. Provide a Floor mounted cabinet for the intercom system head-end and associated equipment, as required.
- B. Located equipment as indicated on Drawings.

2.5 AM/FM TUNER AND CD PLAYER

- A. Provide an AM/FM CD player, Telecor model T-CDP or approved equal. The unit shall

be equipped with a LCD information display, front panel indicators and controls, clock, bass, treble, bass enhance, mute and digital signal processing.

1. The AM section shall be tuned over a range of 531 to 1602 KHz. The FM section shall be tuned over a range of 87.5 to 108.0 MHz. The unit shall be equipped to accommodate storage of up to 12 memory selections, six from each band. Storage can be manually accomplished or automatically performed by the unit based on the strongest signals.
2. The CD player shall provide utilize a sampling frequency of 44.1 KHz. The unit shall provide controls for play, stop, fast forward, rewind, track forward, track reverse, pause and eject. The unit shall provide a preview function, which will play the first 10 seconds of each track on the CD. The unit shall allow for random track play mode by the push of a single button.
3. Provide a roof-mount AM/FM antenna with lightning arrestor.

2.6 POWER AMPLIFIERS

- A. The power amplifiers shall be manufactured by Telecor. The system shall be sized at ½ watt per classroom, 1 watt per corridor speaker, and 3.5 watts per horn. The amplifier load shall not exceed 80% capacity.
- B. The amplifiers shall be capable of producing an audio output of 250 watts RMS at less than 1% distortion with a balanced output.
- C. They shall be designed to operate on a line voltage of 115 AC. One amplifier shall be provided for each audio channel. Provide amplifiers to support two audio channels.

2.7 CALL SWITCHES

- A. In areas, where indicated on the drawings or where required, provide call switch with momentary contact to initiate a “normal” priority level call.
- B. Integral LED shall indicate call confirmation by either a programmable sequence by the Owner or a predetermined sequence by the manufacturer. Confirmation sequence shall be consistent for all call switches.
- C. Call switches shall be mounted in one-gang back box providing a flush mount installation.
- D. Call switches shall be monitored for faults, such as, but not limited to, open-circuit, short-circuit, and damaged or malfunctioning call switch.
- E. Call switches shall have a waterproof finish for ease of cleaning.

2.8 CEILING AND WALL MOUNT SPEAKERS

A. CEILING SPEAKERS

1. Provide an 8” diameter, 12 Watt speaker housed in a baffled assembly designed to lay-in a suspended ceiling providing a flush installation. The speaker shall

have a frequency range of at least 65 Hz to 17,000 Hz. It shall have an axial sensitivity of at least 92db at 1 meter with a 1-watt input. The voice coil shall be 1" diameter with 8-Ohm impedance. The loudspeaker shall be complete with a 25-volt constant voltage transformer with power taps at ¼, ½, 1, 2, and 5 watts.

2. Ceiling speakers shall be flush mounted. Assembly shall include a baffle constructed of 22 gage, cold rolled steel finished with a mar-resistant white, semi-gloss, epoxy coating. The baffle shall be 13" in diameter and include support bridge and speaker enclosure.

B. WALL MOUNT SPEAKERS

1. Wall mounted speakers shall be surface mounted. Assembly shall include a square grille mounted within a slope front steel housing. The housing shall be lined with 1.5" thick acoustic batting. It shall be finished with a mar-resistant white, semi-gloss, epoxy coating.

- C. Provide replacement speakers in all areas that have non-functioning speakers.

2.9 SPEAKER HORN

- A. It shall be a double re-entrant type, with a flared bell and an integral compression driver rated for 15 watts of continuous audio power. The minimum frequency response be 375 - 14,000Hz. Nominal sensitivity shall be such that a sound pressure level of 110 dB at 1000 Hz (on axis) at distance of one meter is produced with an input of one watt. Sound dispersion shall be no less than 100 degrees, regardless of the mounting position.
- B. The horn shall contain a weatherproof, built-in, 25/70 volt line matching transformer, Power taps at 25V shall be at 0.63, 1.25, 2.5, 3.75, 5, 10, 20, and 40 watts. Power taps shall be screwdriver adjustable.
- C. The unit shall include a die-cast universal mounting bracket, allowing the horn to be positioned both in the vertical and horizontal planes with a single adjustment.
- D. The unit shall include a die-cast universal mounting bracket, allowing the horn to be positioned both in the vertical and horizontal planes with a single adjustment.
- E. The wiring terminals and the screwdriver power tap shall be enclosed by a clear plastic cover for security and weather protection. The horn shall be finished in a grey epoxy. Dimensions shall be 9 1/4" deep with a diameter of 8".
- F. Provide replacement horns in all areas that have non-functioning horns.

2.10 REMOTE BUILDINGS

- A. Provide public address network device capable of serving a minimum of 25 stations. A station shall include a call switch and (1) speaker, minimum.
- B. Head-end public address equipment shall communicate, monitor, and provide all functions to remote units via the School's Network.

- C. Communication failure between remote network devices and head-end public address equipment shall initiate an alarm/alert to the main console located in the reception area.
- D. Network device shall be rack mounted and compatible with a standard 19" wall mounted equipment cabinet.
- E. Provide power supply as required.

PART 3 EXECUTION

3.1 WIRING METHODS

- A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters, and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables except in unfinished spaces.
 - 1. Install plenum cable in environmental air spaces, including plenum ceilings.
 - 2. Comply with requirements for raceways and boxes specified in Section 260533 *Raceway and Boxes*.
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.2 INSTALLATION OF RACEWAYS

- A. Raceways and boxes shall be provided by Division 26. Coordinate requirements for raceways and boxes not indicated on Drawings with Division 26.

3.3 INSTALLATION OF CABLES

- A. Comply with NECA 1.
- B. General Cable Installation Requirements:
 - 1. Terminate conductors; no cable shall contain non-terminated elements. Make terminations only at outlets and terminals.
 - 2. Splices, Taps, and Terminations: Arrange on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Cables may not be spliced.
 - 3. Secure and support cables at intervals not exceeding 48 inches (1219 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 - 4. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

5. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
 6. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used.
- C. Open-Cable Installation:
1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
 2. Suspend speaker cable not in a wireway or pathway a minimum of 8 inches (200 mm) above ceiling by cable supports not more than 48 inches (1219mm) apart.
 3. Cable shall not be run through structural members or be in contact with pipes, ducts, or other potentially damaging items.
- D. Separation of Wires: Separate speaker-microphone, line-level, speaker-level, and power wiring runs. Install in separate raceways or, where exposed or in same enclosure, separate conductors at least 12 inches (300 mm) apart for speaker microphones and adjacent parallel power and telephone wiring. Separate other intercommunication equipment conductors as recommended by equipment manufacturer.

3.4 INSTALLATION

- A. Match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.
- B. Identification of Conductors and Cables: Color-code conductors and apply wire and cable marking tape to designate wires and cables so they identify media in coordination with system wiring diagrams.
- C. Equipment Cabinets and Racks:
1. Group items of same function together, either vertically or side by side, and arrange controls symmetrically. Mount monitor panel above the amplifiers.
 2. Arrange all inputs, outputs, interconnections, and test points so they are accessible at rear of rack for maintenance and testing, with each item removable from rack without disturbing other items or connections.
 3. Blank Panels: Cover empty space in equipment racks so entire front of rack is occupied by panels.
- D. Volume Limiter/Compressor: Equip each zone with a volume limiter/compressor. Install in central equipment cabinet. Arrange to provide a constant input to power amplifiers.
- E. Wall-Mounted Outlets: Flush mounted.
- F. Conductor Sizing: Unless otherwise indicated, size speaker circuit conductors from racks to loudspeaker outlets not smaller than No. 18 AWG.
- G. Weatherproof Equipment: For units that are mounted outdoors, in damp locations, or where exposed to weather, install consistent with requirements of weatherproof rating.

H. Speaker-Line Matching Transformer Connections: Make initial connections using tap settings indicated on Drawings.

I. Connect wiring according to Section 260519 *Conductors and Cables*.

3.5 GROUNDING

A. Ground cable shields and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment cabinet. Isolate from power system and equipment grounding.

C. Install grounding electrodes as specified in Section 260526 *Grounding and Bonding*.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Schedule tests with at least seven days' advance notice of test performance.

2. After installing public address and mass notification systems and after electrical circuitry has been energized, test for compliance with requirements.

3. Operational Test: Perform tests that include originating program and page messages at microphone outlets, preamplifier program inputs, and other inputs. Verify proper routing and volume levels and that system is free of noise and distortion.

4. Signal-to-Noise Ratio Test: Measure signal-to-noise ratio of complete system at normal gain settings as follows:

a. Disconnect microphone at connector or jack closest to it and replace it in the circuit with a signal generator using a 1000-Hz signal. Replace all other microphones at corresponding connectors with dummy loads, each equal in impedance to microphone it replaces. Measure signal-to-noise ratio.

b. Repeat test for each separately controlled zone of loudspeakers.

c. Minimum acceptance ratio is 50 dB.

5. Distortion Test: Measure distortion at normal gain settings and rated power. Feed signals at frequencies of 50, 200, 400, 1000, 3000, 8000, and 12,000 Hz into each preamplifier channel. For each frequency, measure distortion in the paging and all-call amplifier outputs. Maximum acceptable distortion at any frequency is 3 percent total harmonics.
 6. Acoustic Coverage Test: Feed pink noise into system using octaves centered at 500 and 4000 Hz. Use sound-level meter with octave-band filters to measure level at five locations in each zone. For spaces with seated audiences, maximum permissible variation in level is plus or minus 2 dB. In addition, the levels between locations in same zone and between locations in adjacent zones must not vary more than plus or minus 3 dB.
 7. Power Output Test: Measure electrical power output of each power amplifier at normal gain settings of 50, 1000, and 12,000 Hz. Maximum variation in power output at these frequencies must not exceed plus or minus 1 dB.
 8. Signal Ground Test: Measure and report ground resistance at public address equipment signal ground. Comply with testing requirements specified in Section 260526 *Grounding and Bonding*.
- E. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Prepare a list of final tap settings of paging speaker-line matching transformers.
- F. Public address and mass notification systems will be considered defective if they do not pass tests and inspections.
- G. Prepare test and inspection reports.
1. Include a record of final speaker-line matching transformer-tap settings, and signal ground-resistance measurement certified by Installer.

3.7 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
1. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements.
 2. Complete installation and startup checks according to manufacturer's written instructions.

3.8 ADJUSTING

- A. On-Site Assistance: Engage a factory-authorized service representative to provide on-site assistance in adjusting sound levels, resetting transformer taps, and adjusting controls to meet occupancy conditions.
- B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.9 TRAINING

- A. Engage a factory-authorized service representative to provide (6) hours of training for the Owner's maintenance personnel to adjust, operate, and maintain the public address and mass notification systems and equipment.

END OF SECTION 275000

DIVISION 27
SECTION 275115
GYMNASIUM AND CAFETERIA SOUND SYSTEMS
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SECTION 275115 – GYMNASIUM AND CAFETERIA SOUND SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections apply to this section.
- B. Division 26, Section *Common Work Results for Electrical*
- C. Division 26, Section *Wiring Devices*

1.2 SUMMARY

- A. The intent of this specification is to provide complete and satisfactory operating systems for the pickup, amplification, distribution, and reproduction of audio program material. This specification may also make certain provisions to incorporate pickup and reproduction in the future.
- B. The work covered in this section is subject to all of the requirements in the General Conditions of the Specifications. Contractor shall coordinate all of the work in this section with all of the trades covered in other sections of the specification to provide a complete and operable system. All Labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this Section.
- C. The Contractor shall furnish all equipment herein specified and as shown on the Drawings.
- D. The Contractor shall furnish acoustical equalization test equipment and trained personnel to equalize the sound equipment to the room acoustics for optimum speech and music performance.
- E. All work shall be performed under the supervision of a company accredited by the basic manufacturer and such accreditation must be supplied to the Architect for approval.
- F. The equipment supplier shall construct the system following good engineering practices and in accordance with applicable codes and regulations of governing bodies.
- G. To assure compliance with all governmental codes, regulations, and laws, the installing contractor shall have on its staff a Master Electrician licensed within the State of Delaware. Proof of such licensing shall be included with the contractor's submittal.
- H. To assure compliance with all industry and governmental standards and policies, the installing contractor shall have on its staff a BiCSi Registered Communications Distribution Designer. Proof of such registration shall be included with the contractor's submittal. The installing contractor shall also have an ICIA-certified CTS on staff.

- I. Gymnasium Sound Reinforcement System - A two zone multi-loudspeaker system shall be provided. The system shall provide a "Separate Mode" which shall allow the areas on both sides of the movable partition to function as local sound systems simultaneously. The system shall also provide for a "Combined Mode" where the two separate systems would combine to form a single system for the complete Gymnasium. A cluster of three loudspeakers shall be placed above and on each side of the movable partition. A "Combine/Separate" switch shall be provided at the equipment cabinet. This switch shall bridge the two mixers and designate a master mixer to feed both amplifier/loudspeakers. Clearly label and color code the master volume control for all functions. Provide remote volume controls, on each end wall of the Gymnasium, to control the local system when in "Separate Mode".
- J. Cafeteria Sound System – A single zone multi-loud speaker system shall be provided to distribute quality sound to the members of the audience. System shall distribute record media, live presentations, and audio streamed via the School's network. Multi-loudspeakers properly spaced to provide consist sound levels throughout the space. Provide easy to use controls with remote capable for adjust throughout the space.
- K. Hearing Assistance System - Provide a reinforcement system for the hearing impaired in the Gymnasium. The hearing assistance system shall be an FM radio system that shall not limit operation to certain seats or areas of the room(s). Provide approximately 20-40 milliseconds of high-quality digital signal delay to help in the localization of the sound source.

1.3 DESCRIPTION OF WORK

- A. Furnish and install a complete system for the Gymnasium and Cafeteria Sound System as indicated on the plans, detailed in the manufacturer submittal and as further defined herein. Contractor is solely responsible to verify quantity, installation locations and wiring requirements for this project. Specific manufacturers' catalog numbers, when listed in this section are for reference only. It is the responsibility of the contractor to verify with lighting control manufacturer all catalog information and specific product acceptability.

1.4 SUBMITTALS

- A. Refer to Division 26 Section, *Common Work Results for Communications*, Paragraph – "Shop Drawing Requirements".
- B. Shop Drawings: Submit dimensioned drawings of sound system and accessories including, but not limited to, amplifiers, signal processor, control panel, loudspeakers, cables, rack enclosures, etc. Sound System installer to verify all sound system material requirements from approved shop drawings. "Cut Sheet" submittal not acceptable.
- C. Product Data: As specified under Division 01, submit for approval manufacturer's data on the specific sound system 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 manufacturer facility. Submit a complete bill of materials with part numbers, description and sound level specifications.

- D. Product Data: Include shop drawings for the following:
1. Amplifiers
 2. Equalizers
 3. Mixing Console
 4. Speakers
 5. Jacks
 6. Cables
 7. Microphones and Stands
 8. Transmitters and Receivers
 9. Enclosure
- E. One Line Diagram: Submit a one-line diagram of the system configuration indicating the type, size and number of conductors between each component to provide diagrammatic representation of component connections. Submittals that show typical riser diagrams are not acceptable.
- F. Operation and Maintenance Manuals: As required by Division 01 and Division 26 including Schematics, Layout Drawings, Interconnecting Diagrams for this particular project and Parts Lists to permit quick and efficient maintenance and repair of the equipment by a qualified technician.
- G. Submit product mounting and installation details.

1.5 QUALITY ASSURANCE

- A. Install and connect all equipment as specified and as shown on the Contract Drawings in accordance with the Manufacturer's instructions and recommendations. Furnish and install complete independent sound systems, serving the Gymnasium and Cafeteria. Furnish and install all electrical connections as recommended by the Manufacturer and as required for proper operation. Before roughing in outlets, verify locations, and type of jack/outlet required from approved shop drawings.
- B. Mark switches, connectors, jacks, receptacles, conduits, outlets, cables and cable terminations clearly, logically and permanently.
- C. Provide labor, material, equipment and services necessary for complete, safe installation in conformity with all applicable codes and authorities having jurisdiction; including, in general, the following:

1. General Provisions for Electronic Work.
2. Raceways, Wire and Cables.
3. Public Address System.
4. Shop Drawings and Record Documents.

1.6 WARRANTY

- A. All equipment and materials, including wiring and installation furnished under this Contract shall be guaranteed for two (2) years from the date of acceptance of the systems against electrical and mechanical defects except when such defects are caused by misuse. Warranty shall include all materials and labor at no additional cost to the Owner.
- B. Service must be rendered within 24 hours of notification.

PART 2 PRODUCTS

2.1 GYMNASIUM

A. MANUFACTURERS

1. Subject to compliance with requirements, provide products by one of the following:
 - a. JBL
 - b. Crown
 - c. Rane
 - d. TOA
 - e. Simplex
 - f. Rauland
 - g. Approved Equal
2. All basic electronic equipment (not including cable) specified herein shall be produced by a manufacturer of established reputation and experience who shall be able to refer to 25 similar installations rendering satisfactory service.

B. EQUIPMENT

1. FM Wireless Microphone System:
 - a. The Wireless Microphone shall be a miniature battery-operated FM transmitter and matching AC powered receiver incorporating compander circuitry to increase dynamic range and signal-to-noise ratio. The system shall operate in the UHF band, utilizing dual diversity antennae for reducing multipath problems. A backlit LCD display shall show the operating frequency, antenna signal strength and transmitter

battery life. An auto-detect mode shall allow the receiver to synchronize with the mating transmitter.

1. Each system shall incorporate agile frequency tuning and shall be able to operate with up to 12 wireless systems simultaneously.
 2. Minimum Overall Performance Requirements:
 - a. Frequency Response: 45-15,000 Hz, ± 2 dB (without mic).
 - b. Distortion: 0.5% THD.
 - c. Dynamic Range: >100dB, A weighted.
 - d. RF Carrier Frequency: 518-752 MHz.
 - e. Frequency Sensitivity: -105dBm for 12dB SINAD
 3. Hand-Held Transmitter, provide one:
 - a. Hand-held microphone with built-in transmitter, batteries, and antenna.
 - b. LCD display showing frequency and battery life.
 - c. Power Output: 30mW RF using 2 AA batteries.
 - d. Acceptable Products:
 - e. AKG HT400/D880 with mating swivel stand adapter.
 - f. Shure SLX2/SM58 with mating swivel stand adapter.
 5. Receiver, provide one:
 - a. AC powered receiver in $\frac{1}{2}$ rack package with dual antennae.
 - b. A backlit LCD displaying frequency, RF signal and transmitter battery life.
 - c. Balanced microphone and line-level output on rear panel.
 - d. Provide two remote $\frac{1}{4}$ wave antennas and mounts per receiver
 - e. Acceptable Products:
 - i. AKG SR400 with rack mount.
 - ii. Shure SLX4 with rack mount.
 - iii. Sennheiser EW100G2 with rack mount
- B. General Purpose Microphone:
1. Usable in floor or desk stand using included clip.
 2. Hyper-cardioid or super-cardioid directional characteristic.
 3. 15 dB or greater front-to-back discrimination from 100-8000 Hz.
 4. Frequency response ± 3 dB from 120-12kHz.
 5. Provide with two 25' braided shield mic cable and cast zinc alloy connectors per microphone.
 6. Acceptable products, provide two:
 - a. Shure SM58.
 - b. AKG D3800.
 - c. EV RE16.

C. Microphone Stands:

1. Floor stand with 10" diameter cast iron base. Two-section extendible tube of 7/8" and 5/8" seamless steel tubing. Standard 5/8"-27 thread, adjustable from 37-60 inches in height. Black tube and base. Provide two Atlas MS-12CE microphone stand.
2. Desk stand with small footprint base and short mounting tube. Tube to be 4-8" in height and finished in black. Base to be isolating type, black in color weighing at least 1.5lb. Provide two Atlas DS-2E.

D. Microphone Mixer:

1. The mixer shall be a high quality modular design with at least eight configurable inputs. Each input shall have a dedicated front panel level control. Input modules shall be available for microphone, line level and other various inputs.
2. A master level control, bass and treble tone controls and level indicator LED shall be provided. A mute function shall be provided. Remote volume control capability must be provided.
3. The rear panel shall feature preamp output connections, a bridging input/output jack low cut switch and external mute jack shall be provided.
4. The output section shall deliver +20dBm at less than 0.1% THD. Provide output terminals for 150 ohm and 600 ohm transformer-balanced main output as well as an aux out jack.
5. Acceptable product, provide one:
 - a. TOA M-900MK2 with rack mount and M-11S microphone and B-01S line input modules.
 - b. Peavey A/A MMA800T with rack mount, MPT-S2 microphone modules and BTM-S line input modules.
 - c. Equal with the above stated features.

E. iPod Dock

1. Provide one (1) Raxxess IRDS1 single iPod Dock in the rack.

F. Programmable Dual DSP Processor:

1. Tamper-resistant unit without front panel controls, with on-board non-volatile memory for multiple presets, field programmable internally with security code lockout, or by external device.
2. Minimum requirements are: two input channels; four output channels; 1/3 octave-band analog cut/boost filters on ANSI preferred 31.5-16,000 Hz center frequencies; input signal delays; output signal delays; compressor/limiters; and programmable gain settings.

3. Programming of settings using personal computer running Windows 98 minimum.
 4. Dimensions: 1-3/4" high for standard 19" rack-mounting.
 5. Minimum Performance Requirements:
 - a. Frequency Response: ± 0.5 dB, 20-20,000 Hz. with controls set for flat response.
 - b. Distortion: 0.05% THD at 0 dBm output, 20-20,000 Hz, with controls set
 - c. for flat response.
 - d. Dynamic Range: >96dB.
 - e. 1/3 Octave Filter Control Range: ± 12 dB in 1/2 dB steps.
 - f. Infra-Sonic Filter: 12 or 18 dB/octave slope, 16-20 Hz.
 - g. Gain: -20 to +20dB.
 - h. Input: max. +18 dBu. balanced bridging min. 10k ohms.
 - i. Output: max. +18 dBu, balanced for min. 600 ohm load.
 - j. Memory: EEPROM non-volatile memory with at least 8 memory locations, battery-backed memory shall not be acceptable.
 6. Programmable Dual DSP Processor-Acceptable Products:
 - a. Rane RPM26z.
 - b. dbx Drive Rack 220i
 - c. Shure DFR22 may be acceptable if 2 units are provided.
 - d. Crown CDi1000 Power Amplifier with built-in DSP
- G. Power Amplifier:
1. Solid-state, two channel amplifier. Capable of withstanding +22dBu input.
 2. Front panel indication of clipping.
 3. All inputs via barrier type terminal strips, Phoenix or XLR-type connectors. All outputs via barrier type terminal strips or 5-way binding posts.
 4. Minimum Performance Requirements:
 - a. Frequency Response: ± 0.1 dB, 20-20,000 Hz.
 - b. Distortion: 0.1% THD, 20-20,000 Hz at full rated output.
 - c. Signal to Noise Ratio: 100 dB below rated 8 ohm output at 1k Hz.
 - d. Inputs: min. 20k, balanced.
 - e. Minimum Rated Load Impedance: 4 ohms, able to operate safely into any load.
 5. Output Power:
 - a. 500W per channel minimum into 4 ohms or 70 volt line.
 6. Acceptable Products, provide two (2):

- a. Crown CDi1000 .with built-in DSP
- b. Architectural Acoustics ICA 600.
- c. QSC ISA 450 (must provide DSP listed above)

H. Gymnasium Loudspeakers

1. The loudspeakers shall be two-way design with 15" low frequency drivers and 1" high frequency driver/horn combination.
2. Each loudspeaker shall provide the following features:
 - a. Protection - Steel ball guards over cone drivers
 - b. Frequency Response/Sensitivity - 60Hz-25KHz, -10dB, 98dB
 - c. Power Rating - 200W continuous pink noise
 - d. Dimensions – 23.1" x 16.9" x 12.3"
 - e. Weight - 32 lbs.
 - f. Dispersion - 65 deg x 65 deg @ -6dB
 - g. Mounting - integral mounting points on cabinet rear for mounting brackets
3. Acceptable products, provide a circular cluster of six, plus two downfiring:
 - a. Electro-Voice SX100+ w/MB200 and MB300 hardware as required.
 - b. Architectural Acoustics Quadra 12.
 - c. Community CPL42-64

I. Cafeteria Loudspeakers

1. The loudspeakers shall be high power, wide frequency response and low distortion for high sound level capability.
2. Each loudspeaker shall provide the following features:
 - a. Construction: Cover shall be perforated with plenum rated housing providing a flush finish.
 - b. Frequency Response/Sensitivity - 75Hz-20KHz,
 - c. Power Rating - 75W continuous pink noise
 - d. Dimensions – 8.3"x9.9"x7.5"
 - e. Weight – 7.5 lbs.
 - f. Mounting – tile support rails for suspended ceiling tiles.

J. Equipment Cabinet:

1. Audio equipment rack is to be located as indicated on the drawings. Final fit will be the responsibility of the AV Contractor.
2. The rack shall be a section wall-mounted cabinet constructed of 16 gauge CRS throughout. The rear section and front door shall be hinged to the center section. The hinges shall be bolted not welded.

3. Each section shall be one-piece construction with M.I.G. welded joints and seams.
 4. The rear section shall have concentric 1/2" and 3/4" knockouts at the top and bottom.
 5. The equipment mounting rails shall be tapped with 10-32 holes at EIA 19" rack spacing.
 6. The front door shall allow 2" of distance from the mounting rails when closed. A cylinder lock shall be provided. Provide six keys to the owner.
 7. Acceptable products, provide one:
 - a. Atlas/Soundolier 320-26B.
 - b. Middle Atlantic SWR18-16 with WRD-10 door.
 - c. Lowell L53-28.
- K. Hearing Assistance System – Gymnasium and Cafeteria:
1. FM radio transmission system operating in the 72-76 MHz Auditory Assistance Band as set aside by the FCC.
 2. Digitally selectable operating frequency within the approved band.
 3. Input connections to include balanced XLR and unbalanced RCA selectable to mic level, line level and speaker level.
 4. Shaped frequency response with selectable high pass filter, compressor, peak limiter and enhancing circuit.
 5. Front panel monitor jack and level control.
 6. Minimum performance characteristics:
 - a. FM modulation transmission system
 - b. 50Hz-15KHz \pm 3dB frequency response
 - c. 8000uV/m radiating power at 3m (~20mW)
 - d. Signal to noise ratio of 80 dB with SQ.
 - e. 50PPM transmitter stability
 7. Acceptable products, provide one transmitter, ten receivers and two neck loops:
 - a. Listen LR400 transmitter with remote antenna and rack mount.
 - b. Listen LT800 receiver with single earbud.
 - c. Listen LA-166 Neckloop.
 - d. Approved equal by Telex, Phonic Ear or Williams Sound with the same features and performance specifications.

2.3 WIRE

- A. Provide West Penn 291, or equal, for all microphone jack, line jacks and remote volume control locations, and for all line level wiring. Color code wires for separate functions (e.g. blue = microphone, violet = line level, green = volume).
- B. Provide West Penn 226, or equal, for the Gymnasium loudspeaker cluster circuits.

2.4 CONNECTORS

- A. Provide Neutrik NC3 series “XLR”, Neutrik NP3C “TRS” or Canare F-09 “RCA” connectors for microphone and line level connections
- B. Provide Switchcraft N112B connectors for line inputs.
- C. Provide crimped or gas-tight terminals for all loudspeaker connections. Wirenuts are not acceptable.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The work to be performed shall be in accordance with the National Electrical Code and meet applicable EIA Standards. All equipment shall meet existing local and State Codes.
- B. The Contractor shall provide ancillary and supporting supplies which may not be specified in detail including, but not limited to, wire, connectors, terminal strips, boxes, panels, transformers, etc., which are essential for a professional, complete, and operable system.
- C. All electronic equipment shall be of the solid state type and all equipment shall be new and in current production by its manufacturer.
- D. The system shall be free of interference from radio frequency signals including AM, FM, TV and Communications Systems signals. The system shall also be free of self-generated low-frequency or supersonic oscillations.
- E. All equipment panels shall be identified by permanent engraved lettering or silkscreening. Vent panels, louvers, fans, and/or blowers shall be provided in the console and rack to limit internal temperature to 120 degrees F during operation.
- F. The control console and equipment rack and all chassis-mounted equipment shall be grounded to the building framework by a copper wire no smaller than #8 gauge. Wiring and shielding and signal circuit grounds shall be insulated and isolated from frame and chassis until a deliberate connection is made at one point in the system grounding plan.
- G. All system work, both inside and outside the console and rack, shall be subject to approval with respect to neatness, good engineering practices, and professional appearance. The console and rack shall be left free of wire clippings, metal chips, dirt or other foreign matter.

3.2 SYSTEM PERFORMANCE TESTS

- A. Provide all required testing apparatus to complete the performance test of the system. Provide knowledgeable personnel to perform the testing.
- B. Provide the following minimum test equipment:
 - 1. Audio Toolbox or Audio Control SA-3050A with calibrated microphone and printer and printer output options.
 - 2. TEF 12+ or TEF 20 TDS analyzer or Audio Precision P1A.
 - 3. Earthworks M30 microphone and preamplifier.
 - 4. Sennheiser ZP-3 or Goldline ZM1 AC impedance bridge
 - 5. HP 8903BDistortion analyzer
 - 6. Oscilloscope
 - 7. Sound level meter
 - 8. Digital Multimeter
- C. Measure and record the DC loop resistance of all microphone lines with a shorting plug installed in place of the microphone.
- D. Check and correct the phasing of all loudspeakers.
- E. Measure and record the impedance of all loudspeakers including the connecting wires. The values may be checked with the impedance meter, but the measurements shall made and recorded with the TEF analyzer, as recommended by the manufacturer, from 20 Hz to 20,000 Hz.
- F. Measure and record the THD and noise level of each amplifier channel. Load the output with 8 ohm power resistors. Adjust controls for optimum signal-to-noise ratio and full amplifier output with a -50 dBm, 1 kHz sine wave at one microphone input. Measure and record the distortion level; the level shall be less than 1%. Substitute a 150 ohm resistor at the microphone input and measure and record the overall hum and noise at each amplifier output. The level shall be down at least 80 dB from the full output level from 20 Hz - 20,000 Hz.
- G. Check for oscillation and radio frequency pickup. Set up system for intended usage, less any microphones. Use an oscilloscope on the speaker lines to monitor the output of the system. Insure that the system is free of spurious oscillation and RF pickup with no input signal and when driven to 75 dBA with a 500 Hz sine wave.
- H. Check for and correct any rattles or buzzes. Apply a full range music source adjusted so that peaks are at specified minimum sound pressure level. Apply a swept sine wave from 100 Hz - 2,000 Hz at the specified average sound pressure level. There shall be no irregularities.
- I. Adjust system levels so the limiter/compressor (or the mixer's integral limiter) activates just before clipping of any and all amplifiers. The limiter shall be turned "OFF" for all other tests. Reactivate and recheck the limiter after all other tests have been completed.

- J. Adjust the digital delay line to a setting that provides the best time coherence between the visual source, speaker systems and hearing assistance system.
- K. Measure and record, on the chart recorder, from at least three (3) representative positions, the "RAW" frequency response of the voice speaker system alone, without equalization. Repeat the above procedure for the program speaker system.
- L. Equalize, measure and record the "EQUALIZED" frequency response of just the speaker system from at least three positions. The response shall be 3 dB of the following:
 - 1. Flat and even between 100 and 5,000 Hz.
 - 2. Fast rolloff (about 12dB per octave) below 50 Hz.
 - 3. Slow rolloff (about 3dB per octave) between 5,000 and 10,000 Hz.
 - 4. Fast rolloff (about 6-12dB per octave) beyond 15,000 Hz.
- M. Measure the maximum output level of the system. Apply full range music adjusted so that peaks remain below the clipping level of the amplifiers. Measure the output level at peaks with the "fast" setting on the SLM. The audio system shall be able to deliver at least 105 dBA SPL to any audience position in the Gymnasium and 95dBA SPL in the Cafeteria.

3.3 DEMONSTRATION

- A. Provide as specified operating instructions. For the system specified in this section, provide without additional expense to the Owner, the services of a competent instructor who will give full instruction in the care, adjustment and operation of all parts of the electronic equipment to the Owner's representatives who are to be in charge of the equipment.
- B. The Instructor shall be familiar with all parts of the system on which instruction is to be given, and shall be trained in operating theory, as well as in practical operation and maintenance work.
- C. Unless otherwise required or approved, the instruction shall be given during the regular work week after the equipment has been accepted and turned over to the Owner for regular operation. All instruction time shall be given at location of equipment.

END OF SECTION