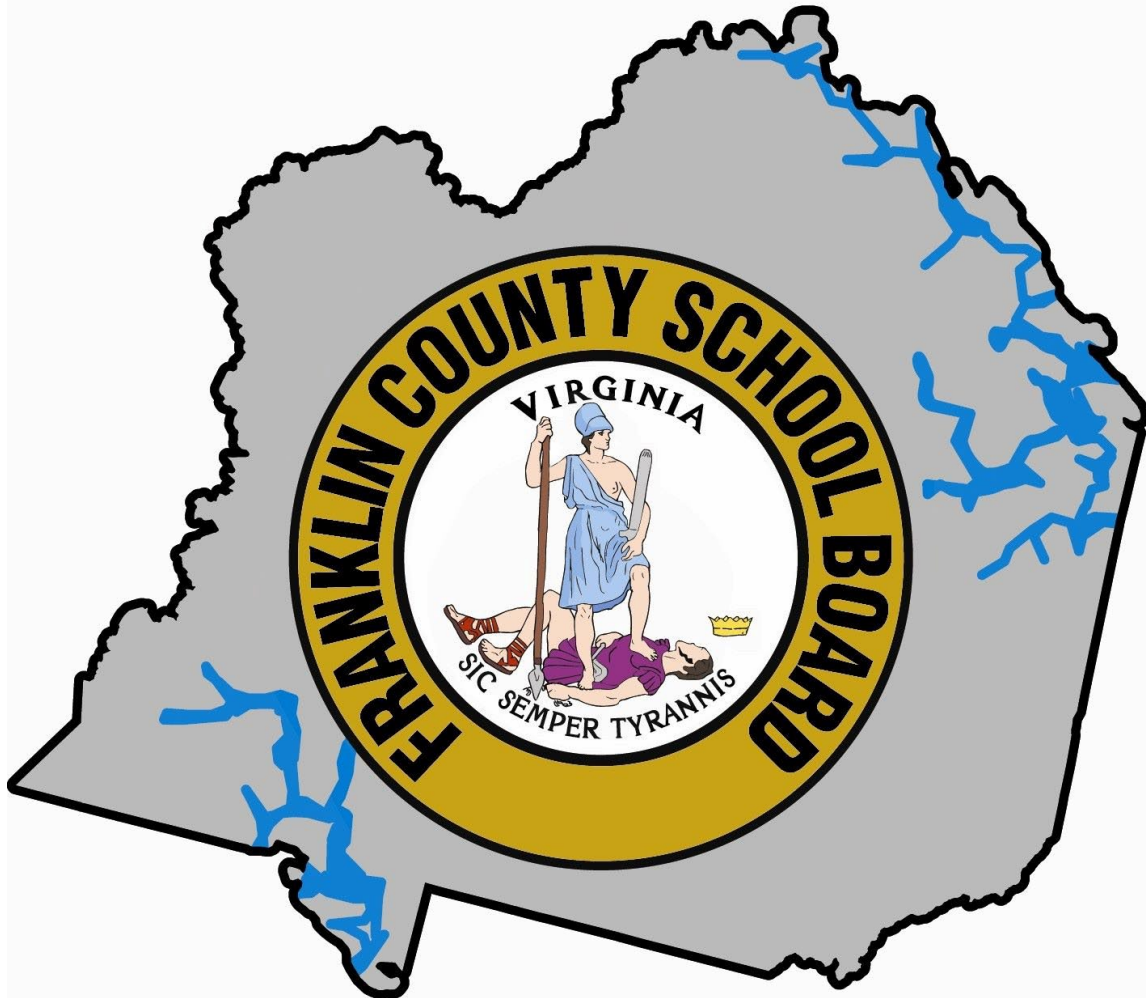


FRANKLIN COUNTY PUBLIC SCHOOLS
SNOW CREEK ES 2CR HVAC UPGRADES



ASCENT. No. 2025-0242
FEBRUARY 19, 2025



ROANOKE
5228 Valleypointe Pkwy,
Suite 4
Roanoke, VA 24019
Tel: 540.265.4444
Fax: 540.265.4445

RICHMOND
11508 Allecingie Parkway
Richmond, VA 23235
Tel: 804.423.6444
Fax: 804.423.6445

TABLE OF CONTENTS

NOTE: This index is for convenience only. Its accuracy and completeness are not guaranteed and it is not to be considered as part of the specifications. In case of discrepancy between the index and the specifications, the specifications shall govern.

BIDDING REQUIREMENTS

	INVITATION TO BID
00100	INSTRUCTIONS TO BIDDERS
00300	BID FORM
00500	AGREEMENT

CONTRACT FORMS

00410	BID BOND
00610	PERFORMANCE BOND
00620	PAYMENT BOND
00680	REQUEST FOR PAYMENT

GENERAL CONDITIONS

00700	GENERAL CONDITIONS
00800	SUPPLEMENTARY CONDITIONS
008200	SPECIAL CONDITIONS

SPECIFICATIONS

DIVISION 0 - SPECIAL CONDITIONS AND DRAWING INDEX

00850	DRAWING INDEX
-------	---------------

DIVISION 1 - GENERAL REQUIREMENTS

010150	CONTRACTOR'S USE OF THE PREMISES
012000	PROJECT MEETINGS
012060	GENERAL CONTRACTOR'S WORK
012200	UNIT PRICES
013000	SUBMITTALS
015000	TEMPORARY FACILITIES AND CONTROLS
016050	PRODUCTS AND SUBSTITUTIONS
016400	PRODUCT HANDLING
017000	PROJECT CLOSEOUT
017300	OPERATION AND MAINTENANCE DATA

DIVISION 2 - SITEWORK

020500	DEMOLITION
--------	------------

DIVISION 4 – MASONRY

042000	UNIT MASONRY
--------	--------------

SNOW CREEK ES 2CR HVAC UPGRADES

DIVISION 5 – METALS

051200 STRUCTURAL STEEL

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

072700 FIRESTOPPING
075000 ROOFING SYSTEM
079000 SEALANTS AND CAULKING

DIVISION 9 – FINISHES

092500 GYPSUM WALLBOARD SYSTEM
095200 ACOUSTICAL CEILINGS
099000 PAINTING

DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING

230010 HVAC GENERAL REQUIREMENTS
230100 OPERATION AND MAINTENANCE OF HVAC SYSTEMS
230500 COMMON WORK RESULTS FOR HVAC
230548 VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING
AND EQUIPMENT
230553 IDENTIFICATION FOR HVAC EQUIPMENT
230593 TESTING, ADJUSTING AND BALANCING FOR HVAC
230700 HVAC INSULATION
230900 INSTRUMENTATION AND CONTROL FOR HVAC
230993 SEQUENCE OF OPERATIONS FOR HVAC CONTROLS
232000 HVAC PIPING AND PUMPS
233000 HVAC AIR DISTRIBUTION
237000 CENTRAL HVAC EQUIPMENT
238000 DECENTRALIZED HVAC EQUIPMENT

DIVISION 26 - ELECTRICAL

260500 COMMON WORK RESULTS FOR ELECTRICAL
260519 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND
CABLES
260523 CONTROL VOLTAGE ELECTRICAL POWER CABLES
260526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
260533 RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS
260536 CABLE MANAGEMENT FOR ELECTRICAL SYSTEMS
260553 IDENTIFICATION FOR ELECTRICAL SYSTEMS
260923 LIGHTING CONTROL DEVICES
262813 FUSES
262816 ENCLOSED SWITCHES AND CIRCUIT BREAKERS
265000 LIGHTING

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

283100 FIRE DETECTION AND ALARM SYSTEM

INVITATION TO BID

Sealed bids are invited for the construction of **SNOW CREEK ES 2CR HVAC UPGRADES** in Franklin County Virginia.

This project is generally described as replacing the existing unit ventilators with packaged rooftops in two classrooms at Snow Creek Elementary School in Franklin County.

Sealed bids will be received at Franklin County Public Schools, Maintenance Department, 250 School Service Road, Rocky Mount, Virginia 24151, Attention: Mr. Mark T. Law. **The deadline for submitting bids is 2:00 P.M. sharp, as determined by the Bid Officer, on April 2, 2025.** The bids will be opened publicly and read aloud **beginning** at 2:00 P.M., on **April 2, 2025**, at the same location.

A Bid Bond is required.

Procedures for submitting a bid, claiming an error, withdrawal of bids and other pertinent information are contained in the Instructions to Bidders. The Owner reserves right to reject any or all bids.

A **Mandatory** pre-bid conference will be held as indicated in the Instructions to Bidders.

The contract shall be awarded on a lump sum basis as follows: The Total Base Bid Amount as the Owner in its discretion decides to award in the manner set forth in Article 14 of the Instructions to Bidders.

See the Instructions to Bidders for bidder qualification requirements. Franklin County Public Schools is an equal opportunity employer.

The Contract Documents for the above project, including the drawings and the specifications containing the information necessary for bidding, may be obtained from the Issuing Office, Ascent Engineering Group, Inc., 5228 Valleypointe Pkwy, Suite 4, Roanoke, VA 24019-2922, Telephone 540-265-4444, beginning Monday February 24, 2022.

A deposit of \$100.00 for each hard-copy set of the Invitation for Bids documents will be required as a guarantee of the safe return of the documents within thirty (30) days after the bid opening. A non-refundable charge of \$25.00 is required for handling. Two separate checks are required in order to refund deposits.

Electronic copies of the contract documents are available free of charge from the following link:
<https://bit.ly/3D2GAmH>

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INSTRUCTIONS TO BIDDERS

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly By

PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE
a practice division of the
NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

AMERICAN CONSULTING ENGINEERS COUNCIL

AMERICAN SOCIETY OF CIVIL ENGINEERS

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1420 King Street, Alexandria, VA 22314-2715

American Consulting Engineers Council
1015 15th Street, N.W., Washington, DC 20005

American Society of Civil Engineers
345 East 47th Street, New York, NY 10017

INSTRUCTIONS TO BIDDERS

TABLE OF CONTENTS

ARTICLE 1 - DEFINED TERMS	2
ARTICLE 2 - COPIES OF BIDDING DOCUMENTS	3
ARTICLE 3 - QUALIFICATIONS OF BIDDERS	3
ARTICLE 4 - EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA, AND SITE.....	3
ARTICLE 5 - PRE-BID CONFERENCE	4
ARTICLE 6 - SITE AND OTHER AREAS	4
ARTICLE 7 - INTERPRETATIONS AND ADDENDA	4
ARTICLE 8 - BID SECURITY	5
ARTICLE 9 - CONTRACT TIMES	5
ARTICLE 11 - SUBSTITUTE AND "OR-EQUAL" ITEMS	5
ARTICLE 12 - SUBCONTRACTORS, SUPPLIERS, AND OTHERS	5
ARTICLE 13 - PREPARATION OF BID	6
ARTICLE 14 - BASIS OF BID; EVALUATION OF BIDS.....	6
ARTICLE 15 - SUBMITTAL OF BID	7
ARTICLE 16 - MODIFICATION AND WITHDRAWAL OF BID	7
ARTICLE 17 - OPENING OF BIDS	7
ARTICLE 18 - BIDS TO REMAIN SUBJECT TO ACCEPTANCE	8
ARTICLE 19 - AWARD OF CONTRACT	8
ARTICLE 20 - CONTRACT SECURITY AND INSURANCE	8
ARTICLE 21 - SIGNING OF AGREEMENT	8

TABLE OF ARTICLES (Alphabetical by Subject)

<u>Subject</u>	<u>Article</u>
Award of Contract	19
Basis of Bid; Evaluation of Bids	14
Bid Security	8
Bids to Remain Subject to Acceptance	18
Contract Security and Insurance	20
Contract Times	9
Copies of Bidding Documents	2
Defined Terms	1
Examination of Bidding Documents, Other Related Data, and Site	4
Interpretations and Addenda	7
Liquidated Damages	10
Modification and Withdrawal of Bid	16
Opening of Bids	17
Pre-Bid Conference	5
Preparation of Bid	13
Qualifications of Bidders	3
Signing of Agreement	21
Site and Other Areas	6
Subcontractors, Suppliers and Others	12
Submittal of Bid	15
Substitute or "Or-Equal" Items	11

ARTICLE 1 - DEFINED TERMS

1.01 Terms used in these Instructions to Bidders will have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below which are applicable to both the singular and plural thereof:

- A. *Bidder*--The individual or entity who submits a Bid directly to OWNER.
- B. *Issuing Office*--The office from which the Bidding Documents are to be issued and where the bidding procedures are to be administered.
- C. *Successful Bidder*--The lowest responsible Bidder submitting a responsive Bid to whom OWNER (on the basis of OWNER's evaluation as hereinafter provided) makes an award.

ARTICLE 2 - COPIES OF BIDDING DOCUMENTS

2.01 Complete sets of the Bidding Documents in the number and for the deposit sum, if any, stated in the Advertisement or Invitation to Bid may be obtained from the Issuing Office. The deposit will be refunded to each document holder of record who returns a complete set of Bidding Documents in good condition within 30 days after opening of Bids.

2.02 Complete sets of Bidding Documents must be used in preparing Bids; neither OWNER nor ENGINEER assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

2.03 OWNER and ENGINEER in making copies of Bidding Documents available on the above terms do so only for the purpose of obtaining Bids for the Work and do not confer a license or grant for any other use.

ARTICLE 3 - QUALIFICATIONS OF BIDDERS

3.01 To demonstrate Bidder's qualifications to perform the Work, within five days of OWNER's request Bidder shall submit written evidence such as financial data, previous experience, present commitments, and such other data as may be called for below.

- A. Sufficient documentation showing Bidder's availability to complete this project in the specified time period, including a preliminary construction schedule/progress chart.
- B. Verification of Bidder's financial ability to procure labor and materials for this project.

ARTICLE 4 - EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA, AND SITE

4.01 On request, OWNER will provide Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies as Bidder deems necessary for submission of a Bid. Bidder shall clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

4.06 Reference is made to Article 7 of the Supplementary Conditions for the identification of the general nature of other work (if any) that is to be performed at the Site by OWNER or others (such as utilities and other prime contractors) that relates to the Work for which a Bid is to be submitted. On request, OWNER will provide to each Bidder for examination access to or copies of Contract Documents (other than portions thereof related to price) for such other work.

4.07 It is the responsibility of each Bidder before submitting a Bid to:

- A. Examine and carefully study the Bidding Documents, including any Addenda and the other related data identified in the Bidding Documents;
- B. Visit the Site and become familiar with and satisfy Bidder as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;
- C. Become familiar with and satisfy Bidder as to all federal, state, and local Laws and Regulations that may affect cost, progress, or performance of the Work;
- D. Obtain and carefully study (or assume responsibility for doing so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents, and safety precautions and programs incident thereto;

E. Agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price bid and within the times and in accordance with the other terms and conditions of the Bidding Documents;

F. Become aware of the general nature of the work to be performed by OWNER and others at the Site that relates to the Work as indicated in the Bidding Documents;

G. Correlate the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents;

H. Promptly give ENGINEER written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by ENGINEER is acceptable to Bidder; and

I. Determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.

4.08 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given ENGINEER written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Bidding Documents and the written resolutions thereof by ENGINEER are acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

ARTICLE 5 - PRE-BID CONFERENCE

5.01 A **mandatory** pre-Bid conference will be held at 10:00 a.m. on March 11th, 2025 at Snow Creek Elementary School. Contractor may request access to the additional schools as necessary. Representatives of OWNER and ENGINEER will be present to discuss the Project. Bidders are **required** to attend and participate in the conference. ENGINEER will transmit to all prospective Bidders of record such Addenda as ENGINEER considers necessary in response to questions arising at the conference. To clarify, the pre-Bid conference is **mandatory** for each contractor wishing to submit a Bid as the prime contractor. Sub-contractors are not required to attend, but attendance for sub-contractors is highly encouraged. The owner will only accept bids from prime contractors who have attended the pre-bid conference **and** who have signed in during the pre-Bid conference as indicated in the advertisement for bids.

ARTICLE 6 - SITE AND OTHER AREAS

6.01 The Site is identified in the Bidding Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by CONTRACTOR. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by OWNER unless otherwise provided in the Bidding Documents.

ARTICLE 7 - INTERPRETATIONS AND ADDENDA

7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to ENGINEER in writing. Interpretations or clarifications considered necessary by ENGINEER in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by ENGINEER as having

received the Bidding Documents. Questions received less than ten days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

7.02 Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by OWNER or ENGINEER.

ARTICLE 8 - BID SECURITY

8.01 A Bid must be accompanied by Bid security made payable to OWNER in an amount of 5% of Bidder's maximum Bid price and in the form of a certified or bank check or a Bid Bond [on the form attached] issued by a surety meeting the requirements of paragraphs 5.01 and 5.02 of the General Conditions.

8.02 The Bid security of the Successful Bidder will be retained until such Bidder has executed the Contract Documents, furnished the required contract security and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 days after the Notice of Award, OWNER may annul the Notice of Award and the Bid security of that Bidder will be forfeited. The Bid security of other Bidders whom OWNER believes to have a reasonable chance of receiving the award may be retained by OWNER until the earlier of seven days after the Effective Date of the Agreement or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be returned.

8.03 Bid security of other Bidders whom OWNER believes do not have a reasonable chance of receiving the award will be returned within seven days after the Bid opening.

ARTICLE 9 - CONTRACT TIMES

9.01 The number of days within which, or the dates by which, the Work is to be (a) Substantially Completed and (b) also completed and ready for final payment are set forth in the Agreement.

ARTICLE 10 – LIQUIDATED DAMAGES

10.01 Time is of the essence as to Contractor's performance of the Work, and the Owner has stipulated that this Project be substantially complete by August 8, 2025. The Contractor agrees that he/she will begin the Work on this Project upon receipt of the Notice to Proceed and that he/she will proceed with the Work so that it will be completed on or before the time specified for substantial completion and a County Occupancy Permit has been issued. The Project shall be Finally Complete no later than August 15, 2025.

10.02 No extension beyond the time of completion fixed by the terms of this Agreement shall be effective unless authorized in writing by the Owner.

10.03 In the event the project is not substantially completed by August 8, 2025 the Contractor shall be liable to the Franklin County School Board for liquidated damages in the amount of \$0.00 per day until Substantial completion is achieved.

10.04 In the event the project is not finally completed by August 15, 2025 the Contractor shall be liable to the Franklin County School Board for liquidated damages in the amount of \$1,000.00 per day until Final completion is achieved. The Contractor acknowledges and agrees that these damages are conclusively reasonable and are not in any way punitive, and waives any right to challenge them as penalty.

10.05 Further, the above stipulated damages for the Project, shall be charged and payable by the Contractor to the Owner and the Contractor and Contractor's surety shall be liable for the amount thereof, provided however, that Liquidated Damages will not be assessed for any days of delay for which the Contractor has obtained an extension to the Contract Time pursuant to the Contract Documents.

10.06 With regard to the above stated Liquidated Damages, in no case shall the total assessed damages be limited to any specific fixed sum.

10.07 Where work is stopped by the ENGINEER, for any cause not due to the fault or negligence of the Contractor, Liquidated Damages shall be waived for that period until the Work is again resumed by written order of the ENGINEER.

10.08 In addition to Liquidated Damages, the Contractor shall pay to the Owner the cost of extended engineering (including Engineer's on-site representative(s), if any, on-site) services for such services rendered beginning at 61 days from the date of Substantial Completion required by the Contract, as adjusted if applicable, and continuously until Final Completion is achieved.

ARTICLE 11 - SUBSTITUTE AND "OR-EQUAL" ITEMS

11.01 The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration of possible substitute or "or-equal" items. Whenever it is specified or described in the Bidding Documents that a substitute or "or-equal" item of material or equipment may be furnished or used by CONTRACTOR if acceptable to ENGINEER, application for such acceptance will not be considered by ENGINEER until after the Effective Date of the Agreement. The procedure for submission of any such application by CONTRACTOR and consideration by ENGINEER is set forth in the General Conditions and may be supplemented in the General Requirements.

ARTICLE 12 - SUBCONTRACTORS, SUPPLIERS, AND OTHERS

12.01 If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, individuals, or entities to be submitted to OWNER in advance of a specified date prior to the Effective Date of the Agreement, the apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening, submit to OWNER a list of all such Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, individual, or entity if requested by OWNER. If OWNER or ENGINEER, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, OWNER may, before the Notice of Award is given, request apparent Successful Bidder to submit a substitute, in which case apparent Successful Bidder shall submit an acceptable substitute, Bidder's Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and OWNER may consider such price adjustment in evaluating Bids and making the contract award.

12.02 If apparent Successful Bidder declines to make any such substitution, OWNER may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, individuals, or entities. Declining to make requested substitutions will not constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which OWNER or ENGINEER makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to OWNER and ENGINEER subject to revocation of such acceptance after the Effective Date of the Agreement as provided in paragraph 6.06 of the General Conditions.

12.03 CONTRACTOR shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom CONTRACTOR has reasonable objection.

ARTICLE 13 - PREPARATION OF BID

13.01 The Bid form is included with the Bidding Documents. Additional copies may be obtained from the ENGINEER.

13.02 All blanks on the Bid form shall be completed by printing in ink or by typewriter and the Bid signed. A Bid price shall be indicated for the base bid, the additive bid item and the total.

13.03 A Bid by a corporation shall be executed in the corporate name by the president or a vice-president or other corporate officer accompanied by evidence of authority to sign. The corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown below the signature.

13.04 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown below the signature.

13.05 A Bid by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm must be shown below the signature.

13.06 A Bid by an individual shall show the Bidder's name and official address.

13.07 A Bid by a joint venture shall be executed by each joint venturer in the manner indicated on the Bid form. The official address of the joint venture must be shown below the signature.

13.08 All names shall be typed or printed in ink below the signatures.

13.09 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid form.

13.10 The address and telephone number for communications regarding the Bid shall be shown.

13.11 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located or covenant to obtain such qualification prior to award of the Contract. Bidder's state contractor license number for the state of the Project, if any, shall also be shown on the Bid form.

ARTICLE 14 - BASIS OF BID; EVALUATION OF BIDS

14.01 *Lump Sum*

- A. Bidders shall submit a Bid on a lump sum basis for the base Bid described in the Bidding Documents as provided for in the Bid form.
- B. Bidders shall bid each School as a separate project as well as a combined project, and the HVAC replacements as a single project.

14.02 The Bid price shall include such amounts as the Bidder deems proper for overhead and profit on account of cash allowances, if any, named in the Contract Documents as provided in paragraph 11.02 of the General Conditions.

ARTICLE 15 - SUBMITTAL OF BID

15.01 Each prospective Bidder is furnished one copy of the Bidding Documents with one separate unbound copy each of the Bid form, and the Bid Bond. The unbound copy of the Bid form is to be completed and submitted with the Bid security and the following data:

- A. A listing of all proposed sub-contractors.
- B. Proposed lighting and lighting controls equipment vendor.
- C. Proposed mechanical equipment and controls vendor(s).

15.02 A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the advertisement or invitation to Bid and shall be enclosed in an opaque sealed envelope plainly marked with the Project title, the name and address of Bidder, and shall be accompanied by the Bid security and the above required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate envelope plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid shall be addressed as follows:

Snow Creek ES 2CR HVAC Upgrades
Franklin County Public Schools
Maintenance Department
250 School Service Road
Rocky Mount, VA 24151

Attn: Mr. Mark T. Law

ARTICLE 16 - MODIFICATION AND WITHDRAWAL OF BID

16.01 A Bid may be modified or withdrawn by an appropriate document duly executed in the manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids.

16.02 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with OWNER and promptly thereafter demonstrates to the reasonable satisfaction of OWNER that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, that Bidder will be disqualified from further bidding on the Work.

ARTICLE 17 - OPENING OF BIDS

17.01 Bids will be opened at the time and place indicated in the advertisement or invitation to Bid and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

ARTICLE 18 - BIDS TO REMAIN SUBJECT TO ACCEPTANCE

18.01 All Bids will remain subject to acceptance for the period of time stated in the Bid form, but OWNER may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 19 - AWARD OF CONTRACT

19.01 OWNER reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. OWNER further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to be non-responsive. OWNER may also reject the Bid of any Bidder if OWNER believes that it would not be in the best interest of the Project to make an award to that Bidder. OWNER also reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate contract terms with the Successful Bidder.

19.02 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.

19.03 In evaluating Bids, OWNER will consider whether or not the Bids comply with the prescribed requirements, and additive bid item as may be requested in the Bid Form or prior to the Notice of Award.

19.04 In evaluating Bidders, OWNER will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities must be submitted as provided in the Supplementary Conditions.

19.05 OWNER may conduct such investigations as OWNER deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities to perform the Work in accordance with the Contract Documents.

19.06 If the Contract is to be awarded, OWNER will award the Contract to the Bidder whose Bid is in the best interests of the Project.

ARTICLE 20 - CONTRACT SECURITY AND INSURANCE

20.01 Article 5 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth OWNER's requirements as to performance and payment Bonds and insurance. When the Successful Bidder delivers the executed Agreement to OWNER, it must be accompanied by such Bonds.

ARTICLE 21 - SIGNING OF AGREEMENT

21.01 When OWNER gives a Notice of Award to the Successful Bidder, it shall be accompanied by the required number of unsigned counterparts of the Agreement with the other Contract Documents which are identified in the Agreement as attached thereto. Within 15 days thereafter, Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached documents to OWNER. Within ten days thereafter, OWNER shall deliver one fully signed counterpart to Successful Bidder with a complete set of the Drawings with appropriate identification.

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BID FORM

PROJECT IDENTIFICATION:

Snow Creek ES 2CR HVAC Upgrades

CONTRACT IDENTIFICATION AND NUMBER:

Snow Creek ES 2CR HVAC Upgrades

Ascent Engineering Group, Inc. Commission Number 2025-0242

THIS BID IS SUBMITTED TO:

Franklin County Public Schools
250 School Service Road
Rocky Mount, Virginia 24151

Attention: Mr. Mark T. Law

1.01 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with OWNER in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

2.01 Bidder accepts all of the terms and conditions of the Advertisement or Invitation to Bid and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. The Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of OWNER.

3.01 In submitting this Bid, Bidder represents, as set forth in the Agreement, that:

- A. Bidder has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents, and the following Addenda, receipt of all which is hereby acknowledged.

Addendum No.

Addendum Date

- B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local and Site conditions that may affect cost, progress, and performance of the Work.
- C. Bidder is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress and performance of the Work.
- D. Bidder has obtained and carefully studied (or assumes responsibility for having done so) all additional or supplementary examinations, investigations, explorations, tests, studies and data concerning conditions at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means,

methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents to be employed by Bidder, and safety precautions and programs incident thereto.

- E. Bidder does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents.
- F. Bidder is aware of the general nature of work to be performed by OWNER and others at the Site that relates to the Work as indicated in the Bidding Documents.
- G. Bidder has correlated the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.
- H. Bidder has given ENGINEER written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by ENGINEER is acceptable to Bidder.
- I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

3.02 Bidder submits as part of the Contract the following unit prices. Unit pricing shall be used as hereinafter specified in Section 012200.

Item #	Description	Unit	Price
1	Receptacle: provide 120-volt, 20-Ampere (NEMA 5-20R) Receptacle and 50 linear ft of 2#12 & 2#12 GW and other materials as needed for a complete receptacle addition.	Per Location	\$
2	Data Drop: Provide Cat-6 data jack complete with testing and termination. Include 300 linear ft of Cat-6 complete with outlet, coverplate, backbox, conduit concealed, labeling, testing and terminations.	Per Location	\$

4.01 Bidder further represents that this Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; Bidder has not solicited or induced any individual or entity to refrain from bidding; and Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over OWNER.

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

BASE BID _____ (\$ _____)

6.01 Bidder agrees that the Work will be substantially complete on or before August 8, 2025, and completed and ready for final payment in accordance with paragraph 14.07.B of the General Conditions on or before August 15, 2025.

7.01 The following documents are attached to and made a condition of this Bid:

- A. Required Bid security in the form of _____;
- B. A tabulation of Subcontractors, Suppliers [and other] individuals and entities required to be identified in this Bid;

8.01 The terms used in this Bid with initial capital letters have the meanings indicated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

SUBMITTED on _____, 2025.

State Contractor License No. _____.

If Bidder is:

An Individual

Name (typed or printed): _____

By: _____ (SEAL)
(Individual's signature)

Doing business as: _____
Business address: _____

Phone No.: _____ FAX No.: _____

A Partnership

Partnership Name: _____ (SEAL)

By: _____
(Signature of general partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Business address: _____

Phone No.: _____ FAX No.: _____

A Corporation

Corporation Name: _____ (SEAL)

State of Incorporation: _____

Type (General Business, Professional, Service, Limited Liability): _____

By: _____
(Signature -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

(CORPORATE SEAL)

Attest _____
(Signature of Corporate Secretary)

Business address: _____

Phone No.: _____ FAX No.: _____

Date of Qualification to do business is _____.

BID BOND

BIDDER (Name and Address):

SURETY (Name and Address of Principal Place of Business):

OWNER (Name and Address):

BID

BID DUE DATE: _____
PROJECT (Brief Description Including Location): _____

BOND

BOND NUMBER: _____
DATE (Not later than Bid due date): _____
PENAL SUM: _____ (Words) _____ (Figures)

IN WITNESS WHEREOF, Surety and Bidder, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Bid Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

BIDDER

SURETY

(Seal)
Bidder's Name and Corporate Seal
By: _____
Signature and Title

(Seal)
Surety's Name and Corporate Seal
By: _____
Signature and Title
(Attach Power of Attorney)

Attest: _____
Signature and Title

Attest: _____
Signature and Title

Note: (1) Above addresses are to be used for giving required notice.
(2) Any singular reference to Bidder, Surety, OWNER or other party shall be considered plural where applicable.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to pay to OWNER upon default of Bidder the penal sum set forth on the face of this Bond.

2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by OWNER) the executed Agreement required by the Bidding Documents and any performance and payment Bonds required by the Bidding Documents.

3. This obligation shall be null and void if:

3.1. OWNER accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by OWNER) the executed Agreement required by the Bidding Documents and any performance and payment Bonds required by the Bidding Documents, or

3.2. All Bids are rejected by OWNER, or

3.3. OWNER fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by paragraph 5 hereof).

4. Payment under this Bond will be due and payable upon default by Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from OWNER, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.

5. Surety waives notice of and any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by OWNER and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from Bid due date without Surety's written consent.

6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in paragraph 4 above is received by Bidder and Surety and in no case later than one year after Bid due date.

7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.

8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.

9. Surety shall cause to be attached to this Bond a current and effective Power or Attorney evidencing the authority of the officer, agent or representative who executed this Bond on behalf of Surety to execute, seal and deliver such Bond and bind the Surety thereby.

10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.

11. The term "Bid" as used herein includes a Bid, offer or proposal as applicable.

STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR ON THE BASIS OF A STIPULATED PRICE

THIS AGREEMENT is by and between **Franklin County Public Schools**

(hereinafter called OWNER) and

(hereinafter called CONTRACTOR).

OWNER and CONTRACTOR, in consideration of the mutual covenants hereinafter set forth, agree as follows:

ARTICLE 1 - WORK

1.01 CONTRACTOR shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

2CR HVAC Upgrades

ARTICLE 2 - THE PROJECT

2.01 The Project for which the Work under the Contract Documents may be the whole or only a part is generally described as follows:

Snow Creek Elementary School: Replace existing unit ventilators with new rooftop air conditioning units for two classrooms. Replace all lighting fixtures in the same two classrooms with new LED lighting fixtures. Replace the ACT ceilings in the same two classrooms.

ARTICLE 3 - ENGINEER

3.01 The Project has been designed by Ascent Engineering Group, Inc., who is hereinafter called ENGINEER and who is to act as OWNER's representative, assume all duties and responsibilities, and have the rights and authority assigned to ENGINEER in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 - CONTRACT TIMES

4.01 *Time of the Essence*

A. All time limits for Milestones, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 *Dates for Substantial Completion and Final Payment*

A. The Work will be substantially completed on or before August 8, 2025, and completed and ready for final payment in accordance with paragraph 14.07 of the General Conditions on or before August 15, 2025.

ARTICLE 5 - CONTRACT PRICE

5.01 OWNER shall pay CONTRACTOR for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the sum of the amounts determined pursuant to paragraphs 5.01.A below:

A. For all Work a Lump Sum of:

_____ (\$ _____)
(use words) (figure)

ARTICLE 6 - PAYMENT PROCEDURES

6.01 Submittal and Processing of Payments

A. CONTRACTOR shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by ENGINEER as provided in the General Conditions.

6.02 Progress Payments; Retainage

A. OWNER shall make progress payments on account of the Contract Price on the basis of CONTRACTOR's Applications for Payment on or about the 20th day of each month during performance of the Work as provided in paragraphs 6.02.A.1 and 6.02.A.2 below. All such payments will be measured by the schedule of values established in paragraph 2.07.A of the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no schedule of values, as provided in the General Requirements:

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as ENGINEER may determine or OWNER may withhold, in accordance with paragraph 14.02 of the General Conditions:

a. 95% of Work completed (with the balance being retainage).

b. 95% of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

2. Upon Substantial Completion, OWNER shall pay an amount sufficient to increase total payments to CONTRACTOR to 95% of the Work completed, less such amounts as ENGINEER shall determine in accordance with paragraph 14.02.B.5 of the General Conditions and less 95% of ENGINEER's estimate of the value of Work to be completed or corrected as shown on the tentative list of items to be completed or corrected attached to the certificate of Substantial Completion.

6.03 Final Payment

A. Upon final completion and acceptance of the Work in accordance with paragraph 14.07 of the General Conditions, OWNER shall pay the remainder of the Contract Price as recommended by ENGINEER as provided in said paragraph 14.07.

ARTICLE 7 - INTEREST

7.01 No interest will be added to any payments by the OWNER.

ARTICLE 8 – CONTRACTOR'S REPRESENTATIONS

8.01 In order to induce OWNER to enter into this Agreement CONTRACTOR makes the following representations:

A. CONTRACTOR has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.

B. CONTRACTOR has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. CONTRACTOR is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.

D. CONTRACTOR has obtained and carefully studied (or assumes responsibility for having done so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by CONTRACTOR, including applying the specific means, methods, techniques, sequences, and procedures of construction, if any, expressly required by the Contract Documents to be employed by CONTRACTOR, and safety precautions and programs incident thereto.

F. CONTRACTOR does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.

G. CONTRACTOR is aware of the general nature of work to be performed by OWNER and others at the Site that relates to the Work as indicated in the Contract Documents.

H. CONTRACTOR has correlated the information known to CONTRACTOR, information and observations obtained from visits to the Site, reports and drawings identified in the Contract Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.

I. CONTRACTOR has given ENGINEER written notice of all conflicts, errors, ambiguities, or discrepancies that CONTRACTOR has discovered in the Contract Documents, and the written resolution thereof by ENGINEER is acceptable to CONTRACTOR.

J. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

ARTICLE 9 - CONTRACT DOCUMENTS

9.01 Contents

A. The Contract Documents consist of the following:

1. This Agreement (pages 1 to 4, inclusive);
2. Performance Bond (pages ____ to ____, inclusive);
3. Payment Bond (pages ____ to ____, inclusive);
4. Other Bonds (pages ____ to ____, inclusive);
 - a. _____ (pages ____ to ____, inclusive);
 - b. _____ (pages ____ to ____, inclusive);
 - c. _____ (pages ____ to ____, inclusive);
5. General Conditions (pages 1 to 40, inclusive);
6. Supplementary Conditions (pages 1 to __), inclusive);
7. Specifications as listed in the table of contents of the Project Manual;
8. Drawings consisting of a cover sheet and additional sheets as indicated on the cover sheet;
9. Addenda (numbers __ to __, inclusive);
10. Exhibits to this Agreement (enumerated as follows):

- a. Notice to Proceed (pages 1 to 1, inclusive);
- b. CONTRACTOR's Bid (pages _____ to _____, inclusive);
- c. Documentation submitted by CONTRACTOR prior to Notice of Award (pages _____ to _____, inclusive);
- d. _____;

11. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:

- a. Written Amendments;
- b. Work Change Directives;
- c. Change Order(s).

B. The documents listed in paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 9.

D. The Contract Documents may only be amended, modified, or supplemented as provided in paragraph 3.05 of the General Conditions.

ARTICLE 10 - MISCELLANEOUS

10.01 Terms

A. Terms used in this Agreement will have the meanings indicated in the General Conditions.

10.02 Assignment of Contract

A. No assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

10.03 Successors and Assigns

A. OWNER and CONTRACTOR each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

10.04 Severability

A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon OWNER and CONTRACTOR, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

IN WITNESS WHEREOF, OWNER and CONTRACTOR have signed this Agreement in duplicate. One counterpart each has been delivered to OWNER and CONTRACTOR. All portions of the Contract Documents have been signed or identified by OWNER and CONTRACTOR or on their behalf.

This Agreement will be effective on _____ (which is the Effective Date of the Agreement).

OWNER: Franklin County Public Schools

CONTRACTOR: _____

By: _____

By: _____

[CORPORATE SEAL]

[CORPORATE SEAL]

Attest _____

Attest _____

Address for giving notices:

Address for giving notices:

(If OWNER is a corporation , attach evidence of authority to sign. If OWNER is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of OWNER-CONTRACTOR Agreement.)

License No. _____
(Where applicable)

Agent for service of process: _____

(If CONTRACTOR is a corporation or a partnership, attach evidence of authority to sign.)

Designated Representative:

Designated Representative:

Name: _____

Name: _____

Title: _____

Title: _____

Address: _____

Address: _____

Phone: _____

Phone: _____

Facsimile: _____

Facsimile: _____

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PERFORMANCE BOND

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

CONTRACTOR (Name and Address):

SURETY (Name and Address of Principal Place
of Business):

OWNER (Name and Address):

CONTRACT

Date:

Amount:

Description (Name and Location):

BOND

Date (Not earlier than Contract Date):

Amount:

Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Performance Bond to be duly executed on its behalf by its authorized officer, agent or representative.

CONTRACTOR AS PRINCIPAL

Company: _____ (Corp. Seal)

Signature: _____

Name and Title:

SURETY

Company: _____ (Corp. Seal)

Signature: _____

Name and Title:

(Attach Power of Attorney)

(Space is provided below for signatures of additional parties, if required.)

CONTRACTOR AS PRINCIPAL

Company: _____ (Corp. Seal)

Signature: _____

Name and Title:

SURETY

Company: _____ (Corp. Seal)

Signature: _____

Name and Title:

EJCDC No. 1910-28-A (1996 Edition)

Originally prepared through the joint efforts of the Surety Association of America, Engineers Joint Contract Documents Committee, the Associated General Contractors of America, and the American Institute of Architects.

1. The CONTRACTOR and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Contract, which is incorporated herein by reference.

2. If the CONTRACTOR performs the Contract, the Surety and the CONTRACTOR have no obligation under this Bond, except to participate in conferences as provided in paragraph 3.1.

3. If there is no OWNER Default, the Surety's obligation under this Bond shall arise after:

- 3.1. The OWNER has notified the CONTRACTOR and the Surety at the addresses described in paragraph 10 below, that the OWNER is considering declaring a CONTRACTOR Default and has requested and attempted to arrange a conference with the CONTRACTOR and the Surety to be held not later than fifteen days after receipt of such notice to discuss methods of performing the Contract. If the OWNER, the CONTRACTOR and the Surety agree, the CONTRACTOR shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive the OWNER's right, if any, subsequently to declare a CONTRACTOR Default; and
- 3.2. The OWNER has declared a CONTRACTOR Default and formally terminated the CONTRACTOR's right to complete the Contract. Such CONTRACTOR Default shall not be declared earlier than twenty days after the CONTRACTOR and the Surety have received notice as provided in paragraph 3.1; and
- 3.3. The OWNER has agreed to pay the Balance of the Contract Price to:
 - 3.3.1. The Surety in accordance with the terms of the Contract;
 - 3.3.2. Another contractor selected pursuant to paragraph 4.3 to perform the Contract.

4. When the OWNER has satisfied the conditions of paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

- 4.1. Arrange for the CONTRACTOR, with consent of the OWNER, to perform and complete the Contract; or
- 4.2. Undertake to perform and complete the Contract itself, through its agents or through independent contractors; or
- 4.3. Obtain bids or negotiated proposals from qualified contractors acceptable to the OWNER for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by the OWNER and the contractor selected with the OWNER's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the Bonds issued on the Contract, and pay to the OWNER the amount of damages as described in paragraph 6 in excess of the Balance of the Contract Price incurred by the OWNER resulting from the CONTRACTOR Default; or
- 4.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances;
 - 4.4.1. After investigation, determine the amount for which it may be liable to the OWNER and, as soon as practicable after the amount is determined, tender payment therefor to the OWNER; or
 - 4.4.2. Deny liability in whole or in part and notify the OWNER citing reasons therefor.

5. If the Surety does not proceed as provided in paragraph 4 with reasonable promptness, the Surety shall be deemed to be in default on this Bond fifteen days after receipt of an additional written notice from the OWNER to the Surety demanding that the Surety perform its obligations under this Bond, and the OWNER shall be entitled to enforce any remedy available to the OWNER. If the Surety proceeds as provided in paragraph 4.4, and the OWNER refuses the payment tendered or the Surety has denied

liability, in whole or in part, without further notice the OWNER shall be entitled to enforce any remedy available to the OWNER.

6. After the OWNER has terminated the CONTRACTOR's right to complete the Contract, and if the Surety elects to act under paragraph 4.1, 4.2, or 4.3 above, then the responsibilities of the Surety to the OWNER shall not be greater than those of the CONTRACTOR under the Contract, and the responsibilities of the OWNER to the Surety shall not be greater than those of the OWNER under the Contract. To a limit of the amount of this Bond, but subject to commitment by the OWNER of the Balance of the Contract Price to mitigation of costs and damages on the Contract, the Surety is obligated without duplication for:

- 6.1. The responsibilities of the CONTRACTOR for correction of defective Work and completion of the Contract;
- 6.2. Additional legal, design professional and delay costs resulting from the CONTRACTOR's Default, and resulting from the actions or failure to act of the Surety under paragraph 4; and
- 6.3. Liquidated damages, or if no liquidated damages are specified in the Contract, actual damages caused by delayed performance or non-performance of the CONTRACTOR.

7. The Surety shall not be liable to the OWNER or others for obligations of the CONTRACTOR that are unrelated to the Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the OWNER or its heirs, executors, administrators, or successors.

8. The Surety hereby waives notice of any change, including changes of time, to the Contract or to related subcontracts, purchase orders and other obligations.

9. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the Work or part of the Work is located and shall be instituted within two years after CONTRACTOR Default or within two years after the CONTRACTOR ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

10. Notice to the Surety, the OWNER or the CONTRACTOR shall be mailed or delivered to the address shown on the signature page.

11. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted here from and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

12. Definitions.

- 12.1. Balance of the Contract Price: The total amount payable by the OWNER to the CONTRACTOR under the Contract after all proper adjustments have been made, including allowance to the CONTRACTOR of any amounts received or to be received by the OWNER in settlement of insurance or other Claims for damages to which the CONTRACTOR is entitled, reduced by all valid and proper payments made to or on behalf of the CONTRACTOR under the Contract.
- 12.2. Contract: The agreement between the OWNER and the CONTRACTOR identified on the signature page, including all Contract Documents and changes thereto.
- 12.3. CONTRACTOR Default: Failure of the CONTRACTOR, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Contract.
- 12.4. OWNER Default: Failure of the OWNER, which has neither been remedied nor waived, to pay the CONTRACTOR as required by the Contract or to perform and complete or comply with the other terms thereof.

PAYMENT BOND

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

CONTRACTOR (Name and Address):

SURETY (Name and Address of Principal Place
of Business):

OWNER (Name and Address):

CONTRACT

Date:

Amount:

Description (Name and Location):

BOND

Date (Not earlier than Contract Date):

Amount:

Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Payment Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

Company: _____ (Corp. Seal)

Signature: _____

Name and Title:

SURETY

Company: _____ (Corp. Seal)

Signature: _____

Name and Title:

(Attach Power of Attorney)

(Space is provided below for signatures of additional parties, if required.)

CONTRACTOR AS PRINCIPAL

Company: _____ (Corp. Seal)

Signature: _____

Name and Title:

SURETY

Company: _____ (Corp. Seal)

Signature: _____

Name and Title:

EJCDC No. 1910-28-B (1996 Edition)

Originally prepared through the joint efforts of the Surety Association of America, Engineers Joint Contract Documents Committee, the Associated General Contractors of America, the American Institute of Architects, the American Subcontractors Association, and the Associated Specialty Contractors.

1. The CONTRACTOR and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the OWNER to pay for labor, materials and equipment furnished for use in the performance of the Contract, which is incorporated herein by reference.

2. With respect to the OWNER, this obligation shall be null and void if the CONTRACTOR:

- 2.1. Promptly makes payment, directly or indirectly, for all sums due Claimants, and
- 2.2. Defends, indemnifies and holds harmless the OWNER from all claims, demands, liens or suits by any person or entity who furnished labor, materials or equipment for use in the performance of the Contract, provided the OWNER has promptly notified the CONTRACTOR and the Surety (at the addresses described in paragraph 12) of any claims, demands, liens or suits and tendered defense of such claims, demands, liens or suits to the CONTRACTOR and the Surety, and provided there is no OWNER Default.

3. With respect to Claimants, this obligation shall be null and void if the CONTRACTOR promptly makes payment, directly or indirectly, for all sums due.

4. The Surety shall have no obligation to Claimants under this Bond until:

- 4.1. Claimants who are employed by or have a direct contract with the CONTRACTOR have given notice to the Surety (at the addresses described in paragraph 12) and sent a copy, or notice thereof, to the OWNER, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.
- 4.2. Claimants who do not have a direct contract with the CONTRACTOR:
 1. Have furnished written notice to the CONTRACTOR and sent a copy, or notice thereof, to the OWNER, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials were furnished or supplied or for whom the labor was done or performed; and
 2. Have either received a rejection in whole or in part from the CONTRACTOR, or not received within 30 days of furnishing the above notice any communication from the CONTRACTOR by which the CONTRACTOR had indicated the claim will be paid directly or indirectly; and
 3. Not having been paid within the above 30 days, have sent a written notice to the Surety and sent a copy, or notice thereof, to the OWNER, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to the CONTRACTOR.

5. If a notice required by paragraph 4 is given by the OWNER to the CONTRACTOR or to the Surety, that is sufficient compliance.

6. When the Claimant has satisfied the conditions of paragraph 4, the Surety shall promptly and at the Surety's expense take the following actions:

- 6.1. Send an answer to the Claimant, with a copy to the OWNER, within 45 days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed.
- 6.2. Pay or arrange for payment of any undisputed amounts.

7. The Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

8. Amounts owed by the OWNER to the CONTRACTOR under the Contract shall be used for the performance of the Contract and to satisfy claims, if any, under any Performance Bond. By the CONTRACTOR furnishing and the OWNER accepting this Bond, they agree that all funds earned by the CONTRACTOR in the performance of the Contract are dedicated to satisfy obligations of the CONTRACTOR and the Surety under this Bond, subject to the OWNER's priority to use the funds for the completion of the Work.

9. The Surety shall not be liable to the OWNER, Claimants or others for obligations of the CONTRACTOR that are unrelated to the Contract. The OWNER shall not be liable for payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.

10. The Surety hereby waives notice of any change, including changes of time, to the Contract or to related Subcontracts, purchase orders and other obligations.

11. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the location in which the Work or part of the Work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by paragraph 4.1 or paragraph 4.2.3, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to the Surety, the OWNER or the CONTRACTOR shall be mailed or delivered to the addresses shown on the signature page. Actual receipt of notice by Surety, the OWNER or the CONTRACTOR, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is, that this Bond shall be construed as a statutory Bond and not as a common law bond.

14. Upon request of any person or entity appearing to be a potential beneficiary of this Bond, the CONTRACTOR shall promptly furnish a copy of this Bond or shall permit a copy to be made.

15. DEFINITIONS

15.1. Claimant: An individual or entity having a direct contract with the CONTRACTOR or with a Subcontractor of the CONTRACTOR to furnish labor, materials or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Contract, architectural and engineering services required for performance of the Work of the CONTRACTOR and the CONTRACTOR's Subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

15.2. Contract: The agreement between the OWNER and the CONTRACTOR identified on the signature page, including all Contract Documents and changes thereto.

15.3. OWNER Default: Failure of the OWNER, which has neither been remedied nor waived, to pay the CONTRACTOR as required by the Contract or to perform and complete or comply with the other terms thereof.

APPLICATION FOR PAYMENT NO. _____

To: _____ (OWNER)

From: _____ (CONTRACTOR)

Contract: _____

Project: _____

OWNER's Contract No. _____.

ENGINEER's Project No. _____.

For Work accomplished through the date of: _____.

1. Original Contract Price: \$ _____

2. Net change by Change Orders and Written Amendments (+ or -): \$ _____

3. Current Contract Price (1 plus 2): \$ _____

4. Total completed and stored to date: \$ _____

5. Retainage (per Agreement):

_____ % of completed Work: \$ _____

_____ % of stored material: \$ _____

Total Retainage: \$ _____

6. Total completed and stored to date less retainage (4 minus 5): \$ _____

7. Less previous Application for Payments: \$ _____

8. DUE THIS APPLICATION (6 MINUS 7): \$ _____

Accompanying Documentation: _____

CONTRACTOR'S Certification:

The undersigned CONTRACTOR certifies that (1) all previous progress payments received from OWNER on account of Work done under the Contract referred to above have been applied on account to discharge CONTRACTOR's legitimate obligations incurred in connection with Work covered by prior Applications for Payment numbered 1 through _____ inclusive; (2) title of all Work, materials and equipment incorporated in said Work or otherwise listed in or covered by this Application for Payment will pass to OWNER at time of payment free and clear of all Liens, security interests and encumbrances (except such as are covered by a Bond acceptable to OWNER indemnifying OWNER against any such Lien, security interest or encumbrance); and (3) all Work covered by this Application for Payment is in accordance with the Contract Documents and not defective.

Dated _____

By: CONTRACTOR

State of _____

County of _____

Subscribed and sworn to before me this _____

day of _____, _____

Notary Public

My Commission expires: _____

Payment of the above AMOUNT DUE THIS APPLICATION is recommended.

Dated _____
ENGINEER

By:

APPLICATION FOR PAYMENT

INSTRUCTIONS

A. GENERAL INFORMATION

The sample form of Schedule of Values is intended as a guide only. Many projects require a more extensive form with space for numerous items, descriptions of Change Orders, identification of variable quantity adjustments, summary of materials and equipment stored at the site and other information. It is expected that a separate form will be developed by Engineer and Contractor at the time Contractor's Schedule of Values is finalized. Note also that the format for retainage must be changed if the Contract permits (or the law provides), and Contractor elects to deposit securities in lieu of retainage. Refer to Article 14 of the General Conditions for provisions concerning payments to Contractor.

B. COMPLETING THE FORM

The Schedule of Values, submitted and approved as provided in paragraphs 2.05.B.3 and 2.07 of the General Conditions, should be reproduced as appropriate in the space indicated on the Application for Payment form. Note that the cost of materials and equipment is often listed separately from the cost of installation. Also, note that each Unit Price is deemed to include Contractor's overhead and profit.

All Change Orders affecting the Contract Price should be identified and included in the Schedule of Values as required for progress payments.

The form is suitable for use in the Final Application for Payment as well as for Progress Payments; however, the required accompanying documentation is usually more extensive for final payment. All accompanying documentation should be identified in the space provided on the form.

C. LEGAL REVIEW

All accompanying documentation of a legal nature, such as Lien waivers, should be reviewed by an attorney, and Engineer should so advise Owner.

ITEM	UNIT PRICE	ESTIMATED QUANTITY	SCHEDULE OF VALUES AMOUNT	QUANTITY COMPLETED	AMOUNT	%	MATERIAL STORED	AMOUNT COMPLETED AND STORED
1.	\$		\$		\$		\$	\$
2.								
3.								
4.								
5.								
6.								
7.								
8.								
9.								
10.								
11.								
12.								
13.								
14.								
15.								
16.								
17.								
18.								
19.								
20.								
21.								
22.								
23.								
24.								
25.								
26.								
27.								
28.								
29.								
30.								
TOTAL			\$		\$		\$	\$

Note: Total Schedule of Values Amount should equal the current Contract Price.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly By

PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE
a practice division of the
NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

AMERICAN CONSULTING ENGINEERS COUNCIL

AMERICAN SOCIETY OF CIVIL ENGINEERS

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The Associated General Contractors of America

Construction Specifications Institute

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TABLE OF CONTENTS

	<u>Page</u>
ARTICLE 1 - DEFINITIONS AND TERMINOLOGY	00700 - 1
1.01 <i>Defined Terms</i>	00700 - 1
1.02 <i>Terminology</i>	00700 - 3
ARTICLE 2 - PRELIMINARY MATTERS	00700 - 4
2.01 <i>Delivery of Bonds</i>	00700 - 4
2.02 <i>Copies of Documents</i>	00700 - 4
2.03 <i>Commencement of Contract Times; Notice to Proceed</i>	00700 - 4
2.04 <i>Starting the Work</i>	00700 - 4
2.05 <i>Before Starting Construction</i>	00700 - 4
2.06 <i>Preconstruction Conference</i>	00700 - 5
2.07 <i>Initial Acceptance of Schedules</i>	00700 - 5
ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE	00700 - 5
3.01 <i>Intent</i>	00700 - 5
3.02 <i>Reference Standards</i>	00700 - 5
3.03 <i>Reporting and Resolving Discrepancies</i>	00700 - 5
3.04 <i>Amending and Supplementing Contract Documents</i>	00700 - 6
3.05 <i>Reuse of Documents</i>	00700 - 6
ARTICLE 4 - AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; REFERENCE POINTS	00700 - 6
4.01 <i>Availability of Lands</i>	00700 - 6
4.02 <i>Subsurface and Physical Conditions</i>	00700 - 6
4.03 <i>Differing Subsurface or Physical Conditions</i>	00700 - 7
4.04 <i>Underground Facilities</i>	00700 - 7
4.05 <i>Reference Points</i>	00700 - 8
4.06 <i>Hazardous Environmental Condition at Site</i>	00700 - 8
ARTICLE 5 - BONDS AND INSURANCE	00700 - 9
5.01 <i>Performance, Payment, and Other Bonds</i>	00700 - 9
5.02 <i>Licensed Sureties and Insurers</i>	00700 - 10
5.03 <i>Certificates of Insurance</i>	00700 - 10
5.04 <i>CONTRACTOR's Liability Insurance</i>	00700 - 10
5.05 <i>OWNER's Liability Insurance</i>	00700 - 11
5.06 <i>Property Insurance</i>	00700 - 11
5.07 <i>Waiver of Rights</i>	00700 - 12
5.08 <i>Receipt and Application of Insurance Proceeds</i>	00700 - 12
5.09 <i>Acceptance of Bonds and Insurance; Option to Replace</i>	00700 - 12
5.10 <i>Partial Utilization, Acknowledgment of Property Insurer</i>	00700 - 13
ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES	00700 - 13
6.01 <i>Supervision and Superintendence</i>	00700 - 13
6.02 <i>Labor; Working Hours</i>	00700 - 13
6.03 <i>Services, Materials, and Equipment</i>	00700 - 13
6.04 <i>Progress Schedule</i>	00700 - 13
6.05 <i>Substitutes and "Or-Equals"</i>	00700 - 14
6.06 <i>Concerning Subcontractors, Suppliers, and Others</i>	00700 - 15
6.07 <i>Patent Fees and Royalties</i>	00700 - 16
6.08 <i>Permits</i>	00700 - 16
6.09 <i>Laws and Regulations</i>	00700 - 16
6.10 <i>Taxes</i>	00700 - 16
6.11 <i>Use of Site and Other Areas</i>	00700 - 16
6.12 <i>Record Documents</i>	00700 - 17
6.13 <i>Safety and Protection</i>	00700 - 17
6.14 <i>Safety Representative</i>	00700 - 17
6.15 <i>Hazard Communication Programs</i>	00700 - 17

6.16	<i>Emergencies</i>	00700 - 17
6.17	<i>Shop Drawings and Samples</i>	00700 - 18
6.18	<i>Continuing the Work</i>	00700 - 19
6.19	<i>CONTRACTOR's General Warranty and Guarantee</i>	00700 - 19
6.20	<i>Indemnification</i>	00700 - 19
ARTICLE 7 - OTHER WORK		00700 - 20
7.01	<i>Related Work at Site</i>	00700 - 20
7.02	<i>Coordination</i>	00700 - 20
ARTICLE 8 - OWNER'S RESPONSIBILITIES		00700 - 20
8.01	<i>Communications to Contractor</i>	00700 - 20
8.02	<i>Replacement of ENGINEER</i>	00700 - 20
8.03	<i>Furnish Data</i>	00700 - 20
8.04	<i>Pay Promptly When Due</i>	00700 - 20
8.05	<i>Lands and Easements; Reports and Tests</i>	00700 - 21
8.06	<i>Insurance</i>	00700 - 21
8.07	<i>Change Orders</i>	00700 - 21
8.08	<i>Inspections, Tests, and Approvals</i>	00700 - 21
8.09	<i>Limitations on OWNER's Responsibilities</i>	00700 - 21
8.10	<i>Undisclosed Hazardous Environmental Condition</i>	00700 - 21
8.11	<i>Evidence of Financial Arrangements</i>	00700 - 21
ARTICLE 9 - ENGINEER'S STATUS DURING CONSTRUCTION		00700 - 21
9.01	<i>OWNER'S Representative</i>	00700 - 21
9.02	<i>Visits to Site</i>	00700 - 21
9.03	<i>Project Representative</i>	00700 - 21
9.04	<i>Clarifications and Interpretations</i>	00700 - 22
9.05	<i>Authorized Variations in Work</i>	00700 - 22
9.06	<i>Rejecting Defective Work</i>	00700 - 22
9.07	<i>Shop Drawings, Change Orders and Payments</i>	00700 - 22
9.08	<i>Determinations for Unit Price Work</i>	00700 - 22
9.09	<i>Decisions on Requirements of Contract Documents and Acceptability of Work</i>	00700 - 22
9.10	<i>Limitations on ENGINEER's Authority and Responsibilities</i>	00700 - 22
ARTICLE 10 - CHANGES IN THE WORK; CLAIMS		00700 - 23
10.01	<i>Authorized Changes in the Work</i>	00700 - 23
10.02	<i>Unauthorized Changes in the Work</i>	00700 - 23
10.03	<i>Execution of Change Orders</i>	00700 - 23
10.04	<i>Notification to Surety</i>	00700 - 23
10.05	<i>Claims and Disputes</i>	00700 - 23
ARTICLE 11 - COST OF THE WORK; CASH ALLOWANCES; UNIT PRICE WORK		00700 - 24
11.01	<i>Cost of the Work</i>	00700 - 24
11.02	<i>Cash Allowances</i>	00700 - 26
11.03	<i>Unit Price Work</i>	00700 - 26
ARTICLE 12 - CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES		00700 - 26
12.01	<i>Change of Contract Price</i>	00700 - 26
12.02	<i>Change of Contract Times</i>	00700 - 27
12.03	<i>Delays Beyond CONTRACTOR's Control</i>	00700 - 27
12.04	<i>Delays Within CONTRACTOR's Control</i>	00700 - 27
12.05	<i>Delays Beyond OWNER's and CONTRACTOR's Control</i>	00700 - 27
12.06	<i>Delay Damages</i>	00700 - 27
ARTICLE 13 - TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK		00700 - 28
13.01	<i>Notice of Defects</i>	00700 - 28
13.02	<i>Access to Work</i>	00700 - 28
13.03	<i>Tests and Inspections</i>	00700 - 28
13.04	<i>Uncovering Work</i>	00700 - 28
13.05	<i>OWNER May Stop the Work</i>	00700 - 29

13.06	<i>Correction or Removal of Defective Work</i>	00700 - 29
13.07	<i>Correction Period</i>	00700 - 29
13.08	<i>Acceptance of Defective Work</i>	00700 - 29
13.09	<i>OWNER May Correct Defective Work</i>	00700 - 29
ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION		00700 - 30
14.01	<i>Schedule of Values</i>	00700 - 30
14.02	<i>Progress Payments</i>	00700 - 30
14.03	<i>CONTRACTOR's Warranty of Title</i>	00700 - 32
14.04	<i>Substantial Completion</i>	00700 - 32
14.05	<i>Partial Utilization</i>	00700 - 32
14.06	<i>Final Inspection</i>	00700 - 33
14.07	<i>Final Payment</i>	00700 - 33
14.08	<i>Final Completion Delayed</i>	00700 - 33
14.09	<i>Waiver of Claims</i>	00700 - 33
ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION		00700 - 34
15.01	<i>OWNER May Suspend Work</i>	00700 - 34
15.02	<i>OWNER May Terminate for Cause</i>	00700 - 34
15.03	<i>OWNER May Terminate For Convenience</i>	00700 - 34
15.04	<i>CONTRACTOR May Stop Work or Terminate</i>	00700 - 35
ARTICLE 16 - DISPUTE RESOLUTION		00700 - 35
16.01	<i>Methods and Procedures</i>	00700 - 35
ARTICLE 17 - MISCELLANEOUS		00700 - 35
17.01	<i>Giving Notice</i>	00700 - 35
17.02	<i>Computation of Times</i>	00700 - 35
17.03	<i>Cumulative Remedies</i>	00700 - 35
17.04	<i>Survival of Obligations</i>	00700 - 35
17.05	<i>Controlling Law</i>	00700 - 35

GENERAL CONDITIONS

ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Contract Documents and printed with initial or all capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof.

1. *Addenda*--Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the Contract Documents.

2. *Agreement*--The written instrument which is evidence of the agreement between OWNER and CONTRACTOR covering the Work.

3. *Application for Payment*--The form acceptable to ENGINEER which is to be used by CONTRACTOR during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Asbestos*--Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

5. *Bid*--The offer or proposal of a bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

6. *Bidding Documents*--The Bidding Requirements and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

7. *Bidding Requirements*--The Advertisement or Invitation to Bid, Instructions to Bidders, Bid security form, if any, and the Bid form with any supplements.

8. *Bonds*--Performance and payment bonds and other instruments of security.

9. *Change Order*--A document recommended by ENGINEER which is signed by CONTRACTOR and OWNER and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

10. *Claim*--A demand or assertion by OWNER or CONTRACTOR seeking an adjustment of Contract Price or Contract Times, or both, or other relief with

respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.

11. *Contract*--The entire and integrated written agreement between the OWNER and CONTRACTOR concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*--The Contract Documents establish the rights and obligations of the parties and include the Agreement, Addenda (which pertain to the Contract Documents), CONTRACTOR's Bid (including documentation accompanying the Bid and any post Bid documentation submitted prior to the Notice of Award) when attached as an exhibit to the Agreement, the Notice to Proceed, the Bonds, these General Conditions, the Supplementary Conditions, the Specifications and the Drawings as the same are more specifically identified in the Agreement, together with all Written Amendments, Change Orders, Work Change Directives, Field Orders, and ENGINEER's written interpretations and clarifications issued on or after the Effective Date of the Agreement. Approved Shop Drawings and the reports and drawings of subsurface and physical conditions are not Contract Documents. Only printed or hard copies of the items listed in this paragraph are Contract Documents. Files in electronic media format of text, data, graphics, and the like that may be furnished by OWNER to CONTRACTOR are not Contract Documents.

13. *Contract Price*--The moneys payable by OWNER to CONTRACTOR for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of paragraph 11.03 in the case of Unit Price Work).

14. *Contract Times*--The number of days or the dates stated in the Agreement to: (i) achieve Substantial Completion; and (ii) complete the Work so that it is ready for final payment as evidenced by ENGINEER's written recommendation of final payment.

15. *CONTRACTOR*--The individual or entity with whom OWNER has entered into the Agreement.

16. *Cost of the Work*--See paragraph 11.01.A for definition.

17. *Drawings*--That part of the Contract Documents prepared or approved by ENGINEER which graphically shows the scope, extent, and character of the Work to be performed by CONTRACTOR. Shop Drawings and other CONTRACTOR submittals are not Drawings as so defined.

18. *Effective Date of the Agreement*--The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

19. *ENGINEER*--The individual or entity named as such in the Agreement.

20. *ENGINEER's Consultant*--An individual or entity having a contract with ENGINEER to furnish services as ENGINEER's independent professional associate or consultant with respect to the Project and who is identified as such in the Supplementary Conditions.

21. *Field Order*--A written order issued by ENGINEER which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.

22. *General Requirements*--Sections of Division 1 of the Specifications. The General Requirements pertain to all sections of the Specifications.

23. *Hazardous Environmental Condition*--The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto in connection with the Work.

24. *Hazardous Waste*--The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

25. *Laws and Regulations; Laws or Regulations*--Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

26. *Liens*--Charges, security interests, or encumbrances upon Project funds, real property, or personal property.

27. *Milestone*--A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

28. *Notice of Award*--The written notice by OWNER to the apparent successful bidder stating that upon timely compliance by the apparent successful bidder with the conditions precedent listed therein, OWNER will sign and deliver the Agreement.

29. *Notice to Proceed*--A written notice given by OWNER to CONTRACTOR fixing the date on which the Contract Times will commence to run and on which CONTRACTOR shall start to perform the Work under the Contract Documents.

30. *OWNER*--The individual, entity, public body, or authority with whom CONTRACTOR has entered into the Agreement and for whom the Work is to be performed.

31. *Partial Utilization*--Use by OWNER of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work.

32. *PCBs*--Polychlorinated biphenyls.

33. *Petroleum*--Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.

34. *Project*--The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part as may be indicated elsewhere in the Contract Documents.

35. *Project Manual*--The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.

36. *Radioactive Material*--Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

37. *Resident Project Representative*--The authorized representative of ENGINEER who may be assigned to the Site or any part thereof.

38. *Samples*--Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

39. *Shop Drawings*--All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for CONTRACTOR and submitted by CONTRACTOR to illustrate some portion of the Work.

40. *Site*--Lands or areas indicated in the Contract Documents as being furnished by OWNER upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by OWNER which are designated for the use of CONTRACTOR.

41. *Specifications*--That part of the Contract Documents consisting of written technical descriptions of materials, equipment, systems, stan-

dards, and workmanship as applied to the Work and certain administrative details applicable thereto.

42. *Subcontractor*--An individual or entity having a direct contract with CONTRACTOR or with any other Subcontractor for the performance of a part of the Work at the Site.

43. *Substantial Completion*--The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of ENGINEER, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

44. *Supplementary Conditions*--That part of the Contract Documents which amends or supplements these General Conditions.

45. *Supplier*--A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with CONTRACTOR or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by CONTRACTOR or any Subcontractor.

46. *Underground Facilities*--All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

47. *Unit Price Work*--Work to be paid for on the basis of unit prices.

48. *Work*--The entire completed construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

49. *Work Change Directive*--A written statement to CONTRACTOR issued on or after the Effective Date of the Agreement and signed by OWNER and recommended by ENGINEER ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change

ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

50. *Written Amendment*--A written statement modifying the Contract Documents, signed by OWNER and CONTRACTOR on or after the Effective Date of the Agreement and normally dealing with the nonengineering or nontechnical rather than strictly construction-related aspects of the Contract Documents.

1.02 Terminology

A. Intent of Certain Terms or Adjectives

1. Whenever in the Contract Documents the terms "as allowed," "as approved," or terms of like effect or import are used, or the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of ENGINEER as to the Work, it is intended that such action or determination will be solely to evaluate, in general, the completed Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign to ENGINEER any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraph 9.10 or any other provision of the Contract Documents.

B. Day

1. The word "day" shall constitute a calendar day of 24 hours measured from midnight to the next midnight.

C. Defective

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it does not conform to the Contract Documents or does not meet the requirements of any inspection, reference standard, test, or approval referred to in the Contract Documents, or has been damaged prior to ENGINEER's recommendation of final payment (unless responsibility for the protection thereof has been assumed by OWNER at Substantial Completion in accordance with paragraph 14.04 or 14.05).

D. Furnish, Install, Perform, Provide

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to

supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When "furnish," "install," "perform," or "provide" is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of CONTRACTOR, "provide" is implied.

E. Unless stated otherwise in the Contract Documents, words or phrases which have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 - PRELIMINARY MATTERS

2.01 *Delivery of Bonds*

A. When CONTRACTOR delivers the executed Agreements to OWNER, CONTRACTOR shall also deliver to OWNER such Bonds as CONTRACTOR may be required to furnish.

2.02 *Copies of Documents*

A. OWNER shall furnish to CONTRACTOR up to ten copies of the Contract Documents. Additional copies will be furnished upon request at the cost of reproduction.

2.03 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

2.04 *Starting the Work*

A. CONTRACTOR shall start to perform the Work on the date when the Contract Times commence to run.

No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

2.05 *Before Starting Construction*

A. *CONTRACTOR's Review of Contract Documents:* Before undertaking each part of the Work, CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. CONTRACTOR shall promptly report in writing to ENGINEER any conflict, error, ambiguity, or discrepancy which CONTRACTOR may discover and shall obtain a written interpretation or clarification from ENGINEER before proceeding with any Work affected thereby; however, CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless CONTRACTOR knew or reasonably should have known thereof.

B. *Preliminary Schedules:* Within ten days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), CONTRACTOR shall submit to ENGINEER for its timely review:

1. a preliminary progress schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;

2. a preliminary schedule of Shop Drawing and Sample submittals which will list each required submittal and the times for submitting, reviewing, and processing such submittal; and

3. a preliminary schedule of values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

C. *Evidence of Insurance:* Before any Work at the Site is started, CONTRACTOR and OWNER shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which CONTRACTOR and OWNER respectively are required to purchase and maintain in accordance with Article 5.

2.06 *Preconstruction Conference*

A. Within 20 days after the Contract Times start to run, but before any Work at the Site is started, a conference attended by CONTRACTOR, ENGINEER, and others as appropriate will be held to establish a working understanding among the parties as to the Work

and to discuss the schedules referred to in paragraph 2.05.B, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

2.07 Initial Acceptance of Schedules

A. Unless otherwise provided in the Contract Documents, at least ten days before submission of the first Application for Payment a conference attended by CONTRACTOR, ENGINEER, and others as appropriate will be held to review for acceptability to ENGINEER as provided below the schedules submitted in accordance with paragraph 2.05.B. CONTRACTOR shall have an additional ten days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to CONTRACTOR until acceptable schedules are submitted to ENGINEER.

1. The progress schedule will be acceptable to ENGINEER if it provides an orderly progression of the Work to completion within any specified Milestones and the Contract Times. Such acceptance will not impose on ENGINEER responsibility for the progress schedule, for sequencing, scheduling, or progress of the Work nor interfere with or relieve CONTRACTOR from CONTRACTOR's full responsibility therefor.

2. CONTRACTOR's schedule of Shop Drawing and Sample submittals will be acceptable to ENGINEER if it provides a workable arrangement for reviewing and processing the required submittals.

3. CONTRACTOR's schedule of values will be acceptable to ENGINEER as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 Intent

A. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.

B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be provided whether or not specifically called for at no additional cost to OWNER.

C. Clarifications and interpretations of the Contract Documents shall be issued by ENGINEER as provided in Article 9.

3.02 Reference Standards

A. Standards, Specifications, Codes, Laws, and Regulations

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard, specification, manual or code, or any instruction of a Supplier shall be effective to change the duties or responsibilities of OWNER, CONTRACTOR, or ENGINEER, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents, nor shall any such provision or instruction be effective to assign to OWNER, ENGINEER, or any of ENGINEER's Consultants, agents, or employees any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 Reporting and Resolving Discrepancies

A. Reporting Discrepancies

1. If, during the performance of the Work, CONTRACTOR discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Law or Regulation applicable to the performance of the Work or of any standard, specification, manual or code, or of any instruction of any Supplier, CONTRACTOR shall report it to ENGINEER in writing at once. CONTRACTOR shall not proceed with the Work affected thereby (except in an emergency as required by paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in paragraph 3.04; provided, however, that CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any such conflict, error, ambiguity, or discrepancy unless CONTRACTOR knew or reasonably should have known thereof.

B. Resolving Discrepancies

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

a. the provisions of any standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents); or

b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof in one or more of the following ways: (i) a Written Amendment; (ii) a Change Order; or (iii) a Work Change Directive.

B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways: (i) a Field Order; (ii) ENGINEER's approval of a Shop Drawing or Sample; or (iii) ENGINEER's written interpretation or clarification.

3.05 *Reuse of Documents*

A. CONTRACTOR and any Subcontractor or Supplier or other individual or entity performing or furnishing any of the Work under a direct or indirect contract with OWNER: (i) shall not have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of ENGINEER or ENGINEER's Consultant, including electronic media editions; and (ii) shall not reuse any of such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of OWNER and ENGINEER and specific written verification or adaption by ENGINEER. This prohibition will survive final payment, completion, and acceptance of the Work, or termination or completion of the Contract. Nothing herein shall preclude CONTRACTOR from retaining copies of the Contract Documents for record purposes.

ARTICLE 4 - AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; REFERENCE POINTS

4.01 *Availability of Lands*

A. OWNER shall furnish the Site. OWNER shall notify CONTRACTOR of any encumbrances or restrictions not of general application but specifically related to use of the Site with which CONTRACTOR must comply in performing the Work. OWNER will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing

facilities. If CONTRACTOR and OWNER are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in OWNER's furnishing the Site, CONTRACTOR may make a Claim therefor as provided in paragraph 10.05.

B. Upon reasonable written request, OWNER shall furnish CONTRACTOR with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and OWNER's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

A. *Reports and Drawings:* The Supplementary Conditions identify:

1. those reports of explorations and tests of subsurface conditions at or contiguous to the Site that ENGINEER has used in preparing the Contract Documents; and

2. those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that ENGINEER has used in preparing the Contract Documents.

B. *Limited Reliance by CONTRACTOR on Technical Data Authorized:* CONTRACTOR may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," CONTRACTOR may not rely upon or make any Claim against OWNER, ENGINEER, or any of ENGINEER's Consultants with respect to:

1. the completeness of such reports and drawings for CONTRACTOR's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by CONTRACTOR, and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any CONTRACTOR interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

4.03 Differing Subsurface or Physical Conditions

A. *Notice:* If CONTRACTOR believes that any subsurface or physical condition at or contiguous to the Site that is uncovered or revealed either:

1. is of such a nature as to establish that any "technical data" on which CONTRACTOR is entitled to rely as provided in paragraph 4.02 is materially inaccurate; or
2. is of such a nature as to require a change in the Contract Documents; or
3. differs materially from that shown or indicated in the Contract Documents; or
4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by paragraph 6.16.A), notify OWNER and ENGINEER in writing about such condition. CONTRACTOR shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *ENGINEER's Review:* After receipt of written notice as required by paragraph 4.03.A, ENGINEER will promptly review the pertinent condition, determine the necessity of OWNER's obtaining additional exploration or tests with respect thereto, and advise OWNER in writing (with a copy to CONTRACTOR) of ENGINEER's findings and conclusions.

C. *Possible Price and Times Adjustments*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in CONTRACTOR's cost of, or time required for, performance of the Work; subject, however, to the following:

- a. such condition must meet any one or more of the categories described in paragraph 4.03.A; and
- b. with respect to Work that is paid for on a Unit Price Basis, any adjustment in Contract Price will be subject to the provisions of paragraphs 9.08 and 11.03.

2. CONTRACTOR shall not be entitled to any adjustment in the Contract Price or Contract Times if:

a. CONTRACTOR knew of the existence of such conditions at the time CONTRACTOR made a final commitment to OWNER in respect of Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or

b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for CONTRACTOR prior to CONTRACTOR's making such final commitment; or

c. CONTRACTOR failed to give the written notice within the time and as required by paragraph 4.03.A.

3. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in paragraph 10.05. However, OWNER, ENGINEER, and ENGINEER's Consultants shall not be liable to CONTRACTOR for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by CONTRACTOR on or in connection with any other project or anticipated project.

4.04 Underground Facilities

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to OWNER or ENGINEER by the owners of such Underground Facilities, including OWNER, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. OWNER and ENGINEER shall not be responsible for the accuracy or completeness of any such information or data; and

2. the cost of all of the following will be included in the Contract Price, and CONTRACTOR shall have full responsibility for:

- a. reviewing and checking all such information and data,
- b. locating all Underground Facilities shown or indicated in the Contract Documents,
- c. coordination of the Work with the owners of such Underground Facilities, including OWNER, during construction, and

d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. Not Shown or Indicated

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to OWNER and ENGINEER. ENGINEER will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, CONTRACTOR shall be responsible for the safety and protection of such Underground Facility.

2. If ENGINEER concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price of Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that CONTRACTOR did not know of and could not reasonably have been expected to be aware of or to have anticipated. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, OWNER or CONTRACTOR may make a Claim therefor as provided in paragraph 10.05.

4.05 Reference Points

A. OWNER shall provide engineering surveys to establish reference points for construction which in ENGINEER's judgment are necessary to enable CONTRACTOR to proceed with the Work. CONTRACTOR shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of OWNER. CONTRACTOR shall report to ENGINEER whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.06 Hazardous Environmental Condition at Site

A. *Reports and Drawings:* Reference is made to the Supplementary Conditions for the identification of those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that have been utilized by the ENGINEER in the preparation of the Contract Documents.

B. *Limited Reliance by CONTRACTOR on Technical Data Authorized:* CONTRACTOR may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," CONTRACTOR may not rely upon or make any Claim against OWNER, ENGINEER or any of ENGINEER's Consultants with respect to:

1. the completeness of such reports and drawings for CONTRACTOR's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by CONTRACTOR and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

3. any CONTRACTOR interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.

C. CONTRACTOR shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. CONTRACTOR shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by CONTRACTOR, Subcontractors, Suppliers, or anyone else for whom CONTRACTOR is responsible.

D. If CONTRACTOR encounters a Hazardous Environmental Condition or if CONTRACTOR or anyone for whom CONTRACTOR is responsible creates a Hazardous Environmental Condition, CONTRACTOR shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by paragraph 6.16); and (iii) notify OWNER and ENGINEER (and promptly thereafter confirm such notice in writing). OWNER shall promptly consult with ENGINEER concerning the necessity for OWNER to retain a qualified expert to evaluate such condition or take corrective action, if any.

E. CONTRACTOR shall not be required to resume Work in connection with such condition or in any affected area until after OWNER has obtained any required permits related thereto and delivered to

CONTRACTOR written notice: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If OWNER and CONTRACTOR cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by CONTRACTOR, either party may make a Claim therefor as provided in paragraph 10.05.

F. If after receipt of such written notice CONTRACTOR does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then OWNER may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If OWNER and CONTRACTOR cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in paragraph 10.05. OWNER may have such deleted portion of the Work performed by OWNER's own forces or others in accordance with Article 7.

G. To the fullest extent permitted by Laws and Regulations, OWNER shall indemnify and hold harmless CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and the officers, directors, partners, employees, agents, other consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by CONTRACTOR or by anyone for whom CONTRACTOR is responsible. Nothing in this paragraph 4.06.E shall obligate OWNER to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

H. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees, agents, other consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by CONTRACTOR or by anyone for whom CONTRACTOR is responsible. Nothing in this paragraph 4.06.F shall obligate CONTRACTOR to indemnify any individual or

entity from and against the consequences of that individual's or entity's own negligence.

I. The provisions of paragraphs 4.02, 4.03, and 4.04 are not intended to apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 - BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

A. CONTRACTOR shall furnish performance and payment Bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all CONTRACTOR's obligations under the Contract Documents. These Bonds shall remain in effect at least until one year after the date when final payment becomes due, except as provided otherwise by Laws or Regulations or by the Contract Documents. CONTRACTOR shall also furnish such other Bonds as are required by the Contract Documents.

B. All Bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All Bonds signed by an agent must be accompanied by a certified copy of such agent's authority to act.

C. If the surety on any Bond furnished by CONTRACTOR is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of paragraph 5.01.B, CONTRACTOR shall within 20 days thereafter substitute another Bond and surety, both of which shall comply with the requirements of paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

A. All Bonds and insurance required by the Contract Documents to be purchased and maintained by OWNER or CONTRACTOR shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue Bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

A. CONTRACTOR shall deliver to OWNER, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other

evidence of insurance requested by OWNER or any other additional insured) which CONTRACTOR is required to purchase and maintain. OWNER shall deliver to CONTRACTOR, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by CONTRACTOR or any other additional insured) which OWNER is required to purchase and maintain.

5.04 *CONTRACTOR's Liability Insurance*

A. CONTRACTOR shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from CONTRACTOR's performance of the Work and CONTRACTOR's other obligations under the Contract Documents, whether it is to be performed by CONTRACTOR, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;
2. claims for damages because of bodily injury, occupational sickness or disease, or death of CONTRACTOR's employees;
3. claims for damages because of bodily injury, sickness or disease, or death of any person other than CONTRACTOR's employees;
4. claims for damages insured by reasonably available personal injury liability coverage which are sustained: (i) by any person as a result of an offense directly or indirectly related to the employment of such person by CONTRACTOR, or (ii) by any other person for any other reason;
5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and
6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

B. The policies of insurance so required by this paragraph 5.04 to be purchased and maintained shall:

1. with respect to insurance required by paragraphs 5.04.A.3 through 5.04.A.6 inclusive, include as additional insureds (subject to any customary exclusion in respect of professional liability) OWNER, ENGINEER, ENGINEER's Consultants, and any other individuals or entities identified in the Supplementary

Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;

3. include completed operations insurance;

4. include contractual liability insurance covering CONTRACTOR's indemnity obligations under paragraphs 6.07, 6.11, and 6.20;

5. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least thirty days prior written notice has been given to OWNER and CONTRACTOR and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the CONTRACTOR pursuant to paragraph 5.03 will so provide);

6. remain in effect at least until final payment and at all times thereafter when CONTRACTOR may be correcting, removing, or replacing defective Work in accordance with paragraph 13.07; and

7. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two years after final payment (and CONTRACTOR shall furnish OWNER and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to OWNER and any such additional insured of continuation of such insurance at final payment and one year thereafter).

5.05 *OWNER's Liability Insurance*

A. In addition to the insurance required to be provided by CONTRACTOR under paragraph 5.04, OWNER, at OWNER's option, may purchase and maintain at OWNER's expense OWNER's own liability insurance as will protect OWNER against claims which may arise from operations under the Contract Documents.

5.06 *Property Insurance*

A. Unless otherwise provided in the Supplementary Conditions, OWNER shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an additional insured;

2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, false work, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, and such other perils or causes of loss as may be specifically required by the Supplementary Conditions;

3. include expenses incurred in the repair or replacement of any insured property (including but

not limited to fees and charges of engineers and architects);

4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by OWNER prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by ENGINEER;

5. allow for partial utilization of the Work by OWNER;

6. include testing and startup; and

7. be maintained in effect until final payment is made unless otherwise agreed to in writing by OWNER, CONTRACTOR, and ENGINEER with 30 days written notice to each other additional insured to whom a certificate of insurance has been issued.

B. OWNER shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and any other individuals or entities identified in the Supplementary Conditions, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured.

C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with paragraph 5.06 will contain a provision or endorsement that the coverage

afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to OWNER and CONTRACTOR and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with paragraph 5.07.

D. OWNER shall not be responsible for purchasing and maintaining any property insurance specified in this paragraph 5.06 to protect the interests of CONTRACTOR, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by CONTRACTOR, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

E. If CONTRACTOR requests in writing that other special insurance be included in the property insurance policies provided under paragraph 5.06, OWNER shall, if possible, include such insurance, and the cost thereof will be charged to CONTRACTOR by appropriate Change Order or Written Amendment. Prior to commencement of the Work at the Site, OWNER shall in writing advise CONTRACTOR whether or not such other insurance has been procured by OWNER.

5.07 *Waiver of Rights*

A. OWNER and CONTRACTOR intend that all policies purchased in accordance with paragraph 5.06 will protect OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. OWNER and CONTRACTOR waive all rights against each other and their respective officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors, ENGINEER, ENGINEER's Consultants, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to

the proceeds of insurance held by OWNER as trustee or otherwise payable under any policy so issued.

B. OWNER waives all rights against CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to OWNER's property or the Work caused by, arising out of, or resulting from fire or other peril whether or not insured by OWNER; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by OWNER during partial utilization pursuant to paragraph 14.05, after Substantial Completion pursuant to paragraph 14.04, or after final payment pursuant to paragraph 14.07.

C. Any insurance policy maintained by OWNER covering any loss, damage or consequential loss referred to in paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against CONTRACTOR, Subcontractors, ENGINEER, or ENGINEER's Consultants and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

A. Any insured loss under the policies of insurance required by paragraph 5.06 will be adjusted with OWNER and made payable to OWNER as fiduciary for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause and of paragraph 5.08.B. OWNER shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order or Written Amendment.

B. OWNER as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to OWNER's exercise of this power. If such objection be made, OWNER as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, OWNER as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, OWNER as fiduciary shall give bond for the proper performance of such duties.

5.09 *Acceptance of Bonds and Insurance; Option to Replace*

A. If either OWNER or CONTRACTOR has any objection to the coverage afforded by or other provisions of the Bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by paragraph 2.05.C. OWNER and CONTRACTOR shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the Bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent Bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

A. If OWNER finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

A. CONTRACTOR shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction, but CONTRACTOR shall not be responsible for the negligence of OWNER or ENGINEER in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents. CONTRACTOR shall be responsible to see

that the completed Work complies accurately with the Contract Documents.

B. At all times during the progress of the Work, CONTRACTOR shall assign a competent resident superintendent thereto who shall not be replaced without written notice to OWNER and ENGINEER except under extraordinary circumstances. The superintendent will be CONTRACTOR's representative at the Site and shall have authority to act on behalf of CONTRACTOR. All communications given to or received from the superintendent shall be binding on CONTRACTOR.

6.02 Labor; Working Hours

A. CONTRACTOR shall provide competent, suitably qualified personnel to survey, lay out, and construct the Work as required by the Contract Documents. CONTRACTOR shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, and CONTRACTOR will not permit overtime work or the performance of Work on Saturday, Sunday, or any legal holiday without OWNER's written consent (which will not be unreasonably withheld) given after prior written notice to ENGINEER.

6.03 Services, Materials, and Equipment

A. Unless otherwise specified in the General Requirements, CONTRACTOR shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All warranties and guarantees specifically called for by the Specifications shall expressly run to the benefit of OWNER. If required by ENGINEER, CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 Progress Schedule

A. CONTRACTOR shall adhere to the progress schedule established in accordance with paragraph 2.07

as it may be adjusted from time to time as provided below.

1. CONTRACTOR shall submit to ENGINEER for acceptance (to the extent indicated in paragraph 2.07) proposed adjustments in the progress schedule that will not result in changing the Contract Times (or Milestones). Such adjustments will conform generally to the progress schedule then in effect and additionally will comply with any provisions of the General Requirements applicable thereto.

2. Proposed adjustments in the progress schedule that will change the Contract Times (or Milestones) shall be submitted in accordance with the requirements of Article 12. Such adjustments may only be made by a Change Order or Written Amendment in accordance with Article 12.

6.05 Substitutes and "Or-Equals"

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to ENGINEER for review under the circumstances described below.

1. "Or-Equal" Items: If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by ENGINEER as an "or-equal" item, in which case review and approval of the proposed item may, in ENGINEER's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment ENGINEER determines that: (i) it is at least equal in quality, durability, appearance, strength, and design characteristics; (ii) it will reliably perform at least equally well the function imposed by the design concept of the completed Project as a functioning whole, and;

b. CONTRACTOR certifies that: (i) there is no increase in cost to the OWNER; and (ii) it will conform substantially, even with deviations, to the detailed requirements of the item named in the Contract Documents.

2. *Substitute Items*

a. If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR does not qualify as an "or-equal" item under paragraph 6.05.A.1, it will be considered a proposed substitute item.

b. CONTRACTOR shall submit sufficient information as provided below to allow ENGINEER to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by ENGINEER from anyone other than CONTRACTOR.

c. The procedure for review by ENGINEER will be as set forth in paragraph 6.05.A.2.d, as supplemented in the General Requirements and as ENGINEER may decide is appropriate under the circumstances.

d. CONTRACTOR shall first make written application to ENGINEER for review of a proposed substitute item of material or equipment that CONTRACTOR seeks to furnish or use. The application shall certify that the proposed substitute item will perform adequately the functions and achieve the results called for by the general design, be similar in substance to that specified, and be suited to the same use as that specified. The application will state the extent, if any, to which the use of the proposed substitute item will prejudice CONTRACTOR's achievement of Substantial Completion on time, whether or not use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) to adapt the design to the proposed substitute item and whether or not incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty. All variations of the proposed substitute item from that specified will be identified in the application, and available engineering, sales, maintenance, repair, and replacement services will be indicated. The application will also contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change, all of which will be considered by ENGINEER in evaluating the proposed substitute item. ENGINEER may require CONTRACTOR to furnish additional data about the proposed substitute item.

B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is shown or indicated in and

expressly required by the Contract Documents, CONTRACTOR may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by ENGINEER. CONTRACTOR shall submit sufficient information to allow ENGINEER, in ENGINEER's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The procedure for review by ENGINEER will be similar to that provided in subparagraph 6.05.A.2.

C. *Engineer's Evaluation:* ENGINEER will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to paragraphs 6.05.A and 6.05.B. ENGINEER will be the sole judge of acceptability. No "or-equal" or substitute will be ordered, installed or utilized until ENGINEER's review is complete, which will be evidenced by either a Change Order for a substitute or an approved Shop Drawing for an "or equal." ENGINEER will advise CONTRACTOR in writing of any negative determination.

D. *Special Guarantee:* OWNER may require CONTRACTOR to furnish at CONTRACTOR's expense a special performance guarantee or other surety with respect to any substitute.

E. *ENGINEER's Cost Reimbursement:* ENGINEER will record time required by ENGINEER and ENGINEER's Consultants in evaluating substitute proposed or submitted by CONTRACTOR pursuant to paragraphs 6.05.A.2 and 6.05.B and in making changes in the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) occasioned thereby. Whether or not ENGINEER approves a substitute item so proposed or submitted by CONTRACTOR, CONTRACTOR shall reimburse OWNER for the charges of ENGINEER and ENGINEER's Consultants for evaluating each such proposed substitute.

F. *CONTRACTOR's Expense:* CONTRACTOR shall provide all data in support of any proposed substitute or "or-equal" at CONTRACTOR's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

A. CONTRACTOR shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to OWNER as indicated in paragraph 6.06.B), whether initially or as a replacement, against whom OWNER may have reasonable objection. CONTRACTOR shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom CONTRACTOR has reasonable objection.

B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to OWNER in advance for acceptance by OWNER by a specified date prior to the Effective Date of the Agreement, and if

CONTRACTOR has submitted a list thereof in accordance with the Supplementary Conditions, OWNER's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. CONTRACTOR shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued or Written Amendment signed. No acceptance by OWNER of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of OWNER or ENGINEER to reject defective Work.

C. CONTRACTOR shall be fully responsible to OWNER and ENGINEER for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as CONTRACTOR is responsible for CONTRACTOR's own acts and omissions. Nothing in the Contract Documents shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between OWNER or ENGINEER and any such Subcontractor, Supplier or other individual or entity, nor shall it create any obligation on the part of OWNER or ENGINEER to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

D. CONTRACTOR shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR.

E. CONTRACTOR shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with ENGINEER through CONTRACTOR.

F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control CONTRACTOR in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

G. All Work performed for CONTRACTOR by a Subcontractor or Supplier will be pursuant to an appropriate agreement between CONTRACTOR and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of OWNER and ENGINEER. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in paragraph 5.06, the agreement between the CONTRACTOR and the Subcontractor or Supplier will

contain provisions whereby the Subcontractor or Supplier waives all rights against OWNER, CONTRACTOR, ENGINEER, ENGINEER's Consultants, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, CONTRACTOR will obtain the same.

6.07 *Patent Fees and Royalties*

A. CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of OWNER or ENGINEER its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by OWNER in the Contract Documents. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees or agents, and other consultants of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 *Permits*

A. Unless otherwise provided in the Supplementary Conditions, CONTRACTOR shall obtain and pay for all construction permits and licenses. OWNER shall assist CONTRACTOR, when necessary, in obtaining such permits and licenses. CONTRACTOR shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. CONTRACTOR shall pay all charges of utility owners for connections to the Work, and OWNER shall pay all charges of such utility owners for capital costs related thereto, such as plant investment fees.

6.09 *Laws and Regulations*

A. CONTRACTOR shall give all notices and comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither OWNER nor ENGINEER shall be responsible for monitoring CONTRACTOR's compliance with any Laws or Regulations.

B. If CONTRACTOR performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, CONTRACTOR shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work; however, it shall not be CONTRACTOR's primary responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve CONTRACTOR of CONTRACTOR's obligations under paragraph 3.03.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work may be the subject of an adjustment in Contract Price or Contract Times. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in paragraph 10.05.

6.10 *Taxes*

A. CONTRACTOR shall pay all sales, consumer, use, and other similar taxes required to be paid by CONTRACTOR in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

6.11 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*

1. CONTRACTOR shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. CONTRACTOR shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.

2. Should any claim be made by any such owner or occupant because of the performance of the Work, CONTRACTOR shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.

3. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultant, and the officers, directors, partners, employees, agents, and other consultants of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against OWNER, ENGINEER, or any other party indemnified hereunder to the extent caused by or based upon CONTRACTOR's performance of the Work.

B. *Removal of Debris During Performance of the Work:* During the progress of the Work CONTRACTOR shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning:* Prior to Substantial Completion of the Work CONTRACTOR shall clean the Site and make it ready for utilization by OWNER. At the completion of the Work CONTRACTOR shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading Structures:* CONTRACTOR shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall CONTRACTOR subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 *Record Documents*

A. CONTRACTOR shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Written Amendments, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to ENGINEER for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to ENGINEER for OWNER.

6.13 *Safety and Protection*

A. CONTRACTOR shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. CONTRACTOR shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. CONTRACTOR shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property. All damage, injury, or loss to any property referred to in paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by CONTRACTOR, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by CONTRACTOR (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of OWNER or ENGINEER or ENGINEER's Consultant, or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of CONTRACTOR or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them). CONTRACTOR's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and ENGINEER has issued a notice to OWNER and CONTRACTOR in accordance with paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

A. CONTRACTOR shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 *Hazard Communication Programs*

A. CONTRACTOR shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

6.16 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, CONTRACTOR is obligated to act to prevent threatened damage, injury, or loss. CONTRACTOR shall give ENGINEER prompt written notice if CONTRACTOR believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If ENGINEER determines that a change in the Contract Documents is required because of the action taken by CONTRACTOR in response to such an emergency, a Work Change Directive or Change Order will be issued.

6.17 *Shop Drawings and Samples*

A. CONTRACTOR shall submit Shop Drawings to ENGINEER for review and approval in accordance with the acceptable schedule of Shop Drawings and Sample submittals. All submittals will be identified as ENGINEER may require and in the number of copies specified in the General Requirements. The data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show ENGINEER the services, materials, and equipment CONTRACTOR proposes to provide and to enable ENGINEER to review the information for the limited purposes required by paragraph 6.17.E.

B. CONTRACTOR shall also submit Samples to ENGINEER for review and approval in accordance with the acceptable schedule of Shop Drawings and Sample submittals. Each Sample will be identified clearly as to material, Supplier, pertinent data such as catalog numbers, and the use for which intended and otherwise as ENGINEER may require to enable ENGINEER to review the submittal for the limited purposes required by paragraph 6.17.E. The numbers of each Sample to be submitted will be as specified in the Specifications.

C. Where a Shop Drawing or Sample is required by the Contract Documents or the schedule of Shop Drawings and Sample submittals acceptable to ENGINEER as required by paragraph 2.07, any related Work performed prior to ENGINEER's review and approval of the pertinent submittal will be at the sole expense and responsibility of CONTRACTOR.

D. *Submittal Procedures*

1. Before submitting each Shop Drawing or Sample, CONTRACTOR shall have determined and verified:

a. all field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

b. all materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work;

c. all information relative to means, methods, techniques, sequences, and procedures of construction and safety precautions and programs incident thereto; and

d. CONTRACTOR shall also have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.

2. Each submittal shall bear a stamp or specific written indication that CONTRACTOR has satisfied CONTRACTOR's obligations under the Contract Documents with respect to CONTRACTOR's review and approval of that submittal.

3. At the time of each submittal, CONTRACTOR shall give ENGINEER specific written notice of such variations, if any, that the Shop Drawing or Sample submitted may have from the requirements of the Contract Documents, such notice to be in a written communication separate from the submittal; and, in addition, shall cause a specific notation to be made on each Shop Drawing and Sample submitted to ENGINEER for review and approval of each such variation.

E. ENGINEER's Review

1. ENGINEER will timely review and approve Shop Drawings and Samples in accordance with the schedule of Shop Drawings and Sample submittals acceptable to ENGINEER. ENGINEER's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. ENGINEER's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. ENGINEER's review and approval of Shop Drawings or Samples shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the Contract Documents unless CONTRACTOR has in writing called ENGINEER's

attention to each such variation at the time of each submittal as required by paragraph 6.17.D.3 and ENGINEER has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample approval; nor will any approval by ENGINEER relieve CONTRACTOR from responsibility for complying with the requirements of paragraph 6.17.D.1.

F. Resubmittal Procedures

1. CONTRACTOR shall make corrections required by ENGINEER and shall return the required number of corrected copies of Shop Drawings and submit as required new Samples for review and approval. CONTRACTOR shall direct specific attention in writing to revisions other than the corrections called for by ENGINEER on previous submittals.

6.18 Continuing the Work

A. CONTRACTOR shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with OWNER. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by paragraph 15.04 or as OWNER and CONTRACTOR may otherwise agree in writing.

6.19 CONTRACTOR's General Warranty and Guarantee

A. CONTRACTOR warrants and guarantees to OWNER, ENGINEER, and ENGINEER's Consultants that all Work will be in accordance with the Contract Documents and will not be defective. CONTRACTOR's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than CONTRACTOR, Subcontractors, Suppliers, or any other individual or entity for whom CONTRACTOR is responsible; or

2. normal wear and tear under normal usage.

B. CONTRACTOR's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of CONTRACTOR's obligation to perform the Work in accordance with the Contract Documents:

1. observations by ENGINEER;

2. recommendation by ENGINEER or payment by OWNER of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by ENGINEER or any payment related thereto by OWNER;

4. use or occupancy of the Work or any part thereof by OWNER;

5. any acceptance by OWNER or any failure to do so;

6. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by ENGINEER;

7. any inspection, test, or approval by others; or

8. any correction of defective Work by OWNER.

6.20 Indemnification

A. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage:

1. is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom; and

2. is caused in whole or in part by any negligent act or omission of CONTRACTOR, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable, regardless of whether or not caused in part by any negligence or omission of an individual or entity indemnified hereunder or whether liability is imposed upon such indemnified party by Laws and Regulations regardless of the negligence of any such individual or entity.

B. In any and all claims against OWNER or ENGINEER or any of their respective consultants, agents, officers, directors, partners, or employees by any employee (or the survivor or personal representative of such employee) of CONTRACTOR, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for CONTRACTOR or any such

Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of CONTRACTOR under paragraph 6.20.A shall not extend to the liability of ENGINEER and ENGINEER's Consultants or to the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them arising out of:

1. the preparation or approval of, or the failure to prepare or approve, maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

ARTICLE 7 - OTHER WORK

7.01 Related Work at Site

A. OWNER may perform other work related to the Project at the Site by OWNER's employees, or let other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:

1. written notice thereof will be given to CONTRACTOR prior to starting any such other work; and

2. if OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in paragraph 10.05.

B. CONTRACTOR shall afford each other contractor who is a party to such a direct contract and each utility owner (and OWNER, if OWNER is performing the other work with OWNER's employees) proper and safe access to the Site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work and shall properly coordinate the Work with theirs. Unless otherwise provided in the Contract Documents, CONTRACTOR shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. CONTRACTOR shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of ENGINEER and the others whose work will be affected. The duties and responsibilities of CONTRACTOR under this paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of CONTRACTOR in said direct

contracts between OWNER and such utility owners and other contractors.

C. If the proper execution or results of any part of CONTRACTOR's Work depends upon work performed by others under this Article 7, CONTRACTOR shall inspect such other work and promptly report to ENGINEER in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of CONTRACTOR's Work. CONTRACTOR's failure to so report will constitute an acceptance of such other work as fit and proper for integration with CONTRACTOR's Work except for latent defects and deficiencies in such other work.

7.02 *Coordination*

A. If OWNER intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:

1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
2. the specific matters to be covered by such authority and responsibility will be itemized; and
3. the extent of such authority and responsibilities will be provided.

B. Unless otherwise provided in the Supplementary Conditions, OWNER shall have sole authority and responsibility for such coordination.

ARTICLE 8 - OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, OWNER shall issue all communications to CONTRACTOR through ENGINEER.

8.02 *Replacement of ENGINEER*

A. In case of termination of the employment of ENGINEER, OWNER shall appoint an engineer to whom CONTRACTOR makes no reasonable objection, whose status under the Contract Documents shall be that of the former ENGINEER.

8.03 *Furnish Data*

A. OWNER shall promptly furnish the data required of OWNER under the Contract Documents.

8.04 *Pay Promptly When Due*

A. OWNER shall make payments to CONTRACTOR promptly when they are due as provided in paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

A. OWNER's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in paragraphs 4.01 and 4.05. Paragraph 4.02 refers to OWNER's identifying and making available to CONTRACTOR copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site that have been utilized by ENGINEER in preparing the Contract Documents.

8.06 *Insurance*

A. OWNER's responsibilities, if any, in respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 *Change Orders*

A. OWNER is obligated to execute Change Orders as indicated in paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

A. OWNER's responsibility in respect to certain inspections, tests, and approvals is set forth in paragraph 13.03.B.

8.09 *Limitations on OWNER's Responsibilities*

A. The OWNER shall not supervise, direct, or have control or authority over, nor be responsible for, CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the performance of the Work. OWNER will not be responsible for CONTRACTOR's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

A. OWNER's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

A. If and to the extent OWNER has agreed to furnish CONTRACTOR reasonable evidence that financial arrangements have been made to satisfy OWNER's obligations under the Contract Documents,

OWNER's responsibility in respect thereof will be as set forth in the Supplementary Conditions.

ARTICLE 9 - ENGINEER'S STATUS DURING CONSTRUCTION

9.01 OWNER'S Representative

A. ENGINEER will be OWNER's representative during the construction period. The duties and responsibilities and the limitations of authority of ENGINEER as OWNER's representative during construction are set forth in the Contract Documents and will not be changed without written consent of OWNER and ENGINEER.

9.02 Visits to Site

A. ENGINEER will make visits to the Site at intervals appropriate to the various stages of construction as ENGINEER deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of CONTRACTOR's executed Work. Based on information obtained during such visits and observations, ENGINEER, for the benefit of OWNER, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. ENGINEER will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. ENGINEER's efforts will be directed toward providing for OWNER a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, ENGINEER will keep OWNER informed of the progress of the Work and will endeavor to guard OWNER against defective Work.

B. ENGINEER's visits and observations are subject to all the limitations on ENGINEER's authority and responsibility set forth in paragraph 9.10, and particularly, but without limitation, during or as a result of ENGINEER's visits or observations of CONTRACTOR's Work ENGINEER will not supervise, direct, control, or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the performance of the Work.

9.03 Project Representative

A. If OWNER and ENGINEER agree, ENGINEER will furnish a Resident Project Representative to assist ENGINEER in providing more extensive observation of the Work. The responsibilities and authority and limitations thereon of any such Resident Project

Representative and assistants will be as provided in paragraph 9.10 and in the Supplementary Conditions. If OWNER designates another representative or agent to represent OWNER at the Site who is not ENGINEER's Consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual

or entity will be as provided in the Supplementary Conditions.

9.04 Clarifications and Interpretations

A. ENGINEER will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents as ENGINEER may determine necessary, which shall be consistent with the intent of and reasonably inferable from the Contract Documents. Such written clarifications and interpretations will be binding on OWNER and CONTRACTOR. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a written clarification or interpretation, a Claim may be made therefor as provided in paragraph 10.05.

9.05 Authorized Variations in Work

A. ENGINEER may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on OWNER and also on CONTRACTOR, who shall perform the Work involved promptly. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of a Field Order, a Claim may be made therefor as provided in paragraph 10.05.

9.06 Rejecting Defective Work

A. ENGINEER will have authority to disapprove or reject Work which ENGINEER believes to be defective, or that ENGINEER believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. ENGINEER will also have authority to require special inspection or testing of the Work as provided in paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.07 Shop Drawings, Change Orders and Payments

A. In connection with ENGINEER's authority as to Shop Drawings and Samples, see paragraph 6.17.

B. In connection with ENGINEER's authority as to Change Orders, see Articles 10, 11, and 12.

C. In connection with ENGINEER's authority as to Applications for Payment, see Article 14.

9.08 *Determinations for Unit Price Work*

A. ENGINEER will determine the actual quantities and classifications of Unit Price Work performed by CONTRACTOR. ENGINEER will review with CONTRACTOR the ENGINEER's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). ENGINEER's written decision thereon will be final and binding (except as modified by ENGINEER to reflect changed factual conditions or more accurate data) upon OWNER and CONTRACTOR, subject to the provisions of paragraph 10.05.

9.09 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. ENGINEER will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. Claims, disputes and other matters relating to the acceptability of the Work, the quantities and classifications of Unit Price Work, the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, and Claims seeking changes in the Contract Price or Contract Times will be referred initially to ENGINEER in writing, in accordance with the provisions of paragraph 10.05, with a request for a formal decision.

B. When functioning as interpreter and judge under this paragraph 9.09, ENGINEER will not show partiality to OWNER or CONTRACTOR and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity. The rendering of a decision by ENGINEER pursuant to this paragraph 9.09 with respect to any such Claim, dispute, or other matter (except any which have been waived by the making or acceptance of final payment as provided in paragraph 14.07) will be a condition precedent to any exercise by OWNER or CONTRACTOR of such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any such Claim, dispute, or other matter.

9.10 *Limitations on ENGINEER's Authority and Responsibilities*

A. Neither ENGINEER's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by ENGINEER in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by ENGINEER shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by

ENGINEER to CONTRACTOR, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. ENGINEER will not supervise, direct, control, or have authority over or be responsible for CONTRACTOR's means, methods, techniques, se-

quences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the performance of the Work. ENGINEER will not be responsible for CONTRACTOR's failure to perform the Work in accordance with the Contract Documents.

C. ENGINEER will not be responsible for the acts or omissions of CONTRACTOR or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. ENGINEER's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, Bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents.

E. The limitations upon authority and responsibility set forth in this paragraph 9.10 shall also apply to ENGINEER's Consultants, Resident Project Representative, and assistants.

ARTICLE 10 - CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

A. Without invalidating the Agreement and without notice to any surety, OWNER may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Written Amendment, a Change Order, or a Work Change Directive. Upon receipt of any such document, CONTRACTOR shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

B. If OWNER and CONTRACTOR are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

A. CONTRACTOR shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in paragraph 3.04, except in the case of an emergency as provided in paragraph 6.16 or in the case of uncovering Work as provided in paragraph 13.04.B.

10.03 *Execution of Change Orders*

A. OWNER and CONTRACTOR shall execute appropriate Change Orders recommended by ENGINEER (or Written Amendments) covering:

1. changes in the Work which are: (i) ordered by OWNER pursuant to paragraph 10.01.A, (ii) required because of acceptance of defective Work under paragraph 13.08.A or OWNER's correction of defective Work under paragraph 13.09, or (iii) agreed to by the parties;

2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and

3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by ENGINEER pursuant to paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, CONTRACTOR shall carry on the Work and adhere to the progress schedule as provided in paragraph 6.18.A.

10.04 Notification to Surety

A. If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times) is required by the provisions of any Bond to be given to a surety, the giving of any such notice will be CONTRACTOR's responsibility. The amount of each applicable Bond will be adjusted to reflect the effect of any such change.

10.05 Claims and Disputes

A. *Notice:* Written notice stating the general nature of each Claim, dispute, or other matter shall be delivered by the claimant to ENGINEER and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. Notice of the amount or extent of the Claim, dispute, or other matter with supporting data shall be delivered to the ENGINEER and the other party to the Contract within 60 days after the start of such event (unless ENGINEER allows additional time for claimant to submit additional or more accurate data in support of such Claim, dispute, or other matter). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of paragraph 12.01.B. A Claim for an adjustment in Contract Time shall be prepared in accordance with the provisions of paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to ENGINEER and the claimant within 30 days after receipt

of the claimant's last submittal (unless ENGINEER allows additional time).

B. *ENGINEER's Decision:* ENGINEER will render a formal decision in writing within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any. ENGINEER's written decision on such Claim, dispute, or other matter will be final and binding upon OWNER and CONTRACTOR unless:

1. an appeal from ENGINEER's decision is taken within the time limits and in accordance with the dispute resolution procedures set forth in Article 16; or

2. if no such dispute resolution procedures have been set forth in Article 16, a written notice of intention to appeal from ENGINEER's written decision is delivered by OWNER or CONTRACTOR to the other and to ENGINEER within 30 days after the date of such decision, and a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction within 60 days after the date of such decision or within 60 days after Substantial Completion, whichever is later (unless otherwise agreed in writing by OWNER and CONTRACTOR), to exercise such rights or remedies as the appealing party may have with respect to such Claim, dispute, or other matter in accordance with applicable Laws and Regulations.

C. If ENGINEER does not render a formal decision in writing within the time stated in paragraph 10.05.B, a decision denying the Claim in its entirety shall be deemed to have been issued 31 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any.

D. No Claim for an adjustment in Contract Price or Contract Times (or Milestones) will be valid if not submitted in accordance with this paragraph 10.05.

ARTICLE 11 - COST OF THE WORK; CASH ALLOWANCES; UNIT PRICE WORK

11.01 Cost of the Work

A. *Costs Included:* The term Cost of the Work means the sum of all costs necessarily incurred and paid by CONTRACTOR in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to CONTRACTOR will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by OWNER, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items, and shall not include any of the costs itemized in paragraph 11.01.B.

1. Payroll costs for employees in the direct employ of CONTRACTOR in the performance of the Work under schedules of job classifications agreed upon by OWNER and CONTRACTOR. Such employees shall include without limitation superintendents, foremen, and other personnel employed full time at the Site. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by OWNER.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to CONTRACTOR unless OWNER deposits funds with CONTRACTOR with which to make payments, in which case the cash discounts shall accrue to OWNER. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to OWNER, and CONTRACTOR shall make provisions so that they may be obtained.

3. Payments made by CONTRACTOR to Subcontractors for Work performed by Subcontractors. If required by OWNER, CONTRACTOR shall obtain competitive bids from subcontractors acceptable to OWNER and CONTRACTOR and shall deliver such bids to OWNER, who will then determine, with the advice of ENGINEER, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as CONTRACTOR's Cost of the Work and fee as provided in this paragraph 11.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

a. The proportion of necessary transportation, travel, and subsistence expenses of CONTRACTOR's employees incurred in discharge of duties connected with the Work.

b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary

facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of CONTRACTOR.

c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from CONTRACTOR or others in accordance with rental agreements approved by OWNER with the advice of ENGINEER, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

d. Sales, consumer, use, and other similar taxes related to the Work, and for which CONTRACTOR is liable, imposed by Laws and Regulations.

e. Deposits lost for causes other than negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by CONTRACTOR in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of OWNER. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining CONTRACTOR's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, expressage, and similar petty cash items in connection with the Work.

i. When the Cost of the Work is used to determine the value of a Change Order or of a Claim, the cost of premiums for additional Bonds and insurance required because of the

changes in the Work or caused by the event giving rise to the Claim.

j. When all the Work is performed on the basis of cost-plus, the costs of premiums for all Bonds and insurance CONTRACTOR is required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of CONTRACTOR's officers, executives, principals (of partnerships and sole proprietorships), general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by CONTRACTOR, whether at the Site or in CONTRACTOR's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in paragraph 11.01.A.1 or specifically covered by paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the CONTRACTOR's fee.

2. Expenses of CONTRACTOR's principal and branch offices other than CONTRACTOR's office at the Site.

3. Any part of CONTRACTOR's capital expenses, including interest on CONTRACTOR's capital employed for the Work and charges against CONTRACTOR for delinquent payments.

4. Costs due to the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in paragraphs 11.01.A and 11.01.B.

C. *CONTRACTOR's Fee:* When all the Work is performed on the basis of cost-plus, CONTRACTOR's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, CONTRACTOR's fee shall be determined as set forth in paragraph 12.01.C.

D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to paragraphs 11.01.A and 11.01.B, CONTRACTOR will establish and maintain records thereof in accordance

with generally accepted accounting practices and submit in a form acceptable to ENGINEER an itemized cost breakdown together with supporting data.

11.02 Cash Allowances

A. It is understood that CONTRACTOR has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums as may be acceptable to OWNER and ENGINEER. CONTRACTOR agrees that:

1. the allowances include the cost to CONTRACTOR (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. CONTRACTOR's costs for unloading and handling on the Site, labor, installation costs, overhead, profit, and other expenses contemplated for the allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

B. Prior to final payment, an appropriate Change Order will be issued as recommended by ENGINEER to reflect actual amounts due CONTRACTOR on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 Unit Price Work

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by CONTRACTOR will be made by ENGINEER subject to the provisions of paragraph 9.08.

B. Each unit price will be deemed to include an amount considered by CONTRACTOR to be adequate to cover CONTRACTOR's overhead and profit for each separately identified item.

C. OWNER or CONTRACTOR may make a Claim for an adjustment in the Contract Price in accordance with paragraph 10.05 if:

1. the quantity of any item of Unit Price Work performed by CONTRACTOR differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

2. there is no corresponding adjustment with respect any other item of Work; and

3. if CONTRACTOR believes that CONTRACTOR is entitled to an increase in Contract Price as a result of having incurred additional expense or OWNER believes that OWNER is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 - CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order or by a Written Amendment. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the ENGINEER and the other party to the Contract in accordance with the provisions of paragraph 10.05.

B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of paragraph 11.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with paragraph 12.01.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in paragraph 11.01) plus a CONTRACTOR's fee for overhead and profit (determined as provided in paragraph 12.01.C).

C. **CONTRACTOR's Fee:** The CONTRACTOR's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

a. for costs incurred under paragraphs 11.01.A.1 and 11.01.A.2, the CONTRACTOR's fee shall be 15 percent

b. for costs incurred under paragraph 11.01.A.3, the CONTRACTOR's fee shall be five percent;

c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of paragraph 12.01.C.2.a is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and CONTRACTOR will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

d. no fee shall be payable on the basis of costs itemized under paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;

e. the amount of credit to be allowed by CONTRACTOR to OWNER for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in CONTRACTOR's fee by an amount equal to five percent of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in CONTRACTOR's fee shall be computed on the basis of the net change in accordance with paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

A. The Contract Times (or Milestones) may only be changed by a Change Order or by a Written Amendment. Any Claim for an adjustment in the Contract Times (or Milestones) shall be based on written notice submitted by the party making the claim to the ENGINEER and the other party to the Contract in accordance with the provisions of paragraph 10.05.

B. Any adjustment of the Contract Times (or Milestones) covered by a Change Order or of any Claim for an adjustment in the Contract Times (or Milestones) will be determined in accordance with the provisions of this Article 12.

12.03 *Delays Beyond CONTRACTOR's Control*

A. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of CONTRACTOR, the Contract Times (or Milestones) will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in paragraph 12.02.A. Delays beyond the control of CONTRACTOR shall include, but not be limited to, acts or neglect by OWNER, acts or neglect of utility owners or

other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

12.04 *Delays Within CONTRACTOR's Control*

A. The Contract Times (or Milestones) will not be extended due to delays within the control of CONTRACTOR. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of CONTRACTOR.

12.05 *Delays Beyond OWNER's and CONTRACTOR's Control*

A. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of both OWNER and CONTRACTOR, an extension of the Contract Times (or Milestones) in an amount equal to the time lost due to such delay shall be CONTRACTOR's sole and exclusive remedy for such delay.

12.06 *Delay Damages*

A. In no event shall OWNER or ENGINEER be liable to CONTRACTOR, any Subcontractor, any Supplier, or any other person or organization, or to any surety for or employee or agent of any of them, for damages arising out of or resulting from:

1. delays caused by or within the control of CONTRACTOR; or

2. delays beyond the control of both OWNER and CONTRACTOR including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God, or acts or neglect by utility owners or other contractors performing other work as contemplated by Article 7.

B. Nothing in this paragraph 12.06 bars a change in Contract Price pursuant to this Article 12 to compensate CONTRACTOR due to delay, interference, or disruption directly attributable to actions or inactions of OWNER or anyone for whom OWNER is responsible.

ARTICLE 13 - TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 *Notice of Defects*

. Prompt notice of all defective Work of which OWNER or ENGINEER has actual knowledge will be given to CONTRACTOR. All defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 *Access to Work*

A. OWNER, ENGINEER, ENGINEER's Consultants, other representatives and personnel of OWNER, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspecting, and testing. CONTRACTOR shall provide them proper and safe conditions for such access and advise them of CONTRACTOR's Site safety procedures and programs so that they may comply therewith as applicable.

13.03 *Tests and Inspections*

A. CONTRACTOR shall give ENGINEER timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. OWNER shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. for inspections, tests, or approvals covered by paragraphs 13.03.C and 13.03.D below;

2. that costs incurred in connection with tests or inspections conducted pursuant to paragraph 13.04.B shall be paid as provided in said paragraph 13.04.B; and

3. as otherwise specifically provided in the Contract Documents.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, CONTRACTOR shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish ENGINEER the required certificates of inspection or approval.

D. CONTRACTOR shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for OWNER's and ENGINEER's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to CONTRACTOR's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to OWNER and ENGINEER.

E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by CONTRACTOR without written concurrence of ENGINEER, it must, if requested by ENGINEER, be uncovered for observation.

F. Uncovering Work as provided in paragraph 13.03.E shall be at CONTRACTOR's expense unless CONTRACTOR has given ENGINEER timely notice of CONTRACTOR's intention to cover the same and ENGINEER has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

A. If any Work is covered contrary to the written request of ENGINEER, it must, if requested by ENGINEER, be uncovered for ENGINEER's observation and replaced at CONTRACTOR's expense.

B. If ENGINEER considers it necessary or advisable that covered Work be observed by ENGINEER or inspected or tested by others, CONTRACTOR, at ENGINEER's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as ENGINEER may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment. If it is found that such Work is defective, CONTRACTOR shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and OWNER shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, OWNER may make a Claim therefor as provided in paragraph 10.05. If, however, such Work is not found to be defective, CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Times (or Milestones), or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, CONTRACTOR may make a Claim therefor as provided in paragraph 10.05.

13.05 *OWNER May Stop the Work*

A. If the Work is defective, or CONTRACTOR fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, OWNER may order CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of OWNER to stop the Work shall not give rise to any duty on the part of OWNER to exercise this right for the benefit of CONTRACTOR, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 *Correction or Removal of Defective Work*

A. CONTRACTOR shall correct all defective Work, whether or not fabricated, installed, or completed, or, if

the Work has been rejected by ENGINEER, remove it from the Project and replace it with Work that is not defective. CONTRACTOR shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

13.07 *Correction Period*

A. If within one year after the date of Substantial Completion or such longer period of time as may be prescribed by Laws or Regulations or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for CONTRACTOR's use by OWNER or permitted by Laws and Regulations as contemplated in paragraph 6.11.A is found to be defective, CONTRACTOR shall promptly, without cost to OWNER and in accordance with OWNER's written instructions: (i) repair such defective land or areas, or (ii) correct such defective Work or, if the defective Work has been rejected by OWNER, remove it from the Project and replace it with Work that is not defective, and (iii) satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom. If CONTRACTOR does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, OWNER may have the defective Work corrected or repaired or may have the rejected Work removed and replaced, and all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by CONTRACTOR.

B. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications or by Written Amendment.

C. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

D. CONTRACTOR's obligations under this paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this paragraph 13.07 shall

not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, OWNER (and, prior to ENGINEER's recommendation of final payment, ENGINEER) prefers to accept it, OWNER may do so. CONTRACTOR shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to OWNER's evaluation of and determination to accept such defective Work (such costs to be approved by ENGINEER as to reasonableness) and the diminished value of the Work to the extent not otherwise paid by CONTRACTOR pursuant to this sentence. If any such acceptance occurs prior to ENGINEER's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and OWNER shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, OWNER may make a Claim therefor as provided in paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by CONTRACTOR to OWNER.

13.09 *OWNER May Correct Defective Work*

A. If CONTRACTOR fails within a reasonable time after written notice from ENGINEER to correct defective Work or to remove and replace rejected Work as required by ENGINEER in accordance with paragraph 13.06.A, or if CONTRACTOR fails to perform the Work in accordance with the Contract Documents, or if CONTRACTOR fails to comply with any other provision of the Contract Documents, OWNER may, after seven days written notice to CONTRACTOR, correct and remedy any such deficiency.

B. In exercising the rights and remedies under this paragraph, OWNER shall proceed expeditiously. In connection with such corrective and remedial action, OWNER may exclude CONTRACTOR from all or part of the Site, take possession of all or part of the Work and suspend CONTRACTOR's services related thereto, take possession of CONTRACTOR's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which OWNER has paid CONTRACTOR but which are stored elsewhere. CONTRACTOR shall allow OWNER, OWNER's representatives, agents and employees, OWNER's other contractors, and ENGINEER and ENGINEER's Consultants access to the Site to enable OWNER to exercise the rights and remedies under this paragraph.

C. All Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by OWNER in exercising the rights and remedies under this paragraph 13.09 will be charged against CONTRACTOR, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and OWNER shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, OWNER may make a Claim therefor as provided in paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of CONTRACTOR's defective Work.

D. CONTRACTOR shall not be allowed an extension of the Contract Times (or Milestones) because of any delay in the performance of the Work attributable to the exercise by OWNER of OWNER's rights and remedies under this paragraph 13.09.

ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

A. The schedule of values established as provided in paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to ENGINEER. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 *Progress Payments*

A. *Applications for Payments*

1. At least 20 days before the date established for each progress payment (but not more often than once a month), CONTRACTOR shall submit to ENGINEER for review an Application for Payment filled out and signed by CONTRACTOR covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that OWNER has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect OWNER's interest therein, all of which must be satisfactory to OWNER.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of CONTRACTOR stating that all previous progress payments received on account of the Work have been applied on account to discharge CONTRACTOR's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. Review of Applications

1. ENGINEER will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to OWNER or return the Application to CONTRACTOR indicating in writing ENGINEER's reasons for refusing to recommend payment. In the latter case, CONTRACTOR may make the necessary corrections and resubmit the Application.

2. ENGINEER's recommendation of any payment requested in an Application for Payment will constitute a representation by ENGINEER to OWNER, based on ENGINEER's observations on the Site of the executed Work as an experienced and qualified design professional and on ENGINEER's review of the Application for Payment and the accompanying data and schedules, that to the best of ENGINEER's knowledge, information and belief:

a. the Work has progressed to the point indicated;

b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under paragraph 9.08, and to any other qualifications stated in the recommendation); and

c. the conditions precedent to CONTRACTOR's being entitled to such payment appear to have been fulfilled in so far as it is ENGINEER's responsibility to observe the Work.

3. By recommending any such payment ENGINEER will not thereby be deemed to have represented that: (i) inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to ENGINEER in the Contract Documents; or (ii) that there may not be other matters or issues between the parties that might entitle CON-

TRACTOR to be paid additionally by OWNER or entitle OWNER to withhold payment to CONTRACTOR.

4. Neither ENGINEER's review of CONTRACTOR's Work for the purposes of recommending payments nor ENGINEER's recommendation of any payment, including final payment, will impose responsibility on ENGINEER to supervise, direct, or control the Work or for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for CONTRACTOR's failure to comply with Laws and Regulations applicable to CONTRACTOR's performance of the Work. Additionally, said review or recommendation will not impose responsibility on ENGINEER to make any examination to ascertain how or for what purposes CONTRACTOR has used the moneys paid on account of the Contract Price, or to determine that title to any of the Work, materials, or equipment has passed to OWNER free and clear of any Liens.

5. ENGINEER may refuse to recommend the whole or any part of any payment if, in ENGINEER's opinion, it would be incorrect to make the representations to OWNER referred to in paragraph 14.02.B.2. ENGINEER may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in ENGINEER's opinion to protect OWNER from loss because:

a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;

b. the Contract Price has been reduced by Written Amendment or Change Orders;

c. OWNER has been required to correct defective Work or complete Work in accordance with paragraph 13.09; or

d. ENGINEER has actual knowledge of the occurrence of any of the events enumerated in paragraph 15.02.A.

C. Payment Becomes Due

1. Ten days after presentation of the Application for Payment to OWNER with ENGINEER's recommendation, the amount recommended will (subject to the provisions of paragraph 14.02.D) become due, and when due will be paid by OWNER to CONTRACTOR.

D. *Reduction in Payment*

1. OWNER may refuse to make payment of the full amount recommended by ENGINEER because:

a. claims have been made against OWNER on account of CONTRACTOR's performance or furnishing of the Work;

b. Liens have been filed in connection with the Work, except where CONTRACTOR has delivered a specific Bond satisfactory to OWNER to secure the satisfaction and discharge of such Liens;

c. there are other items entitling OWNER to a set-off against the amount recommended; or

d. OWNER has actual knowledge of the occurrence of any of the events enumerated in paragraphs 14.02.B.5.a through 14.02.B.5.c or paragraph 15.02.A.

2. If OWNER refuses to make payment of the full amount recommended by ENGINEER, OWNER must give CONTRACTOR immediate written notice (with a copy to ENGINEER) stating the reasons for such action and promptly pay CONTRACTOR any amount remaining after deduction of the amount so withheld. OWNER shall promptly pay CONTRACTOR the amount so withheld, or any adjustment thereto agreed to by OWNER and CONTRACTOR, when CONTRACTOR corrects to OWNER's satisfaction the reasons for such action.

3. If it is subsequently determined that OWNER's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by paragraph 14.02.C.1.

14.03 *CONTRACTOR's Warranty of Title*

A. CONTRACTOR warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to OWNER no later than the time of payment free and clear of all Liens.

14.04 *Substantial Completion*

A. When CONTRACTOR considers the entire Work ready for its intended use CONTRACTOR shall notify OWNER and ENGINEER in writing that the entire Work is substantially complete (except for items specifically listed by CONTRACTOR as incomplete) and request that ENGINEER issue a certificate of Substantial Completion. Promptly thereafter, OWNER, CONTRACTOR, and ENGINEER shall make an inspection of the Work to determine the status of completion. If ENGINEER does not consider the Work substantially complete, ENGINEER will notify CONTRACTOR in writing giving

the reasons therefor. If ENGINEER considers the Work substantially complete, ENGINEER will prepare and deliver to OWNER a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. OWNER shall have seven days after receipt of the tentative certificate during which to make written objection to ENGINEER as to any provisions of the certificate or attached list. If, after considering such objections, ENGINEER concludes that the Work is not substantially complete, ENGINEER will within 14 days after submission of the tentative certificate to OWNER notify CONTRACTOR in writing, stating the reasons therefor. If, after consideration of OWNER's objections, ENGINEER considers the Work substantially complete, ENGINEER will within said 14 days execute and deliver to OWNER and CONTRACTOR a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as ENGINEER believes justified after consideration of any objections from OWNER. At the time of delivery of the tentative certificate of Substantial Completion ENGINEER will deliver to OWNER and CONTRACTOR a written recommendation as to division of responsibilities pending final payment between OWNER and CONTRACTOR with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless OWNER and CONTRACTOR agree otherwise in writing and so inform ENGINEER in writing prior to ENGINEER's issuing the definitive certificate of Substantial Completion, ENGINEER's aforesaid recommendation will be binding on OWNER and CONTRACTOR until final payment.

B. OWNER shall have the right to exclude CONTRACTOR from the Site after the date of Substantial Completion, but OWNER shall allow CONTRACTOR reasonable access to complete or correct items on the tentative list.

14.05 *Partial Utilization*

A. Use by OWNER at OWNER's option of any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which OWNER, ENGINEER, and CONTRACTOR agree constitutes a separately functioning and usable part of the Work that can be used by OWNER for its intended purpose without significant interference with CONTRACTOR's performance of the remainder of the Work, may be accomplished prior to Substantial Completion of all the Work subject to the following conditions.

1. OWNER at any time may request CONTRACTOR in writing to permit OWNER to use any such part of the Work which OWNER believes to be ready for its intended use and substantially complete. If CONTRACTOR agrees that such part of the Work is substantially complete, CONTRACTOR will certify to OWNER and ENGINEER

that such part of the Work is substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. CONTRACTOR at any time may notify OWNER and ENGINEER in writing that CONTRACTOR considers any such part of the Work ready for its intended use and substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. Within a reasonable time after either such request, OWNER, CONTRACTOR, and ENGINEER shall make an inspection of that part of the Work to determine its status of completion. If ENGINEER does not consider that part of the Work to be substantially complete, ENGINEER will notify OWNER and CONTRACTOR in writing giving the reasons therefor. If ENGINEER considers that part of the Work to be substantially complete, the provisions of paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

2. No occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

A. Upon written notice from CONTRACTOR that the entire Work or an agreed portion thereof is complete, ENGINEER will promptly make a final inspection with OWNER and CONTRACTOR and will notify CONTRACTOR in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. CONTRACTOR shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 *Final Payment*

A. *Application for Payment*

1. After CONTRACTOR has, in the opinion of ENGINEER, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, Bonds, certificates or other evidence of insurance certificates of inspection, marked-up record documents (as provided in paragraph 6.12), and other documents, CONTRACTOR may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by: (i) all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by subparagraph 5.04.B.7; (ii) consent of the surety, if any, to final payment; and (iii) complete and legally effective releases or

waivers (satisfactory to OWNER) of all Lien rights arising out of or Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in paragraph 14.07.A.2 and as approved by OWNER, CONTRACTOR may furnish receipts or releases in full and an affidavit of CONTRACTOR that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which OWNER or OWNER's property might in any way be responsible have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, CONTRACTOR may furnish a Bond or other collateral satisfactory to OWNER to indemnify OWNER against any Lien.

B. *Review of Application and Acceptance*

1. If, on the basis of ENGINEER's observation of the Work during construction and final inspection, and ENGINEER's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, ENGINEER is satisfied that the Work has been completed and CONTRACTOR's other obligations under the Contract Documents have been fulfilled, ENGINEER will, within ten days after receipt of the final Application for Payment, indicate in writing ENGINEER's recommendation of payment and present the Application for Payment to OWNER for payment. At the same time ENGINEER will also give written notice to OWNER and CONTRACTOR that the Work is acceptable subject to the provisions of paragraph 14.09. Otherwise, ENGINEER will return the Application for Payment to CONTRACTOR, indicating in writing the reasons for refusing to recommend final payment, in which case CONTRACTOR shall make the necessary corrections and resubmit the Application for Payment.

C. *Payment Becomes Due*

1. Thirty days after the presentation to OWNER of the Application for Payment and accompanying documentation, the amount recommended by ENGINEER will become due and, when due, will be paid by OWNER to CONTRACTOR.

14.08 *Final Completion Delayed*

If, through no fault of CONTRACTOR, final completion of the Work is significantly delayed, and if ENGINEER so confirms, OWNER shall, upon receipt of CONTRACTOR's final Application for Payment and recommendation of ENGINEER, and without terminating the Agreement, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by OWNER for Work not fully completed or corrected is less than the

retainage stipulated in the Agreement, and if Bonds have been furnished as required in paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by CONTRACTOR to ENGINEER with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 *Waiver of Claims*

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by OWNER against CONTRACTOR, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from CONTRACTOR's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by CONTRACTOR against OWNER other than those previously made in writing which are still unsettled.

ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

15.01 *OWNER May Suspend Work*

A. At any time and without cause, OWNER may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to CONTRACTOR and ENGINEER which will fix the date on which Work will be resumed. CONTRACTOR shall resume the Work on the date so fixed. CONTRACTOR shall be allowed an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if CONTRACTOR makes a Claim therefor as provided in paragraph 10.05.

15.02 *OWNER May Terminate for Cause*

A. The occurrence of any one or more of the following events will justify termination for cause:

1. CONTRACTOR's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the progress schedule established under paragraph 2.07 as adjusted from time to time pursuant to paragraph 6.04);

2. CONTRACTOR's disregard of Laws or Regulations of any public body having jurisdiction;

3. CONTRACTOR's disregard of the authority of ENGINEER; or

4. CONTRACTOR's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in paragraph 15.02.A occur, OWNER may, after giving CONTRACTOR (and the surety, if any) seven days written notice, terminate the services of CONTRACTOR, exclude CONTRACTOR from the Site, and take possession of the Work and of all CONTRACTOR's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by CONTRACTOR (without liability to CONTRACTOR for trespass or conversion), incorporate in the Work all materials and equipment stored at the Site or for which OWNER has paid CONTRACTOR but which are stored elsewhere, and finish the Work as OWNER may deem expedient. In such case, CONTRACTOR shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by OWNER arising out of or relating to completing the Work, such excess will be paid to CONTRACTOR. If such claims, costs, losses, and damages exceed such unpaid balance, CONTRACTOR shall pay the difference to OWNER. Such claims, costs, losses, and damages incurred by OWNER will be reviewed by ENGINEER as to their reasonableness and, when so approved by ENGINEER, incorporated in a Change Order. When exercising any rights or remedies under this paragraph OWNER shall not be required to obtain the lowest price for the Work performed.

C. Where CONTRACTOR's services have been so terminated by OWNER, the termination will not affect any rights or remedies of OWNER against CONTRACTOR then existing or which may thereafter accrue. Any retention or payment of moneys due CONTRACTOR by OWNER will not release CONTRACTOR from liability.

15.03 *OWNER May Terminate For Convenience*

A. Upon seven days written notice to CONTRACTOR and ENGINEER, OWNER may, without cause and without prejudice to any other right or remedy of OWNER, elect to terminate the Contract. In such case, CONTRACTOR shall be paid (without duplication of any items):

1. for completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. for expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

3. for all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and

4. for reasonable expenses directly attributable to termination.

B. CONTRACTOR shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *CONTRACTOR May Stop Work or Terminate*

A. If, through no act or fault of CONTRACTOR, the Work is suspended for more than 90 consecutive days by OWNER or under an order of court or other public authority, or ENGINEER fails to act on any Application for Payment within 30 days after it is submitted, or OWNER fails for 30 days to pay CONTRACTOR any sum finally determined to be due, then CONTRACTOR may, upon seven days written notice to OWNER and ENGINEER, and provided OWNER or ENGINEER do not remedy such suspension or failure within that time, terminate the Contract and recover from OWNER payment on the same terms as provided in paragraph 15.03. In lieu of terminating the Contract and without prejudice to any other right or remedy, if ENGINEER has failed to act on an Application for Payment within 30 days after it is submitted, or OWNER has failed for 30 days to pay CONTRACTOR any sum finally determined to be due, CONTRACTOR may, seven days after written notice to OWNER and ENGINEER, stop the Work until payment is made of all such amounts due CONTRACTOR, including interest thereon. The provisions of this paragraph 15.04 are not intended to preclude CONTRACTOR from making a Claim under paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to CONTRACTOR's stopping the Work as permitted by this paragraph.

ARTICLE 16 - DISPUTE RESOLUTION

16.01 *Methods and Procedures*

A. Dispute resolution methods and procedures, if any, shall be as set forth in the Supplementary Conditions. If no method and procedure has been set forth, and subject to the provisions of paragraphs 9.09

and 10.05, OWNER and CONTRACTOR may exercise such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any dispute.

ARTICLE 17 - MISCELLANEOUS

17.01 *Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of,

any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents, and the provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 *Survival of Obligations*

- A. All representations, indemnifications, warranties,

and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Agreement.

17.05 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

SUPPLEMENTARY CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (No. 1910-8, 1996 Edition) and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect.

The terms used in these Supplementary Conditions will have the meanings indicated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings indicated below, which are applicable to both the singular and plural thereof.

See the Standard Form of Agreement for additional project requirements.

SC-3.01 Add the following new paragraph immediately after paragraph 3.01.C:

D. In the event of conflict between the Agreement and any other document, the Agreement governs.

SC-5.04 Add the following new paragraph immediately after paragraph 5.04.B:

C. The limits of liability for the insurance required by paragraph 5.04 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

1. Workers' Compensation, and related coverages under paragraphs 5.04.A.1 and A.2 of the General Conditions:
 - a. State: Statutory
 - b. Applicable Federal (e.g., Longshoreman's): Statutory
 - c. Employer's Liability: \$100,000, \$500,000, \$100,000
2. Contractor's General Liability under paragraphs 5.04.A.3 through A.6 of the General Conditions which shall include completed operations and product liability coverages and eliminate the exclusion with respect to property under the care, custody and control of Contractor:
 - a. General Aggregate \$1,000,000
 - b. Products - Completed Operations Aggregate \$2,000,000
 - c. Personal and Advertising Injury \$1,000,000
 - d. Each Occurrence (Bodily Injury and Property Damage) \$1,000,000
 - e. Property Damage liability insurance will provide Explosion, Collapse, and Underground coverages where applicable.
 - f. Excess or Umbrella Liability
 - 1) General Aggregate \$1,000,000
 - 2) Each Occurrence \$1,000,000
3. Automobile Liability under paragraph 5.04.A.6 of the General Conditions:
 - a. Bodily Injury:
 - Each person \$1,000,000
 - Each Accident \$1,000,000

- b. Property Damage:
Each Accident \$1,000,000
 - c. Combined Single
Limit of \$1,000,000
- 4. The Contractual Liability coverage required by paragraph 5.04.B.4 of the General Conditions shall provide coverage for not less than the following amounts:
 - a. Bodily Injury:
Each Accident \$1,000,000
Annual Aggregate \$1,000,000
 - b. Property Damage:
Each Accident \$1,000,000
Annual Aggregate \$1,000,000

SC-12.07 Add the following new section:

12.07 Liquidated Damages

A. It is imperative that the Work in this contract be substantially completed not later than August 8, 2025 to give time for the Owner to furnish and equip the facility and meet other contractual obligations. The Contractor represents and agrees that he has taken into account in his bid the requirements of the bid documents, the location, the time allowed for the Work, local conditions, availability of materials, equipment, and labor, and any other factors which may affect performance of the Work. The Contractor agrees and warrants that he will achieve substantial completion of the Work not later than August 15, 2025.

B. Subject to the provisions of the General Conditions allowing for extension of time allowed for completion of the Work, if the work is not substantially completed by the specified date, the Contractor shall owe to the Owner, not as a penalty but as liquidated damages, the sum of zero dollars (\$0) per day for each and every calendar day of delay in substantial completion of the Work beyond August 8, 2025. Likewise, if the Work is not finally completed by the specified date of August 15, 2025, the Contractor shall owe to the Owner, not as a penalty but as liquidated damages, the sum of one thousand dollars (\$1,000) per day for each and every calendar day of delay in final completion of the Work."

SC-14.07 Add the following new paragraph at the end of paragraph 14.07,B.:

- 2. OPERATION AND MAINTENANCE MANUALS: Operation and Maintenance Manuals shall be submitted to the ENGINEER for review and forwarded to the OWNER before final payment is recommended. See Section 017000 for Operation and Maintenance Manual requirements.

SC-17.05 Delete Paragraph 17.05. A. in its entirety and substitute the following:

- A. The contract documents shall be subject to and governed by the laws of the Commonwealth of Virginia. Any dispute arising out of the Contract Documents, their performance or their interpretation shall be litigated only in the Circuit Court or General District Court of the Virginia locality in which the project is located.

Add the following:

- B. Employment discrimination by a Contractor is prohibited by Section §2.2-4343.1 of the Code of Virginia.
- C. Equal Opportunity Employment:
 - a. The Contractor shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, national origin, age, disability, or

other basis prohibited by federal or state law relating to discrimination in employment, except where there is a bona-fide occupational qualification reasonably necessary to the normal operation of the Contractor. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.

- b. The Contractor, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, shall state that Contractor is an equal opportunity employer.
- c. Notices, advertisements and solicitations placed in accordance with federal law, rule or regulation shall be deemed sufficient for the purpose of meeting the notice, advertisement, and solicitation requirements of this paragraph.
- d. The Contractor shall cause to be included the provisions of 16.4.1 (substituting the Subcontractor or vendor for Contractor as the obligated party) in every subcontract or purchase order of over \$10,000, so that the provisions will be binding upon each Subcontractor or vendor.

D. Immigration Reform and Control Act

- a. In the performance of the Work under this Agreement, the Contractor shall not knowingly employ any unauthorized alien as defined in the Federal Immigration Reform and Control Act of 1986.

E. Drug-free workplace to be maintained by the contractor; required contract provisions. All public bodies shall include in every contract over \$10,000 the following provisions:

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

For the purposes of this section, "Drug-free workplace" means a site for the performance of work done in connection with a specific contract awarded to a contractor in accordance with this chapter, the employees of whom are prohibited from engaging in the unlawful manufacture, sale, distribution, dispensation, possession or use of any controlled substance or marijuana during the performance of the contract.

F. Contractor must complete the Certificate of Compliance regarding Direct Contact with Students included at the end of this section as Attachment 'A' prior to awarding the contract and must provide background certification in accordance with the Certificate of Compliance for any person who may have direct contact with students prior to commencement of work by that individual.

Attachment 'A'

Franklin County Public Schools

Certificate of Compliance

Name of Bidder/Offeror: _____

Pursuant to the § [22.1-296.1](#) of the Code of Virginia, prior to awarding a contract for the provision of services that require the contractor, his employees (or subcontractors) to have **direct contact with students**, the school board shall require the contractor and, when relevant, any employee who will have direct contact with students, to provide certification that (i) he has not been convicted of a felony or any offense involving the sexual molestation or physical or sexual abuse or rape of a child; and (ii) whether he has been convicted of a crime of moral turpitude.

Any person making a materially false statement regarding any such offense shall be guilty of a Class 1 misdemeanor and, upon conviction, the fact of such conviction shall be grounds for the revocation of the contract to provide such services and, when relevant, the revocation of any license required to provide such services.

For the purposes of this subsection, **direct contact with students** means being in the presence of students during regular school hours or during school-sponsored activities.

As part of this submission, I certify that the employees of, or subcontractors to, the above mentioned contractor that will be providing services to the School Division under the resulting contract (i) will have not been convicted of a felony or any offense involving the sexual molestation or physical or sexual abuse or rape of a child; and/or (ii) whether has been convicted of a crime of moral turpitude. Furthermore, I understand that the duty to certify is ongoing and extends to future employees of subcontractors for the duration of the contract.

Project Name

Signature of Authorized Representative

Printed Name of Authorized Representative

Representative)

Printed Name of Vendor (if different than

Date

SNOW CREEK ES 2CR HVAC UPGRADES
SECTION 008200 - SPECIAL CONDITIONS

PART 1 - GENERAL

1.1 SAFETY:

- A. Virginia State Occupational Safety and Health Standards apply to this project. The Owner and Engineer shall not be held responsible for enforcement of safety conditions. Particular attention to the following subparts must be observed:
- B. Ladders and Scaffolds:
 - 1. All ladders, scaffolds, or temporary work platforms to be kept in locked storage or removed from the job site when not in use or when unattended.
 - 2. Cranes, Derricks, Hoists, Elevators, and Conveyors:
 - a. Cranes are to be guarded, and/or secured at all times when on the job site so as to avoid becoming a hazard to the public, students, and faculty.
 - b. Material hoists, lifts, or conveyors are to be secured so as to avoid becoming a hazard when unattended.
- C. Motor Vehicles and Mechanized Equipment:
 - 1. Keys must be removed and secured from vehicles and other mobile equipment when not in use or unattended.
 - 2. Vehicles and mobile equipment with door locking capability must be locked when not in use.
- D. Demolition:
 - 1. Pay particular attention to safe procedures for demolition and removal of debris so as not to create a hazard to the public, students, and faculty. The disposal of solid waste in open dumps on the Owner's property is prohibited. See Section 020600 - Demolition.
 - 2. Additional Safety Requirements:
- E. No firearms, alcohol or drugs may be brought onto the project at any time.
 - 1. All poisonous or otherwise hazardous material will be kept in locked containers when not in use and shall not be left unattended when in use.
 - 2. Contractor's personnel will strictly adhere to all traffic regulations, traffic patterns, and speed limits.
 - 3. If any hot work, including but not necessarily limited to, welding, burning, or torch cutting is required, the Contractor will station a watchman inside the building with proper fire extinguisher equipment. For renovations, the Contractor must notify the schools' staff prior to work.

1.2 APPLICABLE STANDARDS AND CODES:

- A. Wherever reference is made to any published standards, codes or standard specifications, it shall mean the latest standard code, specification or specification of the technical society, organization, or body referred to, which is in effect at the date of

SNOW CREEK ES 2CR HVAC UPGRADES

Contract Documents. The following is a partial list of typical abbreviations which may be used in the specifications and the organizations to which they refer:

1. ANSI - American National Standards Institute
2. ASTM - American Society for Testing and Materials
3. UL - Underwriters Laboratory
4. NEC - National Electrical Code
5. VUSBC - Virginia Uniform Statewide Building Code
6. VBPVRR - Virginia Boiler and Pressure Vessel Rules and Regulations

1.3 FIRE PROTECTION:

- A. The Contractor shall not use flammable liquids or gases, stoves, salamanders, tar pots, etc., in and on the building unless approved by the Engineer. Where welding, cutting or burning are necessary, School officials shall be notified, incombustible shields shall be used, and suitable fire extinguishing equipment shall be maintained nearby. Paints, oils, turpentine and similar materials shall be stored in well ventilated spaces, and no other materials shall be stored therein. The arrangement for storage must have written approval of the Owner. The Contractor shall provide and maintain an adequate number of fire extinguishers throughout the construction period. Free and unobstructed access shall be maintained at all times to fire extinguishing equipment and fire hydrants.
- B. The Contractor shall designate a regular supervisory employee as a Fire Warden, and he shall be responsible for all fire prevention, fire protective matters, and posting of fire protection procedures at the work site.

1.4 PREVENTION OF NUISANCE FROM NOISE, ETC.:

- A. The Contractor shall be responsible for curtailing noise, smoke, dust, fumes or other nuisances resulting from his operations within the limitations set by law and as directed by the Owner or Engineer.

1.5 PERMITS:

- A. Attention is called to license charges and fees pertaining to construction work, as levied by local governments. Such charges and fees, based on the amount of contracted work, are the responsibility of the Contractor. Such permits include, but are not limited to hauling materials and dumping materials. The Contractor is also responsible for paying all taxes applicable to the project.
- B. The contractor will be required to obtain a building permit. However, no fee will be charged in coordination with the County.

1.6 TEMPORARY FACILITIES:

- A. When possible, parking areas for construction employees in the vicinity of the project site will be allocated by School officials. The Contractor is responsible for informing his employees that they cannot park in any location other than the allocated areas. All

SNOW CREEK ES 2CR HVAC UPGRADES

existing parking regulations will be enforced. Control of vehicles on the site is the responsibility of the Contractor.

- B. Construction fencing, where required, must be adequate to protect persons and property.

1.7 UTILITY OUTAGES:

- A. Authority for power outages must be obtained from the Supervisor of Maintenance and Construction, who will coordinate the interruption of service with the contractor and the schools affected. In general, a request for interruption to service will require at least seven working days for approval.

1.8 CUTTING AND PATCHING:

- A. The Contractor shall perform all necessary cutting and patching that may be required by the various trades to allow proper installation of work as required by drawings and specifications to complete the work. The Contractor shall restore all cut and patch work to match the existing surrounding work to the satisfaction of the Engineer. Cutting of the existing structure that in any way may endanger the work, adjacent property, workmen or the public shall not be performed.
- B. The existing School's roof is under warranty as listed below:

Snow Creek Elementary School: Carlisle Total Roofing System, Warranty Number AB# 060020A.

Any and all cutting and patching of the roofs must be performed by an authorized representative of each roofing system manufacturer. The Contractor shall contact each roofing system manufacturer listed above to obtain the name(s) of an authorized representative to perform cutting and patching of the roof system. The Contractor shall be responsible for any fees associated with an inspection of the work by the above mentioned representatives in accordance with each existing roof warranty. See Section 075000 - Roofing System for coordination of new work. All roofing work shall be by the same Contractor.

1.9 CEILING REMOVAL AND REPLACEMENT

- A. The Contractor shall investigate all mechanical demolition and new work requirements and carefully remove and store all ceiling tile and suspension systems for reinstallation after completion of all mechanical work. Contractor shall replace all damaged tiles and grid systems. This requirement does not apply where existing acoustical ceiling systems will be replaced entirely. Refer to the drawings.

1.10 HAZARDOUS MATERIALS:

- A. The Contractor shall provide the Owner with a list of hazardous materials at least 48 hours before bringing any such materials on site.

SNOW CREEK ES 2CR HVAC UPGRADES

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION 008200

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SNOW CREEK ES 2CR HVAC UPGRADES

SECTION 008500 - DRAWINGS INDEX

SHEET TITLE

T-1	COVER SHEET
E0.1	ELECTRICAL DETAILS, LEGEND & SCHEDULES
E1.1	PARTIAL FIRST FLOOR ELECTRICAL DEMOLITION PLAN
E2.1	PARTIAL FIRST FLOOR ELECTRICAL PLANS
M0.1	MECHANICAL EQUIPMENT NOTES, LEGEND & DETAILS
M1.1	PARTIAL FIRST FLOOR MECHANICAL DEMOLITION PLAN
M2.1	PARTIAL FIRST FLOOR MECHANICAL PLAN
S1.1	MECHANICAL ROOF TOP FRAMING PLAN

END OF SECTION 008500

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PART 1 - GENERAL

1.1 DESCRIPTION:

- A. Work Included: This section applies to situations in which the Contractor or his representatives including, but not necessarily limited to, suppliers, sub-Contractors, employees, and field engineers, enter the School building(s).

1.2 QUALITY ASSURANCE:

- A. Promptly upon award of the Contract, notify all pertinent personnel regarding requirements of this section.
- B. Require that all personnel who will enter the Owner's property certify their awareness of and familiarity with the requirements of this section.

1.3 SUBMITTALS:

- A. Submit to the Owner a record of names and identification of all persons who will be entering upon the Owner's property in connection with the work of this Contract.

1.4 SECURITY:

- A. Restrict the access of all persons entering upon the school properties in connection with the work to the access route and to the actual site of the work. Refer to the "General Conditions."

1.5 CONTRACTOR'S USE OF EXISTING BUILDINGS:

- A. Use of existing buildings will not be permitted, except in the actual area of the work. The Contractor shall not allow the use of the Owner's toilet facilities by the Contractor's personnel, sub-Contractor personnel, or other persons entering upon the Owner's buildings in connection with the work unless otherwise specified. Refer to the "General Conditions."
- B. The Contractor shall keep public areas free from accumulation of waste materials, rubbish, trash, and all forms of construction debris. The Contractor is required to remove all accumulation of waste materials, rubbish, trash, and all forms of construction debris daily.

1.6 TIME OF WORK:

- A. When School is in Session: Unless otherwise permitted by the Owner, no construction work shall be carried out between the hours of 6 a.m. and 4:00 p.m. Monday through Friday local prevailing time except as necessary for the protection of the public and the proper care of work already performed. If work is performed during times when school is in session, the school must be returned to as-found condition at the end of each work session.

SNOW CREEK ES 2CR HVAC UPGRADES

- B. When School is on Summer Break: The contractor is free to work anytime.
- C. Should it become imperative to perform work beyond the time limits stipulated above, permission from the Supervisor of Maintenance and Construction shall be requested in writing by the Contractor. The Contractor shall obey all local ordinances and shall obtain any waivers necessary for working beyond the time limits specified.

END OF SECTION 010150

SECTION 012000 - PROJECT MEETINGS

PART 1 - GENERAL:

1.1 DESCRIPTION:

A. Work Included:

1. To enable orderly review during progress of the work, and to provide for systematic discussion of problems, the Engineer will conduct project meetings throughout the construction period as required by the work.

B. Related Work:

1. The Contractor's relations with his sub-Contractors and material suppliers, and discussions relative thereto, are the Contractor's responsibility and normally are not part of project meetings content.

1.2 QUALITY ASSURANCE:

- A. For those person(s) designated by the Contractor to attend and participate in project meetings, provide required authority to commit the Contractor to solutions agreed upon in the project meetings.

1.3 SUBMITTALS:

A. Agenda Items:

1. To the maximum extent practicable, advise the Engineer at least 24 hours in advance of the project meetings regarding items to be placed on the agenda.

B. Minutes:

1. The Engineer will compile minutes of each project meeting, and will furnish one (1) copy to the Contractor and required copies to the Owner.
2. Recipients of copies may make and distribute such other copies as they wish.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION:

3.1 MEETING SCHEDULE:

- A. Except as noted below for the Preconstruction Meeting, project meetings will be held as required by the Engineer or Owner.
- B. Coordinate as necessary to establish mutually acceptable schedule for meetings at the convenience of the Owner.

3.2 MEETING LOCATION:

- A. The Owner shall establish the meeting location. To the maximum extent practicable, meetings will be held at the job site.

3.3 PRECONSTRUCTION MEETING:

- A. Preconstruction Meeting will be scheduled to be held no later than 15 working days after the Owner has issued the Notice to Proceed.
 - 1. Provide attendance by an authorized representative of the Contractor and major sub-Contractors.
 - 2. The Engineer will advise other interested parties, including the Owner, and request their attendance.

- B. Minimum Agenda:

Data will be distributed and discussed on at least the following items.

- 1. Organizational arrangement of Contractor's forces and personnel, and those of sub-Contractors, material suppliers, and the Engineer.
- 2. Channels and procedures for communication.
- 3. Construction schedule, including sequence of critical work.
- 4. Contract Documents, including distribution of required copies or original Documents and revisions.
- 5. Processing of shop drawings and other data submitted to the Engineer for review.
- 6. Processing of bulletins, field decisions, and change orders.
- 7. Rules and regulations governing performance of the work.
- 8. Procedures for safety and first aid, security, quality control, housekeeping, and related matters.

- C. Preconstruction Conference Format:

The format of the agenda for the Preconstruction Conference shall generally be as follows on the attached form:

PRECONSTRUCTION CONFERENCE FORMAT

PRECONSTRUCTION CONFERENCE FOR _____

OWNER: Franklin County Public Schools

PROJECT: _____ JOB ORDER NO.: _____

LOCATION: _____

COMM. NO.: _____ TIME: _____ DATE: _____

AGENDA AND MINUTES

1. GENERAL

- a. Introductions and Registrations of Attendees (sign attached sheet)
- b. Conference Format and Agenda
- c. Agreement, Performance and Payment Bonds and Insurance
- d. Notice to Proceed
- e. Responsibilities of Owner, Contractor, Engineer, and Owner's Inspector

2. PROJECT COMMUNICATION AND CORRESPONDENCE

a. With Contractor:

Field Superintendent will be: _____

OFFICE _____ FIELD _____ EMERGENCY _____

Company: _____
Street: _____
P.O. Box: _____
Zip: _____
Attention: _____
Telephone: _____

b. With Engineer:

Project Engineer will be: _____

OFFICE _____ FIELD _____ EMERGENCY _____

Company: _____
Street: _____
P.O. Box: _____
Zip: _____
Attention: _____
Telephone: _____

(1) For questions, information, etc., Attention:

In the absence of Mr. _____, if necessary, contact first _____ and second _____.

- (2) For shop drawings and other submittals, use _____
 - (3) Discuss submittals and other points on shop drawings, samples, test data, brochures and other submittals.
 - c. With Owner:
 - Inspector will be _____
 - School Coordinator will be _____
 - Other _____
 - Project Manager will be _____
 - (1) Copies of correspondence
 - (2) Through Owner's Inspector and Engineer
 - (3) Project Identification
 - d. With material suppliers and subcontractors
 - e. Other
3. SCHEDULE, ESTIMATES, CHANGE ORDERS AND TIME EXTENSIONS
- a. Project Schedule: CPM, bar chart, other
 - b. Schedule of Values (Lump Sum Breakdown) No mobilization shall be paid as a schedule of value item on unsecured contracts.
 - c. Monthly requests for payment
 - (1) Closing date
 - (2) Format
 - (3) Preliminary approval by Owner's Inspector and Engineer; copy to College Coordinator
 - (4) Work done and materials on hand
 - (5) Place and projection of materials on hand
 - (6) Conformance to schedule
 - d. List of subcontractors and major suppliers
 - e. Change Orders - G.O. FORM E&B CO-11
 - (1) Request for Proposal and Response (To be initiated by the Project Manager)
 - (2) Acceptance by Engineer and Owner
 - (3) Change Order execution by Contractor, Engineer and Owner

SNOW CREEK ES 2CR HVAC UPGRADES

- (4) Time extension, if any
- (5) Not official until fully approved by Contractor and Owner
- f. Time extensions (other than Change Orders) all are to be on CO-11

4. CONSTRUCTION

- a. Manner of conducting the work
- b. Construction plant area
 - (1) On-site
 - (2) Off-site
 - (3) Borrow and Spoil
 - (4) Disposal of wastes
- c. Project sign(s)
- d. Temporary facilities
- e. Traffic maintenance
- f. Safety--public, on-site, personnel
- g. Layout of the work
- h. Contractor's Quality Control Plan and Owner's Quality Assurance Plan
- i. Special notice

5. PROJECT CLOSE OUT

- a. Final cleanup
- b. Guarantees
- c. Punch lists and final inspections
 - (1) Balancing and Testing
 - (2) O & M instructions and manuals
- d. Final payment, Affidavits for Payments of Debts and Claims, Consent of Surety, Release or Waiver of Liens
- e. As-built drawings
- f. Assessment of Roles in Construction Project
- g. Other

6. ADDED COMMENTS BY OWNER

7. ADDED COMMENTS BY CONTRACTOR

3.4 PROJECT MEETINGS:

A. Attendance:

1. To the maximum extent practicable the same person or persons shall represent the Contractor at the project meetings throughout progress of the work.
2. Sub-Contractors, material suppliers, and others may be invited to attend those project meetings in which their aspect of the work is involved.

B. Minimum Agenda:

1. Review, revise as necessary, and approve minutes of previous meetings.
2. Review progress of the work since last meeting, including status of submittals for approval and payment request.
3. Identify problems which impede planned progress.
4. Develop corrective measures and procedures to regain planned schedule.
5. Complete other current business.

C. Revisions to Minutes:

1. Unless published minutes are challenged in writing prior to the next regularly scheduled progress meeting, they will be accepted as properly stating the activities and decisions of the meeting.
2. Persons challenging published minutes shall reproduce and distribute copies of the challenge to all indicated recipients of the particular set of minutes.
3. Challenge to minutes shall be settled as priority portion of "old business" at the next regularly scheduled meeting.

END OF SECTION 012000

SECTION 012060 - GENERAL CONTRACTOR'S WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General, Supplemental Conditions and Special Conditions, apply to work of this section.

1.2 DESCRIPTION:

- A. The intent of this section is to cover certain miscellaneous work which has not been specified under work of other trades. The Contractor may elect to perform this work, or place all of any part under specific trades.
- B. The Contractor is responsible for including all items of work either shown on the drawings or called for in the specifications. If any item is called for on plans and not specifically designated to a particular section, the Contractor shall determine by whom it will be supplied and installed, as part of the contract amount.
- C. The Engineer will NOT arbitrate differences between Contractor and subcontractor(s).
- D. Carefully study and compare Contract Documents with existing conditions at job site. Report to Engineer, within two (2) weeks of project start date, errors, discrepancies, inconsistencies, and omissions and materials, products, systems, procedures, and construction methods shown or specified which are incorrect, inadequate, obsolete, or unsuitable for actual field conditions discovered, or which Contractor would not warrant as required by the Contract Documents. Do not proceed with Work in areas where errors, discrepancies, inconsistencies, or omissions were found, without Engineer's instructions.
- E. Before ordering materials or doing work at the site, verify dimensions and conditions affecting materials to be ordered or work to be done, to ensure that dimensions shown on Contract drawings accurately reflect actual dimensions. Bring inconsistencies to Engineer's attention and do not proceed without Engineer's instructions.

1.3 EXISTING CONDITIONS:

- A. Contractors Examination of Site:
 - 1. By executing Contracts, Contractor and subcontractors represent that they have:
 - a. Visited each school site and made due allowances for difficulties and contingencies;
 - b. Compared Contract Documents with existing conditions and informed themselves of conditions to be encountered, including work by others, if any, being performed; and
 - c. Notified Engineer of ambiguities, inconsistencies, and errors they have discovered within Contract Documents and existing conditions.
 - 2. Failure to visit the sites and become familiar with conditions shall not relieve Contractor or a subcontractor from furnishing materials or equipment or

- completing the work in accordance with Contract Documents at no additional cost.
3. Contractor or subcontractors will not be given extra payment for work related to conditions they can determine by examining the sites and Contract Documents.
 4. Contractor or subcontractors will not be given extra payment for work related to ambiguities, inconsistencies, or errors within Contract Documents, or between Contract Documents and existing conditions, when such ambiguities, inconsistencies, or errors are known to Contractor or subcontractor before contract execution unless Contractor or subcontractor has notified Engineer in writing of such condition before execution of Agreement between Owner and Contractor.
 5. Interested parties must obtain telephone clearance from the Supervisor of Maintenance and Construction before making a site visit.
- B. Access by Contractor to portions of Owner's property beyond the actual area of work under this Contract is denied, except where necessary to perform the work, and then only with specific written approval in each case. Refer to other sections for additional requirements.
- C. Contractor shall accept each site and the existing buildings in the conditions in which they exist at the time Contractor is given access to begin the work.
- D. While work under this Contract is in progress, protect existing buildings, grounds, contents, and occupants, including those on adjacent property, whether private or public, from damage or harm due to the work under this Contract. Damage resulting from cutting or any other form of weakening of the structures by the Contractor and/or subcontractor(s) shall be the responsibility of the Contractor and the Contractor shall bear full liability of any and all resultant damages.
- E. During the term of this Contract, work by others may be done at the sites at the Owner's discretion. It is also possible that other contractors will occupy parts of the buildings or work in the existing buildings while this Contractor is still on the premises. Access to the sites, and within the sites to the existing buildings, is also required for fire-fighting equipment. Owner will continue to operate parts of the existing buildings and sites while work under this Contract is in progress, and will continue to use parking areas and walkways throughout Owner's property. Areas to remain in use include ways designated or later agreed upon by Contractor and Owner.
1. The work of this Contract shall be done, and such temporary facilities and phasing of activities provided so as not to interfere with access to existing facilities to remain in use.
- F. Temporary Storage and Staging: When necessary, provide secure watertight buildings or mobile units with floor above grade and heated where necessary to protect materials from low temperatures. Use space within the building for storage where available and upon approval by Owner's representative. Do not interfere with Work progress. Relocate storage which interferes with a subcontractor's or other Contractor's work, or Work progress. Remove storage buildings and mobile units and stored materials from within buildings when no longer needed.

1.4 PROGRESS SCHEDULE:

- A. Within seven (7) days of the award of the contract, and before doing work at the site, submit for approval a Progress Schedule for each part of the Work.

SNOW CREEK ES 2CR HVAC UPGRADES

1.5 PROJECT CLEAN-UP:

- A. The General Contractor shall be responsible for all subcontractors disposing of all waste materials, cartons, wrappers, etc., to maintain the project site in a state of cleanliness in accordance with good housekeeping practices and local regulations and to the satisfaction of the Owner and Engineer. Project clean-up shall be performed on a daily basis.

1.6 FINAL CLEAN-UP:

- A. General: At Project completion, to the extent that such areas or surfaces were part of, or were soiled during the Work under this Contract, give exterior and interior of existing buildings and site, including access ways, storage and staging areas, a thorough final cleaning. Remove temporary services, construction equipment, tools and facilities, temporary structures, surplus materials, debris, and rubbish from Owner's property. Put site in neat, orderly condition, ready for use. Leave roof areas, pipe spaces, equipment rooms, and other spaces clean and free from debris. Clean to normal "clean" condition for a first-class building cleaning and maintenance program. Comply with manufacturer's instructions. Upon completion of "final clean-up" the Engineer shall be notified. Before approval of final payment clean-up shall be to the satisfaction of the Owner and Engineer.

1.7 JOB CONDITIONS:

- A. Use all means necessary to prevent the spread of dust and smoke during the performance of all work on this project. Thoroughly moisten all surfaces as required to prevent dust from being a nuisance.

1.8 CUTTING AND PATCHING:

- A. Contractor shall be responsible for cutting, fitting, and patching of both new and existing work as required to carry out the Work under this Contract.
- B. Unless specified otherwise in that Specifications section, work specified in each specification section includes cutting, fitting, and patching to accommodate the work of other trades, and includes cutting, fitting, and patching related to existing construction.
- C. Patch and repair work shall exactly match existing adjacent work in all respects and shall not be obvious as patching. Any patch and repair work found to not exactly match existing adjacent work will be subject to removal and replacement as determined by the Engineer.
- D. Cutting, fitting, and patching shall not endanger or damage Work under this Contract or existing construction, and shall not be undertaken without permission of Owner or separate contractor whose work is being cut or patched.
- E. Do not cut structural members unless specifically required by these contract documents.

SNOW CREEK ES 2CR HVAC UPGRADES

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 COORDINATION OF WORK WITH THE OWNER:

- A. To the maximum extent possible, perform all work in and adjacent to the existing buildings with a minimum of interruption of the Owner's normal use.
- B. Owner's use of the premises: Refer to other sections of these specifications for approved work hours.

3.2 PROJECT CLOSE-OUT:

- A. Maintain at the site, in good order, one record copy of Drawings, Project Manual, Addenda, Construction Change Directives, Change Orders, and other modifications documents, and submittals.
- B. Legibly mark Drawings and Specifications to show changes to the buildings and changes required by Change Order or made necessary by other Work.

END OF SECTION 012060

SNOW CREEK ES 2CR HVAC UPGRADES

SECTION 012200 - UNIT PRICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Measurement and payment criteria applicable to Work performed under a unit price payment method.

1.2 COSTS INCLUDED

- A. Unit Prices shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.3 MEASUREMENT OF QUANTITIES

- A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.
- B. Take all measurements and compute quantities. Measurements and quantities will be verified by Architect.
- C. Assist by providing necessary equipment, workers, and survey personnel as required.

1.4 PAYMENT

- A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.

1.5 SCHEDULE OF UNIT PRICES

Schedule shall be as provided by the Contractor on the Bid Form

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION 012200

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SECTION 013000 - SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including Supplemental and General Conditions of the Contract, apply to this section.

1.2 DESCRIPTION:

A. Work Included:

- 1. Provide submittals required by the Contract Documents; revise and resubmit as necessary to establish compliance with the specified requirements.

B. Related Work:

- 1. Individual requirements for submittals are described in pertinent sections of these specifications.

C. Work not Included:

- 1. Submittals not required by the contract documents will not be reviewed by the Engineer.
- 2. The Contractor may require his sub-Contractors to provide drawings, diagrams, and similar information to help coordinate the work, but such data shall remain between the Contractor and his sub-Contractors and will not be reviewed by the Engineer except where material being provided requires modifications to the locations, piping, or other configurations shown in the contract documents.

1.3 QUALITY ASSURANCE:

A. Coordination of Submittals:

- 1. Prior to each submittal, the Contractor shall carefully review and coordinate all aspects of each item being submitted.
- 2. The Contractor shall verify that each item and the submittal for it conform in all respects with the specified requirements.
- 3. The Contractor shall verify that the material proposed to be incorporated in the work will fit the space provided with connections, etc., as shown, or shall clearly identify the conflicts.
- 4. By affixing the Contractor's signature to each submittal, certify that this coordination has been performed.
- 5. Materials or equipment ordered, fabricated, or shipped or any work performed until the Engineer returns to the Contractor the submissions herein required marked either "No Exceptions Taken" or "Make Corrections Noted" is at the Contractor's own risk.

B. Substitutions:

SNOW CREEK ES 2CR HVAC UPGRADES

1. The Contract is based on the standards of quality established in the Contract Documents. Refer to the General Conditions.
2. Do not substitute materials, equipment, or methods unless such substitution has been specifically approved in writing for this work by the Engineer.

C. "Or Equal":

1. Where the phrase "or equal," or "or equal as approved by the Engineer," occurs in the Contract Documents, do not assume that the materials, equipment, or method will be approved as equal unless the item has been specifically so approved for this work by the Engineer.
2. The decision of the Engineer shall be final.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 SUBMITTALS:

- A. Refer to the General Conditions for Contractor's responsibilities regarding submittals. The Contractor shall submit one (1) electronic (PDF) copy of each submittal.
- B. Submissions will be electronically stamped by the Engineer in one of the following ways:

"No Exceptions Taken"	No exceptions are taken and subject to compliance\ with the Contract Documents.
"Make Corrections Noted"	Minor corrections are noted and a re-submittal is not required subject to compliance with the corrections and the Contract Documents.
"Correct and Resubmit "	The submitted material, method or system meets the intent of the specifications, yet has insufficient data to determine compliance with the Contract Documents. Re-submittal is required.
"Rejected"	The submitted material, method or system does not meet the intent of the specifications, or has insufficient data to determine compliance with the Contract Documents.

C. Submission Procedures:

1. The Engineer will annotate the submission, "No Exceptions Taken" or "Make Corrections Noted" and transmit one (1) electronic (PDF) copy to the Contractor. If a resubmission is required, the Engineer will annotate the submission "Correct and Resubmit" or "Rejected" and transmit one (1) copies to the Contractor for appropriate action.
2. The Contractor shall revise and resubmit submissions as required by the Engineer until submissions are acceptable to the Engineer.

3. Approval of a working and/or shop drawings by the Engineer will constitute acceptance of the subject matter for which the drawing was submitted and not for any other structure, material, equipment or appurtenances indicated as shown.
4. The Engineer's review of the Contractor's submissions shall in no way relieve the Contractor of any of his responsibilities under the Contract. An approval of a submission shall be interpreted to mean that the Engineer has no specific objections to the submitted material, subject to conformance with the Contract Documents.
5. Where as-built drawings, record drawings and specifications are available and when provided to the Contractor for use in performing the work, the Contractor shall verify the content of such drawings and specifications, the suitability of their use in performing the work and their accuracy for the purposes in which the Contractor intends to use any record or historical documents which may be obtained. In no case shall the Contractor assume that such documents reflect a true and accurate record of the construction. Acceptance of any such materials, records, and/or drawings shall in no way result in additional cost to the Owner should an error and/or omission in these documents result in additional costs to the Contractor.

3.2 SHOP DRAWINGS:

- A. Scale and Measurements:
 1. Make shop drawings accurately to a scale sufficiently large to show all pertinent aspects of the item and its method of connection to the work.
- B. Types of Prints Required:
 1. Large scale prints (over 8.5x11) shall be submitted in the quantities indicated under Submittal Procedures or shall be submitted as four (4) blackline prints.
- C. Review Comments:
 1. Review comments of the Engineer will be shown on one copy of the print when it is returned to the Contractor. The Contractor may make and distribute such copies as are required for his purposes including one set to the Owner's inspector.

3.3 MANUFACTURERS' LITERATURE:

- A. Where the contents of submitted literature from manufacturers include data not pertinent to the submittal, clearly show which portions of the contents are being submitted for review. Clearly mark specific products, model numbers, capacities and options intended to be provided under the Contract. Submittals not clearly marked to show relevant portions of contents will be rejected.
- B. Submit one (1) electronic copy of manufacturers' literature.

3.4 SAMPLES:

- A. Provide a sample or samples identical to the precise article proposed to be provided. Identify as described under "Identification of Submittals" in this section.

B. Number of Samples Required:

1. Unless otherwise specified, submit samples in the quantity required in the specifications.
2. By prearrangement in specific cases, a single sample may be submitted for review and, when approved, shall be installed in the work at a location agreed upon by the Engineer.

3.5 COLORS AND PATTERNS:

- A. Unless the precise color and pattern is specifically called out in the Contract Documents, and whenever a choice of color or pattern is available in the specified products, submit accurate and up-to-date color and pattern charts to the Engineer for selection. The Contractor shall delete colors and patterns which are not intended to be provided or are unavailable at the time required which would delay project final completion.

3.6 IDENTIFICATION OF SUBMITTALS:

- A. Each submittal shall be marked showing all information required for identification and checking. Indicate specification, section number and/or drawings sheet number as required to identify each submittal.
- B. Maintain an accurate submittal log for the duration of the work, showing the current the status of all submittals at all times. Make the submittal log available to the Engineer for his review upon request.

3.7 GROUPING OF SUBMITTALS:

- A. Unless otherwise specified, make submittals in groups containing all associated items to assure that information is available for checking each item when it is received.
1. Partial submittals may be rejected as not complying with the provisions of the Contract.
 2. The Contractor may be held liable for delays so occasioned.

3.8 TIMING OF SUBMITTALS:

- A. Make submittals far enough in advance of scheduled dates for installation to provide time required for reviews, for securing necessary approvals, for possible revisions and resubmittals, and for placing orders and securing delivery.
- B. In scheduling, allow at least ten working days for review by the Engineer following his receipt of the submittal.

3.9 ENGINEER'S REVIEW:

- A. Review by the Engineer does not relieve the Contractor from responsibility for errors which may exist in the submitted data.
- B. Revisions:

SNOW CREEK ES 2CR HVAC UPGRADES

1. Make revisions required by the Engineer.
2. If the Contractor considers any required revision to be a change, he shall so notify the Engineer as provided in the General Conditions.
3. Make only those revisions directed or approved by the Engineer.

END OF SECTION 013000

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SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION:

A. Work Included:

1. Provide temporary facilities and controls needed for the work including, but not necessarily limited to the following:

B. Temporary utilities such as heat, water, electricity, and telephone.

1. Field office for the Contractor's personnel.
2. Sanitary facilities.
3. Enclosures such as tarpaulins, barricades, and canopies.
4. Temporary fencing of the construction site.

C. Related Work:

1. Except that equipment furnished by sub-Contractors shall comply with the requirements of pertinent safety regulations, such as equipment normally furnished by the individual trades in execution of their own portions of the work are not part of this section.
2. Permanent installation and hookup of the various utilities lines are not described in this section.
3. Acceptance by the Contractor of the use of the School System's utilities constitutes a release to the School System of all claims and of all liability to the Contractor for whatever damages resulting from utility outages, including damages from loss of services and voltage variations.

1.2 PRODUCT HANDLING:

- A. Maintain temporary facilities and controls in proper and safe condition throughout progress of the work.

PART 2 - PRODUCTS

2.1 UTILITIES:

A. Water:

1. Provide necessary temporary piping and water supply and, upon completion of the work, remove such temporary facilities. Contractor installed temporary piping shall comply with all applicable codes and be installed in a safe manner.
2. Water, if required for work under the contract, will be furnished by the Owner subject to reasonable use by the Contractor, only to the extent and capacity of present services.

B. Electricity:

1. Provide necessary temporary wiring and, upon completion of the work, remove such temporary constructions. Contractor installed temporary wiring shall comply with all applicable codes and be installed in a safe manner.
2. Electricity, if required for the work under the contract, will be furnished by the Owner subject to reasonable use by the Contractor, only to the extent and capacity of present services.

C. Heating:

1. Provide and maintain heat necessary for proper conduct of operations needed in the work and to protect the Owner's facilities from damage from cold weather.
2. The Contractor shall not employ temporary heating devices which use open flames or produce harmful gases in the interior space of the Owner's facilities.

D. Telephone:

1. Make necessary arrangements and pay all costs for installation and operation of telephone service to the Contractor's office at the site.
2. Make the telephone available to the Engineer, Owner's inspectors, and other representative of the Owner or Engineer in connection with the work. Any long distance calls shall be paid by the initiator of the call.

2.2 FIELD OFFICES AND SHEDS

A. Contractor's Facilities:

1. The Contractor may provide a field office building, trailer adequate in size and accommodation for the Contractor's offices, supply, and storage. Field offices shall be located within the work areas.

B. Sanitary Facilities:

1. Provide temporary sanitary facilities in the quantity required for use by all Contractor personnel.
2. Maintain all temporary sanitary facilities in a clean, serviceable, and sanitary condition at all times.

2.3 TEMPORARY BARRIERS

- A. Provide and maintain for the duration of construction a temporary barrier of design and type needed to prevent entry onto the work by the public, students, and other persons not connected with the work.

PART 3 - EXECUTION

3.1 MAINTENANCE AND REMOVAL:

- A. Maintain temporary facilities and controls as long as needed for safe and proper completion of the work.

SNOW CREEK ES 2CR HVAC UPGRADES

- B. The Contractor shall insure all temporary facilities, utility connections, and storage offices, trailers, and sheds are maintained in a good state of repair as determined by the Engineer, and in good appearance throughout the duration of the work. Unsafe, unattractive or poorly maintained facilities shall be corrected or removed at the direction of the Engineer.
- C. Remove such temporary facilities and controls as soon as the progress of the work will permit, or as directed by the Engineer.

END OF SECTION 015000

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SECTION 016050 - PRODUCTS AND SUBSTITUTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General, Supplemental and Special Conditions apply to work of this section.

1.2 DESCRIPTION:

- A. Wherever possible throughout the Contract Documents, one or more materials, trade names, manufacturers' or catalog numbers are specified to establish the minimum standard of quality, durability and efficiency, and NOT to limit competition.
- B. Products not specified may be accepted, if, in the Engineer's opinion, they are equal in quality, durability and efficiency to those specified, and are of a design in harmony with the work as outlined.
- C. Substitutions which require alterations to the design as outlined by the plans and specifications will NOT be approved.
- D. Individual requirements for submittals are described in other sections of these specifications.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS:

- A. The materials, products and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution. Bids shall be based upon the material, systems and equipment required by the bidding documents without exception. No substitutions will be considered prior to receipt of bids. The contract award will be made solely on the basis of the Base Bid with regards to any proposed substitutions and deducts when offered. Proposed substitute products or manufacturers shall only be submitted in accordance with the following provisions:
 - 1. Where the specification has listed three (3) or more product lines, substitutions will not be accepted after the bid opening.
 - 2. Where the specification has listed less than three (3) product lines, substitution requests will only be considered after Contract Award.

PART 3 - EXECUTION

3.1 SUBMITTALS:

- A. Unless otherwise specified, make all submittals in groups containing all associated items to insure that information is available for checking each item when it is received.

SNOW CREEK ES 2CR HVAC UPGRADES

- B. Partial submittals may be rejected as not complying with the provisions of the Contract Documents, and the contractor is strictly liable for all delays so occasioned.
- C. Review by the Owner is not to be construed as a complete check, but only that the general method of construction and detailing is satisfactory. Review does not relieve the Contractor from complying with all requirements of the Contract Documents, or from any errors which may exist.

END OF SECTION 016050

SECTION 016400 - PRODUCT HANDLING

PART 1 - GENERAL

1.1 DESCRIPTION:

A. Work Included:

1. Protect products scheduled for use in the Work by means including, but not necessarily limited to, those described in this section.

B. Related Work:

1. Additional procedures also may be prescribed in other sections of these specifications and the "General Conditions."

1.2 QUALITY ASSURANCE:

- A. Include within the Contractor's quality assurance program such procedures as are required to assure full protection of work and materials.

1.3 MANUFACTURER'S RECOMMENDATIONS:

- A. Except as otherwise approved by the Engineer, determine and comply with the manufacturer's recommendations on product handling, storage and protection.

1.4 PACKAGING:

- A. Deliver products to the job site in the manufacturer's original container, with labels intact and legible.
- B. Maintain packed materials with seals unbroken and labels intact until time of use.
- C. Promptly remove damaged material and unsuitable items from the job site, and promptly replace with material meeting the specified requirements, at no additional cost to the Owner.
- D. The Engineer may reject as non-complying such material and products that do not bear identification satisfactory to the Engineer as to manufacturer, grade, quality, and other pertinent information.

1.5 PROTECTION:

- A. Protect roof surface where any construction activity takes place.
- B. Protect finished surfaces, including jams and soffits of openings used as passageways, through which equipment and materials are handled.
- C. Provide protection for finished floor surfaces in all areas prior to allowing equipment or materials to be moved over such surfaces.

SNOW CREEK ES 2CR HVAC UPGRADES

- D. Maintain finished surfaces clean, unmarred, and suitably protected until the work is accepted by the Owner.

1.6 REPAIRS AND REPLACEMENTS:

- A. In the event of damage, promptly make replacements and repairs to the approval of the Engineer and at no additional cost to the Owner.
- B. Additional time required to secure replacements and to make repairs will not be considered by the Engineer to justify an extension in the contract time of completion.

1.7 DELIVERY AND STORAGE:

- A. The Contractor shall be responsible for making all arrangements for the delivery, unloading, receiving, and storage of materials. The Owner shall not assume any responsibility for receiving, storage or unloading of shipments.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION 016400

SECTION 017000 - PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General, Supplemental Conditions and Special Conditions sections, apply to work of this section.

1.2 DESCRIPTION OF REQUIREMENTS:

- A. Definitions: Project closeout is the term used to describe certain collective project requirements, indicating completion of the Work that is to be fulfilled near the end of the Contract time in preparation for final acceptance and occupancy of the Work by the Owner, as well as final payment to the Contractor and the normal termination of the Contract.
- B. Specific requirements for individual units of work are included in the appropriate sections of these specifications.
 - 1. Time of closeout is directly related to "Substantial Completion"; therefore, the time of closeout may be either a single time period for the entire Work or a series of time periods for individual elements of the Work that have been certified as substantially complete at different dates. This time variation, if any, shall be applicable to the other provisions of this section.

1.3 PREREQUISITES TO SUBSTANTIAL COMPLETION:

- A. General: Complete the following before requesting the Engineer's inspection for certification of substantial completion, either for the entire Work or for portions of the Work. List known exceptions in the request.
- B. In the progress payment request that coincides with, or is the first request following the date substantial completion is claimed, show either 100% completion for the portion of the Work claimed as "substantially complete", or list incomplete items, the value of incomplete work, and reasons for the Work being incomplete.
 - 1. Include supporting documentation for completion as indicated in these Contract Documents.
- C. Submit a statement showing an accounting of changes to the Contract Sum.
- D. Advise Owner of pending insurance change-over requirements.
- E. Submit specific warranties, workmanship/maintenance bonds, maintenance agreements, final certifications and similar documents.
- F. Obtain and submit releases enabling Owner's full, unrestricted use of the Work and access to services and utilities. Where required, include occupancy permits, operating certificates and similar releases.
- G. Deliver tools, spare parts, extra stocks of material and similar physical items to the Owner.

SNOW CREEK ES 2CR HVAC UPGRADES

- H. Complete start-up testing of systems, and instruction of the Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities and services from the project site, along with construction tools and facilities, mock-ups, and similar elements.
- I. Complete final cleaning up requirements, including touch-up painting of marred surfaces.
- J. Touch-up and otherwise repair and restore marred exposed finishes.
- K. Inspection Procedures: Upon receipt of Contractor's request for inspection, the Engineer will either proceed with inspection or advise Contractor of unfulfilled prerequisites.
 - 1. Following the initial inspection, the Engineer will either prepare the certificate of substantial completion, or will advise Contractor of work which must be performed before the certificate will be issued. The Engineer will repeat the inspection when requested and when assured that the Work has been substantially completed. If upon final inspection and a subsequent rejection, items which are not completed as directed and to the satisfaction of the Engineer shall result in the Contractor being required to reimburse the Engineer at a rate of \$180.00 per hour portal-to-portal for subsequent inspections.
 - 2. Results of the completed inspection will form the initial "punch-list" for final acceptance.

1.4 PREREQUISITES TO FINAL ACCEPTANCE:

- A. General: Complete the following before requesting the Engineer's final inspection for certification of final acceptance, and final payment as required by the General Conditions. List known exceptions, if any, in request:
 - 1. Submit the final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
 - 2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
 - 3. Submit a certified copy of the Engineer's final punch-list of itemized work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance and has been endorsed and dated by the Engineer.
 - 4. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

1.5 RECORD DOCUMENT SUBMITTALS:

- A. General: Specific requirements for record documents are indicated in the individual sections of these specifications. Other requirements are indicated in the General Conditions. General submittal requirements are indicated in "submittals" sections.
 - 1. Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Engineer's reference during normal working hours.

- B. Record Drawings: Maintain a record set of black line white-prints of contract drawings and shop drawings in a clean, undamaged condition. Mark-up the set of record documents to show the actual installation where the installed work varies substantially from the work as originally shown. Mark whichever drawing is most capable of showing the actual "field" condition fully and accurately; however, where shop drawings are used for mark-up, record a cross-reference at the corresponding location on the working drawings. Give particular attention to concealed work that would be difficult to measure and record at a later date.
1. Mark record sets with red erasable pencil and, where feasible, use other colors to distinguish between variations in separate categories of work.
 2. Mark-up new information which is known to be important to the Owner, but for some reason was not shown on either contract drawings or shop drawings.
 3. Note related change-order number where applicable.
 4. Upon completion of the Work, the Contractor shall submit "As-Built Drawings"; a set of black line marked-up Contract Documents indicating all changes or deviations from the Contract Documents. The drawings should indicate all the information from the Record Drawings.
- C. Record Specifications: Maintain one complete copy of the Project Manual, including specifications and addenda, and one copy of other written construction documents such as change orders and similar modifications issued in printed form during construction. Mark these documents to show substantial variations in the actual work performed in comparison with the text of the specifications and modifications as issued. Give particular attention to substitutions, selection of options and similar information on work where it is concealed or cannot otherwise be readily discerned at a later date by direct observation. Note related record drawing information and product data, where applicable.
1. Upon completion of the Work, submit record specifications to the Engineer for the Owner's records.
- D. Record Product Data: Maintain one (1) copy of each product data submittal. Mark these documents to show significant variations in the actual Work performed in comparison with the submitted information. Include both variations in the products as delivered to the site, and variations from the manufacturer's instructions and recommendations for installation. Give particular attention to concealed products and portions of the Work which cannot otherwise be readily discerned at a later date by direct observation. Note related change orders and mark-up of record drawings and specifications.
1. Upon Completion of mark-up, submit complete set of record product data to the Engineer for the Owner's records.
- E. Maintenance Manuals: Organize operating and maintenance data into suitable sets of manageable size. Bind data into individual binders properly identified and indexed. Bind each set of data in a heavy-duty 2-inch, 3-ring vinyl-covered binder, with pocket folders for folded sheet information. Mark the appropriate identification on both front and spine of each binder. See also Section 017300 OPERATION AND MAINTENANCE DATA for more detailed requirements.
- F. Include the following types of, but not limited to, information in operation and maintenance manuals:
- Emergency instructions.
 - Spare parts listing.

SNOW CREEK ES 2CR HVAC UPGRADES

Copies of warranties.
Wiring diagrams.
Recommended "turn-around" cycles.
Inspection procedures.
Shop drawings and product data.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 CLOSEOUT PROCEDURES:

- A. General Operating and Maintenance Instructions: Arrange for each installer of operating equipment and other work that requires regular or continuing maintenance, to meet at the site with the Owner's personnel to provide necessary basic instruction in the proper operation and maintenance of the entire Work. Where installers are not experienced in the required procedures, include instruction by the manufacturer's representatives. The instruction sessions shall be arranged such that Owner's personnel can attend one session and be completely trained for all items of Work. Multiple sessions to completely train personnel will not be acceptable and the Contractor will be liable for the additional lost time of the personnel, as well as the Engineer.

1. As part of this instruction, provide a detailed review of the following items:

Maintenance manuals
Record documents
Spare parts and materials
Tools
Identification systems
Control sequences
Hazards
Cleaning
Warranties, bonds, maintenance agreements and similar continuing commitments.

2. As part of this instruction for operating equipment, demonstrate the following procedures:

Start-up
Shut-down
Emergency operations
Safety procedures
Economy and efficiency adjustments

3.2 FINAL CLEANING:

- A. General: Special cleaning requirements for specific units of Work are included in the appropriate sections of these Specifications. General cleaning during the regular progress of the Work is required by the General Conditions and is included under section "General Contractor's Work".

SNOW CREEK ES 2CR HVAC UPGRADES

- B. Cleaning: Provide final cleaning of the Work at the time indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of work to the condition expected from a normal, commercial building cleaning and maintenance program. Comply with the manufacturer's instructions for operations.
 - 1. Complete the following cleaning operations before requesting the Engineer's inspection for certification of substantial completion.
 - 2. Remove labels which are not required as permanent labels.
 - 3. Wipe surfaces of mechanical and electrical equipment clean. Remove excess lubrication and other substances.
 - 4. Clean the project site, including landscape development areas, of rubbish, litter and foreign substances. Sweep paved areas to a broom-clean condition; remove stains, spills, and other foreign deposits.
- C. Pest Control: Rid new work of rodents, insects, and other pests.
- D. Removal of Protection: Except as otherwise indicated or requested by the Engineer, remove temporary protection devices and facilities which were installed during the course of the work to protect previously completed work during the remainder of the construction period.
- E. Compliances: Comply with safety standards and governing regulations for cleaning operations. Do not burn waste materials at the site. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile or other harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.
- F. Where extra materials of value remaining after completion of associated work have become the Owner's property, dispose of these to the Owner's best advantage as directed.

END OF SECTION 017000

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SECTION 017300 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 DESCRIPTION:

A. Work Included:

1. To aid the continued instruction of operating and maintenance personnel, and to provide a source of information regarding the products incorporated into the work, furnish and deliver the data described in this section and in pertinent other sections of these specifications.

B. Related Work:

1. Required contents of submittals also may be amplified in pertinent other sections of these specifications and the "General Conditions".

1.2 QUALITY ASSURANCE:

- A. In preparing data required by this section, use only personnel who are thoroughly trained and experienced in the operation and maintenance of the described items, completely familiar with the requirements of this section, and skilled communicating the essential data.

1.3 SUBMITTALS:

- A. Unless otherwise directed in other sections, or in writing by the Engineer, submit three copies of the final manual to the Engineer for approval prior to indoctrination of operation and maintenance personnel.

PART 2 - PRODUCTS

2.1 INSTRUCTION MANUALS:

- A. Where instruction manuals are required to be submitted under other sections of these specifications, prepare in accordance with the provisions of this section.

B. Format:

1. Size: 8-1/2" x 11"
2. Paper: White bond, at least 20 lb. weight.
3. Text: Typed or computer print-out (Hand printed or written is not acceptable)
4. Drawings: 11" x 8-1/2" preferable; bind in with text; foldouts are acceptable; larger drawings are acceptable if folded to fit within the manual and provide a drawing pocket inside rear cover or bind in with text.
5. Fly Sheets: Separate each portion of the manual with neatly prepared Fly Sheets or tabbed index sheets briefly describing the contents of the ensuing portion. Fly sheets or index tabs may be in color.

SNOW CREEK ES 2CR HVAC UPGRADES

6. Binding: Use heavy-duty plastic covers with binding mechanism concealed inside the manual; 3-ring binders are required. All binding is subject to the Engineer's approval.
- C. Provide front and back covers for each manual, using durable plastic material approved by the Engineer and clearly identified on the front cover with at least the following information:

OPERATING AND MAINTENANCE INSTRUCTIONS

FOR

(Item/system name and description)

(Name and address of Contractor and sub-contractor)

(General subject of this manual)

(Name and address of Engineer)

(Engineer's approval and date approved)

- D. Contents:
 1. Neatly prepared and typewritten detailed table of contents.
 2. Complete instructions regarding operation and maintenance of all equipment involved including lubrication, disassembly, and reassembly.
 3. Complete nomenclature of all parts of all equipment.
 4. Complete nomenclature and part number of all replaceable parts, name and address of nearest vendor, and all other data pertinent to procurement procedures.
 5. Copy of all guarantees and warranties issued.
 6. Manufacturer's bulletin, cuts, and descriptive data, where pertinent, clearly indicating the precise items included in this installation and deleting, or otherwise clearly indicating, all manufacturers' data with which this installation is not concerned.
 7. Such other data as required in pertinent sections of these specifications.

PART 3 - EXECUTION

3.1 INSTRUCTION MANUALS:

- A. Revisions:
 1. Following the indoctrination and instruction of operation and maintenance personnel, review all proposed revisions of the Manual with the Engineer.

END OF SECTION 017300

SNOW CREEK ES 2CR HVAC UPGRADES

SECTION 020500 - DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. The provisions contained in GENERAL CONDITIONS, BIDDING REQUIREMENTS & CONDITIONS OF THE CONTRACT, and in DIVISION 1, GENERAL REQUIREMENTS, are hereby made a part of this section of the Specifications.
- B. The work provided under this section is to be coordinated with all other sections of the Specifications.

1.2 WORK INCLUDED:

- A. The work of this section includes all labor, materials, and equipment required to provide all demolition work as indicated on the Drawings and specified herein.
- B. Remove or alter any existing work as required to accommodate the installation of new work as shown in these documents.
- C. Removal of all debris and excess materials from the jobsite.
- D. Disconnect, cap, and remove utilities to be abandoned.

1.3 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES:

- A. All shop drawings, product data, and samples shall be provided in accordance with SECTION 013000 - SUBMITTALS.

1.4 REFERENCE STANDARDS AND QUALITY ASSURANCE:

- A. All materials, preparations, and workmanship shall be performed by experienced workmen regularly engaged in the work of this section.
- B. All products shall be installed in strict conformance with the manufacturer's printed instructions, and acceptable trade practices.
- C. The Reference Standards and Quality Assurance, as described in DIVISION 1 - GENERAL REQUIREMENTS, shall apply to this section.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 GENERAL:

SNOW CREEK ES 2CR HVAC UPGRADES

- A. Notify the Owner a minimum of 3 days in advance prior to starting demolition. The Owner shall, using his own forces, remove parts of the existing equipment as needed for their own use.
- B. Prevent movement or settlement of all adjacent construction not to be removed. Provide bracing and shoring as required.
- C. Protect existing work which is not to be demolished. As specified in Section 015000 - TEMPORARY CONSTRUCTION FACILITIES.
- D. Disconnect, remove, and cap designated utility lines within demolition areas. Mark location of disconnected utilities. Identify utilities and indicate capping locations on Project Record Documents.
- E. Remove all debris and materials in a timely and orderly manner. Debris is not to be stockpiled at the job site.

3.2 EXECUTION:

- A. Demolish indicated construction and appurtenances in an orderly and careful manner.
- B. Cease operations and notify Engineer immediately if adjacent construction appears to be endangered. Do not resume operations until corrective measures have been taken.
- C. Except where noted otherwise, immediately remove all demolished material from the site.
- D. Remove materials to be re-installed or retained in a manner to prevent damage. Store and protect in accordance with requirements of SECTION 015000 - TEMPORARY CONSTRUCTION FACILITIES.
- E. In certain areas, ceiling demolition may be required for electrical appurtenances being installed. In each instance, selective ceiling demolition shall occur to the minimum extent needed and shall be replaced and reinstalled to match existing grid and tile conditions. Coordinate carefully with Division 26 to determine all such locations of selective ceiling demolition and reinstall and replace accordingly.
- F. Remove and properly dispose of contaminated, vermin infested, or dangerous materials encountered.
- G. Do not burn or bury materials on site.
- H. Keep work sprinkled to minimize dust. Provide hoses and watermain or hydrant connections for this purpose.
- I. Remove demolished materials from site on a daily basis as work progresses and leave site in clean condition.
- J. All salvage material, (e.g., equipment, structural steel, refrigerant, copper pipe and wire, etc.) to be removed remains the property of the Owner. The Supervisor of Maintenance and Construction shall decide the disposition of said salvage material.

END OF SECTION 020500

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the contract, including General and Supplemental Conditions and Division-1 Specifications Sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Provide all materials, equipment, services and labor necessary to complete all masonry work in accordance with the plans and specifications.

1.3 SAMPLES:

- A. All materials received or used on the job that do not match approved samples in color, size, texture or quality will be rejected. Any concrete masonry unit that does not match the texture of the approved sample will be removed, regardless of the state of construction, when so directed by the Engineer.

1.4 DELIVERY, STORAGE AND HANDLING:

- A. Unload and stack in hacks all brick that is to be exposed after building is finished. Handle carefully; under no circumstances dump brick from trucks, wheelbarrows or any other conveyances.
- B. Cover all masonry block units with tarpaulins or other satisfactory covers to protect them from rain or snow.
- C. All packaged materials are to be delivered in undamaged, sealed, labeled containers.

1.5 QUALITY ASSURANCE:

- A. Use only skilled journeyman masons who are thoroughly experienced with the materials, specified methods and design requirements, and cutting and patching of masonry units.
- B. Provide at least one skilled journeyman mason to be present at all times during execution of the work of this section who will personally direct the execution of masonry work.
- C. Comply with all pertinent codes and regulations relating to the standards of masonry installation.

SNOW CREEK ES 2CR HVAC UPGRADES

PART 2 - PRODUCTS:

2.1 MATERIALS:

- A. Face Brick: To match color, texture, size, coursing and bond of existing face brick, in adjoining existing building, as closely as possible, subject to sample panel approval by Owner (Coursing to match existing). Furnish all special shapes as required, as part of this project.
- B. Concrete Masonry Units: Units shall be manufactured using "Solite," "Weblite", "Amlite," or other approved lightweight aggregate. Load-bearing units to conform to ASTM C-90, and non-load bearing units to conform to ASTM C-129.
- C. Cure units by moisture-controlled atmosphere or by atmospheric drying for not less than 30 days before installation, to comply with ASTM requirements.
- D. Units to be true to size and sound, with clean, sharp, unchipped edges. All exposed exterior corners inside the building to be rounded edge with 1" radius.
- E. Furnish as part of the base bid all solid units and special shapes including bond beam units, as indicated on drawings.

2.2 MORTAR AND MORTAR MATERIAL:

- A. Above grade, use mortar conforming to ASTM C-270, Type N, 750 p.s.i. in 28 days, except where otherwise prohibited by the Statewide Uniform Building Code (BOCA).
- B. Use low alkali masonry cement conforming to ASTM C-91 and well-washed masonry sand conforming to ASTM C-144. DO NOT use admixtures.
- C. Mortar color to match existing.

2.3 WALL REINFORCING:

- A. Use DUR-O-WAL or approved equal heavy continuous rectangular "LADUR-EYE" adjustable tab tie reinforcing for all exterior cavity walls, conforming to ASTM A-82, fabricated with high-tensile steel rods, hot dipped galvanized after fabrication. "EYE" tabs and tie wires shall be 3/16", horizontal rods are to be No. 9 and shall be approximately 1" from face of wall.
- B. Use concrete block anchor ties equivalent to Heckmann Type 270, standard size, 20" long plus 2" bend, with 18" corrugation, 14 gauge x 1-1/2" galvanized steel anchors.

PART 3 - EXECUTION:

3.1 SURFACE CONDITIONS:

- A. Verify that unit masonry may be completed in accordance with all pertinent codes and regulations, the referenced standards and the original design. In the event of discrepancy, immediately notify the Engineer. Do not proceed with installation in areas of discrepancy until such discrepancies have been completely resolved.

3.2 COORDINATION:

- A. Carefully coordinate with all other trades to insure proper and adequate interfacing of the work of other trades with the work of this section.

3.3 GENERAL REQUIREMENTS:

- A. Do not cut masonry units except when fractional units will not serve the purpose, and then only using a masonry saw to give true lines and a neat fit.
- B. Remove disturbed, defective, or damaged masonry units and replace without cost to the Owner, when so directed by the Engineer.
- C. Carefully measure materials for each batch of mortar. Mix only sufficient mortar at one time to supply immediate requirements. Do not retemper mortar after it has begun to set.
- D. Keep work clean as it progresses, leaving no mortar dabs or unworked joints behind.
- E. All mortar joints on the exterior of the building and all mortar joints exposed to view on the interior of the building, unless indicated otherwise, shall be tooled joints to exactly match existing adjacent joints.

3.4 PRECAUTIONS AGAINST FREEZING:

- A. Protect all masonry against freezing for not less than 48 hours after installation. Do not construct masonry when below 32 degrees F. on rising temperatures, or below 40 degrees F. on falling temperatures, without temporary heated enclosures, heating materials, or other approved precautions necessary to prevent freezing. Do not use frozen materials, and do not build on frozen masonry.

3.5 LAYING THE BRICK:

- A. Unless otherwise shown in sections on the drawings, lay brick work accurately using mortar as previously specified. Lay brick plumb and true, with head and bed joints of uniform thickness.
- B. Tool exposed head and bed joints to approved joint shape after mortar has taken as initial set, using tools that exactly fit the width of joint, to force mortar against brick and give a smooth, water-tight joint.
- C. For all face work, use full mortar beds, and completely fill all head joints. For all backup work, lay bricks with a full, shoved joint. Parge the back of all face brick well. Where solid masonry walls are shown on the drawings, fill all joints with mortar, including collar joints, and leave no voids.
- D. In hot weather, wet down bricks before laying. In moderate weather, dampen bricks, and lay dry only in very cool or cold weather.

SNOW CREEK ES 2CR HVAC UPGRADES

3.6 LAYING MASONRY BLOCK UNITS:

- A. Lay in a running bond. Line up all vertical joints in alternate courses. Match existing block and brick coursing.
- B. Lay the first or starting course in full bed of mortar. Lay other concrete units with face shell bedding. In vertical joints, apply mortar to face shells of units and shove into place to produce a well-compacted vertical mortar joint.
- C. For both bed and head joints of all block scheduled to be exposed in completed building, neatly tool to approve joint shape after mortar has taken an initial set. Non-exposed joints elsewhere are to be struck off flush.

3.7 CHECKING AND BUILDING IN:

- A. Take all measurements and carefully check sizes of all openings and items to be built into masonry walls. Regulate joining and coursing to produce desired effect. The Contractor is responsible for all such items being in their proper location before masonry walls are carried up.
- B. Consult with other trades and make provisions for other work to avoid cutting and patching the walls. Carefully perform all cutting and patching to protect structural stability, appearance and weather-resistance of walls.

3.8 LINTELS:

- A. Provide structural steel lintels at all duct and louver penetrations in brick and block walls. Steel shall conform to ASTM A36.

3.9 POINTING AND CLEANING:

- A. Point and fill all holes, cracks and voids with fresh mortar.
- B. Upon completion of the work, thoroughly clean all exposed brick work, using fiber brushes and a solution of Non. 101 Lime Solvent by Process Solvent Co., or an approved equivalent. Apply according to manufacturer's directions, and hose down thoroughly with clean water. Leave the final surfaces clean and free of stains.
- C. Clean masonry units with wire brushes and rubbing stones, and leave ready for the painter's finish.
- D. Upon completion of all work of this section, promptly remove from the job site all mortar droppings, broken units, debris arising from work and all tools and equipment. Leave all areas in a neat, orderly condition to the approval of the Owner.

3.10 MITERED BRICK CORNERS:

- A. When corners, other than 90 degrees, occur, the Masonry Contractor shall miter brick with masonry saw and provide a neat vertical masonry joint at such corners.

END OF SECTION 042000

SECTION 051200 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION

- A. Provide all labor, materials, and equipment required to install all structural steel and related accessories, including anchor bolts, washers, nuts, bolts, etc., as indicated on the Drawings and specified herein.

1.3 REFERENCE STANDARDS AND QUALITY ASSURANCE

- A. All materials, preparations and workmanship shall be performed by experienced workmen regularly engaged in the work of this section.
- B. All products shall be installed in strict conformance with the manufacturer's printed instructions, and acceptable trade practices.
- C. Codes and Standards: Comply with provisions of following, except as otherwise indicated.
 - 1. American Institute of Steel Construction (AISC)
 - 2. AISC "Code of Standard Practice for Steel Buildings and Bridges"
 - 3. AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings," including the "Commentary" and Supplements thereto as issued.
 - 4. AISC "Specifications for Architecturally Exposed Structural Steel"
 - 5. AISC "Specifications for Structural Joints using ASTM A325 or A490 Bolts" approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation
 - 6. American Welding Society (AWS) "Structural Welding Code - Steel"
 - 7. ASTM A6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use"

1.4 PRODUCT HANDLING

- A. Use all means necessary to protect structural steel before, during and after installation, and to protect installed work and materials of other trades.
- B. In the event of damage, immediately make all repairs and replacements necessary to the Engineer's approval and at no additional cost to the Owner.

SNOW CREEK ES 2CR HVAC UPGRADES

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Structural Steel: ASTM A36.
- B. Bolts: ASTM A307 and ASTM A325.
- C. Pipe Columns: ASTM A501.

2.2 PAINTING

- A. Anchors built into masonry shall be coated with shop coat of asphalt paint. All other steel work, except items encased in concrete shall be painted one shop coat of approved primer, gray in color.
- B. After erection of all structural steel members, field welds and abrasions shall be touched up, using the same priming material as the original shop coat.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Erect all structural steel members in accordance with the reference standards listed in paragraph 1.03.

END OF SECTION 051200

SECTION 072700 - FIRESTOPPING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Penetrations through fire-resistance-rated floor and roof construction including both empty openings and openings containing cables, ducts, conduits, and other penetrating items.
- B. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, conduits, and other penetrating items.
- C. Sealant joints in fire-resistance-rated construction.
- D. Penetrations through suspended, fire-rated-gypsum shaftwall soffit assemblies.

1.2 RELATED WORK

- A. Section 22 04 00 – General Requirements for Plumbing
- B. Section 23 00 10 – HVAC General Requirements
- C. Section 23 07 00 – HVAC Insulation
- D. Section 23 20 00 – HVAC Piping and Pumps
- E. Section 26 05 00 – Common Work Results for Electrical
- F. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables
- G. Section 26 05 23 – Control Voltage Electrical Power Cables
- H. Section 26 05 33 – Raceway and Boxes for Electrical Systems
- I. Section 28 05 00 – Common Work Results for Electronic Safety and Security
- J. Section 28 05 28 – Pathways for Electronic Safety and Security

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. General: Provide firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gases.
- B. F-Rated Through-Penetration Firestop System: Provide through-penetration firestop systems with F. ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.
- C. T-Rated Through-Penetration Firestop System: Provide through-penetration firestop systems with T ratings, in addition to F ratings, as determined per ASTM E 814, where indicated and where systems protect penetrating items exposed to contact with

adjacent materials in occupiable floor areas. T-rated assemblies are required where the following conditions exist:

1. Where firestop systems protect penetrations located outside of wall cavities.
 2. Where firestops systems protect penetrations located outside fire-resistive shaft enclosures.
 3. Where firestop systems protect penetrating items larger than a 4-inch diameter nominal pipe or 16 sq. In. In overall cross-sectional area.
- D. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E 119, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.
- E. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to the conditions. For floor penetrations with annular spaces exceeding 4 inches or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing floor plates or by other means.
- F. For firestopping exposed to view, provide products with flame-spread values of less than 25 and smoke-developed values of less than 450, as determined per ASTM E 84.

1.4 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specifications Section.
- B. Product data for each type of product specified.
1. Certification by firestopping manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.
- C. Products certificates signed by manufacturers of firestopping products certifying that their products comply with specified requirements.

1.5 QUALITY ASSURANCE

- A. Fire-Test Response Characteristics: Provide firestopping that complies with the following requirements and those specified under the "System Performance Requirements" article:
1. Firestopping tests are performed by qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, Warnock Hersey, or another agency performing testing and follow-up inspection services for firestop systems that is acceptable to authorities having jurisdiction.
 2. Through-penetration firestop systems are identical to those tested per ASTM E 814 under conditions where positive furnace pressure differential of at least 0.01 inch of water is maintained at a distance of 0.78 inch below the fill materials surrounding the penetrating items in the test assembly. Provide rated systems complying with the following requirements;
 - a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.

- b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by UL in their "Fire Resistance Directory," by Warnock Hersey or by another qualified testing and inspecting agency.
 - 3. Fire-resistive joint sealant systems are identical to those tested for fire-response characteristics per ASTM E 119 under conditions where the positive furnace pressure differential is at least 0.01 inch of water, as measured 0.78 inch from the face exposed to furnace fire. Provide systems complying with the following requirements;
 - a. Fire-Resistance Ratings of Joint Sealants: As indicated by reference to design designations listed by UL in their "Fire Resistance Directory" or by another qualified testing and inspecting agency.
 - b. Joint sealants, including backing materials, bear classification marking of qualified testing and inspection agency.
- B. Information on drawings referring to specific design designations of through-penetration firestop systems is intended to establish requirements for performance based on conditions that are expected to exist during installation. Any changes in conditions and designated systems require the Engineer's prior approval. Submit documentation showing that the performance of proposed substitutions equals or exceeds that of the systems they would replace and are acceptable to authorities have jurisdiction.
- C. Installer Qualifications: Engage and experienced Installer who has completed firestopping that is similar in material, design, and extent to that indicated for this Project and that has performed successfully.
- D. Single-Source Responsibility: Obtain through-penetration firestop systems for each kind of penetration and construction condition required from a single manufacturer.
- E. Provide firestopping products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy."
- F. Coordinating Work: Coordinate construction of openings and penetrating items to ensure that designated through-penetration firestop systems are installed per specified requirements.

1.6 DELIVER, STORAGE, AND HANDLING

- A. Deliver firestopping products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying products and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multi-component materials.
- B. Store and handle firestopping materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Conditions: Do not install firestopping when ambient or substrate temperatures are outside limits permitted by firestopping manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilation: Ventilate firestopping per firestopping manufacturers' instructions by natural means or, where this is inadequate, forced air circulation.

PART 2 - PRODUCTS

2.1 FIRESTOPPING, GENERAL

- A. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.
- B. Accessories: Provide components for each firestopping system that are needed to install fill materials and to comply with "System Performance Requirements" article in Part 1. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:
 - 1. Permanent forming/damming/backing materials including the following:
 - 2. Semirefractory fiber (mineral wool) insulation.
 - 3. Joint fillers for joint sealants.
 - 4. Temporary forming materials.
 - 5. Substrate primers.
- C. Applications: Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.

2.2 FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS

- A. Intumescent, Latex Sealant: Single-component, intumescent, latex formulation.
- B. Intumescent Putty: Non-hardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.
- C. Silicone Foam: Two-component, silicone-based liquid elastomer that, when mixed, expands and cures in place to produce a flexible, non-shrinking foam.
- D. Silicone Sealant: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealant of grade indicated below:
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping/ gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.

2.3 MIXING

- A. For those products requiring mixing prior to application, comply with firestopping manufacturer's directions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce firestopping products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:
 - 1. Remove all foreign material from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.
 - 2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form release agents from concrete.
- B. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing firestopping's seal with substrates.
- D. General: Comply with the "System Performance Requirements" article in Part 1 and the through-penetration firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.
- E. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

SNOW CREEK ES 2CR HVAC UPGRADES

- F. Install fill material for through-penetration firestop systems by proven techniques to produce the following results:
1. Completely fill voids and cavities formed by openings, forming materials, accessories and penetrating items.
 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.3 FIELD QUALITY CONTROL

- A. The Local Fire Marshall may examine completed firestopping to determine, in general, if it is being installed in compliance with requirements.
- B. Do not proceed to enclose firestopping with other construction until reports of examinations are issued.
- C. Where deficiencies are found, repair or replace firestopping so that it complies with requirements.

3.4 CLEANING

- A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.
- B. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction and operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to produce firestopping complying with specified requirements.

3.5 SYSTEM AND APPLICATION SCHEDULE*

Penetrating Item	Concrete or Approved Concrete Block	Gypsum Board Wall	Wood Floor/Ceiling
Plastic Pipe	CAJ2001(64) CAJ2002(64) CAJ2003(64) CAJ2004(64) CAJ2005(64) FA2001(64) CBK2002(182) FA2002(254) CAJ2027(394) CAJ2028(448) CAJ2029(448) CAJ2030(448)	WL2002(148) WL2003(148) WL2004(148) WL2005(148) WL1037(570) WL2031(570) WL8002(570) WL2032(572) WL2033(573)	FC2001(160) FC2002(167) FC2007(446) FC2008(451) FC2009(451)

SNOW CREEK ES 2CR HVAC UPGRADES

Metal Pipe	CAJ1001(49) CAJ7001(49) CAJ1002(63) CAJ1006(93) CAJ3005(93) CAJ5030(93) CAJ8001(93) FA1001(94) CAJ1007(95) CBJ1015(137) FB1002(138) FC2001(160) CAJ1021(176) CAJ1027(202) CBJ1020(233) CBJ3016(233) CBJ5004(233) CBJ8004(233) CBJ1021(234) CBJ3017(234) CBJ8005(234) CAJ1044(319) CAJ7003(319) WJ1010(321) CAJ1052(337) CAJ3031(337) CAJ1066(395) CAJ2044(395) CAJ5017(395) CAJ8013(395)	WL1001(147) WL1002(147) WL1003(147) WL5001(147) WL5002(147) WL1016(322) WL1017(328) WL3015(328) WL1036(569) WL1037(570) WL2031(570) WL8002(570)	FC1001(159) FC1002(169) FC7001(169) FC1006(453)
Insulated Metal Pipe	CAJ5001(91) CAJ5002(91) CAJ5003(91) CBJ5002(91) CBJ5003(91) FA1002(152) FA5001(152) FA8001(152) CAJ5005(203) CBJ1020(233) CBJ3016(233) CBJ5004(233) CBJ8004(233) CAJ1066(395) CAJ2044(395) CAJ5017(395) CAJ8013(395)	WL1001(147) WL1002(147) WL1003(147) WL5001(147) WL5002(147) WL5009(566) WL5010(567) WL5011(568)	FC5002(454)
Insulated Cable	CAJ3001(33) CAJ3002(65) FB3002(140) CAJ3014(171) CAJ3015(172) CAJ3021(204) CBJ1020(233)	WL3001(149) WL1017(328) WL3015(328) WL3030(571) WL2032(572) WL2033(573)	FC3001(168) FC3007(452) FC3008(452)

SNOW CREEK ES 2CR HVAC UPGRADES

	CBJ3016(233) CBJ5004(233) CBJ8004(233) CBJ1021(234) CBJ3017(234) CBJ8005(234) CAJ3030(320) CAJ1052(337) CAJ3031(337) CAJ3044(447) CAJ2028(447) CAJ2029(448) CAJ2030(448)		
Blank	CAJ0003(86) CAJ0004(92) CAJ0006(238) CAJ0007(280) CBJ0001(19) CBJ0003(36) CBJ0006(54)		
Construction Gap	J900B J900C U900J U900L		

* The test numbers listed in the schedule are taken from the Underwriters Laboratories, Inc., Fire Resistance Directory, Latest Edition

Old Underwriters Laboratories, Inc. Test system Numbers Indicated Thus ().

END OF SECTION 072700

SECTION 075000 - ROOFING SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. This section applies to all cutting and patching where existing roof is removed and replaced to accommodate support curbs for new mechanical equipment.

1.2 SUBMITTALS:

- A. Product Data: Submit specifications, installation instructions and general recommendations from manufacturers of membrane roofing system materials, for types of roofing required. Include data substantiating that materials comply with requirements. Include samples of insulation and roofing materials.

1.3 SPECIAL PROJECT WARRANTY:

- A. The Contractor shall provide standard manufacturer's total system warranty on the membrane roofing system for all new roofing and for points of overlap with the existing roofing, signed by an authorized representative of the membrane manufacturer; guaranteeing the roof materials against failures resulting from normal roof exposure, excluding unusual weather phenomena, failure of substrate, fire and abuse by traffic or other activities on the roof for the guarantee period as follows:
 - 1. Remainder of existing roof guarantee period. The roof at Snow Creek was replaced in January 2005 and the warranty expires in January of 2026.
 - 2. This guarantee shall cover both labor and materials necessary to effect watertightness, including that required to repair conditions caused by structural movement or standing water on the roof membrane, without limit as to the amount required to effect repairs.
- B. In addition to the above, furnish roofer's standard two year guarantee.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Both Schools: Fully Adhered EPDM membrane. Membrane shall be minimum 0.060 inch thick EPDM polymer shall match existing material. Flashing shall be minimum 0.060 EPDM. Roofing systems shall be manufactured by the following:
 - 1. Snow Creek Elementary School: Carlisle.

2.2 MISCELLANEOUS MATERIALS

- A. Sheet Seaming System: Manufacturer's standard materials for sealing lapped joints, including edge sealer to cover exposed spliced edges as recommended by manufacturer of membrane system.

SNOW CREEK ES 2CR HVAC UPGRADES

- B. Cant Strips: Tapered Edge Strips and Flashing Accessories: Types recommended by manufacturer of membrane material, provided at locations indicated and at locations recommended by manufacturer, including adhesive tapes, flashing cements, and sealants.
- C. Aggregate Surface Ballast: Washed, rounded, riverbed gravel or other acceptable smooth-faced stone ranging in size from 3/4" to 1-12" in diameter, which will withstand weather exposure without significant deterioration; white or near-white in color.
- D. Flashing and Sheet Metal Materials:
 - 1. Zinc-Coated Steel: Commercial quality with 0.20% copper, ASTM A525, G90 hot-dip galvanized, mill phosphatized where indicated for painting; 26 gage except as otherwise indicated.
 - 2. Aluminum: ASTM B209, alloy 3003, temper H14, clean anodized finish, 0.032" thick unless noted otherwise.
 - 3. Copper/Paper Flashing: 5 oz. copper sheet laminated between 2 sheets of bituminous impregnated creped Kraft paper or saturated fabric.
- E. Steel Roof Decking: Galvanized steel metal deck units, ASTM A446, Grade A, 1-1/2" deep, bonderized and painted, 22 gage, with 1/2" diameter fusion welds at structural supports and No. 8 machine screws between supports. Touch-up paint all welds and abrasions after thorough wire-brush cleaning.
- F. Insulation Materials:
 - 1. General: Provide insulating materials to match thickness and arrangement of existing surrounding insulation.
 - 2. Expanded Polystyrene Board Insulation: Rigid, cellular thermal insulation with closed cells, formed by the expansion of polystyrene base resin in a closed mold to comply with ASTM C578 for type indicated; with 5-year aged R-values of 4.25 and 3.92 at 40 and 75°F (4.4 and 23.9°C) respectively; and minimum density of 1.25 lb./cu. ft. and minimum compressive strength of 18 psi.
- G. Pipe Flashing: Flashing shall be cone-shaped EPDM specifically designed for flashing of insulated piping. Flashing shall have mechanical closure ring at top and shall be anchored to roof system in accordance with manufacturer's instructions.

PART 3 - EXECUTION

3.1 GENERAL

- A. Comply with roofing system manufacturer's instructions, except where more stringent requirements are indicated.

3.2 INSULATION INSTALLATION

- A. General: Extend insulation over entire surface to be insulated, cutting and fitting tightly around obstructions. Form cant strips, crickets, saddles, and tapered areas with additional material as required for proper drainage of membrane.
- B. Do not install more insulation each day than can be covered with membrane before end of day and before start of inclement weather.

3.3 MEMBRANE INSTALLATION

- A. Install membrane by unrolling over prepared substrate, fastening at perimeter and at roofing penetrations. Lap and band adjoining sheets as recommended by manufacturer, covering top edges of each sheet at seams with uniform fillet of sealant if recommended by manufacturer. Install flashings and counterflashings as shown and as recommended by manufacturer. Apply ballast course in uniform thickness at rate of 10 to 12 lbs. per square foot, spreading with care to minimize possibility of damage to membrane.

END OF SECTION 075000

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SECTION 079000 - SEALANTS AND CAULKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Furnish all materials, labor, equipment and services necessary to complete all sealant work including, but not limited to, the following:
 - 1. Interior of Building
 - a. All places where partitions or other materials join masonry walls.
 - b. All penetrations through rated walls.
 - c. All places as indicated on the drawings.

1.3 SUBMITTALS:

- A. Submit copies of manufacturer's literature for approval. Colors of all sealants and caulking shall be selected by the Engineer.

PART 2 - PRODUCTS:

2.1 MATERIALS:

- A. Sealant for interior use shall be one part non-sag acrylic latex. Sealant shall be paintable.
- B. One-part Fire Stopping Sealant: One part UL tested non-asbestos ceramic fiber based sealant formulated for use as part of a through-penetration fire-stop system (conforming to ASTM E84) for sealing openings around cables, conduit, pipes and similar penetrations.
- C. Use gun-grade sealant material of "standard" colors, selected by the Engineer to match surrounding materials as closely as possible. Submit color samples to the Engineer for approval.
- D. Use only joint fillers, bond-breaker tape and primers recommended by the sealant manufacturer.
- E. Backer Rods: Open-cell polyurethane material 20% larger than joint opening. Backer rods must be compatible with sealants.

PART 3 - EXECUTION:

3.1 GENERAL REQUIREMENTS

- A. Apply all sealant materials in strict accordance with the manufacturer's printed instruction, which becomes a part of this specification by reference. Should the specified sealant not be recommended by the manufacturer for the application detailed, contact the Engineer for instructions.
- B. Use only workmen thoroughly experienced in the use of sealant materials.
- C. In joints up to 1/2" wide, apply caulking of depth equal to the width. In wider joints, apply caulking of depth equal to half the width.

3.2 PREPARATION

- A. Before sealant material is applied, take care that all joints and spaces are dry, clean and free from dust, oil, grease or other foreign matter.
- B. Install joint filler as recommended by sealant manufacturer. In shallow joint, where there is insufficient depth to install joint filler, bond-breaker tape may be used.
- C. Prime concrete, masonry and wood surfaces as recommended by sealant manufacturer.

3.3 APPLICATION

- A. Apply sealant compound with a gun having the proper sized nozzle. Use sufficient pressure to fill all voids and joints solid. Superficial pointing of joints with a skin bead will not be accepted.
- B. Remove excess sealant and leave surfaces neat, smooth and clean. Upon completion, leave caulking with a smooth, even finish and all sealed joints completely watertight.
- C. Seal joints before final coat of paint is applied to adjacent surfaces. When approved by the Engineer, caulking adjacent to surfaces scheduled for painting may be furnished in a neutral color for field painting.

3.4 CLEAN-UP

- A. Remove excess caulking from adjacent surfaces and leave clean. Remove containers, rubbish and debris from the site.

END OF SECTION 079000

SECTION 092500 - GYPSUM WALLBOARD SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION

- A. The work under this section includes all labor, material, services, and equipment necessary to perform all gypsum wallboard work as required to complete the work in accordance with the drawings, schedules of finishes, and this specification.

1.3 RELATED WORK SPECIFIED ELSEWHERE:

- A. Caulking, Section 079000
- B. Painting, Section 099000

1.4 EXAMINATION AND ACCEPTANCE OF SURFACES

- A. Carefully examine all surfaces on which the work is to be installed, and make certain that all surfaces are in proper condition to receive materials.

1.5 HANDLING OF MATERIALS

- A. Deliver, store, and handle all materials so as to prevent inclusion of foreign materials, and damage by water or breakage. All materials showing evidence of damage will be rejected.

PART 2 - PRODUCTS:

2.1 ACCEPTABLE PUBLICATIONS

- A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.
 - 1. American Society for Testing and Materials
 - C36-75 Gypsum Wallboard
 - C514-84 Nails for the Application of Gypsum Wallboard
 - C475-64 (1975) Joint Treatment Materials for Gypsum Wallboard Construction
 - Latest Edition Underwriters' Laboratories, Inc. Fire Resistance Directory
 - 2. American National Standards Institute (ANSI)

2.2 GENERAL

- A. Except as otherwise indicated or specified, work shall conform to ANSI Standard A97.1. Gypsum wallboard of types for the work includes:
 - 1. Regular Gypsum Wallboard
- B. Cold Weather Protection: When ambient outdoor temperatures are below 55°F (13°C) maintain continuous, uniform, comfortable building working temperatures of not less than 55°F (13°C) for a minimum period of 48 hours prior to , during and following application of gypsum board and joint treatment materials or bonding of adhesives.
- C. Ventilation: Ventilate building spaces as required to remove water in excess of that required for drying of joint treatment material immediately after its application. Avoid drafts during dry, hot weather to prevent too rapid drying.

2.3 MATERIALS:

- A. Metal Studs: USG 22 gauge galvanized screw type with 1-1/4" flange. Use 20 gauge at door and opening jambs.
- B. Floor Runner and Ceiling Runner: USG 22 gauge galvanized except 20 gauge where 20 gauge studs are used.
- C. Adhesives shall be of types recommended by wallboard manufacturer for following uses: laminating, fastening.
- D. Embedding and Finishing Compound for joint and fastener concealment shall be mixed in accordance with manufacturer's printed instructions. Ready-mixed compounds may be used in lieu of job-mixed materials provided ready-mixed material is delivered to job site in original, unopened containers.
- E. Bolts, Expansion Shields and Toggle Bolts shall be approved types, suitable for use intended. Power-driven fasteners may be used only when approved in writing.
- F. Screws for wallboard attachment shall be shouldered, flathead design for use with special power-driven tools.
- G. Metal screws shall be not less than 1" long with self-tapping threads and self-drilling points. Screws 1-5/8" long shall be used for second ply attachment in two-ply application.
- H. Gypsum Wallboard shall conform to ASTM Specification C36, tapered edge, in thicknesses as indicated, equal to Gold Bond Products Div., National Gypsum Co., United States Gypsum or Georgia-Pacific Corp.
- I. Gypsum Wallboard 1/2" or 5/8" minimum thickness gypsum board, as required.
- J. Wallboard shall be supplied in 48" widths and in such lengths as will result in a minimum number of joints.

SNOW CREEK ES 2CR HVAC UPGRADES

- K. Metal Trim for wallboard shall be formed from zinc-coated steel not lighter than 0.0217 inch nominal thickness (26 gauge) and shall conform to ASTM Specification A526.
- L. Casing Beads shall be channel shaped with concealed wing not less than 7/8" wide and perforated for nailing and joint treatment or with combination metal and paper wings bonded together, not less than 1-1/2" wide and suitable for joint treatment.
- M. Reinforcing Tape shall be as recommended in writing by manufacturer of wallboard.

PART 3 - EXECUTION:

3.1 INSTALLATION

- A. Gypsum wallboard to be installed with long dimension perpendicular to studs.
- B. All ends and edges of all gypsum wallboard shall occur over nailing members, except that this is not required for treated joints at right angles to framing members in horizontal application. Maximum nail spacing at ends and edges and in field shall be 8" o.c. on walls. Nails shall not be placed less than 3/8 inches from edge of sheet.
- C. Fasten to steel framing members with power-driven screws, at least 3/8" from edges and ends of gypsum panel, to provide uniform dimple 1/32" deep. Screws to be as recommended by wallboard manufacturer.
- D. Install metal corner beads at external corners of drywall work.
- E. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed, and except where plastic trim is indicated. Provide type with face flange to receive joint compound except where semi-finishing type is indicated.
- F. Install L-type trim where work is tightly abutted to other work, and install special kerf-type where other work is kerfed to receive long leg of L-type trim. Install U-type trim where edge is exposed, revealed, gasketed, or sealant-filled.

3.2 JOINT SYSTEM

- A. Following completion of the drywall installation, install a joint system at all joints of drywall surfaces not concealed by other finish materials, including vertical corners, and wall-ceiling intersections.
- B. Joint system to be USG "Durabond" or approved equal, applied in 3 coats in strict accordance with manufacturer's installation recommendations.
- C. Temperature, moisture, ventilation and other application conditions shall be as recommended by manufacturer.

3.3 QUALITY OF WORK

- A. Wallboard finish must be applied by trained applicators. Execute workmanship in accordance with the best established trade practices, in strict accordance with the manufacturer's directions, and employ only competent workmen especially skilled in the work to be performed. No rough or unsightly work will be acceptable.

SNOW CREEK ES 2CR HVAC UPGRADES

- B. Protect walls, floors, and other adjacent work from damage during the installation of the work, and make good all damaged work at no expense to the owner.
- C. Install materials furnished under this section promptly when notified, and cause not delay in the work of others, nor in the completion of the building.

3.4 CLEAN-UP

- A. Clean up and remove all excess materials and debris from the site. Touch up satisfactorily all wall finishes damaged during construction.

END OF SECTION 092500

SECTION 095200 - ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and Division-1 Specification sections, apply to work of this section.

1.2 WORK INCLUDED

- A. Furnish and install all acoustical ceiling and acoustical tile, including metal suspension systems, mouldings, wire and fasteners, for new ceilings as indicated and as follows:
 - 1. Snow Creek Elementary School:
 - a. A complete new 2' x 2' acoustical ceiling in both classrooms. Both ceilings include a section of vertical bulkhead, constructed from the same materials, adjacent to the windows.
- B. See Electrical Drawings for ceiling layouts.

1.3 QUALITY ASSURANCE

- A. For actual fabrication and installation of suspended acoustical ceiling systems, use only personnel who are thoroughly trained and experienced in the fabrication and erection of the selected systems.

1.4 PRODUCT HANDLING

- A. Deliver materials to job sites in original sealed packages showing manufacturer's brand name, and part number.
- B. Store all materials in a dry and heated space. Protect all materials from other construction operations.
- C. Use all means necessary to protect suspended acoustical ceiling materials before, during and after installation, and to protect installed work and materials of other trades. In the event of damage, immediately make all repairs and replacements necessary to the Engineer's approval and at no additional cost to the Owner.

1.5 EXTRA MATERIALS

- A. At the completion of the project, leave the Owner with a minimum of 10% spare acoustical tiles in unopened and protected boxes.

SNOW CREEK ES 2CR HVAC UPGRADES

PART 2 - PRODUCTS:

2.1 GENERAL

- A. All acoustical tile and panels are to have a flame-spread rating of 0-25 (ASTM E-84).
- B. Furnish tiles and panels produced by one manufacturer only who is a member of AIMA.

2.2 ACOUSTICAL CEILING PANELS

- A. 24" x 24" x 5/8" lay-in panels, square edge, Radar Basic by USG Corporation.

2.3 SUSPENSION SYSTEM

- A. The Suspension System shall be an exposed inverted steel tee direct hung type system that meets the requirements of ASTM C635, latest edition, intermediate duty classification. Include wall angle and hold-down clips. All suspension members shall have baked-on white paint finish on all exposed surfaces and shall be 15/16" wide. Each runner shall be punched to allow cross members each 1'-0" on center.
- B. System is to consist of all wire, rod or strip hangers, wall angles, support "Ts", cross "Ts", clips, etc. as approved by the grid manufacturer and installed in accordance with the manufacturer's specifications.
- C. Furnish all required trim, moulding, materials, etc. to make a complete installation.

PART 3 - EXECUTION:

3.1 GENERAL

- A. The complete acoustical ceiling installation shall be in compliance with ASTM C636, latest edition.

3.2 SURFACE CONDITIONS

- A. Prior to all work of this section, carefully inspect the installed work of all other trades, and verify that all such work is complete to the point where this installation may properly begin.
- B. Coordinate ceiling grid layout with subcontractors for the purpose of symmetrically locating lighting fixtures, diffusers, grilles, speakers and/or other ceiling-mounted devices.
- C. Provide additional support for light fixtures which slip to or rest on ceiling grid. Install a minimum of 4 additional hanger wires or rods per fixture to ceiling grid to adequately support ceiling and related light fixtures, with at least 1 support near each corner of light fixture.
- D. Examine mechanical drawings to determine conflict, if any, with ductwork and other mechanical devices. Do not begin work in a given space until satisfied that ceiling

SNOW CREEK ES 2CR HVAC UPGRADES

installation will not conflict with other elements of building construction, including beams, lights, ducts, etc.

- E. Where conflict with ducts and other mechanical devices prohibits the use of the normal suspension method, provide additional black steel framing members to independently support the ceiling system.
- F. In the event of discrepancy, immediately notify the Engineer. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.3 INSTALLATION OF EXPOSED 'T' GRID

- A. Space hanger wires a maximum of 4' on centers along main runners.
- B. Suspend hangers only from concrete structural joists and beams. Use power driven or electrical driven eye pins to secure to concrete structure. Do not allow hangers to touch, or be suspended from, any mechanical or electrical equipment or supports.
- C. Accurately level all main runners. Space main runners a maximum of 4' on centers.
- D. Space cross "T" members and secure to main runners and wall angles.
- E. Securely anchor all wall angle members in place. Provide and install hold down clips for all ceiling boards as required by Code.
- F. Make all grid level within a tolerance of 1 in 500, and straight within a tolerance of 1 in 1000.

3.4 INSTALLATION OF ACOUSTICAL CEILING PANELS

- A. Install with all panels in alignment and exposed surfaces smooth and level. Fit pieces neatly to each other and to other surfaces. Cut all pieces neatly.
- B. Rest ceiling panels on the flanges of the inverted "Ts" with board units abutting surfaces and supported at walls by wall angles.
- C. Small pieces of tile are to be "clipped" into place.

3.5 CLEAN-UP

- A. Complete remove all fingerprints and traces of soil from the surfaces of grid and acoustical ceiling boards, using only those cleaning materials specifically recommended for the purpose by the manufacturers of the materials cleaned.

END OF SECTION 095200

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SECTION 099000 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and Division-1 Specification sections, apply to work of this section.

1.2 DESCRIPTION

- A. Perform all painting and painting patch/repair necessary for the completion of the project. Such work to include furnishing, applying and completing all painting finish, interior and exterior, as required to complete the finishing of the building surfaces, equipment, and structures furnished or reworked.
- B. The term "paint" specified in this section includes paints, enamels, sealers, fillers, emulsions and other coatings, whether used as prime, intermediate or finish coats.

1.3 RELATED WORK SPECIFIED ELSEWHERE:

- A. Shop priming and factory prefinishing as required on some, but not all of the items described in other specification sections.

1.4 QUALITY ASSURANCE

- A. Use only qualified journeyman painters for mixing and applying paint on exposed surfaces. In accepting or rejecting painting, no allowance will be made for lack of skill on the part of painters.

1.5 SUBMITTALS:

- A. Within 35 days after the award of the contract, and before any paint materials are delivered to the job site, submit to the Owner a complete list of all materials proposed to be furnished and installed under this section.
- B. This is not to be construed as permitting substitution of materials for those specified or approved for this work by the Owner.

1.6 PRODUCT HANDLING

- A. Deliver all paint materials to the job site in their original unopened containers, with all labels intact and legible at the time of use.
- B. Store only approved materials at the job site, in a suitable and designated area restricted to storage of paint materials and related equipment.
- C. Use all means necessary to insure the safe storage and use of paint materials, and prompt and safe disposal of waste.

SNOW CREEK ES 2CR HVAC UPGRADES

- D. Use all means necessary to protect paint materials before, during and after application, and to protect the installed work and materials of all other trades.
- E. In the event of damage, immediately make all repairs and replacements necessary to the Engineer's approval and at no additional cost to the Owner.

PART 2 - PRODUCTS:

2.1 MATERIALS:

- A. When possible, use only products of a single manufacturer for paint materials and coating systems for each type of service.
- B. Paint materials listed in this section, unless otherwise designated in the Painting Schedule, are the products of Pittsburgh Paints, and require no further approval as to manufacturer or catalog number.
- C. Equivalent products of Devoe, Sherwin-Williams, Benjamin Moore, or Pratt and Lambert may be used, subject to approval by the Owner.
- D. Equivalent products of other major paint manufacturers may be used subject to final approval by the Owner of the materials list.
- E. All paint materials and equipment are to be compatible in use; finish coats with prime coats, prime coats with surface to be coated, and all tools and equipment with coating to be applied. use only those thinners recommended for the painting product by the manufacturer of the material to be thinned.

PART 3 - EXECUTION:

3.1 SURFACE CONDITIONS

- A. Prior to the work of this section, carefully inspect installed work of all other trades and verify that all such surfaces are satisfactory to the point where painting application may properly begin.
- B. Verify that paint finishes may be applied in strict accordance with all pertinent codes, regulations and the requirements of this section.
- C. In the event of discrepancy, immediately notify the Owner. Do not proceed with painting in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 PREPARATION OF SURFACES - GENERAL

- A. Prior to all surface preparation and painting operations, completely mask, remove or otherwise adequately protect all hardware, accessories, machined surfaces, plates, lighting fixtures and similar items in contact with painted surfaces but not scheduled to receive paint.
- B. Spot prime all exposed nails and other metals that are to be painted with emulsion paints, using a primer recommended by the manufacturer of the coating system.

- C. Before applying paint or other surface treatment, thoroughly clean all surfaces involved.
- D. Schedule all cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly-painted surfaces.

3.3 PREPARATION OF WOOD SURFACES

- A. Clean all wood surfaces until they are free from dirt, oil and all other foreign substances.
- B. Unless specifically noted to be left rough, smooth all finished wood surfaces exposed to view, using the proper sandpaper. Where so required, use varying degrees of coarseness in sandpaper to produce uniformly smooth and unmarred wood surfaces.

3.4 PREPARATION OF METAL SURFACES

- A. Galvanized Metal: Clean all surfaces thoroughly with solvent until they are completely free from dirt, oil and grease. Thoroughly treat the cleaned surface with phosphoric acid etch. Remove all excess etching solution and allow to dry completely before applying paint.
- B. Other Metals: Thoroughly clean all surfaces until they are completely free from dirt, oil and grease. Allow to dry thoroughly before applying paint.
- C. Paint Application:
 - 1. Paint all surfaces except glass, masonry, flat concrete and similar items not pre-finished and not called out as unfinished.
 - 2. Paint all grilles and other pre-finished items where the factory pre-finish is not in accordance with the painting Schedule and color selection.
 - 3. Prime coats specified in this section will not be required on items delivered with acceptable prime or shop coats already applied.
 - 4. Allow sufficient drying time between coats. Modify the period as recommended by the material manufacturer to suit adverse weather conditions.
 - 5. Oil-base and oleo-resinous solvent-type paints are considered dry for re-coating when the paint feels firm, does not deform or feel sticky under moderate thumb pressure, and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.
 - 6. Comply with the manufacturer's recommendations as to environmental conditions under which the coating systems may be applied. Do not apply paint in areas where dust is being generated.
 - 7. Use a moisture meter approved by the Owner to test surfaces. Do not apply the initial coating until moisture meter reading is within the limits recommended by the paint materials manufacturer.
 - 8. Sand and dust between coats to remove all defects visible to the unaided eye from a distance of 5 feet.
 - 9. Slightly vary the color of succeeding coats.

3.5 MECHANICAL AND ELECTRICAL PAINTING

- A. Mechanical and electrical painting as specified in This Section applied to heating and ventilating equipment and plumbing and electrical systems. Do not paint work in concealed spaces unless otherwise specified.
- B. Paint duct work and exposed plumbing piping, etc., to match adjacent wall or ceiling surfaces, if on the surface. Otherwise, apply a semi-gloss finish as per the following schedule:
 - 1. Flat: First coat, proper metal primer for metal to be painted, if not factory primed. Second coat, and third coat, PPG Speedhide Alkyd Flat Enamel, #6-50.
 - 2. Semi-Gloss: First coat, proper metal primer for metal to be painted. Second and third coats, PPG Speedhide Lo-Sheen Enamel, #6-90.
 - 3. Exposed Non-conductive Covering: (On heating, ventilating, duct work, in finished areas only.) Two coats of PPG Speedhide Acrylic Latex Interior Flat, #6-70.
 - 4. Other Surfaces: (Including inside of ducts visible through registers, grilles or their openings.) One coat of PPG Flat Black Enamel #54-312.

3.6 REINSTALLATION OF REMOVED ITEMS

- A. Following completion of painting in each space, promptly reinstall all items removed for painting, using only workmen skilled in the particular trade.

3.7 FERROUS METALS

- A. All ferrous metals shall be thoroughly primed, regardless of location in construction.
- B. In addition, all exposed surfaces of all ferrous metals which are exposed and visible in finished rooms shall be painted in accordance with Painting Schedule below.

3.8 PAINTING SCHEDULE

- A. Apply the following finishes to areas and surfaces designated on the drawings or otherwise required to be finished or refinished due to installation of work in this contract:
 - 1. Finish Type 1 (All Ferrous Metals)
 - 1 Coat PPG Speedhide White Metal Primer (tinted) 6-212
 - 2 Coats PPG 54-Line (Q.D. Alkyd Gloss Enamel)
 - 2. Finish Type 2 (Gypsum Board and Plaster, Walls & Ceilings)
 - 1 Coat PPG Speedhide Q.D. Latex Sealer 6-2
 - 2 Coats PPG Satinhide Lo-Lustre Enamel 88 Line
 - 3. Finish Type 3 (Existing Concrete and Masonry)
 - 2 Coats - PPG Speedhide Flat Latex 6-70
- B. Match existing finishes in color, texture, and type when patch painting or restoring existing finishes.

3.9 CLEAN-UP

- A. During the progress of the work, do not allow accumulation of empty containers or other excess items except in areas specifically set aside for this purpose.
- B. Prevent accidental spilling of paint materials, and in the event of such a spill, immediately remove all spilled material and the waste or other equipment used to clean up the spill. Wash surfaces to their original undamaged condition, all at no additional cost to the Owner.
- C. Upon completion of this portion of the work, and prior to final inspection, visually inspect all surfaces, and remove all paint and traces of paint from surfaces not scheduled to be painted.

END OF SECTION 099000

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SNOW CREEK ES 2CR HVAC UPGRADES
SECTION 230010 - HVAC GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Work Included:
Every item of labor, materials, equipment and appurtenances for installing complete new Heating, Ventilating and Air Conditioning Systems included in Division 23 of the Specifications.

1.2 DRAWINGS

- A. The mechanical Drawings are diagrammatic in nature and show the general arrangement of all ductwork, piping, equipment and appurtenances and shall be followed as closely as actual building construction and the work of other trades will permit. Because of the small scale of the mechanical Drawings, it is not feasible to indicate all offsets, fittings and accessories that may be required. The Contractor shall investigate the construction conditions affecting the work and provide fittings and accessories as required to meet actual conditions.
- B. Where discrepancies in scope of work as to which Trade provides specific items, such as starters, disconnects, flow switches, electrical control components, etc. exist, such conflicts shall be reported to the Engineer. If such action is not taken, the Contractor, as applicable, shall furnish such items as part of his work, for complete and operable systems and equipment, as determined by the Engineer.

1.3 REGULATIONS AND STANDARDS

- A. The completed installation and all materials and equipment shall conform to local ordinances and codes, other regulations and standards listed herein or in related sections. These are intended as a minimum and shall be exceeded if required by the specifications or the Drawings. In the event of conflict between the codes, standards, or regulations, and information contained in the Contract Documents, the applicable code, standards, or regulation shall take precedence.
- B. Refer to Division 1 and Supplementary Instructions to Bidders for construction permitting requirements.

1.4 INSPECTION CERTIFICATES

- A. The Contractor shall furnish three copies of certificates of final acceptance to the Engineer from all inspection authorities having jurisdiction.

1.5 SUBSTANTIAL COMPLETION INSPECTION

- A. The Engineer will visit the site for the purpose of conducting a substantial completion inspection once the following items have been met by the Contractor:

SNOW CREEK ES 2CR HVAC UPGRADES

1. All HVAC systems shall be complete, operational and under automatic control.
 2. HVAC systems cleaning, balancing, and testing as described in Section 23 05 93 shall be complete and the final report shall be approved by the Engineer.
 3. Letters, signed by representatives of the manufacturer, for the air conditioning unit shall be provided attesting that their respective equipment has been started, tested, and set to operate safely and at the control points required as an integral part of the systems in which they are installed.
 4. A letter, signed by a representative of the temperature controls manufacturer as described in Section 23 09 00, shall be provided attesting that the installation of the temperature controls system is complete, proper control of all equipment, valves, dampers, and the like has been verified, set points have been established to provide proper control of installed equipment, and graphics are accurate with real time data.
 5. The Contractor shall provide certification from an authorized official of the equipment manufacturer(s) stating that all refrigerant piping as described in Section 23 20 00 and specialties have been installed in accordance with the manufacturer's recommendations.
 6. The noise and vibration control supplier as described in Section 23 05 48 shall provide a letter stating that all items have been installed properly and that all equipment is adequately isolated and/or restrained.
 7. The Contractor shall attest by letter that all equipment has been wired and tested to verify that the indicated sequence of motor control is established, that all safety controls function properly, that all motor protective devices are sized correctly, and that the systems are operating at the proper set points.
- B. All discrepancies noted in the substantial completion report shall be corrected prior to the final inspection. The Contractor shall provide a detailed item-by-item description of all corrections made for each item on the substantial completion discrepancy list prior to scheduling final inspection by the Engineer. Additional visits required after the final inspection, for the reason that previously documented discrepancies had not been corrected at the time of the final inspection, will be made at the Contractor's expense.

1.6 ASBESTOS

- A. Asbestos Free Materials: The intention of these Drawings and specifications is that there are no asbestos-containing materials installed on this project. To the best of the Architects and Engineers knowledge, none of the material or equipment specified herein or shown on the Drawings contains asbestos. The Contractor shall make every effort to prevent any asbestos materials from being installed in or used on the construction of the project. At the completion of the project, the Contractor shall certify by letter that to the best of his knowledge, no asbestos-containing materials were used for or in the construction of this project.
- B. Existing Materials:
1. Contractor shall review the Owners asbestos management plan to ensure suspected asbestos containing materials are under surveillance.
 2. Discovery: If during the construction of this project, work involving friable asbestos is suspected, or encountered, all work in this area shall be discontinued and the Owner or the Owner's representative, shall be notified immediately and the Owner with his own forces or by separate contract shall be responsible for complete investigation, removal, and disposition of the friable asbestos hazard in accordance with applicable laws and regulations. If the Contractor claims that

SNOW CREEK ES 2CR HVAC UPGRADES

delay or additional cost is involved because of such action by the Owner, he shall make such claim as provided elsewhere in the Contract Documents.

3. Removal: All work involving the removal of friable asbestos will be done under a separate contract.

1.7 MATERIALS AND WORKMANSHIP

- A. Equipment and material used in the project shall be new and undamaged. The mechanical installation shall fit into the space allotted and shall allow adequate and acceptable clearances for entry, servicing and maintenance. Similar types of equipment shall be the products of the same manufacturer unless specified otherwise. Work shall be performed by mechanics or tradesmen skilled in the trade involved.
- B. All ductwork, piping and conduit shall be installed in a neat and organized manner, parallel to other work and the nearest building elements, unless specifically shown otherwise on the Drawings.
- C. Equipment and materials shall be suitable for use in the environment in which they are installed. Equipment exposed to outside conditions shall be adequately protected from the weather, manufactured from materials suitable for outdoor use, and designed specifically for use in outdoor environments.

1.8 SUBMITTALS

- A. Submit shop drawings, product data and samples in accordance with Division 1 for all items as specified in related sections of these specifications. One (1) electronic (PDF) copy of the submittal shall be submitted. One (1) electronic (PDF) copy of the submittal will be returned to the Contractor. If additional copies are required, they will be the responsibility of the Contractor. Where drawings are submitted, the Contractor shall submit a minimum of two (2) sets of full scale prints. One (1) copy will be marked and returned to the Contractor, and the Contractor shall be responsible for all additional copies required for his use. All submittal data shall be correctly identified to show project name, and the exact model, style or size of item being submitted. Improperly identified submittals will not be reviewed by the Engineer. Each item submitted for review shall bear the Subcontractor's stamp which states that they have reviewed the submission, that it is complete, and that in their opinion it meets the contract requirements. Contractor's stamp shall identify the specification section, paragraph, and page number for which the submittal is being made. Shop drawings will be reviewed only for general compliance with the Contract Documents. Review will not include correctness of details, proper configuration, utility connections, dimensions, sizes, quantities, and the like. Any submission which has not been reviewed and stamped by the M/E Subcontractor will not be reviewed by the Engineer. No reviews prior to award of Contract will be considered or accepted. Re-submissions of shop drawings, product data and samples shall include the entire original submittal. **Partial submittals will not be reviewed by the Engineer.**
- B. Submissions will be stamped by the Engineer in one of the following ways:

"No Exceptions Taken"	No exceptions are taken and subject to compliance\ with the Contract Documents.
"Make Corrections Noted"	Minor corrections are noted and a re-submittal is not required subject to compliance with the corrections and the Contract Documents.

"Correct and Resubmit"	The submitted material, method or system meets the intent of the specifications, yet has insufficient data to determine compliance with the Contract Documents. Re-submittal is required.
"Rejected"	The submitted material, method or system does not meet the intent of the specifications, or has insufficient data to determine compliance with the Contract Documents.

C. Submission Procedures:

1. If a submission is satisfactory to the Engineer, the Engineer will annotate the submission, "No Exceptions Taken" or "Make Corrections Noted" and transmit the electronic copy to the Contractor. If a resubmission is required, the Engineer will annotate the submission "Correct and Resubmit" or "Rejected" and transmit the electronic copy to the Contractor for appropriate action.
2. The Contractor shall revise and resubmit submissions as required by the Engineer until submissions are acceptable to the Engineer.
3. Approval of a working and/or shop drawings by the Engineer will constitute acceptance of the subject matter for which the drawing was submitted and not for any other structure, material, equipment or appurtenances indicated as shown.
4. The Engineer's review of the Contractor's submissions shall in no way relieve the Contractor of any of his responsibilities under the Contract. An approval of a submission shall be interpreted to mean that the Engineer has no specific objections to the submitted material, subject to conformance with the Contract Documents.
5. Where as-built drawings, record drawings and specifications are available and when provided to the Contractor for use in performing the work, the Contractor shall verify the content of such drawings and specifications, the suitability of their use in performing the work and their accuracy for the purposes in which the Contractor intends to use any record or historical documents which may be obtained. In no case shall the Contractor assume that such documents reflect a true and accurate record of the construction. Acceptance of any such materials, records, and/or drawings shall in no way result in additional cost to the Owner should an error and/or omission in these documents result in additional costs to the Contractor.
6. When major equipment being submitted is a different manufacturer or model than the basis of design, the shop drawing shall include sketches of the proposed equipment and associated service clearances overlaid against other equipment and architectural features.
7. On the first pages of all submittals, the Contractor shall provide a table showing all individual specification section paragraphs and drawings that apply to the equipment/component and a statement for each paragraph and drawing that the requirements have been met. The table shall be similar in format to the following, but shall include all relevant specification paragraphs and drawings:

Section 23 07 00 (example)	
1.2 A	Comply
1.2 B	Comply

SNOW CREEK ES 2CR HVAC UPGRADES

1.3 A	Comply
1.3 B	Comply
1.3 C	Comply
1.4 A	Comply
1.4 A.1	Comply
1.4 A.2	Comply
Drawing M0.01	Comply

- D. Equivalents: Manufacturers, trade names, and model numbers indicated herein and on Drawings shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. Unless definitely stated otherwise and upon complying with Division 1, the Contractor may use any article which, in his judgment is equal to that specified and is accepted by the Engineer. Where three (3) or more manufacturers are named in the specifications for any item, the Contractor shall use one of the named manufacturers. No others will be reviewed or accepted. Manufacturers listed first in these specifications and on Drawings were used as a basis of design. It will be the responsibility of the Contractor to verify all connections, physical sizes, capacities, etc. of all other manufacturer's items, both named or proposed. If the equipment necessitates changes in ductwork, piping, wiring or other building systems from that indicated on the Drawings, the Contractor shall be responsible for all additional costs included and notify other trades. Where such changes are required, detail drawings indicating all required changes shall be submitted for review at the same time the manufacturers drawings are submitted for approval.
- E. Shop drawings, diagrams, catalog data and such other data necessary to fully describe and substantiate compliance with these specifications shall be submitted for all equipment and materials where specifically required by specification and all items identified with an [S] behind the product title. Submittals not required by the Contract Documents will not be reviewed.
- F. Operation and Maintenance manual(s) shall be submitted in accordance with Division 1 and shall include a complete product index in each volume, installation and maintenance data, sequence of controls, parts lists, a copy of all approved shop drawings and the name, address and telephone number of supplier or nearest representative. All mechanical devices, equipment and systems marked [O/M] in these specifications shall be included and all other such mechanical items that will require servicing before the duration of its useful life has been reached. Manual(s) shall be presented to the Engineer for review and transmittal to the Owner before final payment is recommended.

1.9 WARRANTY

- A. The Contractor shall provide a warranty for a period of one year for all work provided under the Contract to include, but not necessarily limited to, all systems, equipment, materials, and workmanship. This shall not be construed to limit any extended warranty periods of longer than one year for specific items or systems specified elsewhere in the Contract Documents.

SNOW CREEK ES 2CR HVAC UPGRADES

- B. The warranty period shall commence on the date of acceptance by the Owner and shall cover all parts and labor as required to fulfill the warranty at no cost to the Owner.
- C. Refer to Division 1 for additional warranty requirements.
- D. Information on all warranties shall be included in the O&M Manuals specified herein to be provided to the Owner.
- E. In phased construction, warranties shall not begin until substantial completion of the FINAL phase. Contractor shall maintain all new equipment and systems until that time. Owner will maintain all existing equipment and systems. Where new systems are connected to existing, the Contractor and Owner shall determine coordination of maintenance responsibilities at the preconstruction meeting.

1.10 EROSION AND SEDIMENT CONTROL

- A. Furnish all materials required by the Erosion and Sediment Control Plan and applicable provisions of the Commonwealth of Virginia's Erosion and Sediment Control Ordinance.
- B. Any control measure disturbed or modified by any days operation shall be repaired or replaced prior to leaving job site at end of each days operation.
- C. Upon completion of the work and when all permanent structures, seeding and other control measures are in place, remove all temporary control components.

1.11 SEEDING

- A. The work consists of providing seeding the Construction Site disturbed by excavation and backfilling for the installation of pipe lines.
- B. All disturbed areas shall receive sufficient top soil as required to support grass. Topsoil shall not be placed while in frozen or muddy condition.
- C. After the topsoil has been spread and approved, it shall be cleared of all surface trash, and other objects that would hinder maintenance of seeded areas. The Contractor shall machine rake or hand rake in small confined areas, all areas to be seeded, to provide a seed bed ready for fertilizing and seeding.
- D. Prior to planting seed, the areas shall be brought to proper finished grades and previously graded areas shall be repaired as necessary. Commercial fertilizer 10-10-10 shall be uniformly spread over the entire area at a rate of 1000 lbs. per acre. Work fertilizer into soil to depth of 3 inches by raking, tilling, or other approved methods.
- E. The Contractor shall use a fresh, clean, new crop grass seed to match the existing surrounding grass, as close as possible. Seed shall be uniformly sown at a rate as recommended for type seed used. After sowing, seed shall be lightly covered by means of harrowing or raking and then compacted by rolling. Mulch immediately with straw mulch at the rate of 2000 lbs. per acre.
- F. At the Contractor's option, seed, mulch and 10% of fertilizer may be applied by a hydro-seeding method. 90% of fertilizer shall be applied as hereinbefore specified. A letter stating the mix proportions, rate of application, application procedure to be followed, and previous qualifications of applier shall be sent to the Engineer for approval prior to doing the work.

SNOW CREEK ES 2CR HVAC UPGRADES

- G. The seeded areas shall be maintained for a period of two months after completion of seeding operations. Maintenance shall consist of providing protection against traffic, re-seeding, weeding, re-fertilizing, watering, and mowing as necessary to produce completely established grass. The Contractor shall do such replanting as required to establish a uniform stand of grass. The work under this area will be accepted only after a uniform stand of grass has been established, and in no case in less than 2 months after seeding.
- H. Seeding shall be done between March 15 and May 15 or August 15 and October 15 unless a supplemental irrigation system is used in summer months.

1.12 CUTTING AND PATCHING OF EXISTING PAVEMENT AND CONCRETE

- A. Pavement and concrete removed for trenching shall be saw cut before removal. All paving removed for trenches shall be restored to original condition with materials that match adjacent surfaces, as close as possible. The Contractor shall be responsible for any sinking of the backfill or pavement which may occur within one year from acceptance by the Owner.

1.13 EXISTING UNDERGROUND UTILITIES

- A. The location of underground utilities shown on the Drawings shall be considered approximate, and any locations may not be indicated or known. Care shall be exercised by the Contractor during construction to locate and protect the known and unknown utilities, and to prevent disrupting the affected utility. The Contractor shall be responsible for repairing damage to any utility caused by his work.
- B. Where any existing utilities are damaged, they shall be repaired as directed by the Engineer, with materials approved by the local utility company or the Owner, at no additional cost to the Owner.

1.14 VERIFYING MEASUREMENTS AND CONDITIONS

- A. The exactness of grades, elevations, dimensions, or locations given on the Drawings, is not guaranteed by the Engineer. The Contractor shall, therefore, satisfy himself as to the accuracy of all grades, elevations, dimensions and locations. In all cases of interconnection of his work with existing or other work, he shall verify at the site all dimensions relating to such existing or other work. Any errors due to the Contractor's failure to so verify all such grades, elevations, locations, or dimensions shall be promptly rectified by him without cost to Owner.
- B. The Contractor shall base his bid on site examinations performed by him. This requirement is mandatory. The Contractor shall visit the site of the proposed project where work is scheduled to be performed, visit the existing buildings scheduled to be renovated, inspect piping systems where new-to-existing connections shall be made, etc., and ascertain for himself the amount of work required to fulfill the intent of his Contract and the complexity of the installation. The Contractor shall not hold the Engineer, his Consultants, agents or employees responsible for or bound by, any schedule, estimate or for any plan thereof. The Contractor shall study all Contract Documents to determine exactly the extent of work to be provided under each Section, and in installing new equipment and systems and coordinating the work with the other Trades and existing conditions.

SNOW CREEK ES 2CR HVAC UPGRADES

1.15 INTERRUPTION OF UTILITY SERVICES

- A. It is necessary that close liaison be maintained with the Administrative Authorities in all matters affecting interruptions of any utility services serving the facility and existing buildings. Prior to interrupting any utility service, the Administrative Authorities shall be consulted and interruptions for connections made at a time (or times) suitable to the Administrative Authorities. Work shall be laid out and planned to limit the interruption times to a minimum.

1.16 COORDINATION OF WORK

- A. General: The Contract Documents indicate the extent and general arrangement of the mechanical systems. The Contractor shall be responsible for the coordination and proper relation of the mechanical work to the building structure and to the work of other trades. No additional compensation or extension of completion time will be granted for extra work caused by the lack of coordination.
- B. Cooperation: The Contractor shall provide dimensions and locations of all openings, shafts and similar items to the proper trades and install work as required so as not to interfere with, or delay, the building construction.
- C. Locations of lines and equipment shall be determined from actual field measurements. The outlines of the building shown on the mechanical Drawings are intended only as a guide to indicate relative locations of the mechanical work. Refer to architectural and structural Drawings for building construction details. The Contractor shall determine the exact routing and location of his systems prior to fabrication or installation of any system component. Accurate measurements and coordination shall be completed to verify dimensions and characteristics for the installation of each system.
- D. Unless necessitated by equipment access or otherwise indicated in the Contract Documents, all piping, ductwork, and conduit concealed above ceilings and in finished or utility spaces shall be routed as high as possible.
- E. Offsets, transitions and changes of direction in all systems shall be made as required to maintain proper headroom and pitch of sloping lines whether or not indicated on the drawings. The Contractor shall provide manual air vents and drains as required for his work to affect these offsets, transitions and changes in direction, as applicable.
- F. Cutting and Patching: Unless stated otherwise, the Mechanical Trade shall do all cutting necessary for the installation of his work. All work should be installed sufficiently in advance of new construction in order to permit installation of supports, sleeves, and similar items without cutting. Patching and repair work shall exactly match new and existing adjacent work in all respects and shall not be obvious as patching. Cutting which will in any way affect the building structure shall not be performed without permission of the Architect-Engineer. The Mechanical Trade is responsible for patching where he does cutting. Patching shall be done to the satisfaction of the Architect-Engineer.
- G. Roughing-In: Verify the locations of other buildings machines, door swings, block coursing, alignment of tile end and other similar features before roughing-in for mechanical equipment components and/or controls.
- H. Damage to Other Work: Each Contractor is responsible for damage to other work caused by his work or workmen. Repairing of damaged work shall be done by the Contractor who installed the work, and as directed by the Architect-Engineer; the cost of which shall be paid for by the Contractor responsible for the damage.

1.17 EQUIPMENT INSTALLATION

- A. General: Equipment shall be installed in accordance with manufacturer's instructions to conform with the details and application indicated. Where manufacturer's recommendations or installation instructions require options or accessories not specified, they shall be included and installed by the Contractor.
- B. Supports: Provide necessary supports for all equipment and appurtenances as required; this includes but is not limited to frames or supports for items such as tanks, compressors, boilers, plumbing fixtures, pumps, valves, fans, and other similar items requiring supports. Floor mounted equipment in Equipment Rooms shall be set on 4-inch high concrete foundation pads unless shown otherwise. All pads shall be poured such that the top of the pad is level. Foundation drawings, bolt setting information and foundation bolts shall be furnished by the subcontractors furnishing the equipment for all equipment required to have concrete foundations. Concrete for foundations shall be provided by mechanical subcontractor unless indicated otherwise. Except where indicated in Section 23 05 48, all equipment shall be anchored to concrete pads. Provide additional structural steel supports under air handlers where required to achieve correct elevation for cooling coil condensate drains. Structural supports shall be firmly anchored to concrete housekeeping pads. Air handler or vibration isolators shall be firmly anchored to structural supports. Rooftop equipment, ductwork, and piping shall be set on pre-manufactured curbs anchored to the roof and flashed into the roofing system. Rooftop equipment, ductwork, piping, etc. shall be anchored to the curb except where vibration isolation is installed between the curb and the equipment. Unless otherwise noted, outdoor equipment (on grade) shall be installed on 4-inch thick cast-in-place concrete equipment pads.
- C. Service Area: All equipment and appurtenances shall be located to permit adequate service clearance in accordance with manufacturer's recommendations and as otherwise required. Service clearance shall include but not be limited to service and removal of filters, coils, motors, controls and removal of equipment sections. Service clearance shall include adequate space for rodding and removing tubes from boilers, chillers, and heat exchangers. All piping, ductwork, and other equipment shall be located outside of the service area or shall be flanged for easy removal to facilitate equipment service. All equipment shall be located with sufficient distance from building features, structural components, and the equipment of other trades. Service clearance in front of electrical panels shall be minimum as required by National Electric Code (NEC) where applicable. Equipment requiring service and located above ceiling shall be located within two feet of the ceiling vertically to allow for proper maintenance access.
- D. Temporary Requirements: Temporary filters shall be provided for all fans that are operated during construction. Return openings, grilles, and registers shall be provided with temporary filters to prevent the intrusion of dust and particulate into the return air ductwork. Temporary filter shall have a minimum efficiency of MERV 8 in accordance with ASHRAE 52.2. Openings in equipment shall be kept plugged at all times until connection is made to the system. The ends of all pipes, ducts and equipment openings shall be kept plugged or capped properly with approved devices. Approved devices are items such as specially molded plastic caps, pipe plugs, test plugs and sheet metal caps.
- E. All equipment indicated to be installed exposed within finished spaces shall be installed such that all conduit, piping, and appurtenances are concealed. Air conditioning units utilizing gravity condensate drains shall be installed at an elevation necessary for the specified pipe slope.

SNOW CREEK ES 2CR HVAC UPGRADES

1.18 EXISTING EQUIPMENT

- A. General: Care shall be exercised to protect all existing equipment to be reused. The Contractor shall remove from operation all equipment that is shown to be reused and provide adequate protection including but not limited to prevention of corrosion, protection of seals, prevention of leaking, and prevention of internal/external contamination. All electronic components shall be protected from weather and moisture, deterioration and loss of programming.

1.19 SLEEVES AND INSERTS

- A. General: Sleeves and inserts shall be provided and correctly located in the structure, as require for the work.
- B. Inserts shall be steel and proper size for loads encountered.
- C. Sleeves shall be provided for all pipes passing through concrete or masonry walls, partitions, concrete beams or slabs installed during construction of the wall, partition, beam or slab. Sleeves through existing concrete walls and slabs may be omitted if wall or slab can be core drilled and properly sealed in a manner acceptable to the Engineer. Sleeves placed horizontally in walls or in any position in beams shall be standard weight ASTM A53 steel pipe of length equal to thickness of wall or beam. Those placed vertically in non-waterproof floors shall be 20 gauge galvanized sheet steel of length equal to thickness of slab, flared and nailed to the form, or fastened to reinforcing fabric and filled with sand during pouring to prevent deformation. Sleeves occurring in floors of rooms where hose bibs or floor drains occur, and in pipe spaces, shall be standard weight steel pipe projecting 2" above the finished floor except in Equipment Rooms they shall project four (4) inches above floor. Sleeves in floors with waterproof membrane shall be provided with flanges or flashing rings and shall be clamped or flashed into membrane. All sleeves (and core drilled openings) shall be of sufficient diameter to clear bare or covered pipes by 1/4" all around except sleeves on lines subject to movement by expansion which shall clear the bare pipe or insulation on insulated pipe at least one inch all around. Pipes through exterior walls below grade and above footings shall be installed in sleeves having a minimum size of two larger pipe diameters and sealed watertight with flexible synthetic rubber seals. Sleeve shall have anchor and water stop plate. The entire assembly shall be tightened and adjusted and made watertight. Sleeves for pipes and conduit, penetrating fire (and smoke) rated partitions, walls and floors shall be sealed in accordance with the terms of U.L. Listed Through-Penetration Firestop Systems XHEZ as published in the U.L. Fire Resistance Directory. Penetrations shall exactly conform to details of the Firestop System indicated for the type of partition, wall and floor construction encountered. All penetrations through nonfireresistance rated floor assemblies and through the ceiling membrane of nonfireresistance rated roof assemblies shall be fireblocked with tightly packed mineral-wool insulation secured in place. All penetrations through equipment room walls and other areas of noise or heat generation shall be tightly sealed with mineral fiber rope. All penetrations through draftstop partitions shall be sealed to maintain the integrity of the partition. All firestopping and draftstopping of sleeves for mechanical work shall be provided under Division 23.

1.20 ESCUTCHEONS

- A. Where pipes pass through floors, walls or ceilings in finished rooms, they shall be fitted with chromium plated escutcheons of suitable pattern to effectively cover the rough opening. Where sleeves project above floors, special deep type escutcheons shall be provided.

SNOW CREEK ES 2CR HVAC UPGRADES

1.21 ACCESS DOORS

- A. Provide for all concealed valves, controls, dampers, junction boxes, equipment, or any item requiring access. Doors shall be of sufficient size and so located that the concealed items may be serviced or completely removed and replaced. Doors required for Mechanical work shall be furnished as a part of this Division to the General Contractor for installation. The Mechanical Contractor shall provide locations of all access doors such that service may be safely performed from a ladder, lift, or platform without the need for support from the ceiling system. Doors in acoustic tile ceilings shall be furnished in multiples of tile sizes. Doors are not required in exposed grid type ceilings where tiles are removable. Doors shall be metal access doors with cam lock, style to match ceiling or wall construction. Doors occurring in rated construction shall be fire rated U.L. labeled access doors correlated to preserve the integrity of the rated construction. Doors leading to concealed spaces shall be provided with means to open from the inside. Doors shall be prime finish steel except those in toilets, shower rooms, locker rooms, kitchens and other similar areas shall be stainless steel with brushed finish.

1.22 ELECTRICAL WIRING AND EQUIPMENT

- A. Wiring, low voltage (100 volts or less) control wiring shall be provided as a part of Division 23 in strict accordance with Division 26 and shall be in accordance with manufacturer's recommendations to comply with the sequence of control indicated. Verify that wiring of all motors and controls required by equipment furnished is accomplished for the correct sequence of operation.
- B. Wiring, line voltage (101 volts or higher) power or control wiring shall be furnished and installed under Division 26.
- C. Disconnects shall be provided for each item of equipment under Division 26 unless specified otherwise in other sections.
- D. Miscellaneous manual or automatic control and protective or signal devices required for the sequence of operation indicated for mechanical equipment shall be provided under the section of the specifications where the item of equipment is specified unless indicated otherwise.

1.23 PROTECTION FROM MOVING PARTS

- A. Belts, pulleys, chains, gears, shafts, couplings and other rotating or moving parts located so that any person may come in close proximity thereto shall be fully enclosed or properly guarded.

1.24 RECORD OF UNDERGROUND LINES

- A. On completion of the project, the Contractor shall prepare and submit to the Engineer a drawing on tracing paper and one blue line print to show the location of any underground lines installed in locations different from those on the Architect-Engineer's Drawings. The location of cleanouts, and the distance from the building to outside sewers, mains, and manholes shall be dimensioned.

SNOW CREEK ES 2CR HVAC UPGRADES

1.25 CHARTS AND DIAGRAMS

- A. General: Material as listed below shall be provided by the Contractor and shall be mounted in separate hardwood frames where directed in the field or folded and stored in a plastic document folder and located in the control cabinets. All charts, diagrams and schemes shall be photographic positives prepared from original tracings. A copy of charts and diagrams shall be included with O/M manuals.
- B. Automatic Temperature Control Diagrams identified as to name, sequence of operation, location and number of systems. Components of a control system shall be identified as to location, function, temperature setting and manufacturer's part number.
- C. Electric Sequence Control Diagrams of entire Mechanical system.
- D. Charts for identification of valves.

1.26 INSTRUCTION OF OWNER'S REPRESENTATIVE

- A. Contractors shall instruct the representative of the Owner in the proper operation and maintenance of all elements of the Mechanical systems. Competent representatives of the Contractor shall spend such time as necessary to fully prepare the Owner to operate and maintain the Mechanical and Electrical systems.

1.27 CONSTRUCTION STATUS REPORT

- A. Each item of discrepancies noted on Construction Status Report prepared by the Engineer shall be answered in detail in writing by the Contractor before payment can be recommended.

1.28 GRAPHICS DATABASE

- A. This project's Computer Aided Design & Drafting (CADD) drawing files may be obtained through the Architect/Engineer for use in preparing computer graphics specific to this project. See Appendix A at the end of this Section for Letter of Indemnification and ordering instructions.

1.29 DEMOLITION

- A. Contractor shall visit site before bidding to determine extent of demolition.
- B. Removal of Ducts, Piping and Equipment: Remove all ductwork and piping connections, plugging outlets, etc., such that are not required for present equipment and fixtures, or are not reused or needed for reconnecting new equipment and fixtures. Remove all equipment, fixtures, etc., indicated to be removed, or not reused or needed after the renovations are complete.
- C. Where piping, conduit, ductwork or other similar items passing through rated assemblies are removed; the assemblies shall be patched in accordance with UL so as to maintain the integrity of the assembly.
- D. The Owner will select and retain such existing equipment and materials which are indicated to be removed and not reused, as he desires. All other existing equipment and materials indicated to be removed and not reused shall become the property of the

SNOW CREEK ES 2CR HVAC UPGRADES

Contractor, who shall promptly remove them from the premises. All existing equipment and fixtures indicated to be relocated shall be disconnected, removed, relocated and reconnected. All equipment and fixtures shall be protected from damage during demolition.

- E. Miscellaneous: In all altered portions of the buildings, the Contractor shall remove or alter as necessary all existing mechanical work that is not coordinated to operate with the new construction. Demolition shall not begin until the work schedule is approved by the owner. The work shall be scheduled to prevent any disruption to the normal operations of the building.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION 230010

**APPENDIX A
LETTER OF INDEMNIFICATION**

Project Name:

Project Location:

The Contractor may obtain from Ascent Engineering Group a CD-ROM or electronic mail version of the projects Revit / CADD database. All seals, details, schematics, tables, controls, etc. will be deleted. All drawings will be provided in Autocad™ 2014 format.

Ascent Engineering Group reserves all rights to the original drawing files.

The Recipient agrees, to the fullest extent permitted by the law, to hold harmless and indemnify Ascent Engineering Group, as defined in the Bid Documents, from and against all claims, liabilities, losses, damages, and costs, including but not limited to attorney's fees, arising out of or in any way connected with the use, modification, misinterpretation, misuse, or reuse by the Recipient or others of the machine readable information and data provided by Ascent Engineering Group under this Agreement. The foregoing indemnification applies, without limitation, to any use of the project documentation on other projects, for additions to this project, or for completion of this project by others, excepting only such use as may be authorized, in writing, by Ascent Engineering Group.

The electronic drawing files are not part of the Contract Documents for the Project. The Recipient assumes all risks associated with the use of the transmitted files. Ascent Engineering Group will not be responsible for any differences in the information included in the transmitted files and the information shown on the Contract Documents. Modifications to the Contract Documents made before or during construction may or may not be included in the transmitted electronic drawing files.

The Recipient further agrees that the drawing files will only be used in graphics preparation for the above-referenced project.

Company Name of Recipient: _____

Recipient's Designated Representative: _____

Title: _____

Signature: _____

Address: _____

Return to: Ascent Engineering Group
 5228 Valleypointe Parkway, Suite 4
 Roanoke, VA 24019
 AEG # 22270

SECTION 230100 - OPERATION AND MAINTENANCE OF HVAC SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Work Included:
 - 1. To aid the continued instruction of operating and maintenance personnel, and to provide a source of information regarding the products incorporated into the work, furnish and deliver the data described in this section and in pertinent other sections of these specifications.
- C. Related Sections:
 - 1. Section 23 00 10 – HVAC General Requirements
 - 2. Section 23 05 00 – Common Work Results for HVAC
 - 3. Section 23 20 00 – HVAC Piping and Pumps
 - 4. Section 23 30 00 – HVAC Air Distribution
 - 5. Section 23 70 00 – Central HVAC Equipment
 - 6. Section 23 80 00 – Decentralized HVAC Equipment

1.2 SUBMITTALS

- A. Unless otherwise directed in other sections, or in writing by the Engineer, submit three copies of the final manual to the Engineer for approval prior to indoctrination of operation and maintenance personnel.
- B. Operation and Maintenance manual(s) shall be submitted in accordance with Division 1 and shall include a complete product index in each volume, installation and maintenance data, sequence of controls, parts lists, a copy of all approved shop drawings and the name, address and telephone number of supplier or nearest representative. All mechanical devices, equipment and systems marked [O/M] in these specifications shall be included and all other such mechanical items that will require servicing before the duration of its useful life has been reached. Motor driven equipment shall include data for the motor. Manual(s) shall be presented to the Engineer for review and transmittal to the Owner before final payment is recommended.

1.3 QUALITY ASSURANCE

- A. In preparing data required by this section, use only personnel who are thoroughly trained and experienced in the operation and maintenance of the described items, completely familiar with the requirements of this section, and skilled communicating the essential data.

PART 2 - PRODUCTS

2.1 INSTRUCTION MANUALS

- A. Where instruction manuals are required to be submitted under other sections of these specifications, prepare in accordance with the provisions of this section.
- B. Format:
1. Hard Copy
 - a. Size: 8-1/2" x 11"
 - b. Paper: White bond, at least 20 lb. weight.
 - c. Text: Typed (Hand printed or written is not acceptable)
 - d. Drawings: 11" x 8-1/2" preferable; bind in with text; foldouts are acceptable; larger drawings are acceptable if folded to fit within the manual and provide a drawing pocket inside rear cover or bind in with text.
 - e. Fly Sheets: Separate each portion of the manual with neatly prepared Fly Sheets or tabbed index sheets briefly describing the contents of the ensuing portion. Fly sheets or index tabs may be in color.
 - f. Binding: Use heavy-duty plastic covers with binding mechanism concealed inside the manual; 3-ring binders are required. All binding is subject to the Engineer's approval.
 2. Electronic
 - a. All submission must be provided with a digital table of contents with linked bookmarks to allow for quick access to each section. Table of Contents shall be ordered by specification section.
 - b. All PDF's must be searchable utilizing the standard search function of a PDF viewer.
 - c. Where native PDF files are available from a vendor, those shall be used. Scanned versions of these documents are not acceptable.
 - d. Fly Sheets: Separate each portion of the manual with neatly prepared Fly Sheets briefly describing the contents of the ensuing portion. Fly sheets shall include the equipment type, applicable specification section, and address and telephone number of equipment supplier or nearest representative.
- C. Provide front and back covers for each manual, using durable plastic material approved by the A.E, and clearly identified on the front cover with at least the following information:

OPERATING AND MAINTENANCE INSTRUCTIONS

FOR

(Item/system name and description)

(Name and address of Contractor and sub-contractor)

(General subject of this manual)

(Name and address of Engineer)

(Engineer's approval and date approved)

- D. Contents:
- Neatly prepared and typewritten detailed table of contents.
 - Complete instructions regarding operation and maintenance of all equipment involved including lubrication, disassembly, and reassembly.
 - Complete nomenclature of all parts of all equipment.
 - Complete nomenclature and part number of all replaceable parts, name and address of nearest vendor, and all other data pertinent to procurement procedures.
 - Copy of all guarantees and warranties issued.
 - Manufacturer's bulletin, cuts, and descriptive data, where pertinent, clearly indicating the precise items included in this installation and deleting, or otherwise clearly indicating, all manufacturers' data with which this installation is not concerned.
 - Such other data as required in pertinent sections of these specifications.

PART 3 - EXECUTION

3.1 INSTRUCTION MANUALS

- A. Revisions:
1. Following the indoctrination and instruction of operation and maintenance personnel, review all proposed revisions of the Manual with the Engineer.

END OF SECTION 230100

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SECTION 230500 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Work Included:
 - 1. Common Motor Requirements for HVAC Equipment
 - 2. Variable Frequency Drives
 - 3. Hangers and Supports for HVAC Piping and Equipment
- C. Related Sections:
 - 1. Division 01 -- Commissioning
 - 2. Section 23 00 10 – HVAC General Requirements
 - 3. Section 23 05 48 – Vibration and Seismic Controls for HVAC Systems
 - 4. Section 23 05 53 – Identification for HVAC Piping and Equipment
 - 5. Section 23 05 93 – Testing, Adjusting and Balancing for HVAC
 - 6. Section 23 09 00 – Instrumentation and Control for HVAC
 - 7. Section 23 20 00 – HVAC Piping and Pumps
 - 8. Section 23 30 00 – HVAC Air Distribution
 - 9. Section 23 70 00 – Central HVAC Equipment
 - 10. Section 23 80 00 – Decentralized HVAC Equipment

1.2 REFERENCES

- A. General: The following standards or codes form a part of this specification to the extent indicated by the reference thereto.
- B. American Society of Mechanical Engineers (ASME):
- C. ASME 95 Boiler and Pressure Vessel Code
- D. B16.3 Malleable Iron Threaded Fittings
- E. B16.4 Cast Iron Threaded Fittings
- F. B31.9 Building Services Piping
- G. National Electrical Manufacturers Association (NEMA)
- H. Underwriters Laboratories, Inc. (UL)

SNOW CREEK ES 2CR HVAC UPGRADES

1.3 SUBMITTALS

- A. Submit shop drawings and product data in accordance with Division 1 and Section 23 00 10.
- B. Shop drawings, diagrams, catalog data and such other data necessary to fully describe and substantiate compliance with these specifications shall be submitted for all equipment and materials marked with notation set forth in Section 23 00 10.
- C. Operation and maintenance data shall be submitted in accordance with Division 1, for all items of equipment and materials marked with notation set forth in Section 23 01 00.

PART 2 - PRODUCTS

2.1 COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

- A. Motors shall be provided in place as an integral part of the driven equipment, ready for electrical connections. Motors shall be in accordance with NEMA Standards and of design suitable for the starting and running characteristics of the driven equipment. Motors over 5 HP shall be "premium" efficiency as defined by NEMA MG-1, latest edition.
- B. All three phase motors over 5 HP shall be provided with minimum power factor of 90%. Power factor correction capacitors shall be provided if required and shall be furnished to the electrical subcontractor for installation. Shop Drawing submittals for motors over 5 HP shall list efficiency and power factor. Unless specified otherwise, all motors shall have continuous duty classification, 40° Centigrade ambient temperature, shall have enclosure suitable for indicated application and shall be wound for 120 volt, single phase, 60 cycle current, except motors above 1/2 horsepower (unless indicated otherwise) shall be wound for 200V or 230V/460V as required by the secondary voltage specified for main service in Division 26. Each motor shall be selected and rated at the voltage indicated so that the driven load does not exceed the nameplate rating and service factor of the motor. All motors 460V/480V 20 HP and above and 208V/230V 10 HP and above shall be wound for wye-delta (6 or 12 lead) starting with capabilities of being wired for across-the-line starting.
- C. Motors for use with variable frequency drives (VFD) shall be wound for across-the-line type starting and shall be rated for "VFD-duty" or shall be Premium Efficiency type with Class F (1500 volt) insulation and thermal overload protection. Motors for VFD applications shall meet or exceed IEEE 519-1992. Motors for VFD applications shall have maximum 4:1 speed range corresponding to 60 Hz and 15 Hz. Power factor correction is not required when motor is used with VFD. Motors for VFD service shall be Inverter Duty Rated with internal shaft grounding to prevent common mode voltage (shaft current) bearing failures.
- D. Motor starters and motor protective switches shall be provided under Division 26 except where specified to be furnished specifically with the driven equipment. Accessories such as auxiliary contacts, hand-off-automatic switches, start-stop switches, pilot lights, control power transformers and other similar items shall be provided in or on the controllers as required by the control sequence indicated. Starting equipment, unless factory mounted on the equipment, shall be installed under Division 26.

2.2 VARIABLE FREQUENCY DRIVES [S] [O/M]:

- A. Variable Frequency Drives (VFD) shall convert primary power to adjustable voltage/frequency three phase AC power for stepless motor control from 5% to 105% of motor base speed. Units shall be pulse-width-modulation (PWM) type. Units shall be UL listed and suitable for installation in return air plenums, complete with Hand/Off/Auto switch, Run or Stop switch and display to indicate unit status, frequency and fault diagnostics. Unit shall have automatic soft restart after power outage, soft start/stop, and interface provisions for start/stop and control from the DDC system specified in Section 23 09 00 interconnections. Unit shall have all motor protective devices as required by NEC. Unit shall have line circuit breaker, bypass switch, motor thermal overload relay, phase-loss protection, ground-fault protection, harmonic compensated load side reactor and control transformer.
- B. All drives provided for the project shall be supplied by the same manufacturer, including those installed with equipment at the factory. The VFD shop drawing shall be inclusive of all drives on the project.
- C. Drives shall be suitable for operation without damage to the connected motor. Drives shall have multiple, adjustable deadbands across the entire speed range for operation of connected equipment without vibration. Units shall have display on each drive to indicate all faults and diagnostics.
- D. Drives shall be matched to driven motors in accordance with motor and drive manufacturers' recommendations.
- E. Drives shall be suitable for speed control by the DDC System specified in Section 23 09 00 using any of the following signals, 3-15 psi, 0-5 vdc, 0-10 vdc or 4-20 ma dc.
- F. Drives shall be provided with current sensing device to indicate abnormal conditions such as broken belt.
- G. Where wiring to the driven motor exceeds 150 feet or as otherwise recommended by the manufacturer, a load side drive filter shall be furnished and installed. Where drives have remote disconnects at the driven motor, a run contact shall be provided to stop the drive without harm if the remote disconnect is opened.
- H. Drives shall be installed in NEMA classified cabinets suitable for the location in which installed. Units located outdoors shall be NEMA 3R or NEMA 4.
- I. Harmonics: The drives provided shall not add significant voltage harmonic distortion to the electrical system. If voltage harmonic distortions exceed 5%, line reactors or isolation transformers shall be provided in a separate enclosure.
- J. VFD shall be provided with communication interface to allow two-way communication with the DDC System specified in Section 23 09 00.
- K. Warranty: Provide parts and labor warranty for a period of five (5) years.
- L. Installation and Start-up:
 - 1. The services of a qualified manufacturer's technical representative shall supervise the contractor's installation, testing, and start-up of all the drives furnished under this specification. A maximum total of one (1) supervision day (8 hours) shall be provided by the manufacturer's representative.

2. System start-up shall include a checkout of vibration at various frequencies through field observation and manufacturer's data on the driven equipment. Frequency deadbands shall be set-up for each point of equipment vibration.
3. Upon acceptance of the drive equipment, training of the operators shall consist of one (1) training day (8 hours).

2.3 HANGERS AND SUPPORTS FOR HVAC DUCTWORK, PIPING AND EQUIPMENT

- A. Suspended horizontal piping shall be supported by adjustable wrought steel clevis hangers except that straight runs of hot piping ($>100^{\circ}\text{F}$) with 40 ft. or more between anchor and expansion device shall be supported on roller type hangers or supports. See Section 23 07 00 for calcium silicate hanger inserts at clevis hangers. All piping connected to motor driven reciprocating or rotating equipment shall have vibration isolation hangers as specified in Section 23 05 48. Protection saddle, welded to pipe, shall be provided at each roller support except on chilled water lines, saddle shall be as specified in Section 23 07 00, vapor sealed. Where supports bear on copper pipe they shall be copper plated. Chain, strap or other makeshift devices will not be permitted as hangers of supports.
- B. Maximum pipe support spacing for steel piping shall be ten feet on center, copper and brass tubing 1-1/4" and smaller shall be supported six feet on center.
- C. Vertical steel piping shall be guided or supported in the center of each riser and not over 15 feet on center, copper or brass tubing shall be supported at not over 10 feet on center; and supported at the base of each riser and/or at the top of each riser as required by the piping run. All vertical piping shall be guided or braced where required to prevent lateral movement. Bracing shall include auxiliary stanchions where piping is not in close proximity to suitable structure.
- D. Refrigerant piping smaller than 3/4" shall be supported using B-Line Armafix clamps by Cooper Industries or equal.
- E. Rigid support sway bracing shall be provided at changes in direction greater than 45 degrees for all pipe 4 inches and larger.
- F. Pipe and suspended equipment hanger rods shall be attached to the top chord only on steel joists and beams by joist or beam clamps without welding. Welding of support rods and connection at any place other than the top chord will not be permitted unless written approval is granted by the Engineer and the Architect. C-clamp hangers shall be limited to 50 lb. or less when used at joists. Threaded rod shall be used through joist chords for loads greater than 50 lb.
- G. Pipe and suspended equipment supported from concrete structure shall be high-strength screw anchor and threaded rod system. Anchor shall be zinc plated, heat treated, carbon steel with integral flanged head to accept threaded rod. Anchor shall be selected to provide a minimum safety factor of 2 for the load to be supported and shall be approved for use in cracked and uncracked concrete applications. Anchor shall be Simpson Strong-Tie Titen HD or equal.
- H. Duct supports shall consist of not less than 1" by 1/16" galvanized strap iron hangers spaced not over 4 feet on center, except medium and high pressure flat-oval ducts wider than 48 inches shall be supported by trapeze angles. Straps shall be lapped across the bottom ducts a minimum of 1 inch. Ductwork shall be supported from the building structure. Ductwork shall not be supported from the ceiling system or any other building services. Heavy ductwork such as medium or high pressure duct

supported by hanger rods, shall be attached to the top chord only on steel joists and beams by joist or beam clamps without welding. Welding of support rods and connection at any place other than the top chord will not be permitted unless written approval is granted by the Engineer and the Architect. All ductwork shall be braced as required to prevent lateral movement.

- I. Where piping is to be installed on an existing roof, pipe supports shall be pre-manufactured rubber pedestal supports, manufactured specifically for mounting on top of existing roofing systems. Pedestals shall be minimum 2.5 inches high complete with galvanized steel slide channel attached to the base. Two ½ inch diameter threaded rods 10 inches in length shall attach a galvanized steel slide channel to the base channel with the pipe being secured by a rigid steel pipe clamp. The support height shall be adjustable to accommodating a sloping pipe. Rooftop support shall be equal to RTSPUCES Rooftop Support Systems manufactured by Eberl Iron Works, Inc.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's recommendations.
- B. Support riser piping independently from the connected horizontal piping.
- C. Hangers shall be spaced so that the supported load does not exceed the load recommended by the manufacturer. The supported load shall not overstress the building structural members. Where required hangers for the suspension of heavy items do not correspond with the building structural members, provide supplemental steel members fastened to the building structural members.
- D. Valves in horizontal lines shall be installed with stems horizontal or above. Flanged butterfly valves shall be provided with spacer or spool piece between valve and adjacent appurtenance. Isolation service valves shall be installed on each side of each major piece of equipment such as a heating coil, cooling coil, and other similar items; and at any other points indicated or required for draining, isolation or sectionalizing purposes. Control valves shall be installed in accordance with control manufacturer's recommendations.
- E. Install all thermometers and gages such that they can be easily readable standing on floor. Gages subject to vibration or physical damage shall be adequately supported and protected.
- F. Where pressure/temperature ports are indicated on the drawings, they shall be provided with full port gauge cocks that allow penetration of instrument probes.
- G. All outdoor water piping that does not contain glycol shall be provided with heat trace under insulation. All accessories shall be provided as necessary for a complete operating system.
- H. Butterfly valves in horizontal lines shall be installed with the stem horizontal.

END OF SECTION 230500

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SNOW CREEK ES 2CR HVAC UPGRADES

SECTION 230548 - VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Work Included:
 - 1. Vibration Isolators
 - 2. Inertia Bases
- C. Related Sections:
 - 1. Section 23 00 10 – HVAC General Requirements
 - 2. Section 23 20 00 – HVAC Piping and Pumps
 - 3. Section 23 30 00 – HVAC Air Distribution
 - 4. Section 23 70 00 – Central HVAC Equipment
 - 5. Section 23 80 00 – Decentralized HVAC Equipment
 - 6. Division 26 - Electrical

1.2 QUALITY ASSURANCE

- A. All vibration control apparatus shall be supplied by a single recognized manufacturer. The supplier of noise and vibration control equipment shall supervise, inspect and approve the installation of their equipment. The supplier shall submit a letter to the Engineer at the conclusion of the project stating that all items have been installed properly and that all equipment is adequately isolated.

1.3 SHOP DRAWINGS

- A. Submit shop drawings and product data in accordance with Division 1.
- B. Shop drawings, cuts, diagrams, catalog data sheets or such other data necessary to fully describe and substantiate compliance with the specifications shall be submitted for all vibration isolation equipment and materials. The Contractor shall submit drawings for review stating the static deflection, load capacity and location of the isolators, inertia slab dimensions and installation instructions.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Kinetics Noise Control, Vibration Mountings and Control, Inc., Vibration Eliminator Co., Mason Industries, Vibro-Acoustics or Amber/Booth Company.

SNOW CREEK ES 2CR HVAC UPGRADES

- B. Model numbers used in this specification are those of Kinetics Noise Control and are included to establish a standard of quality.

2.2 ISOLATOR TYPES

A. Floor Mounted Equipment:

1. Type S spring vibration isolators shall be free-standing, unhooused, laterally stabile, steel springs, wound using high strength heat treated spring alloy steel, and shall have a horizontal spring stiffness equal to or greater than 1.0 times the rated vertical spring stiffness. Springs shall be selected to provide the tabulated minimum operating static deflections and shall provide a 50% overload capacity before reaching a solid state. Springs shall be designed to reach a solid state before exceeding the spring steel fatigue point. Springs used to isolate floor mounted equipment shall include a drilled and tapped steel top load plate, and a steel bottom load plate bonded to a 1/4" thick ribbed neoprene noise stop pad. Each spring mount shall include a steel leveling bolt, locknuts, and washers for attachment to supported equipment. Type S units shall be Kinetics Model FDS. Springs shall have the following minimum outside diameters:

<u>Spring Deflection,</u>	<u>Rated Capacities, Lbs.</u>		
<u>Inches</u>	<u>Up to 370</u>	<u>371 to 1600</u>	<u>1601 to 11000</u>
Up to 1.5	1.75" dia.	3.00" dia.	3.00" dia.
1.51 to 2.25	3.50"	5.0"	5.0"

B. Suspended Equipment:

1. Type F hangers shall consist of an elastomer-in-shear isolator encased in a welded steel bracket. The elastomer shall be bonded to the hanger bracket and shall be selected to support the load within its published load rating. The hanger bracket shall be designed to carry a five (5) times overload without failure and allow up to 15° rod misalignment without short circuiting. Type F hanger shall be Kinetics Model RH.

2.3 BASE TYPES

- A. Type 8 bases shall be prefabricated extruded aluminum rail system using 1" deflection Type S free standing stabile springs and a continuous elastomeric air and water seal. All metal parts shall be non-corrosive or zinc plated. Each rail system shall be designed and sized specifically to fit the roof curb and the equipment proposed to receive the isolation rails. The upper portion of the equipment rail shall be designed to continuously support the weight of the equipment provided. Springs shall be spaced to provide a uniform 1" static deflection when equipment is mounted on the isolation rails. All rail sections shall be designed and arranged to shed water outward and shall be watertight. Type 8 bases shall be Kinetics Model KSR.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Equipment: All equipment listed hereinafter shall be isolated from the structure and fixed parts by means of resilient vibration and noise isolators. Isolators for floor and

SNOW CREEK ES 2CR HVAC UPGRADES

roof mounted equipment shall be solidly anchored to the support base or floor and to the supported equipment unless indicated otherwise.

- B. Piping and Conduit: All piping and electrical conduit connected to the air handling units, or other pieces of moving equipment which are isolated from the structure by spring type vibration isolators shall be isolated from these units by flexible pipe connectors and shall be suspended on isolation hangers to a point 10 feet away. Use Type 2 hangers for suspended piping, Type S mounts for floor mounted piping. Flexible pipe connectors are specified as part of the piping work.
- C. Ductwork: Flexible connections shall be incorporated in the ductwork adjacent to all air moving units as part of the sheet metal work. Ductwork shall be suspended on Type F hangers for a distance of 10 feet from these units, except isolators shall not be required beyond wall surrounding the equipment room.

3.2 MINIMUM VIBRATION ISOLATOR STATIC DEFLECTION

<u>Type of Equipment</u>	<u>Base Type</u>	<u>Isolator Type</u>	<u>Deflection, In.</u>
Rooftop Air Conditioning Units	8	S	1

END OF SECTION 230548

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SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Work Included:
 - 1. Identification of piping in exposed and accessible locations.
 - 2. Marking and designation of equipment.
- C. Work Not Included:
 - 1. Painting of ductwork, piping or equipment located on the building exterior.
 - 2. Painting of ductwork, piping or equipment exposed in finished areas other than those listed under WORK INCLUDED above.
 - 3. Painting of existing equipment, piping or ductwork.
- D. Related Sections:
 - 1. Section 09 90 00 – Painting and Coating
 - 2. Section 23 00 10 – HVAC General Requirements
 - 3. Section 23 05 00 – Common Work Results for HVAC
 - 4. Section 23 07 00 – HVAC Insulation
 - 5. Section 23 09 00 – Instrumentation and Control for HVAC
 - 6. Section 23 20 00 – HVAC Piping and Pumps
 - 7. Section 23 80 00 – Decentralized HVAC Equipment
 - 8. Division 26 - Electrical

1.2 REFERENCED STANDARDS:

- A. General: The following standards or codes (latest edition) form a part of this specification to the extent indicated by the reference thereto.
- B. American National Standards Institute (ANSI):
 - 1. ANSI A13.1 Scheme for Identification of Piping Systems
- C. American Society for Testing and Materials (ASTM):
 - 1. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
 - 2. ASTM C 411 Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation
- D. National Fire Protection Association (NFPA):

SNOW CREEK ES 2CR HVAC UPGRADES

1. Standard 255 Method of Test of Surface Burning Characteristics of Building Materials
- E. Underwriters Laboratories, Inc. (UL)
 1. Standard 723 Tests for Surface Burning Characteristics of Building Materials

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. Except as otherwise specified, materials shall be the products of the following manufacturers:
 1. Seton Identification Products

2.2 MATERIALS:

- A. Deliver all paints and materials to the project site in their unopened original containers with all labels intact and legible at the time of use.
- B. All coatings exposed to supply and return airstreams and where applied to exposed surfaces in a return air plenum, shall have a composite flame spread rating not exceeding 25, and a smoke developed rating not exceeding 50 as tested under procedure ASTM E-84-75, NFPA 255 and UL 723. Coatings shall not flame, glow, smolder or smoke when tested in accordance with ASTM C411, latest edition.
- C. Valve tags ([S]) shall be neat circular brass with designations stamped thereon, attached with solid brass jack chain to each valve stem or handle.
- D. Each item of equipment such as pumps, air handlers, etc., and equipment control devices such as motor starters, disconnect switches, etc. shall be properly marked with laminated engraved plastic nameplates ([S]) fastened with sheet metal screws, bolts or permanent adhesive. Pressure sensitive tape is not acceptable.
- E. All piping, insulated and uninsulated, shall be identified ([S]) with Seton Set-Mark or equal wrap around piping system markers and arrow flow directional marker. Markers shall be pre-coiled, semi-rigid plenum-rated plastic or polyester with sealed color graphics. Markers shall be minimum 12 inches long with 1-¼ inch high letters, formed to cover entire circumference of the pipe. Markers shall be attached to piping using plenum-rated plastic tie wraps. Pipe identification shall use the same designations or abbreviations used on the drawings. Marker colors shall be in accordance with ANSI.

PART 3 - EXECUTION

3.1 WORKMANSHIP:

- A. The work shall be accomplished by qualified mechanics skilled in the painting trade. Painting of equipment, piping, ductwork and other materials shall not commence until all testing is complete and systems are ready for operation. Materials shall be applied according to manufacturer's directions. All containers shall be securely closed when not in use. Flammable materials shall not be stored on premises. Flammable waste shall be disposed of daily in devices approved for such purposes. Materials shall be

SNOW CREEK ES 2CR HVAC UPGRADES

evenly spread, and smoothly flowed on without runs or sags. Each coat shall be thoroughly dry before application of succeeding coats.

3.2 PROTECTION OF WORK:

- A. The painters shall protect all adjacent surfaces with drop covers during the process of painting. Upon completion, paint spots, if any, shall be removed from all surfaces.

3.3 PREPARATION OF SURFACE:

- A. Surfaces to be painted shall be completely dry before applying paint. Metal surfaces shall be cleaned with mineral spirits before applying materials. Rust and scale shall be removed by wire brushing or sanding. Galvanized surfaces shall be chemically pretreated with crystalline (zinc phosphate) phosphate in strict accordance with the manufacturer's recommendations. Surfaces shall not be painted when the temperature is, or is likely to be, near the freezing point, nor when they are exposed to hot sun.

3.4 IDENTIFICATION OF PIPES AND EQUIPMENT:

- A. Equipment: After all other painting is completed, each major item of equipment shall be properly identified with nameplates. Identification symbols and designations shall be the same as shown on the Contract Documents.
- B. Apply piping system markers after completion of required insulation and finishes on piping systems. Markers shall be applied in the following locations and where identified by the Engineer:
 - 1. At each valve and at connection to equipment.
 - 2. At every tee and branch connection.
 - 3. At each riser including branch risers from mains.
 - 4. At each side of a pipe passage through floors, walls and partitions.
 - 5. Every 15 feet on straight runs of piping mains and branches.
 - 6. Within 6 feet of elbows (each side).
 - 7. At access doors or similar points that permit view of concealed piping.
 - 8. Markers shall be provided on all piping above lay-in ceilings.
 - 9. Provide arrow markers showing direction of flow incorporated into, or adjacent to, each piping system marker.
 - 10. Apply all piping system markers where view is unobstructed, and legends can be read and easily identified.
 - 11. Apply all tags and piping system markers in accordance with the supplier's instructions.

END OF SECTION 230553

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PART 1 - GENERAL

1.1 SUMMARY

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Work Included:
 - 1. Cleaning
 - 2. Adjusting and Balancing
- C. Related Sections:
 - 1. Section 23 00 10 – HVAC General Requirements
 - 2. Section 23 05 00 – Common Work Results for HVAC
 - 3. Section 23 07 00 – HVAC Insulation
 - 4. Section 23 09 00 – Instrumentation and Control for HVAC
 - 5. Section 23 20 00 – HVAC Piping and Pumps
 - 6. Section 23 30 00 – HVAC Air Distribution
 - 7. Section 23 70 00 – Central HVAC Equipment
 - 8. Section 23 80 00 – Decentralized HVAC Equipment

1.2 REFERENCES

- A. General: The following publications listed below, form a part of this specification to the extent indicated by the reference thereto.
- B. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA):
Balancing and Adjustment Manual
- C. Associated Air Balancing Council (AABC):
National Standards for Total System Balance
- D. National Environmental Balancing Bureau (NEBB):
Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

1.3 QUALIFICATIONS

- A. For the air conditioning, heating and ventilation systems the Contractor shall obtain the services of a qualified, independent testing organization specializing in total system air and water testing and balancing. The Contractor shall be responsible for making changes in pulleys, belts and dampers where necessary to obtain the required air volume as determined by the Testing and Balancing Contractor. The Testing and Balancing Contractor shall provide all labor, engineering and test equipment required

to adjust, test and balance all heating, ventilating, air conditioning and exhaust systems as hereinafter specified. All personnel involved in the execution of the work under the balancing contract shall be experienced and factory trained specifically in the total balancing of mechanical systems, as well as being regular employees of the Balancing Contractor. The Test and Balance Contractor shall work in close coordination with the Controls Contractor to ensure that the system is operating as designed and to aid in adjusting setpoints as necessary for proper system operation.

1.4 TAB COORDINATION AND RESPONSIBILITIES

A. The TAB Agent shall provide the following:

1. All instrumentation used in the course of testing and balancing shall be accurate and shall have been calibrated within the six months prior to commencing test and balance work for this project.
2. Where existing hydronic systems are to be renovated, the TAB Contractor shall provide a complete measurement of water flow for systems indicated to remain prior to any construction or demolition of existing systems. Data shall be provided as outlined for balancing data hereinafter. For hydronic systems, pump flow data for each system shall be provided as well as flow to each terminal device being modified, replaced, or removed. Any discrepancies in the data shall be reported to the Architect/Engineer prior to commencing any mechanical work. Where entire systems are being removed, pre-demo TAB is not required.
3. The TAB Agent shall conduct a pre-TAB inspection two weeks prior to commencing the test and balance. The TAB Agent shall notify the Contractor in writing of any deficiencies that would affect the ability to successfully complete the test and balance or result in an incomplete or unacceptable report.
4. During the course of the test and balance, the TAB Agent shall immediately notify the Contractor of any equipment or system discrepancies discovered that need to be corrected prior to the satisfactory completion of the test and balance procedures.
5. Equipment settings, including damper positions, valve positions, fan speed controls, and similar devices shall be marked to show final settings.

B. The Contractor shall provide the following:

1. Prior to the commencement of testing and balancing, the installation of building systems shall be fully complete. Building controls systems shall be complete, operational, and verified by the Contractor.
2. The Contractor shall resolve any discrepancies noted by the TAB Agent in the Pre-TAB Inspection prior to commencing the test and balance. The Contractor shall provide written confirmation of the corrective action that was taken to correct each deficiency.
3. The Contractor shall make available qualified personnel during the period in which the test and balance is being conducted for the purpose of problem resolution and controls support.
4. The Contractor shall resolve any deficiencies noted by the TAB Agent prior to the submission of the report and prior to any subsequent visits required by the TAB Agent.

SNOW CREEK ES 2CR HVAC UPGRADES

1.5 SUBMITTALS

- A. Prior to commencing work under this section, the Contractor shall submit the name of the testing organization, a proof of certification by the Associated Air Balance Council or National Environmental Balancing Bureau, and a list of five local projects on which testing and balancing has been completed for two years, for approval by the Architect/Engineer. The submittal shall include TAB procedures proposed for the systems specific to this project.
- B. Heating, Air Conditioning and Ventilation Systems Balance and Performance Data: At a time no later than the Substantial Completion Inspection, the Contractor shall provide the Architect/Engineer with two (2) typewritten copies of schedules containing air and water system balance and performance data.
- C. Equipment and System Verification: Letters, signed by representatives of air conditioning unit, and temperature control manufacturers, shall attest that their respective equipment installed on this project has been started, tested and set to operate safely and at the control points required as an integral part of the systems specified herein. The Contractor shall attest by letter that all equipment has been wired and tested to see that the indicated sequence of motor control is established, that all safety controls function properly, that all motor protective devices are sized correctly and that the systems are operating at the points set on the controls. The Engineers will not conduct a site visit for the purpose of determining the status of final payment until these letters are received.
- D. Test data shall be submitted for all equipment and systems where specifically required by this specification and all items identified with [TD] behind the product data.

1.6 CONDITIONS

- A. Partial Testing: As much as practical, systems shall be tested as complete systems. Tests on portions of a system will be permitted to facilitate proper progress scheduling. When systems are tested in segments, a system diagram indicating portion tested and a separate and complete report including the date of test is required for each segment.
- B. Concealed Work:
 - 1. All concealed work shall be tested and approved by the Architect/Engineer prior to the application of insulation or construction of chase walls.
 - 2. Covering shall not be applied to any piping nor shall any piping be concealed or covered until pipes have been tested, all leaks stopped, retested and approved.
- C. Work in Existing Buildings: Where new piping systems are connected to existing systems, test the new system prior to making connections to existing system. Connections to existing systems are not to be tested unless required by local authorities.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All equipment, instruments, materials and utilities required for cleaning, testing and balancing of the air and hydronic systems shall be provided by the Contractor.

SNOW CREEK ES 2CR HVAC UPGRADES

2.2 INSTRUMENTATION

- A. All instruments used by this Contractor shall be accurately calibrated and maintained in good working condition.

2.3 TESTS OF MATERIALS

- A. Manufacturers' certificates will be accepted in lieu of tests of materials. If individual laboratory tests are desired by the Architect-Engineer, they will be secured by this Contractor and paid for by the Owner.

PART 3 - EXECUTION

3.1 CLEANING

- A. Equipment shall be wiped clean to remove all dust, oil, dirt or paint spots. Trash, plaster, mortar or paint shall be removed from all coils, plenums and end pockets.
- B. Heating Piping, Cooling Piping, and Ductwork shall be thoroughly blown out or flushed and cleaned of all foreign matter before connections are made to equipment. Temporary bypasses shall be provided around coils, control valves, ice tanks, heat exchangers and other similar items to prevent trash from being flushed into these items. Care shall be taken at time of installation to prevent pipe compound, scale or other objectionable matter from entering the piping systems. Strainers shall be cleaned. After all construction dirt has been removed from the building, new filters shall be installed in all air units.

3.2 ADJUSTING AND BALANCING:

- A. Equipment: Before attempting to adjust and balance the air and water systems, the Contractor shall verify that the following items have been completed and are correct.
 - 1. Motor and bearings are properly lubricated.
 - 2. Direction of rotation of motors.
 - 3. Belt tension.
 - 4. Electric current flow in each phase of motors and electric heating elements.
 - 5. Motor protective devices are sized to properly protect installed motors.
 - 6. Thermostats, controls, accessories and other items requiring setting or adjustment shall be set as indicated.
- B. Air System Balancing Procedure:
 - 1. Place all related supply, exhaust and return air systems in operation with the fans running at design RPM.
 - 2. Establish system conditions for the maximum demand in airflow; generally, a cooling application. Variable volume systems shall be set and balanced such that the systems are operating at minimum static pressure necessary to maintain proper airflow at the terminal devices.
 - 3. Measure supply air volumes by means of the duct traverse method, making a minimum of sixteen (16) readings. Test holes shall be in straight duct as far as

possible downstream from elbows, takeoffs, dampers, etc. Seal duct access holes with metal snap-in plugs. The use of duct tape to seal access holes will not be permitted.

4. Adjust balancing dampers for required branch duct air quantities. Ducts with multiple branches shall have at least one branch with volume damper(s) completely open.
5. Adjust grilles and diffusers to within 10% of individual requirements specified, and also adjust so as to minimize drafts and sound in all areas. Restriction imposed by flow regulating devices in or at terminals shall be minimal. Final measurement of air quantity shall be made after optimum air pattern has been achieved.
6. The total air delivery in any particular fan system shall be obtained by adjustment of the particular fan speed. The drive motor of each fan shall not be loaded over the corrected full load amperage rating of the motor involved. Where belt drive fans are used in conjunction with VFD's, the fan speed shall be adjusted by changing pulleys such that fan speed to achieve design airflow occurs at 60 Hz.
7. Adjust quantity of air on each zone to the values given in the specifications and/or plans.
8. If the supply fan volume is not within plus or minus 5% of the design capacity at design RPM, determine the reason by reviewing all system conditions, procedures and recorded data. Check and record the air pressure drop across filters, coils, eliminators, sound traps, etc., to see if excessive loss is occurring. Particularly study duct and casing conditions at the fan inlet and outlet.
9. Any changes that are required for the final balancing results will be provided for by the respective Contractors who supplied and installed such equipment under their contractual obligations. Such changes may encompass, but are not necessarily restricted to, the changing of pulleys, belts, dampers or adding dampers or access holes.

3.3 BALANCE AND PERFORMANCE DATA REPORT [TD]:

- A. General: Each heating, ventilating and air conditioning system shall be operated and tested continuously for at least two consecutive days to verify that the system is operating satisfactorily and safely and that all equipment is producing the required capacity. To be successful, this test must be conducted with all controls in automatic position and all lights on or off to simulate day time or night time use of the building. Submit two typewritten copies of reports covering air and water system balance and performance. Reports must be received by the Architect-Engineer at least one week prior to the Contractor's request for a substantial completion inspection. Reports that contain deficiencies related to incomplete or improper system installation will be rejected by the Engineer without further review.
- B. Calibration Data: The report shall include a list of all instrumentation used and the date of the most recent calibration for each instrument.
- C. Balance Data: The following balance data shall be provided. Design and actual water and air flows shall be provided in tabular form.
 1. All Air Handling and Air Conditioning Equipment Used for Heating, Cooling and Ventilating:
 - a. System nomenclature and identification.

SNOW CREEK ES 2CR HVAC UPGRADES

- b. Nameplate information: Manufacturer, model and serial number, horsepower, rpm, voltage, phase, maximum amperage.
 - c. Fan speed.
 - d. Static pressure profile – reading between all components and total external static pressure.
 - e. Outside, return, and supply air quantities.
 - f. Actual running motor amperage.
 - g. For all VAV units, provide location of downstream static pressure sensor, set point (if applicable), and reading.
 2. Air Outlet and Inlet:
 - a. Room identification.
 - b. Manufacturer.
 - c. Size.
 - d. Free area factor.
 - e. Air quantity.
 - f. Velocity.
 - D. Performance Data: The following information shall be recorded twice each day and twice each night during the performance test. Reading shall be taken for each item at a different time each succeeding day at least two hours later than the time the reading was taken on the preceding day. Day and Night are defined as Occupied and Unoccupied per the BAS ventilation schedule.
 1. All Air Handling and Air Conditioning Equipment Used for Heating, Cooling and Ventilating (except for unit heaters, VAV boxes, and cabinet unit heaters):
 - a. System nomenclature and identification.
 - b. Dry bulb and wet bulb temperatures entering and leaving all coils.
 - c. Test all electric heating coils for operation at low airflow interlock.
 2. Space Pressurization:
 - a. Measure and record space pressurization in each Cafeteria with the associated kitchen hood both on and off.
 - b. Coordinate with Controls Contactor for damper adjustments to achieve space pressurization setpoint of 0.05" w.c. (adjustable).
 3. Temperature: Each Renovated Room in Building. Temperature measurements shall be taken with the Contractor's calibrated equipment. Trended data from the temperature control system is not acceptable.
 - E. Control Setting: During the performance and balance tests, control settings may require adjustment, and if so, shall be adjusted to produce the best balanced system operation. The final setting of each operating and safety control shall be recorded. This shall include, but not be limited to, thermostats, limit controls, damper position switches, firestats, freezestats, humidistats, aquastats and other similar items.
- 3.4 HVAC SYSTEMS FINAL TESTS:
- A. Upon completion of the work, in accordance with these drawings and specifications, the Contractor shall make a final test in the presence of the Architect-Engineer. With

all equipment energized and all controls in automatic position, the systems and equipment specified herein shall be proven to operate safely and to heat and cool the structure uniformly. If not, adjustments and corrections shall be made until satisfactory operation is achieved.

3.5 HVAC SYSTEM POST ACCEPTANCE TESTS:

- A. Should completion of the building occur at such time that the required performance test must be conducted and test data recorded and submitted during a season when both heating and cooling system performance cannot be checked, the Contractor shall perform the tests and record all such data as is available with system operating automatically under the prevailing weather conditions. That part of the system portion which cannot be recorded because of the prevailing weather shall be delayed until the weather is appropriate at which time the remaining part of the required tests shall be conducted and data recorded accordingly. Portions of the tests may not be delayed without written consent of the Engineer.

END OF SECTION 230593

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PART 1 - GENERAL

1.1 SUMMARY

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Work Included:
 - 1. Piping Insulation
 - 2. Ductwork Insulation
- C. Related Sections:
 - 1. Section 23 00 10 – HVAC General Requirements
 - 2. Section 23 05 00 – Common Work Results for HVAC
 - 3. Section 23 20 00 – HVAC Piping and Pumps
 - 4. Section 23 30 00 – HVAC Air Distribution
 - 5. Section 23 70 00 – Central HVAC Equipment
 - 6. Section 23 80 00 – Decentralized HVAC Equipment

1.2 SUBMITTALS:

- A. Submit shop drawings in accordance with Division 1 and Section 23 00 10.
- B. Submit shop drawings and catalog data for each type of material proposed for this project. Indicate thickness of material for individual services, and installation methods.

1.3 REFERENCES:

- A. General: The following standards or codes (latest edition) form a part of this specification to the extent indicated by the reference thereto.
- B. American Society for Testing and Materials (ASTM):
 - ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building materials.
 - ASTM C 411 Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation
- C. National Fire Protection Association (NFPA):
 - Standard 255 Method of Test of Surface Burning Characteristics of Building Materials
- D. Underwriters Laboratories, Inc. (UL)
 - Standard 723 Tests for Surface Burning Characteristics of Building Materials

PART 2 - PRODUCTS:

2.1 GENERAL

A. Acceptable Manufacturers:

1. Manville, Owens Corning, Armstrong, IMCOA, Knauff or Certain-Teed except where specific manufacturer is named.

B. All insulation materials, jackets and fitting covers shall have a composite flame spread rating not exceeding 25, and a smoke developed rating not exceeding 50 as tested under procedure ASTM E-84-75, NFPA 255 and UL 723. Duct coverings and linings shall not flame, glow, smolder or smoke when tested in accordance with ASTM C411.

2.2 MATERIALS

A. Piping:

1. Hot Water (100°-225°F): Fine heavy density fibrous glass, rigid phenolic foam or calcium silicate insulation with general purpose jacket, molded to conform to piping, 0.25 btu•in./sq.ft./°F/hr. maximum "K" value at 75°F.

B. Ductwork:

1. Round Ducts, Flat Oval Ducts and Concealed Rectangular Ducts: Flexible fibrous glass insulation, 1.0 lb. density, 0.27 btu•in./sq.ft./°F/hr. maximum "K" value at 75°F, with factory applied reinforced aluminum foil vapor barrier.
2. Acoustic Lining (where indicated and/or noted on Drawings): Fiberglass insulation, 0.26 btu•in./sq.ft./°F/hr. maximum "K" value at 75°F, absolute roughness of exposed surface shall not exceed 0.005 ft., coated to prevent erosion at air velocities up to 2000 fpm, 1.5 lbs/cu.ft. minimum density. Noise reduction co-efficient shall average not less than 0.60 when tested by Acoustical Material Association procedure mounting 6. Liner shall be provided with EPA approved biocide in the erosion coating to protect against microbial growth. Liner shall meet or exceed requirements of ASTM G21 (fungi resistance) and ASTM G22 (bacterial resistance). Acoustic lining shall be one inch thick unless specifically noted otherwise.

C. Sealants, Mastics and Adhesives: Products either manufactured by or recommended by the insulation material manufacturer.

PART 3 - EXECUTION:

3.1 PREPARATION

A. Do not install insulation before piping and equipment have been tested and approved.

B. Ensure surface is clean and dry prior to installation. Ensure insulation material is undamaged and dry before application. Finish with system at operating conditions and temperature.

3.2 INSTALLATION

- A. General: Ensure insulation is continuous through inside walls and partitions. Insulated piping passing through smoke partitions, fire walls, fire partitions, and fire rated floors shall have insulation of type, thickness and density to match U.L. Through-Penetration Firestop Systems as specified in Section 23 00 10 under Sleeves and Inserts. Insulated piping passing through nonfireresistance rated floors shall be fireblocked as specified in Section 23 00 10 under Sleeves and Inserts. Insulated ducts passing through smoke partitions and fire rated assemblies where a fire damper is not required shall be insulated with calcium silicate for a length equal to twice the thickness of the wall with all voids between the sleeve and duct insulation tightly packed with mineral-wool insulation or U.L. approved packing with sealant. All penetrations through equipment room walls and other areas of noise or heat generation shall be tightly sealed with mineral fiber rope. Finish insulation neatly at hangers, supports and other protrusions.

B. Piping:

1. General:

- a. All fiberglass pipe insulation shall be secured with outward clinching stainless steel staples and sealer.

Fittings and valves shall be insulated and jacketed with the same material as the adjacent piping or it may be finished with a smooth coat of approved insulating cement and jacketed with an approved recovering cloth and vapor sealed. Where PVC fitting covers are used, insulation shall be wrapped tightly using sufficient quantities to prevent deformation of covers.

OR

Use mitered segments of insulation on elbows and oversized insulation on valves and tees coated with two coats of vapor barrier mastic, reinforced with glass fabric extending two inches onto adjacent pipes, and same diameter as adjoining covering. No plastic materials on fittings will be allowed.

- b. Mitering of straight pipe insulation to form elbows will not be acceptable or allowed.
- c. All jacket joints and seams shall be lapped not less than 2".
- d. Insulation exposed to weather shall be covered with minimum 0.016 aluminum jacket with all joints sealed weather-tight.
- e. Insulation at pipe hangers shall be as follows:

- 1) Hot Water Piping: H-Block Pipe Support insulation as manufactured by ICA Insulation. Supports shall be pre-formed sections of molded fiberglass, minimum 12" long, quantity as suggested by the manufacturer for a given pipe size. Insulation shall be ASTM E84 25/50 rated and shall have a service temperature rating of -120°F to +1000°F. Supports shall have a minimum density of 18 lb. cu./ft. and a maximum "k" value of .30. Pipe hangers shall be oversized to enclose pipe and insulation. Provide sheet metal saddle between hanger and insulated pipe. Supports shall be placed between the bottom of the pipe to be supported and the metal shield. On pipe sizes above 5" IPS, supports should be oriented along the bottom 60° arc of the system. The thickness of the support should be the same thickness as the insulation system.

2. Hot Piping:

- a. Insulation shall be terminated neatly at unions, flanges, and valves. All exposed edges of insulation materials shall be sealed.
- b. Where heating coils are located downstream from cooling coils and at variable air volume units, piping shall be insulated continuously up to the coil. Insulation shall be vapor sealed and installed as specified for cold piping for a distance of 5 feet from the coil. All punctures in jacket shall be sealed.

C. Ductwork:

1. External:

- a. Rigid duct insulation shall be secured to rectangular ducts with mechanical fasteners such as metal stick clips or cupped head weld pins located a maximum of 3" from each edge and spaced a maximum of 12" on center each way. All insulation joints shall be tightly butted. All joints, voids and punctures in facing shall be sealed vapor tight with pressure sensitive foil tape and mastic.
 - b. Flexible duct insulation shall be provided with a minimum 2" facing flap overlapping adjacent and connecting insulation. Seams shall be stapled approximately 6" on center with 1/2" outward clinching staples. Where rectangular ducts are 24" in width or greater, insulation shall be secured to the bottom of the duct with mechanical fasteners to prevent sagging. All insulation joints shall be tightly butted. All joints, voids and punctures in facing shall be sealed vapor tight with mastic.
2. Internal: The lining shall be applied to cut-to-size pieces fastened to the entire interior of the duct with mastic, stick clips and speed washers. Edges and joints shall be coated with fire resistant mastic. External duct insulation is not required on ducts with internal lining unless noted otherwise.
 3. Ductwork exposed to outside conditions shall be insulated as specified herein and covered with minimum .025 inch thick aluminum jacket with seams lapped a minimum 3", sealed with silicon caulk. Covers shall be neatly finished and completely watertight.
 4. Where duct mounted heating coils are located downstream from cooling coils and at variable air volume terminal units the coil shall be provided with vapor-sealed external duct insulation on sides, top and bottom.
 5. Where ductwork is indicated to have internal acoustic lining, sheet metal drops to diffuser and register necks shall be unlined and shall be externally insulated.
 6. The top of all diffusers shall be insulated to cover the entire top surface area, including flex duct transitions, and vapor sealed.

D. Damaged Insulation: All existing thermal coverings that are removed or damaged during construction shall be replaced or repaired to not less than original condition. Repaired sections shall provide equal or better thermal performance and vapor protection.

E. Patching: Where existing control, monitoring or other penetrating devices are removed from ductwork or piping, the insulation shall be patched to match thickness, type and finish of existing insulation.

SNOW CREEK ES 2CR HVAC UPGRADES

3.3 INSULATION THICKNESS SCHEDULE

A. Piping:

<u>Type</u>	<u>Size, Inches</u>	<u>Insulation Thickness, Inches</u>
Heating Water	1-1/4" and Under	1-1/2
	1-1/2" and Over	2

B. Ductwork:

<u>Type</u>	<u>Insulation Thickness Inches, External</u>
Supply (Heating and Cooling)	1-1/2

END OF SECTION 230700

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SECTION 230900 - INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section.
- B. Work Included:
 - 1. Incorporation of new systems into existing System of Automatic Controls
 - 2. Electric Appurtenances
 - 3. Direct Digital Controls (DDC)
- C. Related Sections:
 - 1. Section 23 00 10 – HVAC General Requirements
 - 2. Section 23 01 00 – Operation and Maintenance of HVAC Systems
 - 3. Section 23 05 00 – Common Work Results for HVAC
 - 4. Section 23 05 53 – Identification for HVAC Piping and Equipment
 - 5. Section 23 05 93 – Testing, Adjusting, and Balancing for HVAC
 - 6. Section 23 09 93 – Sequence of Operations for HVAC Controls
 - 7. Section 23 20 00 – HVAC Piping and Pumps
 - 8. Section 23 30 00 – HVAC Air Distribution
 - 9. Section 23 70 00 – Central HVAC Equipment
 - 10. Section 23 80 00 – Decentralized HVAC Equipment
 - 11. Division 26 - Electrical

1.2 SUBMITTALS:

- A. Submit shop drawings and product data in accordance with Division 1 and Section 23 00 10.
- B. Provide complete shop drawings, catalog data sheets and such other data necessary to fully describe and substantiate compliance with these specifications for all control items and systems included in this section.
- C. Shop drawings shall indicate the exact location(s) of the outdoor temperature sensor(s).
- D. Operation and maintenance data shall be submitted in accordance with Division 1, for all items of equipment and materials indicated in this Section.
- E. Application Software Documentation: Contractor shall provide a blueprint documentation of the software application program for each stand-alone digital controller. Documentation shall include block software flowchart showing the

interconnection between each of the control algorithms and sequences. A program listing shall be printed on the same blueprint, along with the program flowchart, and description of the sequence of operation. This blueprint shall be stored and maintained in each stand-alone digital controller. System acceptance shall not be completed until this documentation is provided and located in each panel.

1.3 QUALITY ASSURANCE:

- A. When all temperature controls have been installed, the temperature control contractor shall completely commission the system to verify that all systems and components are operating in accordance with the specifications. Where corrections or adjustments to the controlled equipment are required, the temperature control contractor shall document such changes to the Contractor, and recheck the control system once the changes have been made.
 - 1. All equipment and subsystems shall be operated through all specified modes of control and sequences of operation, including full load and part load conditions.
 - 2. All physical valve and damper positions shall be visually verified to correspond with the positions indicated by the controls software.
 - 3. All instrumentation shall be properly calibrated.
- B. Final point-to-point check-out and commissioning of the Temperature Control System shall be by the temperature control manufacturer or its exclusive authorized representative.
- C. At the completion of this project, the Contractor shall submit a letter to the Engineer stating that all controls have been installed as specified, that each system has been calibrated and that each system is operating in a safe and efficient manner. Included with the letter, the Contractor shall provide a printout of all status control and monitoring points for a 48-hour period at 4-hour intervals, one printout of each type report available, and a copy of the completed start-up checklist used by the technician during system verification.

1.4 SCOPE OF WORK:

- A. Furnish and install complete direct digital temperature control systems (DDC) integration. The direct digital control system shall be comprised of a network of various independent, stand-alone digital controllers, together with Centralized Control Stations, and Centralized Host Stations as specified to provide centralized access and facility wide control functions. The stand-alone digital controllers shall be interconnected in a communicating network to provide facility wide access and sharing of information. A Local Area Network (LAN) shall be provided to interconnect the stand-alone digital controllers for high-speed data transmission within each building.
 - 1. The Temperature Controls Subcontractor shall provide technical support for the Testing and Balancing Subcontractor. The technicians shall be fully qualified in all aspects of the system and shall have extensive knowledge of the project. Support shall include, but not be limited to the following:
 - 2. Assistance in determining hydronic and air systems pressure setpoints.
 - 3. Assistance in determining proper automatic damper positions for all air handling units, air conditioning units, and VAV units.
 - 4. Simulating conditions as necessary for proper and optimized testing and balancing of the air and hydronic systems.

SNOW CREEK ES 2CR HVAC UPGRADES

- B. Programming shall be provided in accordance with commonly accepted industry standards and practices to ensure proper and efficient control of all equipment and systems. Where ASDC's with factory programming are not capable of operating systems in the sequence described herein, the Contractor shall provide a digital controller with custom programming.
- C. Programming shall be provided to accomplish the sequence of operations as described in Section 23 09 93. Changes to the operational sequences shall be made only with written approval from the Engineer.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

- A. Component parts of this system shall be manufactured by Trane. Trane is used as basis of design.
- B. Installation shall be by qualified employees or authorized representative of the temperature control manufacturer. Temperature control work by independent contractors performing work without direct supervision from the authorized representative will not be accepted.

2.2 SYSTEM REQUIREMENTS:

- A. The system shall be a complete system of automatic temperature regulation of the DDC type with electric and electronic accessories and components as indicated. The system shall be as required to upgrade the Owner's existing operating and control systems.
- B. The software shall not require any licensing fees or annual fees. The host must be able to support a minimum of 50 simultaneous users with the ability to expand the system to accommodate an unlimited number of users.
- C. All control items except thermostats, sensors and transmitters located in rooms shall be properly identified with engraved plastic nameplates permanently attached.
- D. Room thermostat, sensor and transmitter locations shall be coordinated to align vertically or horizontally with adjacent light switches or control instruments. Room thermostats and sensors shall be mounted with bottom 5'-4" above the floor.
- E. All components and materials shall be UL or ASTM rated for use in air plenums.

2.3 MATERIALS:

- A. Sensors, Transmitters and Thermostats:
 - 1. Temperature sensors for the Direct Digital Control (DDC) System shall be precision RTD's or thermistor. Accuracy shall be plus or minus 1 degree F over the entire control range. Sensors for pipe applications shall be immersion type, provided with pipe well. Sensors for duct application shall be of the averaging type, with a 5 foot or a 22 foot length element. Duct element length shall be adequate to serpentine across the entire duct area. Where sensors are located downstream of fans or at least 10 duct diameters downstream of coils, elbows,

junctions, or dampers, single point sensors may be used. Outdoor temperature sensors shall be provided with sunshield of copper or painted aluminum on a northern exposure. Space temperature sensors shall be compatible with unit controller and shall be provided in a decorative metal or plastic enclosure. Sensors located in gymnasiums or multi-purpose rooms shall be provided with heavy-duty wire guards. Sensors located in public spaces such as corridors and public toilets shall be recessed type with flush mounted stainless steel blanking cover. Space sensors shall be provided with set-point adjustment and override switch/button.

2. Differential pressure transmitters for measuring duct system pressures, shall have an approximate range of no greater than two times the maximum operating pressures of the duct system.
3. Differential pressure sensors for measuring space static pressure relative to outside static pressure shall have a range of -0.1 to 0.1" w.c. and an accuracy of $\pm 1\%$. The low port shall be connected to an outside air static sensing probe, such as a Dwyer A-306, designed to mitigate the effects of wind. The high port shall be connected to a tube terminating through the ceiling into the occupied space.
4. Differential pressure transmitters for measuring hydronic system differential pressure shall be two-wire type with true differential pressure sensing, ceramic sensor technology, stainless steel housing, NEMA 4 rated, and shall have an approximate range of no greater than two times the maximum differential pressure of the piping system. Unit shall be equal to Kele DPW-692.
5. Humidity sensors shall provide a range of 0-100% relative humidity and an accuracy of plus or minus 2% RH from 0 to 93.8% RH at 25 degrees Celsius. Accuracy shall be plus or minus 1% RH within 10% RH of the user setpoint. Operating temperatures shall be from -40 degrees Fahrenheit to +176 degrees Fahrenheit. The unit shall not be damaged when exposed to 100% relative humidity.
6. High temperature thermostat for detection of excessive temperature in the duct shall be U.L. listed, manual reset type with an adjustable temperature setting. Set at 136°F.
7. Low temperature thermostat for detection of low temperature in the duct shall be manual reset type with 20' temperature sensitive element, located downstream from the coil. If any portion of the element senses a temperature below its setting, the contacts shall break. Set at 35°F. Units shall be double pole for connection to the fan starter circuit and for monitoring by the DDC.
8. Electric thermostats shall be line voltage type complete with auto-off switch. The thermostat shall be rated for 6 amps at 120 volts.
9. Remote bulb electric thermostats shall be equipped with a liquid-filled capillary tube 8' long. The electrical rating shall be 10 amps at 120 volts.
10. Surface-mounted aquastats shall have adjustable set point and 10° differential. Contacts shall be rated 10 amps at 120 volts.
11. Flow switches for water shall be McDonnell Miller.
12. Carbon dioxide sensors shall be auto-calibration type with LCD display. Units shall utilize non-dispersive infrared (NDIR) and shall have a range of 0-2000 ppm CO₂. Units shall have accuracy of $\pm 3\%$. Operating range shall be 32°F to 122°F. Outputs shall be 0-10 VDC or 4-20 mA. Unit housings shall be suitable for installation in return air plenums (where applicable) and shall have a standard one (1) year element warranty with lifetime warranty on calibration.

13. Space mounted combination carbon dioxide/relative humidity/temperature sensors. Where the drawings indicate multiple space sensors at a single location, a combination sensor shall be used. The combination sensor shall provide the functions matching the sensor annotations on the drawings. Operating range shall be 32°F to 122°F. Outputs shall be 0-10 VDC or 4-20 mA. Unit shall be provided with a one (1) year warranty.
 - a. Temperature accuracy shall be ± 1 degree. Sensors shall be provided with set-point adjustment and override switch/button.
 - b. Carbon dioxide sensing (where indicated) shall be auto-calibration type with utilizing non-dispersive infrared (NDIR) with gold-plated optical chamber. Range shall be 0-2000 ppm CO₂. Units shall have accuracy of $\pm 3\%$. Field replaceable carbon dioxide element shall be provided with a lifetime warranty on calibration.
 - c. Humidity sensors (where indicated) shall provide a range of 10-90% relative humidity and an accuracy of plus or minus 2% RH with an operating range of 0 to 100% RH at 25 degrees Celsius. Field replaceable relative humidity element shall be provided with a one (1) year warranty
 14. Current relays shall be Hawkeye 700 Series or approved equal. Units shall be self-induced powered, solid state electronic with status and power LED's and binary output. Units shall be automatically self adjusting to detect loss-of-load and under current conditions (broken belt, etc.) with a range of 3 to 135 amps. Units shall be suitable for use with variable frequency drives, automatically compensating for changes in frequency and voltage. Operating range shall be 5°F to 185°F. Units shall have a limited five (5) year warranty.
- B. Dampers and Damper Motors:
1. Control dampers shall be Ruskin Model CD36 low leakage type manufactured specifically to control the air flow in heating, ventilating and air conditioning systems. Frames shall be made of galvanized sheet steel, formed into channels and riveted. In addition to the rigid frame construction, corner brackets shall be used to maintain alignment of the damper. Blades shall consist of formed galvanized sheets, formed for extra strength to withstand high velocities and static pressures. Square or hex blade pins shall be furnished to assure non-slip pivoting of the blades when a damper is used as a single module or is interconnected with others. Motor operated dampers shall be Class 1A with maximum leakage rate of 4 cfm/ft² at 1.0 inch water gauge when tested in accordance with AMCA 500D. Maximum blade width shall be 8".
 2. Damper actuators shall be provided for all automatic dampers. Damper actuators controlled from the DDC shall be electronic modulating type, low voltage, spring return and shall be of sufficient capacity to operate the connected damper. Outside air and relief air damper actuators shall be spring return normally closed. Line voltage motors shall be two-position type.
- C. Transformers are required for low voltage control items. Control manufacturer shall provide transformers with adequate capacity to operate connected equipment.
- D. Panels: Control cabinets shall be furnished for each a.c. unit, major equipment components and elsewhere as indicated. Control cabinets shall be fabricated of extruded aluminum or steel. The cabinets shall have a face panel for flush mounting gauges, switches, pilot lights, etc. and sub-panel for mounting controllers, relays, etc. Controls which require manual positioning or visual indication shall be flush mounted and identified with engraved nameplates on the face panel. Controls which are

required to be accessible only for maintenance and calibration are to be mounted on the sub-panel in the cabinet. Each item shall be identified by engraved nameplates.

- E. Miscellaneous relays, transformers, switches and other devices shall be provided as required for the sequence of control indicated. Relays shall be located adjacent to the controlled device such as motor or motor starter. Relays may be located within starters and equipment control panels where space is available and where approved by NEC. Relays outside of the controlled device shall be provided with NEMA enclosure suitable for location where installed.
- F. Disconnect Switches shall be provided for each 120V power connection to Stand-Alone Digital Controllers, Application-Specific Digital Controllers and all other electronic devices provided under this Section.
- G. Uninterruptible power supply (UPS) with power conditioning shall be provided for each Building Network Controller and Stand-Alone Digital Controller. UPS power shall be capable of providing a minimum of 15 minutes backup power.
- H. Direct Digital Control System:
 - 1. Building Network Controllers:
 - a. Central Building Controllers shall be provided as required by the system architecture for network communication with, and supervision over the control system. The controller shall provide for custom programming, global management, and overriding control of the all components of the control system via a LAN or communications link. Controller shall provide seamless communication with all Stand-Alone Digital Controllers, Application Specific Digital Controllers, unitary controllers, and third party controllers where indicated. Controllers shall be provided with Ethernet card capable of 10/100/1000 megabits for connection to Owner's LAN/WAN.
 - 2. Stand-Alone Digital Controllers:
 - a. Stand-Alone Digital Controllers shall be programmable controllers capable of custom programming provided for air handling units, heating water systems, chilled water systems, and other similar equipment/systems.
 - b. Stand-Alone Digital Controllers shall be 16-bit microcomputer based, providing a multi-tasking operating system for control functions simultaneous with all other facility management, operator interface, and system communications functions. Stand-alone digital controllers shall provide true floating point arithmetic calculations, to accommodate accumulation of large totalized valves, and shall support calculation and accumulation of values up to 10 to the thirty-eighth power. Controllers connected to the local area network shall provide communications to all connected stand-alone digital controllers. Controllers shall be tested and certified to operate in ambient temperature of -40°F to + 140°F. Stand-alone digital controllers shall provide interface for portable operator access to password controlled access to all levels of operational capability, from simple information access, to full programmability of all functions.
 - c. All programming defining the functions to be performed by the stand-alone digital controller, including but not limited to application programs and point database, shall be protected from loss due to power failure for a minimum of thirty days. Systems providing non-volatile memory for these functions are preferred. Systems not providing non-volatile memory shall provide battery backup sufficient to provide protection for the specified period.

- d. Each Stand-Alone Digital Controller shall be provided with a minimum of 8 spare inputs and outputs. These spare points shall be allocated as follows: 2 spare binary outputs, 2 spare binary inputs, 2 spare analog outputs, and 2 spare analog inputs.
 - e. Stand-Alone Digital Controller operating system software shall be multi-tasking. Multi-tasking capability shall be provided to simultaneously perform at least, but not limited to, the following functions:
 - 1) Downloading of application program changes to the stand-alone digital controller without affecting the simultaneous operation of existing operating application programming.
 - 2) Printing of scheduled or on-demand reports without pre-empting operator functions.
 3. Application Specific Digital Controllers:
 - a. Application Specific Digital Controllers (ASDC) with factory programming and no time clock may be provided for equipment such as VAV units, fan coil units, unit heaters, exhaust fans, small unitary equipment, etc. provided they are capable of controlling the equipment in accordance with the Drawings and the specified sequence of operations. ASDC's shall be capable of receiving program changes and time functions via the LAN or communications link. ASDC's shall be capable of making monitored point available to the DDC.
 - b. DDC control, monitoring and alarm functions may be extended to remote equipment by the use of ASDC's. Use of ASDC's shall be transparent to the central DDC without effect on DDC functions or color graphic displays.
 - c. Each ASDC shall be microprocessor based DDC and shall perform all sequences as indicated and shall communicate with all other DDC controllers via the LAN or communications link. Each ASDC shall also be capable of stand-alone operation and as directed by the central DDC system.
 - d. Each ASDC shall provide for portable operator interface either through connection to the space sensor or connection directly to the ASDC.
 - e. Programmable ASDC's shall be provided with 72 hour battery back-up or non-volatile EEPROM memory and self-contained clock. The clock shall be capable of time synchronization from the DDC.
 4. Unitary Control Interfaces:
 - a. Where unitary controls of packaged equipment are capable of communicating with the specified control system, they may be integrated into the network in lieu of Stand-Alone Digital Controllers. All specified functions and monitoring points shall be provided as specified in the Drawings and/or sequence of operations. Where required control and monitoring points are not provided as part of the unitary controls, DDC control and monitoring shall be provided.
 5. Centralized Host Stations:
 - a. The digital control system shall have capacity to support a Centralized Host Station. Centralized Host Stations shall, in conjunction with the network of stand-alone digital controllers, and additional computers or components, provide the performance requirements within this specification. The centralized host station shall include all hardware and software components to serve as a centralized facility operator station providing color graphics, facility wide access and coordination of global control

strategies, and centralized documentation. The centralized host station is existing.

6. Web Browser Access Interface/Controller: Provide a Web Browser Access Interface/Controller to allow real time access to the DDC system from a remote location via the Internet. Device shall be capable of supporting Internet Explorer and Netscape Navigator web browsers and provided with a minimum of two Ethernet (RJ-45) ports for connection to the Owner's LAN/WAN and the dedicated DDC network. Secure Sockets Layer (SSL) security protocol shall be provided with a minimum of two levels of security. Privileges allowed at each level of security shall be adjustable and programmed by the Temperature Controls Subcontractor as defined by the Owner. The following functions shall be available through the web browser:
 - a. View operation of all systems controlled by the DDC.
 - b. Modify system setpoints and schedules.
 - c. View and acknowledge alarms.
 - d. Define, save, plot, and print trend data.

I. Centralized Host Station Performance Requirements:

1. Color Graphic Operator Interface: The color graphic terminal shall be driven by software allowing the operator to access any system information via a "system penetration" method. "System penetration" shall allow the operator to begin at an entire site plan color graphic display and progressively select portions of the site plan to be chosen for closer inspection or selection of a more detailed color graphic display of a desired portion of the facility. The operator shall be able in this manner to "penetrate" to any desired system information without being required to enter any commands via the keyboard.
2. Dynamic Color Graphic Displays: Color graphic floor plan displays and system schematics for each piece of mechanical equipment including air handling units, chilled water systems, hot water systems and all other equipment shall be provided to optimize system performance analysis and speed alarm recognition. All mark numbers for equipment, controller and sensor designations shall exactly match those indicated on the Contract Drawings unless otherwise directed by the Owner. All software and hardware upgrades shall be provided as required to upgrade Owner's existing color graphics. All Campus, Building and Floor Plan graphic conceptals shall be approved by the Owner prior to creation of screen graphics. Names and numbers for rooms, wings, and buildings shall be in accordance with the Owner's final numbering systems. Color graphic display shall include, but not be limited to:
 - a. The real-time value dynamic display of any connected point in the network of stand-alone digital controllers.
 - b. The alarm status condition of any desired system alarm point.
 - c. Any software parameter such as setpoints for control sequences, minimum position adjustments, or throttling ranges.
 - d. All systems having air-side economizer shall display calculated or measured return air and outside air enthalpies.
3. Appearance of color graphics shall follow the below-listed order of penetration progression:
 - a. Campus plan (where more than 1 building, new and existing, is controlled or monitored).

- b. Plan color view of each building showing each floor and penthouse.
- c. Entire color floor plan of the building on one screen without scrolling, and showing all equipment rooms with tags of all equipment located therein, and locations of all major system space sensors.
- d. Large scale color floor plan view of each equipment room showing actual locations of controlled or monitored equipment.
- e. Each item of equipment with dynamic color graphic system schematic display.
- f. Each system schematic display shall be "linked" to the previous graphic, and to the system parameters of each monitored and controlled point.

All graphics shall have user definable background, line and text colors for all screens.

- 4. Centralized Scheduling and Modification: The color graphic terminal shall support operator access to the global scheduling screens which allow the operator to review and modify any or all controlled schedules as desired. The centralized scheduling function shall allow modification of equipment and lighting operating schedules, modification of facility holiday schedules, and when desired allow assignment of temporary schedules for designated portions of the facility or specific equipment.
- 5. Global Electrical Demand Limiting Control shall have the capability to allow the operator to review and modify the parameters affecting global demand control strategies. Demand control shall utilize sliding window control algorithm with provision for multiple load shed facility wide as appropriate to owner's requirements. Time of day demand limits shall be assignable to appropriate billing period time slots.
- 6. Energy Management Reporting shall have the capability to provide daily, weekly, monthly, and/or yearly formatted reports of facility, metered electrical consumption. Reports shall provide detail information for hourly KWH consumption, daily peak hour of consumption, daily time of peak demand, demand setpoint in use at time of peak, daily degree days, and outside air temperature and relative humidity at time of peak. Reports shall be created to provide individual reporting as desired by the owner for multiple facility meters, multiple sites, or aggregate facility metering combining multiple meters. The centralized host station shall retain daily summary energy data for up to five years. Reports can be designated as automatically printed, or called-up for report printout demand. The centralized host station shall support auto dial polling for remote sites for individual energy reporting and histories of multiple sites and have sufficient capacity to accommodate auto polling and report accumulation of a minimum of 100 sites. Reporting parameters, formatting, and frequency shall be in accordance with the Owners preferences.
- 7. Optimum Start Control programs shall be self-learning and shall adapt the algorithm parameters to the optimum values for each applied zone. Optimum start/stop shall provide separate control outputs for heating, cooling, fan and ventilation control sub-systems to maximize energy efficiency. The Centralized Host Station shall provide operator access to all optimum start parameters for designated items, equipment, or scheduled systems. Trend Reports: The Centralized Host System shall support logging and historical accumulation of trended data from the entire facility, or multiple sites with capacity for acquiring trend data from a minimum of 100 sites. The system shall be capable of utilizing dedicated logging printers and provide the capacity to document printed trend data accumulated from any or all of the stand-alone digital controllers in connected on-site network, or from any number of remote sites which connect to

- the centralized host system dedicated logging printer via dial-up modem or Ethernet connection. The centralized host system shall provide capacity to store to disk a directory of at least 150 trend logs. Such trend logs can be accessed from the directory by the operator at any time for analysis of selected sets of the trended data, display onto the screen, or hard copy documentation.
8. Third Party Software Packages: The Centralized Host System shall provide the capacity to run specific third party software packages for word processing, spreadsheets, or database management programs.
 9. Database Archiving: The Centralized Host System shall provide capability to upload or download global control functions and programs being performed by the network of stand-alone digital controllers, and the individual database and application programming resident in each controller in the facility, or on remote sites. The up-load programs shall be retained on the centralized host system's hard disk for system backup. Programs may be modified using editor functions, and downloaded to individual units as desired.
 10. Database Maintenance Reports: The centralized host system shall provide a daily report of all modifications made to any software function in the system. Report shall include the specific setpoints, schedules, sequence parameters, or limits that were modified and the time and location of the modification, and the identification of the operator making the modification.
 11. Override Report: The centralized host system shall provide a daily report of all overrides issued, and/or in force on the system. Override reports shall allow tracking of operator functions and maintenance of desired operational conditions.
 12. System Maintenance Report: The centralized host system shall provide a report of maintenance items on an automatic printout basis. Maintenance events shall be settable by the user based on event, elapsed run time, number of cycles or calendar day/date.
 13. All operator access shall have multiple-level password protection. All setpoints for safeties shall be protected by the highest level password.
 14. All help files imbedded in the software as well as all auxiliary software necessary for full access and to allow programming and other functions shall be provided and made accessible to the operator.
- J. Control Panels shall be a fully electronic analog control or digital control system, providing all control functions for the equipment specified to be controlled from that panel. Each control panel shall serve one or more equipment systems. Multiple control panels serving a single piece of equipment are prohibited. Each control point shall serve a single, distinct input or output. Control functions to be performed by control panels are as described hereinafter in the sequences of operation and on the drawings. Each panel shall service one or more equipment systems.
- K. All signals between the DDC control panel and the monitored or controlled devices shall be low voltage (less than 100 volts).
- L. Sensing of temperature, humidity, differential pressure, and all other inputs shall be industry standard signals by one of the following types:
1. 0-20 mA
 2. 4-20 mA
 3. 0-5 VDC
 4. 0-12 VDC

5. Resistance Signals

All inputs shall be compatible with the controllers used, and with the requirements for readout of variables.

- M. On/Off Outputs: The control panel shall internally provide test points for the circuit driving the equipment contactor, for troubleshooting the low voltage circuit to the contactor. All relays or digital output modules shall provide a pilot light or LED display of this same status.
- N. Modulating Outputs shall be industry standard 0-5 VDC, 0-12 VDC or Milliamp outputs of 0-20 mA or 4-20 mA, or drive open/drive closed type modulating outputs. Drive open/drive closed type controllers shall include sufficient components and control algorithms.
- O. Standard Software Function Libraries: Complete libraries of control algorithms for DDC, Energy Management, and Facilities Management functions shall be resident for all stand-alone digital controllers and shall be drawn from for the creation of the application programming.
- P. Energy Management Control: The network of stand-alone controllers shall individually perform Time of Day Scheduling, Optimum Start/Stop, Enthalpy Optimization, and all Control Optimization strategies, such as Supply Air Reset, and Soft Start Ramp-up, for their connected systems of equipment. Coordination of strategies involving multiple systems of equipment shall be performed by sharing of necessary data between the stand-alone controllers on the communicating network.
- Q. Electric Demand Limiting Control: The stand-alone controllers shall have the capability to communicate and provide coordination for global electric demand limiting control. Demand limiting algorithm shall be resident within a selected stand-alone digital controller and shall issue load shed commands to the network for control of specific items of equipment. Demand limiting shall be sliding window demand control with a minimum of three user definable time of day demand limit setpoints. Multiple load shed tables shall be definable, and be shed for rotational or sequential restoration as appropriate for the loads within each designated shed table. The stand-alone digital controller to which electrical consumption meters may be installed shall provide for daily, and monthly formatted reports of metered electrical consumption. Reports shall be individually named and identified with a title line definable for each report, and shall provide information as detailed as hourly KWH consumption, daily peak hour of consumption, daily time of peak demand, demand setpoint in use at time of peak, daily degree days, and outside air temperature and relative humidity at time of peak. Reports shall be created to provide individual reporting as desired by the Owner for multiple facility meters, multiple sites, or aggregate facility metering combining multiple meters. System shall have capability to designate reports for automatic print, or call-up for report printout on demand, as well as upload to selected centralized host system for historically archiving.
- R. Alarm Occurrence Status: Alarm condition reports shall provide a printout listing the status of specific items associated with the equipment generating the alarm. Report shall be routed to a specific printer or combination of printers at the Centralized Host Station or the on-site programming unit. Report shall record time and status information and allow operational personnel to use this information to diagnose the alarm situation.
- S. Telecommunications Support: Each building network shall be provided with the necessary equipment, programming, and connections to communicate with remote

host computers through one auto dial/auto answer modem and through an Ethernet connection to the Owner's LAN/WAN.

- T. Remote Access and Notification: The system shall be installed such that access to the entire facility can be accomplished through both the modem and the Owner's LAN/WAN. The modem and Ethernet connection shall each be capable of providing the following functions:
 - 1. Access to the entire facility control system by the Contractor to provide service and diagnostic support.
 - 2. Access by the Owner from off-site for similar purposes, and for remote operation, monitoring, and adjustment of facility functions.
 - 3. Notification of desired exceptions and alarms to multiple remote sites scheduled as necessary for business hours, or off-hours reporting.
- U. Off Hours Exception Reporting shall provide the Owner a means of specifying up to two remote sites for which off hours exceptions shall be reported. Selection of the site to be connected shall be programmed by the Temperature Controls Subcontractor as directed by the Owner, and set to change automatically per time of day and day of week.
- V. Generally, the stand-alone digital controller and control panel shall be located on or near the unit, which they control as indicated on the Drawings.
- W. Lightning arrestors shall be provided on all wiring, which exists or enters the building. Arrestors shall be located adjacent to the protected equipment.
- X. As a part of this contract the Temperature Control Subcontractor shall provide eight hours of classroom instruction in operation, programming and maintenance of the system to owners operating and maintenance personnel. Instructors shall be fully qualified in all aspects of the system. Training shall be scheduled as required by the owner and shall take place at an owner-designated location. Training shall be video recorded and provided to the Owner in DVD format.

PART 3 - EXECUTION

3.1 WORK BY OTHERS:

- A. All line voltage wiring (101 volts or more) shall be furnished and installed as a part of Division 26.
- B. All low voltage wiring (100 volts or below) shall be furnished and installed as an integral part of this section of the specification in strict accordance with Division 26. Refer to Division 26 for special requirements of separation between Control and Instrumentation wiring from Communications/Data Cabling.
- C. All dampers, valves, immersion wells and pipe pressure tappings will be installed by the Mechanical Contractor.
- D. All relays, firestats, sensors, annunciators, alarms, or other electrical devices not indicated to be installed by Division 26, shall be installed under Division 23. Coordinate with Division 26 for locations as necessary.

3.2 GENERAL SEQUENCE REQUIREMENTS:

- A. Refer to Section 23 09 93 for Sequence of Operation for HVAC Controls.

3.3 INTERFACE WITH PACKAGED UNITARY EQUIPMENT CONTROLLERS:

- A. Where packaged equipment is indicated elsewhere within the Contract Documents to provide unitary control with BACNET or similar interface, the DDC shall communicate with and monitor the packaged controllers. Coordinate with available equipment protocols, BACNET MS/TP (or BACNET IP if approved by Owner). At a minimum, the DDC system shall:
 - 1. Provide signals to the packaged controllers for occupancy and all setpoints necessary. Setpoints adjustment shall be available through the graphics interface. Occupancy scheduling shall be as indicated for equipment with DDC control.
 - 2. Monitor all unit alarms and provide an alarm within the BAS of any alarm conditions within the unit. Alarm indications shall be specific to the type alarm occurring with the unit.
 - 3. Monitor all points indicated within this section, all points indicated within the respective equipment specifications and all points shown on the controls schematic Drawings. Additional points shall include monitoring of actual unit percent capacity or stages of capacity where available. Where any control or data point is not provided within the equipment controls, the DDC shall provide the necessary input/output, sensor, etc. necessary for control or monitoring of that point.
 - 4. Provide graphics displays for all packaged equipment to include: all points indicated within this section, all points indicated within the respective packaged equipment specifications, and all points shown on the controls schematic Drawings. The main graphics display for the respective unit shall include all points shown on the controls schematic Drawings. Any data available in excess of that indicated above shall be available outside the main graphics screen.

3.4 SYSTEM MONITORING AND ALARM

- A. The DDC shall provide an alarm for the following points as applicable to each unit, system, or piece of equipment. Where points occur in more than one unit or system, an alarm shall be provided for each system in which it occurs. The alarm indication shall be specific as to the parameter that has either exceeded or fallen below limits or provides indication that the system is not operating as commanded. The alarm indication shall identify the system in which the alarm occurs. Limits for alarm indication shall be coordinated with the Owner's representative and shall not be so tight as to cause nuisance alarms.
 - 1. High/low discharge air temperature for all VAV units
 - 2. Return air humidity
 - 3. Differential static pressure across filters
 - 4. Minimum outside airflow on VAV units (below setpoint)
 - 5. High return or space CO2
 - 6. VFD alarm indication
 - 7. Current relays

SNOW CREEK ES 2CR HVAC UPGRADES

8. High/low space temperature
9. Duct smoke detectors
10. Differential pressure across fans or pumps
11. Activation of freeze protection
12. Float switch alarms

3.5 INSTALLATION

- A. The location of all control items on the exterior of the building shall be approved by the Architect prior to installation.
- B. Where the condition occurs, provide insulated sub bases for all space temperature sensors located on exterior walls.
- C. All sensors located in equipment, ductwork and piping shall be installed with appropriate fittings such that devices are securely attached to coils, duct, pipe, or similar and are not free to move, rotate, or become dislodged. The use of adhesives for attachment is not permitted.

3.6 SERVICE AND GUARANTEE

- A. The entire control system shall be serviced and maintained in first class condition by the control manufacturer for a period of one year after acceptance at no extra cost to the Owner.

END OF SECTION 230900

SECTION 230993 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section.
- B. Work Included:
 - 1. Sequence of Operations for HVAC Systems
- C. Related Sections:
 - 1. Section 23 00 10 – HVAC General Requirements
 - 2. Section 23 05 00 – Common Work Results for HVAC
 - 3. Section 23 05 53 – Identification for HVAC Piping and Equipment
 - 4. Section 23 05 93 – Testing, Adjusting, and Balancing for HVAC
 - 5. Section 23 09 00 – Instrumentation and Control for HVAC
 - 6. Section 23 20 00 – HVAC Piping and Pumps
 - 7. Section 23 30 00 – HVAC Air Distribution
 - 8. Section 23 70 00 – Central HVAC Equipment
 - 9. Section 23 80 00 – Decentralized HVAC Equipment

1.2 GENERAL REQUIREMENTS

- A. Programming shall be provided in accordance with commonly accepted industry standards and practices to ensure proper and efficient control of all equipment and systems.
- B. Control sequences shall be accomplished in accordance with control drawings and the sequences specified in this section and described on the drawings. It is the intent of this section to utilize sequences included in pre-programmed controllers when such sequences provide the intended operation. Where factory programming is incapable of providing the sequence specified in the Contract Documents, a custom controller with custom programming shall be provided.

1.3 SUBMITTALS

- A. Refer to Section 23 09 00, Instrumentation and Control for HVAC.

1.4 WARRANTY

- A. Refer to Section 23 09 00, Instrumentation and Control for HVAC.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 GENERAL SEQUENCE REQUIREMENTS:

- A. Set points: All control setpoints shall be provided with appropriate deadbands where necessary to prevent the excessive cycling of equipment, valves, dampers, etc.
- B. Failure of Digital Control System: The control system shall be installed to fail safe to the heating mode.
 - 1. All air handling and air conditioning units shall fail on with outside air damper closed, heating valves open to the coil and the reset valve open to the boilers.
 - 2. Night setback shall fail to day (occupied) mode.
 - 3. Heating water system shall fail with boiler energized to boiler control and heating water pump on.
 - 4. All interlocked exhaust fans shall be de-energized with the dampers closed.
- C. Unoccupied Period Freeze Protection: When outdoor air temperature falls below 35°F during unoccupied periods, the following sequence shall occur.
 - 1. Heating water pumps shall be energized (pumps should be energized whenever any space requires heat).
 - 2. All air unit heating valves shall be fully open when the fan is off.
 - 3. All outdoor air dampers shall be closed and verified.
 - 4. All exhaust fans shall be de-energized with dampers closed (should already be de-energized during unoccupied periods).
- D. Unoccupied Periods: At times when the building is unoccupied, the DDC shall control all systems to maintain an adjustable night setting for both heating and cooling. Unless otherwise specified, all outside air dampers shall be closed and all exhaust fans shall be de-energized. Where fan powered VAV boxes are utilized, night heating shall be performed as required by the individual terminal units without energizing the associated air handling units. Terminal units such as cabinet unit heaters and fan coil units shall cycle the fans as necessary to maintain unoccupied setpoints. The DDC shall stagger the occupied/unoccupied schedules for all air handling units to prevent large fluctuations in heating or cooling demand. Activation of the manual override on a space temperature sensor, where applicable, shall result in the following: the space temperature setpoint shall be indexed to the occupied setpoint for that space and the system serving that space shall be indexed to the occupied mode. All other spaces shall be maintained at unoccupied temperature setpoints.
- E. Morning Warm-up: All air systems shall bring space up to occupied temperature before opening outside air dampers as part of the optimal start sequence.
- F. System Start-up: Following any type of system shutdown, the DDC shall stagger the starting of all electrical loads to reduce electric peak demand.
- G. System Shut-down: At any time air systems are de-energized, the DDC shall disable all ancillary systems dependent upon air movement such as electric heaters,

humidifiers and direct expansion cooling. Ancillary systems required for freeze protection (except electric coils) shall remain operational.

- H. Direct Expansion (DX) Cooling: Where the Sequence of Operation calls for DDC control of refrigeration compressors, condensing units or packaged compressor-cooling, the DDC shall provide "minimum-on" and "minimum-off" times in accordance with the equipment manufacturer's recommendations.
- I. Duty/Standby and Lead/Lag Control: All equipment indicated to be operated as duty/standby or lead/lag shall be sequenced based on run time and alternated bi-monthly or as otherwise required in accordance with the Owner's preferred schedule. Sequencing shall occur as scheduled without the need for shutdown, if necessary. Sequencing for individual equipment shall occur so as not to impact the operation of the entire system. The DDC shall automatically energize the standby or lag device in the event of a failure in the duty or lead equipment.
- J. Smoke Detection Control: Upon activation of an air handling unit duct smoke detector, all fan powered VAV boxes associated with that unit shall be deenergized.
- K. Refer to the Electric Sequence Controls Schematics on the drawings for automatic control of fans, ancillary heating equipment, and other similar items. The following hard-wired interlocks shall be provided in addition to any others indicated on the Electric Sequence Controls Schematics:
 - 1. Activation of duct smoke detectors shall de-energize associated supply fans and return/relief fans (where applicable).
 - 2. Low air flow condition indicated by the air flow switch shall prevent the operation of electric heating coils.
 - 3. Cooling coil condensate drain pans shall be provided with safety switches to de-energize the unit and alarm the DDC upon accumulation of water.
- L. All screen graphics for systems with economizers shall show calculated values of enthalpy for outdoor air and return air.

3.2 SEQUENCE OF OPERATION:

- A. REFER TO DRAWINGS.

END OF SECTION 230993

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PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Work Included:
 - 1. Pipe and Pipe Fittings
 - 2. Miscellaneous Piping Accessories
- C. Related Sections:
 - 1. Division 01 -- Commissioning
 - 2. Section 23 00 10 – HVAC General Requirements
 - 3. Section 23 05 00 – Common Work Results for HVAC
 - 4. Section 23 05 48 – Vibration and Seismic Controls for HVAC Equipment and Piping
 - 5. Section 23 05 53 – Identification for HVAC Piping and Equipment
 - 6. Section 23 05 93 – Testing, Adjusting, and Balancing for HVAC
 - 7. Section 23 09 00 – Instrumentation and Control for HVAC
 - 8. Section 23 70 00 – Central HVAC Equipment
 - 9. Section 23 80 00 – Decentralized HVAC Equipment

1.2 REFERENCES:

- A. General: The following standards or codes form a part of this specification to the extent indicated by the reference thereto.
- B. American Society for Testing and Materials (ASTM):
 - A53-88a Pipe, Steel, Black and Hot-dipped, Zinc-coated, Welded and Seamless
 - A106-88a Seamless Carbon Steel Pipe for High Temperature Service
 - A120-88a Pipe, Steel Black and Hot-dipped, Zinc-coated, Welded and Seamless for Ordinary Uses
 - A126-84 Gray Iron Castings for Valves, Flanges and Pipe Fittings
 - A254-88 Copper Brazed Steel Tubing
 - A420-88 Piping Fittings of Wrought Iron Carbon Steel and Alloy Steel for Low Temperature Service
 - A539-88 Electric-Resistance-Welded Coiled Steel Tubing for Gas and Fuel Oil Lines

SNOW CREEK ES 2CR HVAC UPGRADES

- B32-89 Solder Metal
- B42-88 Seamless Copper Pipe, Standard Sizes
- B75-86 Seamless Copper Tube
- B88-95a Seamless Copper Water Tube

C. American Society of Mechanical Engineers (ASME):

- ASME 95 Boiler and Pressure Vessel Code
- B16.3 Malleable Iron Threaded Fittings
- B16.4 Cast Iron Threaded Fittings
- B31.9 Building Services Piping

D. International Ground Source Heat Pump Association (IGSHPA) Installation Manuals.

E. National Electrical Manufacturers Association (NEMA)

F. Underwriters Laboratories, Inc. (UL)

1.3 SUBMITTALS:

- A. Submit shop drawings, product data and samples in accordance with Division 1 and Section 23 00 10.
- B. Shop drawings, diagrams, catalog data and such other data necessary to fully describe and substantiate compliance with these specifications shall be submitted for all equipment and materials marked with notation set forth in Section 23 00 10.
- C. Operation and maintenance data shall be submitted in accordance with Division 1, for all items of equipment and materials marked with notation set forth in Section 23 00 10.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS:

A. Material Standards:

- 1. Steel pipe shall be manufactured in accordance with ASTM A53 and shall be so labeled.
- 2. Copper pipe shall be manufactured in accordance with ASTM B88 and shall be so labeled.

- B. Heated Water Lines: Pipe 4" and smaller shall be type L hard drawn copper tubing or standard weight schedule 40 black steel pipe over 4" shall be standard weight black steel. Fittings for copper pipe shall be ASME B16.18 or ASME B16.22 solder type. Viega ProPress (no substitute) or Viega MegaPressFKM (no substitute) may be used for pipe 4" and smaller. Fittings for steel pipe shall be standard weight, threaded, black, malleable in accordance with ASME B16.3 or cast iron in accordance with

SNOW CREEK ES 2CR HVAC UPGRADES

ASME B16.4 except fittings over 2" size may be welding type. Flanges shall be weld neck type. All fittings shall be suitable for 125 psi water service.

- C. Cooling coil condensate drain lines shall be type L hard drawn copper tubing (except where buried they shall be service weight cast iron). Fittings shall match the piping.

2.2 MISCELLANEOUS PIPING SPECIALTIES:

- A. Drains shall be accessible and shall consist of 3/4" ball valves with hose thread adapters, cap and chain unless indicated otherwise.
- B. Escutcheons shall be the split pattern chromium plated bronze or steel. Special height escutcheons shall be provided where extended sleeves are used. Escutcheons shall be sized to cover the entire opening.
- C. Water seals (Trap) shall be provided on condensate drain from each air handling unit. Seal shall be of sufficient depth to prevent blowout or siphoning of water and shall be configured as indicated on the Drawings.
- D. Pipe sleeves shall be installed as outlined in SECTION 23 00 10 HVAC GENERAL REQUIREMENTS.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION:

- A. General: Sleeves and sealant shall be provided where pipes pass through floors, partitions or walls as outlined in Section 23 00 10, HVAC GENERAL REQUIREMENTS. Pipe shall be cut accurately to measurements established at the job site and worked into place without springing or forcing, properly clearing all windows, doors and other openings. Pipe in finished areas shall be concealed. Excessive cutting or other weakening of the building structure to facilitate piping installation will not be permitted. Each end of each piece of pipe shall be reamed. Pipe shall be installed to permit free expansion and contraction without damage to joints or hangers. Changes in direction shall be made with fittings. Bushings and all thread nipples will not be allowed.
- B. All piping shall be installed with sufficient pitch to insure adequate drainage and all high points in water lines shall be provided with manual-air vents, all low points with drains. Cooling coil condensate drain lines shall slope 1/8" per foot in direction of flow. Pipe extending through the roof shall be properly flashed.
- C. Open ends of pipe lines or equipment shall be properly capped or plugged during installation to keep dirt or foreign material out of the system.
- D. Escutcheons shall be provided where exposed pipes pass through finished walls or floors.
- E. Miscellaneous piping terminating at roof drains or in the air shall be resiliently anchored to protect against fatigue or damage incurred as a result of vibration or abuse.
- F. Joints:

SNOW CREEK ES 2CR HVAC UPGRADES

1. Copper tubing shall be cut square, ends reamed and all filings and dust wiped from interior of pipe. Joints shall be soldered with solder drawn through the full fitting length. Excess solder shall be wiped from joint before solder hardens. Solder shall be 95/5 composition – 50/50 will not be allowed. All solder joints shall have piping surfaces sanded or brushed. Self-cleaning solder flux as a substitute for sanding or brushing is not acceptable. In lieu of soldered fittings in hydronic piping, Viega ProPress (no substitute) fittings may be used for copper pipe 2" and smaller.
2. Threaded joints shall be made with tapered threads properly cut. Joints shall be made tight with a stiff mixture of litharge and glycerin or other approved thread joint compound applied with a brush to the male threads only. Not more than three threads shall show after the joint is made up. The use of thread protectors for pipe couplings is not acceptable. Expanding self-hardening pipe dope ("expando") shall not be used.
3. Welded Joints:
 - a. Welded joints shall be fusion-welded by qualified welders in accordance with American National Standard B31.1.06, Chapter 5, unless otherwise required. Changes in direction of piping shall be made with welding fittings only. Mitering or notching pipe to form elbows and tees or other similar type construction will not be permitted. The contractor shall wire brush and paint welded pipe welds before insulation is applied. Saddle type welding outlets may be used for equipment take-off's from the mains.
 - b. All pipe welding shall be done only by competent and experienced welders. High test welding rods suitable for the material to be welded are to be used throughout. All welds shall be built up to a thickness of 1 ½ times pipe wall thickness. All tees, branches, reducers or specialties that may be required in welded piping shall be carefully laid out by welders, using templates, and the joints shall have carefully matched intersections and shall be properly spaced. Finished pass on all welds shall be a smooth continuous weld cap. Multiple "stringers" on horizontal welds will not be acceptable.
 - c. During welding, all piping shall be securely clamped in place so that true alignment is held throughout the welding process. Where there is apt to be distortion, proper allowance shall be made so that the sections to be joined will be in proper alignment after the weld is completed. Care shall be exercised to prevent the occurrence of protruded metal into the pipe. All welds shall be of sound metal, free from laps, cold shuts, gas pockets, oxide inclusions and similar defects.
 - d. Adequate protection blankets, screens, etc. shall be provided during cutting and welding to protect existing adjacent surfaces.
4. Flanges and unions shall be faced true and made square and tight. Unions shall be 125 psi service, bronze seat type. Flanges shall be ASA Standard 125 psi service with red rubber gaskets. Unions or flange joints shall be provided on each side of each valve 2-1/2" or larger and in each line immediately preceding the connection to each major piece of equipment such as a heating coil, cooling coil and other similar items.

3.2 CONTROL ACCESSORIES:

- A. Control valves, pipe wells and pressure tapings shall be furnished under Section 23 09 00 and installed as work of this Section.

3.3 TESTING:

A. Heating Water Supply and Return Piping:

1. Piping shall be tested and results approved by the Architect/Engineer prior to application of insulation.
2. Piping system shall be capped and subjected to a static water pressure of 50 psig above operating pressure (minimum 125 psig), and pressure maintained for four (4) hours with no leaks or loss in pressure. Testing with air is prohibited.
3. Test source of pressure shall be isolated from the system before conducting pressure tests.

3.4 SYSTEM STARTUP:

A. When heating water systems have been tested and made tight, flush all dirt, trash, and extraneous material with cleaner as recommended by equipment manufacturers and in accordance with Sections 23 80 00 and 23 05 93. The cleaning chemicals used shall be provided by the Contractor.

B. The chemicals to be used by the Contractor for the specified initial treatment shall be furnished by the Owner's water treatment consultant. The Owner's water treatment consultant shall supervise the cleaning of equipment and the initial chemical fill for placing the equipment in normal service. The Owner shall provide all chemical treatments after systems have been cleaned, flushed, and filled.

1. The Owners Chemical Treatment Consultant is:

Tom Stewart, Industrial Water Solutions, 540-520-6341

C. After cleaning and chemically treating the HVAC systems, the Contractor shall furnish the Owner, in writing, the following information:

1. Date of initial treatment.
2. Type of chemicals used for treatment.
3. Estimated date that further treatment or testing will be required.

END OF SECTION 232000

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PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Work Included:
 - 1. HVAC Ductwork
 - 2. Air Duct Accessories
 - 3. Air Outlets and Inlets
- C. Related Sections:
 - 1. Section 01 91 13 -- General Commissioning Requirements
 - 2. Section 23 00 10 – HVAC General Requirements
 - 3. Section 23 05 00 – Common Work Results for HVAC
 - 4. Section 23 05 48 – Vibration and Seismic Controls for HVAC Equipment and Piping
 - 5. Section 23 05 53 – Identification for HVAC Piping and Equipment
 - 6. Section 23 07 00 – HVAC Insulation
 - 7. Section 23 05 93 – Testing, Adjusting, and Balancing for HVAC
 - 8. Section 23 09 00 – Instrumentation and Control for HVAC
 - 9. Section 23 70 00 – Central HVAC Equipment
 - 10. Section 23 80 00 – Decentralized HVAC Equipment

1.2 REFERENCES:

- A. General: The following standards or codes form a part of this specification to the extent indicated by the reference thereto.
- B. Air Movement and Comfort Association (AMCA):
 - Bulletin 210, Standard Test Code for Air Moving Devices
 - Standard 511, Air Performance and Water Penetration
- C. American Society for Testing and Materials (ASTM):
 - ASTM A 525 General Requirements for Steel Sheet, Zinc Coated (Galvanized) By the Hot-Dip Process
 - ASTM A 527 Steel Sheet, Zinc Coated (Galvanized) By the Hot-Dip Process, Lock-Forming Quality

SNOW CREEK ES 2CR HVAC UPGRADES

ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials

ASTM C 411 Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation

D. Underwriters Laboratories, Inc. (UL)

Standard 723 Tests for Surface Burning Characteristics of Building Materials

E. Sheet Metal and Air Conditioning Contractors' Association (SMACNA)

Duct Construction Standards (Latest Edition)

HVAC Air Duct Leakage Test Manual (Latest Edition)

F. National Fire Protection Association (NFPA):

1. Standard 90A – Standard for the Installation of Air Conditioning and Ventilating Systems
2. Standard 90B – Standard for the installation of Warm Air Heating and Air Conditioning Systems
3. Standard 255 – Method of Test of Surface Burning Characteristics of Building Materials

1.3 DEFINITIONS:

- A. Duct Sizes: Sizes shown on Drawings are actual sheet metal dimensions. For acoustically lined ducts, sizes indicated are actual sheet metal sizes allowing for 1" thick acoustic lining. For double wall ductwork, sizes indicated are inside dimensions.
- B. Low Pressure Ductwork: Static pressure rating less than 2" w.g. and velocities less than 2000 fpm.
- C. Medium Pressure Ductwork: Static pressure rating less than 6" w.g. and velocities greater than 2000 fpm and all ductwork upstream of VAV boxes.
- D. High Pressure Ductwork: Static pressure rating over 6" w.g. and velocities greater than 2000 fpm.

1.4 SUBMITTALS:

- A. Submit shop drawings, product data and samples in accordance with Division 1 and Section 23 00 10.
- B. Shop drawings, diagrams, catalog data and such other data necessary to fully describe and substantiate compliance with these specifications shall be submitted for all equipment and materials marked with notation set forth in Section 23 00 10.
- C. Operation and maintenance data shall be submitted in accordance with Division 1, for all items of equipment and materials marked with notation set forth in Section 23 01 00.

SNOW CREEK ES 2CR HVAC UPGRADES

- D. All fans for use with Variable Frequency Drives (VFD) shall have critical speed and multiples of critical speed indicated on each submittal.

1.5 SPARE PARTS

- A. Each belt driven piece of equipment shall be provided with one spare set of belts to be turned over to the Owner at the end of construction.

PART 2 - PRODUCTS

2.1 HVAC DUCTWORK

A. Materials:

1. Sheet Metal Ducts: Trademarked galvanized steel, lock forming quality, having zinc coating of 0.90 ounces per square foot for each side (G90, ASTM A653 and A653M).
2. All ductwork without external insulation, exposed to view in finished, non-utility spaces shall have paint-grip or galvaneal coating to accept field painting.
3. Fasteners: Use rivets and bolts throughout; sheet metal screws may be used on low pressure ducts.
4. Sealants: United McGill "United Duct Sealer" or equal. Water and fire resistant when dry, compatible with mating materials. Where sealants are used on exposed ductwork, composition shall be designed to prevent bleed-through of finish paint, or sealant shall be pre-painted with a coating impervious to bleed-through.
5. All duct and accessory materials shall have a composite flame spread rating not exceeding 25, and a smoke developed rating not exceeding 50 as tested under procedure ASTM E-84-75, NFPA 255 and UL 723. Duct coverings and linings shall not flame, glow, smolder or smoke when tested in accordance with ASTM C411.

B. Fabrication:

1. All ductwork shall conform accurately to the dimensions indicated on plans and shall be fabricated and installed in accordance with ASHRAE Guide and Data Books and SMACNA Duct Construction Standards, except that sheet metal gauges and zinc coating shall not be lighter than specified under this Section.
2. All rectangular sheet metal ducts over 18" wide shall be cross-broken for rigidity.
3. Reinforcing angles, stiffeners and tie-rods for all sheet metal ducts shall be provided where required to prevent sagging, buckling, and vibration in accordance with the latest SMACNA Duct Construction Standards Publication. Reinforcing for flat oval duct shall be provided as specified for rectangular duct in accordance with the latest SMACNA Duct Construction Standards Publication.
4. Lap metal ducts in direction of air flow. Hammer down edges and slips to leave smooth interior surface.
5. Where square elbows are indicated on the Drawings, curved elbows may be used provided the centerline radius is not less than 1-1/2 times the width of duct and as space allows.

SNOW CREEK ES 2CR HVAC UPGRADES

6. Provide turning vanes in all square elbows. Provide air foil type turning vanes on all ducts more than 24" wide. Mitered round elbows (2-piece) shall not be used unless specifically indicated. Mitered round elbows shall have airfoil turning vanes.
7. Transitions shall be made with a slope ratio of 4:1, except at equipment divergence and convergence shall not exceed a slope ratio of 3:1.
8. All duct joints and seams shall be mechanically tight, and sealed with sealant or gaskets to provide a substantially airtight system.
9. All duct liners shall be installed using fasteners in strict accordance with SMACNA Duct Construction Standards. Fastener pins shall be clinched pin type or welded pin type. The use of adhesive type pins is not acceptable. All liners shall have transverse edges coated with adhesive, all corners lapped and butted or folded.
10. Duct liners at fan discharges shall be lapped on outside of fan discharge flange or shall have metal nosing on leading edge. Fastening pin length shall be equal to liner thickness.
11. Provide easements where low pressure ductwork conflicts with piping and structure. Where easement exceeds 10% duct area, split into two ducts maintaining original duct area.
12. Plenums and Casings (Site Fabricated Units) [S]: Construct of galvanized steel panels joined by standing seams on outside of casing. Rivet or bolt all seams and joints on approximately 6" centers and seal with sealant. Reinforce with steel angles and provide diagonal bracing. Access doors shall be 36" x 18" with frame welded to plenum, three brass hinges and three brass tension fasteners operable from either side of door.
13. All radiused elbows shall have centerline radius ($R = 1.5 D$), and shall be stamped or pressed smooth radius or minimum five gore type. Adjustable gore type fittings are not acceptable.

C. Low Pressure Ducts:

1. Sheet Metal Gauges:

a. Rectangular Ducts:

<u>Max. Dimen., In.</u>	<u>Min. Gauge</u>
Up to 30	24
31 to 54	22
55 to 84	20
85 and Over	18

b. Round Ducts:

<u>Duct Diameter, In.</u>	<u>Min. Gauge</u>
Up to 22	24
23 to 36	22
37 to 50	20
51 to 60	18
61 to 84	16

D. Medium and High Pressure Ducts:

1. Sheet Metal Gauges:

a. Rectangular Ducts:

<u>Max. Dimen., In.</u>	<u>Min. Gauge</u>
Up to 18	22

SNOW CREEK ES 2CR HVAC UPGRADES

19 to 48	20
49 to 72	18
73 to 96	16
97 to 144	14

- b. Round Ducts (Factory Made With Spiral Lock Seams equal to United McGill):

<u>Duct Diameter, In.</u>	<u>Min. Gauge</u>
Up to 26	24
28 to 36	22
38 to 50	20
51 to 60	18
61 and Over	16

- c. Flat-Oval Ducts (Factory Made With Spiral Lock Seams equal to United McGill):

<u>Max. Width, In.</u>	<u>Min. Gauge</u>
9 to 24	24
25 to 48	22
49 to 70	20
71 and Over	18

2. Fittings shall be minimum 20 gauge on flat oval, but not less than 2 gauges heavier than ductwork in which it is installed on round and flat oval. Fittings for duct sizes 5" round and below may be minimum 24 gauge.
 3. All take-offs shall be full body pre-manufactured 45° conical lateral type or alternate pre-manufactured fitting with equivalent loss coefficient. The use of field-installed or factory lateral taps or manifolds is not acceptable.
- E. All elbows shall have centerline radius ($R = 1.5 D$), and shall be stamped or pressed smooth radius or minimum five gore type. Adjustable gore type fittings are not acceptable.
- F. Flexible Ducts [S]: Flexible Ducts shall be Flexmaster Type 1M or Thermaflex type M-KE. Duct shall incorporate acoustic rated CPE or PE inner liner, 1" thick fiberglass insulation, and reinforced metalized vapor barrier. Maximum C factor shall be 0.24 btu/hr/sq.ft./°F at 75°F mean temperature. Duct shall have a working pressure of not less than 6 inches w.g. for positive pressure and 1 inch w.g. for negative pressure and suitable for velocities up to 4000 fpm. Vapor transmission shall be less than 0.05 Perm when tested in accordance with ASTM E96, Procedure A. The entire assembly shall be rated and marked as UL 181 Class 1. Flame Spread Rating shall not exceed 25 and Smoke Developed Rating shall not exceed 50 when tested in accordance with ASTM E-84-75, NFPA 255, and UL 723. Minimum duct insertion loss at 2500 fpm for a 10-foot length of straight duct shall be as listed below when tested in accordance with ADC FD-72 R1:

Duct Insertion Loss, dB

Octave Band Frequency, Hz	2 125	3 250	4 500	5 1000	6 2000
6 inch duct	7	19	34	37	38
8 inch duct	8	13	29	35	36
12 inch duct	20	26	27	33	26

2.2 AIR DUCT ACCESSORIES

A. Access Doors:

1. Doors for low pressure rectangular ductwork shall be galvanized steel, 20 gauge rigid type, 12" X 16" minimum size unless noted otherwise, except where size of duct will not accommodate this size, they shall be as large as possible. Door shall have gasket, two hinges, and two compression latches with outside and inside handles. Provide insulated doors where installed in insulated ductwork.
2. Doors for round or flat-oval low, medium or high pressure ductwork shall be a complete factory mounted, duct section/access door assembly constructed of minimum 20 gauge galvanized steel. Access door shall match within two inches the diameter of duct and shall be complete with gasket, insulated door with handle, compression clips and chain retainer.

B. Dampers:

1. General:

- a. Fabricate of galvanized steel.
- b. Where manual dampers occur behind or above finished portions of hard ceilings or walls, a Zipset Remote Balancing System shall be provided.
 - 1) System shall include an RP series remote panel with the number of connectors as required. Panels shall be located in Mechanical Rooms only, coordinate exact locations with all applicable trades. Patch panels shall be labeled as to the location of each damper. Where air devices are located less than 10'-0" AFF, feed through option may be utilized at the discretion of the Contractor. THERE SHALL BE NO ACCESS HOLES, PLATES, ETC. in the ceilings. All actuator connections shall either be feed-thru or remote panel type.
 - 2) Actuators shall be Model ZSA-1, 9-12V Actuator. They shall operate over a temperature range of 30-125°F and shall be rated for a maximum torque of 30 in-lbs. Actuators shall be UL94-5VA rated for plenum-rated ceilings.
 - 3) System shall come complete with an HHC-1 controller, or HHC-1R controller at the Contractors discretion. Controller shall be hand held and 9V battery powered and shall be turned over to the Owner upon completion of the testing and balancing.
- c. Where dampers are located in accessible spaces, operators shall be locking type quadrant operators. Quadrant operators shall be installed on 1-1/2" high 4 bend galvanized steel bracket so that duct insulation may be extended and sealed under the quadrant operator.
- d. End of damper rod on each damper shall be grooved to show damper position.

C. Manual Volume Dampers shall be opposed blade multi-louver construction 16 gauge minimum with molded synthetic or stainless steel bearings, galvanized channel iron frame and maximum blade width of 8 inches. Axles shall be positively locked into blades to prevent slippage or loosening. Damper blades shall be interlocking type with linkage, control shaft, and standoff locking regulator (Rossi Everlock or equal).

D. Rectangular branch take-off connections from mains shall be made using 45 degree entry fittings per SMACNA 1995 figure 2-6. Grille and register connections to mains shall be made using 45 degree entry fittings where space allows. Where diffuser,

register or grille is located too close to the main, air deflectors shall be used. Air deflectors shall be factory fabricated. Adjustable deflectors shall be complete with worm gear operator when behind grilles, an extension rod and concealed regulator when above plaster ceilings, or self-locking lever type regulator when accessible.

- E. Instrument Test Holes: Holes, with patches, in ducts and plenums shall be provided where directed or necessary for using pitot tubes for taking air measurements for balancing the air systems. At locations where ducts or plenums are insulated and on all medium and high pressure ductwork die cast collars with threaded neoprene caps shall be provided.
- F. Apparatus Connections: At points where sheet metal connections are made to fans or where ducts of dissimilar metal are connected, provide a flexible connection of neoprene coated canvas of sufficient length to eliminate transmission of vibration. Flexible connections shall be securely fastened and air tight.
- G. Duct Sleeves: All ducts shall have sleeved openings 1" larger than the overall duct dimensions framed in place when the wall is constructed and 1/4" larger when floors are poured. Space between duct or duct insulation and sleeve shall be tightly filled with mineral fiber rope insulation and sealed. All duct penetrations through corridor walls, floors not requiring fire dampers and walls indicated to be smoke partitions shall be sealed with U.L. approved firestopping sealant. In fire partitions or floors requiring fire dampers, the duct sleeve shall be sized to match the fire damper frame with all voids packed tight with mineral fiber rope. All penetrations through draftstop partitions shall be sealed to maintain the integrity of the partition. Flanges, constructed of 20 gauge galvanized sheet metal, not less than 3" wide, shall be installed at each opening in finished areas.
- H. Spin-in collar [S] shall be 20 gauge galvanized steel, welded and riveted construction. Each fitting shall have conical bell-mouth duct fitting, locking groove, insulation guard, adjustable damper with 3/8" square shaft, u-bolt, nylon bushings, and standoff locking regulator (Rossi Everlock or equal).
- I. All wire mesh, woven metal fabric, bird screens, and similar items shall be constructed from corrosion resistant, galvanized steel or aluminum.
- J. Acoustic Lining: See Section 23 07 00.

2.3 AIR OUTLETS AND INLETS [S]:

- A. Acceptable Manufacturers:
 - 1. Standard Products: Price, Metal Industries, Krueger, Tuttle and Bailey, and Titus.
- B. General:
 - 1. All devices shall be commercial grade and shall be constructed of steel or aluminum as indicated on the drawings.
 - 2. Manufacturer shall certify cataloged performance and ensure correct application of each air device to provide air pattern, velocity, pressure drop and sound characteristics NC suitable for space installed. Shop drawings shall include air quantity, size, pressure drop, throw ft, and sound level NC.
 - 3. All devices located in ceilings shall have white baked enamel finish. Devices at other locations shall have prime finish suitable for painting or anodized aluminum unless noted otherwise.

SNOW CREEK ES 2CR HVAC UPGRADES

4. Maximum air outlet noise level shall not exceed NC30.
- C. Diffusers:
 1. Square ceiling diffusers shall be welded steel or aluminum as indicated on the drawings, removable core, louver face, complete with volume control unit and adjustable vanes for down-discharge pattern.
- D. Registers and Grilles:
 1. Return and exhaust registers shall be aluminum, unless noted otherwise, complete with 45 degree fixed airfoil vanes at not more than 1/2 inch centers. Provide 1 or 1-1/4 inch margin, 1/8 inch beveled frame with concealed screw holes. Damper shall be opposed blade face operated type with removable key. Units on watertight ducts shall be all polished stainless steel or aluminum with baked enamel finish, including damper, linkage, core and frame.
 2. Grilles shall be as specified for registers except without opposed blade dampers.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Duct clearance and lengths shall be established from measurements taken at the job site before any ducts are fabricated.
- B. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pitot tube openings where required for testing and balancing of system. Where exhaust ducts are installed within a chase or shaft, pitot tube shall extend to the outside of the chase or shaft and be capped.
- C. Locate ducts with sufficient space around equipment to allow normal passage, and operating and maintenance activity.
- D. Locate all ductwork to align with the ceiling grid where connections are to be made to Diffusers, Registers and Grilles. Field verify exact grid location before installing ductwork.
- E. Locate all Diffusers, Registers and Grilles as indicated on plans and in accordance with the Reflected Ceiling Plans, if provided.
- F. Provide low loss factory fabricated fittings for all round take-off connections to low velocity rectangular ducts.
- G. All Flex duct shall be properly supported to prevent any short radius bends or kinks. Connections to diffusers shall be made using long radius bends or elbows with turning vanes to ensure that airflow is distributed evenly across the neck of the diffuser. Conditions that create higher airflows in one quadrant of diffuser throw are not acceptable. Maximum flex duct runout length shall be 5 feet. Flex duct shall not penetrate wall construction of any type.
 1. Flex duct clamps shall be Thermaflex Snaplock Clamp or equal using minimum 1/2" wide stainless-steel band with cadmium plated hex bolt to tighten band with worm-gear action.
- H. Install duct accessory items in accordance with manufacturers printed instructions.

- I. Install volume, smoke and fire dampers where shown on plans.
- J. Manual volume dampers shall be installed at all branch connections, divided flow branches, and end-of-run diffuser/register connections for low pressure supply, return, and exhaust duct systems. Manual volume dampers shall be installed within 3 feet of the main duct.
- K. Provide access doors at all automatic dampers, fire/smoke dampers, duct heaters, duct mounted coils, thermostats and at all other points requiring inspection or servicing. Duct access doors for fire and smoke dampers shall be permanently labeled with minimum 1/2 inch high letters reading FIRE DAMPER or SMOKE DAMPER. Labeling shall be as specified for equipment nameplates under Section 23 05 53.
- L. Connection of horizontal ducts to roof vents shall be made using radiused elbows or mitered elbows with turning vanes. Duct transitions shall be as hereinbefore specified.
- M. Ductwork installed or stored on site shall be protected such that open ends are covered to prevent construction dust and debris and other foreign matter from being introduced into the duct systems. If at any time during construction, dust or debris is discovered within the duct systems or ducts openings are observed to be unprotected, the Contractor will be responsible for properly cleaning all duct systems in accordance with NADCA procedures for the respective type of ductwork.
- N. Grille, Register and Diffuser Installation:
 - 1. Boots to diffusers shall fit airtight to diffuser necks and diffusers shall be securely fastened thereto.
 - 2. Where grilles are installed at walls or ceilings, the duct shall be fastened securely to the masonry or panel at each side of the opening and the grille shall be securely fastened snug against the masonry or panel.
 - 3. If flanged grille frames are used on exposed ducts, runout shall be same size as outside dimension of flange and full depth of register assembly.
 - 4. Unless otherwise indicated in the Contract Documents, sidewall grilles and registers to be installed high shall be installed within 6 inches of the ceiling or nearest overhead projection. Unless otherwise indicated in the Contract Documents, sidewall registers and or grilles to be installed low shall be installed within 6 inches of the floor, but shall be coordinated with cove or base molding. Sidewall registers shall also be coordinated with the block coursing where applicable.
 - 5. Ceiling diffusers shall be installed in and coordinated with the ceiling tile or other ceiling units. Diffusers, Registers and Grilles shall be centered in each ceiling unit, unless shown otherwise. Mounting frames shall be installed as required to support diffusers, registers and grilles. Grilles, registers and diffusers shall not be supported from the ceiling system, conduit, piping or unrelated ductwork.
- O. Patching: Where existing control, monitoring or other penetrating devices are removed from ductwork, the opening shall be patched to match thickness, type and finish of existing ductwork, and sealed airtight.

3.2 DUCT SCHEDULE:

- A. All ductwork shall be fabricated, installed, sealed, and tested in accordance with the schedule below. All testing shall be in accordance with the latest edition of the SMACNA HVAC Air Duct Leakage Test Manual.
 - 1. Testing shall be conducted and the results approved by the Architect/Engineer prior to the application of insulation.
 - 2. The Architect/Engineer shall be notified one week prior to conducting the test. Unless specifically waived, the Engineer and Owner reserve the right to witness the test. Final, signed and dated test results shall be documented as outlined in SMACNA HVAC Air Duct Leakage Test Manual and submitted to the Architect/Engineer.
- B. Supply Ductwork
 - 1. Low pressure duct connected to air handling units and rooftop air conditioning units/heat pumps:
 - a. Pressure Class: Positive 3" w.g.
 - b. Seal Class: A
 - c. Leakage Class for Round Duct: 4
 - d. Leakage Class for Rectangular Duct: 4
 - e. Testing Requirement: 25%
 - 2. Ductwork connected to equipment not listed above:
 - a. Pressure Class: Positive 2" w.g.
 - b. Seal Class: A
 - c. Leakage Class for Round Duct: 8
 - d. Leakage Class for Rectangular Duct: 8
 - e. Testing Requirement: N/A
- C. Return Ductwork:
 - 1. Ductwork located in unconditioned spaces or fully ducted systems located above ceiling:
 - a. Pressure Class: Negative 2" w.g.
 - b. Seal Class: A
 - c. Leakage Class for Round Duct: 8
 - d. Leakage Class for Rectangular Duct: 8
 - e. Testing Requirement: 10%
 - 2. Ductwork connected to equipment not listed above:
 - a. Pressure Class: Negative 2" w.g.
 - b. Seal Class: A
 - c. Leakage Class for Round Duct: 8
 - d. Leakage Class for Rectangular Duct: 8
 - e. Testing Requirement: N/A

SNOW CREEK ES 2CR HVAC UPGRADES

D. Exhaust Ductwork:

1. Negative pressure general exhaust:
 - a. Pressure Class: Negative 2" w.g.
 - b. Seal Class: A
 - c. Leakage Class for Round Duct: 8
 - d. Leakage Class for Rectangular Duct: 8
 - e. Testing Requirement: N/A

END OF SECTION 233000

PART 1 - GENERAL

1.1 SUMMARY:

- A. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Work Included:
 - 1. Packaged Outdoor Unitary HVAC Equipment
- C. Related Sections:
 - 1. Section 23 00 10 – HVAC General Requirements
 - 2. Section 23 05 00 – Common Work Results for HVAC
 - 3. Section 23 05 48 – Vibration and Seismic Controls for HVAC Piping and Equipment
 - 4. Section 23 05 53 – Identification for HVAC Piping and Equipment
 - 5. Section 23 05 93 – Testing, Adjusting, and Balancing for HVAC
 - 6. Section 23 09 00 – Instrumentation and Control for HVAC
 - 7. Section 23 20 00 – HVAC Piping and Pumps
 - 8. Section 23 30 00 – HVAC Air Distribution

1.2 REFERENCES:

- A. General: The following standards or codes form a part of this specification to the extent indicated by the reference thereto.
- B. Air Moving and Conditioning Association, Inc. (AMCA):
 - Bulletin 210 Standard Test Code for Air Moving Devices
- C. Air Conditioning and Refrigeration Institute (ARI):
 - Guideline T Thermal Performance for Cool Storage Equipment
 - Standard 210 Standard for Unitary Air Conditioning Equipment
 - Standard 410 Standard for Forced Circulation Air Cooling and Heating Coils
 - Standard 430 Standard for Central Station Air Handling Units
- D. American National Standards Institute (ANSI):
 - Standard B31.1 Code for Pressure Piping
- E. American Society of Heating, Refrigeration and Air Conditioning Engineers (ANSI/ASHRAE):

SNOW CREEK ES 2CR HVAC UPGRADES

Standard 15 Safety Code for Mechanical Refrigeration

F. National Fire Protection Association (NFPA):

Standard 30 Flammable and Combustible Liquids Code

Standard 90A Air Conditioning and Ventilating Systems of other than Residence Type

G. National Electrical Manufacturers Association (NEMA)

H. Sheet Metal and Air Conditioning Contractors' Association (SMACNA)

Duct Construction Standards (Latest Edition)

I. International Fuel Gas Code (IFGC)

J. International Energy Conservation Code (IECC)

K. Underwriters Laboratories, Inc. (UL)

1.3 EQUIPMENT LABEL:

- A. All mechanical equipment and appliances shall be listed and labeled by a nationally recognized testing and inspection agency approved by the authority having jurisdiction. All equipment and appliances shall be installed in accordance with the conditions of the listing. Manufacturer's installation instructions shall be available at the job site at the time of inspection.

1.4 SUBMITTALS:

- A. Submit shop drawings, product data and samples in accordance with Division 1 and Section 23 00 10.
- B. Shop drawings, diagrams, catalog data and such other data necessary to fully describe and substantiate compliance with these specifications shall be submitted for all equipment and materials marked with notation set forth in Section 23 00 10.
- C. Operation and maintenance data shall be submitted in accordance with Division 1, for all items of equipment and materials marked with notation set forth in Section 23 01 00.
- D. All fans for use with Variable Frequency Drives (VFD) shall have critical speed and multiples of critical speed indicated on each submittal.

1.5 SPARE PARTS:

- A. Each cooling or heating unit shall be provided with 3 sets of filters. At end of construction each unit shall be provided with a clean filter and one set shall be turned over to the Owner as spares.
- B. Each belt driven piece of equipment shall be provided with one spare set of belts to be turned over to the Owner at the end of construction.

PART 2 - PRODUCTS

2.1 PACKAGED OUTDOOR UNITARY HVAC EQUIPMENT [S][O/M]:

- A. General: Rooftop air conditioning units shall be Trane or Daikin factory fabricated units furnished complete with all components as specified herein and as required by application and model number indicated on drawings. Units shall be packaged direct expansion single-zone draw through type complete with air-tight and weather-tight insulated and gasketed casing, fans, motors, adjustable V-belt or direct drive, belt guards (where belt driven fans provided), drain pan, cooling coil, compressors, air cooled condenser, hot gas reheat, filter, and economizer. Each unit shall have physical dimensions suitable for allotted space and allow complete removal of filters, coils, drain pans and accessories without having to dismantle the unit, adjacent equipment or building components. Units shall be sized to allow conduit to enter the unit within the curb and to allow valves and accessories within the unit casing. Where units are indicated to be variable air volume, unit mounted and wired variable frequency drives (VFD's) as specified hereinafter shall be provided for the supply.
- B. Casings for all sections of the unit shall be single wall galvanized steel construction with removable access panels or access doors as required for each individual section of unit. Casing shall be completely insulated internally with a minimum half-inch thick, one pound density fiberglass insulation factory coated with manufacturer's standard material to prevent erosion of insulating material.
- C. Condensing section shall be complete with a scroll compressor with centrifugal type oil pumps, condenser coil, stamped sheet metal condenser coil guards, condenser fans, motor starters, controls and piping enclosed in a sheet steel enclosure recommended for outside installation. The compressor motor shall be a permanent magnet type and have an anti-short cycle timer. Condenser fans shall have aluminum blades and be direct drive, vertical discharge as shown. Motors shall be permanently lubricated with integral thermal overload protection. Intake and discharge openings shall be provided with stamped sheet metal coil guards. Condensing unit controls shall provide automatic capacity modulation and condenser and evaporator pressure control for operation down to 0°F outside air temperature.
- D. Supply fan shall be double width double inlet centrifugal type with galvanized steel housing. Fan wheel shall be forward curved type mounted on solid steel fan shaft supported by grease lubricated ball bearing with average minimum life of 200,000 hours. Bearings shall be provided with lubrication facilities located outside of the unit enclosure. Fan shall be provided with unit mounted motor and V-belt or direct drive. Belt drives shall be designed for 150% of the connected motor capacity and sheaves shall be adjustable to provide at least 20% speed variation. Sheaves shall be selected to drive the fan at a speed which will produce the specified capacity when set at its approximate midpoint. Fan shall be statically and dynamically balanced at the factory after unit has been assembled. Fan shall be certified in accordance with ARI 430.
- E. Fan casing shall be provided with hinged, gasketed and insulated access door with quick opening latches. Access door shall be located on drive side of fan housing. Location of access shall be coordinated with drawings to assure adequate clearances and service capabilities.
- F. Coils:
 - 1. Heating coils shall be electric coils as specified in Section 23 80 00.
 - 2. Cooling coils shall be direct expansion refrigerant type as specified in Section 23 80 00.

3. All coils shall be installed within casing sections. Coil casings shall completely enclose all coil items including headers and return bends. Casing shall provide a minimum of six inches between coils to allow for field mounting of sensors or instrumentation. Casing shall provide removable access panels for removal of coils without disassembling remainder of unit. Stainless steel condensate drain pans are required for all cooling coils. Stacked cooling coils shall be provided with intermediate drain pans internally piped to main drain pan. Coil drain pans shall be insulated to prevent sweating under all conditions. Drain pan shall be provided with mastic coating to prevent corrosion. Drain pan shall slope to drain all moisture collected from the coil. Drain piping connections shall be provided at the lowest point of the drain pan.
- G. Combination filter mixing section shall be included in the packaged unit. Section shall include angular filter holding racks, outside air and return air dampers. Section shall be complete with access panel to facilitate filter media installation and replacement. Filter face velocity shall not exceed 350 feet per minute. Dampers for outside air and return air shall be full size of unit openings and shall be low leakage type with maximum leakage rate not to exceed 5 cfm per square foot at one inch water gauge. Damper arrangement shall provide proper mixing of outside air and return air.
- H. Fiberglass filters shall be pleated media, UL Class 2 listed and labeled, two inches thick. Filter media shall have a rigid frame around entire perimeter and rigid support grille on entering and leaving faces to adequately support the filter media.
- I. Unit shall be capable of operating at 100% economizer, with complete outside air, return air, and barometric relief air dampers. Provide controls as required for comparative enthalpy and dry bulb economizer.
- J. Unit Controls shall be factory furnished, installed and coordinated to operate with the system specified in 23 09 00. System shall include all necessary terminal blocks, motor contactors, motor overload protection, grounding lugs, control transformers, auxiliary contactors and terminals for the connection of external control devices or relays. Control system shall be a factory-mounted stand alone microprocessor-based DDC with all necessary sensors and interfaces to monitor and operate all functions as outlined in the equipment/control schedule and required for complete unit operation. The DDC controller shall be a Native BACnet applications controller that can communicate on a RS-485 LAN using the BACnet MS/TP or BACnet IP protocols. Control system shall be mounted in the unit main control compartment. Factory-mounted DDC control system shall be factory-programmed and run-tested prior to shipment to verify functions and logic. A unit-mounted intelligent programmable interface device shall be included for communication, display and setpoint control. A unit-mounted Hand/Off/Auto switch shall be included to allow for servicing. Refer to Section 23 09 93 for Sequence of Operation requirements of the packaged DDC controller. Refer to the Control Schematics on the Drawings to obtain configuration requirements of specific units. All points indicated on the controls diagrams shall be communicated to/with the Building Automation System. The controls shall be capable of receiving setpoint and occupancy signals from the Building Automation System.
- K. Unit shall have through the base factory wired circuit breaker and non-powered 15A GFI convenience outlet. Circuit breaker shall be a thermal magnetic, molded case, HACR type with provisions for through the base electrical connections. The circuit breaker shall be installed in a water tight enclosure in the unit with access through a swinging door. Wiring shall be provided from the switch to the unit high voltage terminal block. The circuit breaker shall be sized to provide overcurrent protection in accordance with NEC and UL guidelines and be agency recognized by UL/CSA. Unit

SNOW CREEK ES 2CR HVAC UPGRADES

shall also have integral phase monitor to protect motors and compressors against problems associated with phase loss, phase imbalance or phase reversal.

- L. All duct openings in unit floor over 12 inches wide shall have personnel-load-rated safety grates.
- M. Rooftop units shall be provided with factory fabricated curb, 12"-14" high suitable for vibration isolation rail. The roof curb shall be pitched to match the pitch of the roof such that the top of the curb is level without the use of shims or other similar type devices.
- N. Warranty: Motor-compressor shall be guaranteed for 5 years.
- O. See PART 1 for spare parts requirements.

PART 3 - EXECUTION

3.1 GENERAL:

- A. All equipment and materials, specified herein or shown on the drawings shall be installed complete, coordinated with all other work, tested and made tight and put into safe controlled operation to perform its intended function as a part of this project.
- B. All rooftop equipment shall be secured to the roof framing structure.

3.2 ROOFTOP AIR HANDLING AND AIR CONDITIONING UNITS:

- A. Coordinate all openings and location with structural systems.
- B. Contractor's attention is directed to Section 23 05 48 Vibration and Seismic Controls for HVAC Piping and Equipment for requirements.
- C. Install and connect unit in accordance with manufacturer's recommendations and contract drawing details. Should conflicts in the two occur notify the Architect/Engineer.
- D. Coordinate all control items with Section 23 09 00 Instrumentation and Control for HVAC.

END OF SECTION 237000

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SECTION 238000 - DECENTRALIZED HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY:

- A. Related Documents: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Work Included:
 - 1. Heating and Cooling Coils
 - 2. Miscellaneous Appurtenances
- C. Related Sections:
 - 1. Section 23 00 10 – HVAC General Requirements
 - 2. Section 23 05 00 – Common Work Results for HVAC
 - 3. Section 23 05 48 – Vibration and Seismic Controls for HVAC Piping and Equipment
 - 4. Section 23 05 53 – Identification for HVAC Piping and Equipment
 - 5. Section 23 05 93 – Testing, Adjusting, and Balancing for HVAC
 - 6. Section 23 09 00 – Instrumentation and Control for HVAC
 - 7. Section 23 20 00 – HVAC Piping and Pumps
 - 8. Section 23 30 00 – HVAC Air Distribution

1.2 REFERENCES:

- A. General: The following standards or codes form a part of this specification to the extent indicated by the reference thereto.
- B. Air Moving and Conditioning Association, Inc. (AMCA):
 - Bulletin 210 Standard Test Code for Air Moving Devices
- C. Air Conditioning and Refrigeration Institute (ARI):
 - Standard 210 Standard for Unitary Air Conditioning Equipment
 - Standard 240 Standard for Unitary Heat Pump
 - Standard 310 Standard for Packaged Terminal Air Conditioners
 - Standard 410 Standard for Forced Circulation Air Cooling and Heating Coils
 - Standard 440 Standard for Room Fan Coil Air Conditioners
- D. American National Standards Institute (ANSI):

Standard B31.1 Code for Pressure Piping

- E. American Society of Heating, Refrigeration and Air Conditioning Engineers (ANSI/ASHRAE):

Standard 15 Safety Code for Mechanical Refrigeration

- F. National Fire Protection Association (NFPA):

Standard 90A Air Conditioning and Ventilating Systems of other than Residence Type

- G. National Electrical Manufacturers Association (NEMA)

- H. Sheet Metal and Air Conditioning Contractors' Association (SMACNA)
Duct Construction Standards (Latest Edition)

- I. Underwriters Laboratories, Inc. (UL)

1.3 EQUIPMENT LABEL:

- A. All mechanical equipment and appliances shall be listed and labeled by a nationally recognized testing and inspection agency approved by the authority having jurisdiction. All equipment and appliances shall be installed in accordance with the conditions of the listing. Manufacturer's installation instructions shall be available at the job site at the time of inspection.

1.4 SUBMITTALS:

- A. Submit shop drawings, product data and samples in accordance with Division 1 and Section 23 00 10.
- B. Shop drawings, diagrams, catalog data and such other data necessary to fully describe and substantiate compliance with these specifications shall be submitted for all equipment and materials marked with notation set forth in Section 23 00 10.
- C. Operation and maintenance data shall be submitted in accordance with Division 1, for all items of equipment and materials marked with notation set forth in Section 23 01 00.

1.5 SPARE PARTS:

- A. Each cooling or heating unit shall be provided with 3 sets of filters. At end of construction each unit shall be provided with a clean filter and one set shall be turned over to the Owner as spares.
- B. Each belt driven piece of equipment shall be provided with one spare set of belts to be turned over to the Owner at the end of construction.

PART 2 - PRODUCTS

2.1 HEATING AND COOLING COILS [S]:

- A. General: This specification applies to all coils whether remote mounted, mounted in factory fabricated air handling units or mounted in site-built units and shall be used as a guideline to establish the minimum requirements unless definitely specified otherwise for the particular case involved.
- B. Direct expansion (DX) refrigerant evaporator coils shall be full tube face, fin and tube type constructed of seamless copper tubes and aluminum fins mechanically bonded to tubes. Coil support frame shall be heavy gauge galvanized steel with heavy gauge flanges and support plates. Tubes shall be 1/2 inch or 5/8 inch diameter. Tube wall shall be minimum 0.020 inch thickness. Fins shall be minimum .0075 inch thickness. Tubes shall be staggered and circuited with equalizing distributing tubes to match the number of compressor refrigerant circuits provided. Coil circuiting shall be full face interlaced type where required for optimum capacity reduction. Units shall be provided with brass liquid distributors for each circuit. Coils shall be factory proof tested at 450 psig and leak tested at 300 psig, cleaned, dehydrated and sealed with dry nitrogen charge. Coils shall be coordinated with the manufacturer of the condensing unit for capacities indicated. Cooling coil ratings shall be certified in accordance with ARI Standard #410. Maximum cooling coil face velocity shall not exceed 550 feet per minute.
- C. Electric coils shall be UL approved and shall be 80% nickel – 20% chromium bare wire heating elements, unless indicated otherwise, mounted in a frame and wired at the factory to an identified terminal strip enclosed in a metal box on one end of the coil. Heater frame shall be constructed for slip-in or flanged frame installation as applicable. Thermal cutout shall be provided to prevent the coil from overheating. Magnetic contactor and fuse shall be provided for each step of control or Solid state silicone controlled rectifiers (SCR) shall be provided for fully modulating control as indicated on the Drawings. Control voltage shall be suitable for control system indicated. Contactors and fuse block shall be UL approved and mounted and wired inside a steel cabinet for remote mounting with all wiring terminated at an identified terminal strip inside the cabinet. Provide air motion switch to prevent heater from operating unless there is proper air flow. Provide additional interlock connections as indicated in Section 23 09 00. An interlocking safety disconnect switch shall be provided in the terminal box door of each coil.
- D. Heating and cooling coils in the same unit shall be provided as separate coils with independent fin sheets to allow preheat, dehumidification, and individual removal of each coil.

2.2 MISCELLANEOUS APPURTENANCES [S] [O/M]:

- A. Miscellaneous electric appurtenances such as transformers, solenoid valves, electric relays, selector switches, on-off switches, pilot lights and other similar items required

by the electric sequence control diagrams and not shown to be provided by the Electrical Contractor shall be provided as part of the Mechanical Contract.

1. Solenoid valves shall be Asco or Alco of coil rating and size to accomplish the indicated requirement.
2. On-Off switches shall be toggle type, 20 amp. contract rating complete with engraved cover plate where required.
3. Selector switches shall be manual selector type with the indicated poles and contacts and engraved cover plate. Contact rating shall be a minimum of 20 amps.
4. Relays shall be G.E., Square D, or Cutler-Hammer 20 amp rating with sufficient contacts for the sequence indicated.

B. Dampers and Damper Motors:

1. Automatic control dampers shall be opposed blade construction for modulating service and parallel blade construction for two-position service. Dampers shall be of the multi-louver construction with brass bearings, channel iron frame and maximum width of 10". Damper blades shall be interlocking felt edged and air tight.
2. Damper motors shall be provided for all automatic dampers and shall be sufficient capacity to operate the connected damper. Damper motor shall be electric type.

PART 3 - EXECUTION

3.1 GENERAL:

- A. All equipment and materials, specified herein or shown on the drawings shall be installed complete, coordinated with all other work, tested and made tight and put into safe controlled operation to perform its intended function as a part of this project.
- B. All new rooftop equipment shall be secured to the roof framing structure.

END OF SECTION 238000

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 1 Specification Sections, apply to this Section.

1.2 WORK INCLUDED:

- A. Every item of labor, material, devices and appurtenances for installing a complete Electrical System and other related systems included in Division 26 of the Specifications.
- B. Section 26 05 00 – Common Work Results For Electrical
- C. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables
- D. Section 26 05 23 – Control Voltage Electrical Power Cables
- E. Section 26 05 26 – Grounding And Bonding For Electrical Systems
- F. Section 26 05 33 – Raceway And Boxes For Electrical Systems
- G. Section 26 05 36 – Cable Management For Electrical Systems
- H. Section 26 05 53 – Identification For Electrical Systems
- I. Section 26 09 23 – Lighting Control Devices
- J. Section 26 28 13 – Fuses
- K. Section 26 28 16 – Enclosed Switches And Circuit Breakers
- L. Section 26 50 00 – Lighting

1.3 RELATED WORK:

- A. General: See all other portions of these Contract Documents and apply to those portions of work, relating to Electrical Work, the same as if repeated herein in its entirety. The Division 26 Electrical Trade shall allow for wiring and controlling all equipment requiring electrical connections as described therein even though not shown on the electrical drawings.
- B. Section 07 80 00 - Firestopping
- C. Section 09 90 00 - Painting
- D. Division 23 – Mechanical
- E. Division 21 – Fire Suppression
- F. Division 28 – Electronic Safety and Security

SNOW CREEK ES 2CR HVAC UPGRADES

1.4 WORK NOT INCLUDED:

- A. Certain electrical equipment will be provided in-place as specified under other Divisions of these Contract Documents and other pieces of equipment such as operating controls, etc., will be provided f.o.b. (freight on board) premises, which shall be mounted and connected to electrically under Division 26.

1.5 DRAWINGS:

- A. Where conduit, equipment, devices and other electrical appurtenances are shown on the drawings, the general arrangement of such items on the electrical drawings shall be followed as closely as actual building construction and the work of other trades will permit. Because of the small scale of the electrical drawings, it is not feasible to indicate all offsets, fittings and accessories which may be required. The Contractor shall investigate the construction conditions affecting the work and provide fittings and accessories as required to meet actual conditions.

1.6 QUALITY ASSURANCE:

- A. Equipment and material used in the project shall be new and undamaged. The electrical installation shall fit into the space allotted and shall allow adequate, acceptable, clearances for entry, servicing, safety, and maintenance. The Contractor shall coordinate the work to ensure that the equipment may be moved into place without altering building components or other installations. All Electrical work shall be performed by a Commonwealth of Virginia Class-A licensed Electrical Contractor whose technicians, mechanics, or tradesmen shall be skilled in the trade involved. All electrical work shall be performed under the direct supervision of an electrician with a locally recognized and accepted master license.
- B. Equipment and material in existing installations may be reused where specifically indicated on the drawings.

1.7 REFERENCES:

- A. The complete installation and all materials and equipment under Division 26 shall conform to the Virginia Uniform Statewide Building Code, current issue, including all applicable portions of the National Electrical Code (NEC) and all other governing codes and regulations.
- B. All equipment used shall bear the Underwriters Laboratory (U.L.) label for the intended application, or other organizations label if acceptable to the Authority having jurisdiction and concern with product evaluation.
- C. In addition, the following codes, standards, and regulations shall apply to the complete installation and all materials and equipment. These are referred to by their accompanying abbreviations.
- D. National Electrical Code (NFPA No. 70) 2020 NEC
- E. National Electrical Manufacturers Association NEMA
- F. Underwriters Laboratories, Inc. UL
- G. Telecommunications Building Wiring Standards TIA/EIA

SNOW CREEK ES 2CR HVAC UPGRADES

- H. All Systems' Installation Certification Compliance Documents for Installing Trades
- I. National Fire Protection Association NFPA
- J. Uniform Federal Accessibility Standards UFAS
- K. Americans with Disabilities Act Accessibility Guideline ADAAG
- L. The above standards are intended as a minimum and shall be exceeded if required by the Contract Documents. In the event information contained in the Contract Documents conflicts with one of the above mentioned codes, the codes shall take precedence.

1.8 PERMITS, LICENSES, TAXES AND INSPECTION CERTIFICATES:

- A. All permits, bonds, licenses, electrical connection fees, inspection fees and taxes required for the execution of the work shall be obtained and paid for by the Contractor. Under each phase of the Electrical work the Contractor shall furnish three copies of certificates of final acceptance to the Engineer from any inspection authority having jurisdiction.
- B. At the completion of the job, provide the Engineer with three (3) copies of an electrical inspection certificate from the local Electrical Inspector, if such inspection is provided and/or required by the locality.

1.9 REGULATIONS AND STANDARDS:

- A. The completed installation and all materials and equipment shall conform to local ordinances and codes, other regulations and standards listed herein or in related sections. These are intended as a minimum and shall be exceeded if required by the specifications or Drawings. In the event of a conflict between the codes, standards, or regulations, and information contained in the Contract Documents, the applicable code, standard, or regulation shall take precedence.

1.10 SUBMITTALS:

- A. Submit shop drawings, product data and samples in accordance with Division 1 for all items as specified in related sections of these specifications. One (1) electronic (PDF) copy of the submittal shall be submitted. One (1) electronic (PDF) copy of the submittal will be returned to the Contractor. If additional copies are required, they will be the responsibility of the Contractor. Where drawings are submitted, the Contractor shall submit a minimum of two (2) sets of full-scale prints. One (1) copy will be marked and returned to the Contractor, and the Contractor shall be responsible for all additional copies required for his use. All submittal data shall be correctly identified to show project name, and the exact model, style or size of item being submitted. Improperly identified submittals will not be reviewed by the Engineer. Each item submitted for review shall bear the Subcontractor's stamp which states that they have reviewed the submission, that it is complete, and that in their opinion it meets the contract requirements. Contractor's stamp shall identify the paragraph and page number for which the submittal is being made. Any submission which has not been reviewed and stamped by the Electrical Trade will not be reviewed by the Engineer. No reviews prior to award of Contract will be considered or accepted.
- B. Shop drawings, samples, diagrams, catalog data and such other data necessary to fully describe and substantiate compliance with these contract documents shall be submitted as follows:

SNOW CREEK ES 2CR HVAC UPGRADES

1. All the equipment and materials where submissions are specifically required by other Divisions of these Contract Documents.
 2. All the equipment and materials that are indicated with an [S] behind the product title. This shall include submission of the specified products equipment and materials.
 3. All the equipment and materials that are acceptable equal substitution.
 4. If submission is NOT required for the SPECIFIED products "shop drawings and product data" under 1. and 2. above, the Contractor shall NOT submit a shop drawing for the SPECIFIED products.
 5. Samples, in good working order, shall be submitted in accordance with Division 1, complete with all installation and service drawings and instructions. All samples will be returned at the submitter's expense unless otherwise indicated. Samples may be subject to destructive testing by the Engineer.
- C. Operation and Maintenance manual(s) shall be submitted in accordance with Division 1 and shall include a complete product index, a copy of all accepted shop drawings, installation and maintenance data, sequence of controls, parts lists, and the name, address and telephone number of supplier or nearest representative. All electrical devices, equipment and systems marked [O/M] in these specifications shall be included and all other such electrical items which will require servicing before the duration of its useful life has been reached. The manual(s) shall be presented to the Engineer for review and transmitted to the Owner before the final payment is recommended.
- D. Equivalents: Manufacturers, trade names and model numbers indicated herein and on drawings shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. Unless definitely stated otherwise and upon complying with Division 1, the Contractor may use any article of equal appearance which, in his judgment is equal to that specified and is accepted by the Engineer. Where three or more manufacturers are named in the specifications for any item, the Contractor should use one of the manufacturers. No others shall be reviewed or accepted. Manufacturers listed first in these specifications and on drawings were used as a basis of design. It will be the responsibility of the Contractor to verify all connections, physical sizes and capacities of all other manufacturer's items, both items named herein, or items proposed. If the equipment necessitates changes in power distribution, conduit, wiring, lighting, ductwork, piping, or any other building systems from that indicated on the drawings, the Contractor shall be responsible for all additional costs included and notify other trades of the changes. Where such changes are required, detail drawings indicating all required changes shall be submitted for review at the same time the manufacturers drawings are submitted for approval. See Division 1 for substitutions.
- E. The ten day prior approval requirements of The Instructions to Bidders, AIA 701, are waived for this Division of the Specifications, and unless stated otherwise the Contractor may use items that he deems as equivalent in quality and performance to the specified item subject to final acceptance of substituted items by the Engineer upon his review of shop drawings.
- F. Guarantee: Electrical equipment, materials and labor required by these specifications and accompanying drawings shall be guaranteed to be free from defective materials or workmanship, including lamps, for a period of one year after final acceptance of the project except extended warranties as specified elsewhere in these documents on specific items of equipment will be furnished by the Trade providing the equipment. Defects in material or workmanship occurring during this period shall be corrected with new material and equipment or additional labor at no cost to the Owner. Manufacturer's certificates of warranty shall be transmitted to the Owner before final payment is recommended.

SNOW CREEK ES 2CR HVAC UPGRADES

1.11 WARRANTIES:

- A. The Contractor shall warrant for a period of one year all work provided under the Contract to include, but not necessarily limited to, all systems, equipment, materials, and workmanship. This shall not be construed to limit any extended warranty periods of longer than one year for specific items or systems specified elsewhere in the Contract Documents.
- B. The warranty period shall commence on the date of final acceptance by the Owner and shall cover all parts and labor as required to fulfill the warranty at no cost to the Owner.
- C. Refer to Division 1 for additional warranty requirements.
- D. Information on all warranties shall be included in the O&M Manuals specified herein to be provided to the Owner.

1.12 COORDINATION OF WORK:

- A. General: The contract documents indicate the extent and general arrangement of the electrical systems. The Contractor shall be responsible for the coordination and proper relation of the electrical work to the building structure and to the work of other trades. No additional compensation or extension of completion time will be granted for extra work caused by the lack of coordination.
- B. Miscellaneous loads, such as control panel power, are not always shown on the Drawings. Where additional circuits are needed for such loads, extend wiring to the load from the nearest electrical panel serving receptacle loads and connect to a spare circuit breaker.
- C. Cooperation: The Contractor shall provide dimensions and locations of all openings, shafts and similar items to the proper trades and install work as required so as not to interfere with, or delay, the building construction.
- D. Locations of lines and equipment shall be determined from actual field measurements. The outlines of the building shown on the electrical drawings are intended only as a guide to indicate relative locations of the electrical work. Refer to structural drawings for building construction details. If conflicts prevent installation of electrical work at the locations indicated, minor deviations shall be made subject to acceptance by the Engineer, and without additional compensation.
- E. Cutting and Patching: Unless stated otherwise, the Electrical Trade shall do all cutting necessary for the installation of his work. All work should be installed sufficiently in advance of new construction in order to permit installation of supports, sleeves, and similar items without cutting. Cutting which will in any way affect the building structure shall not be performed without permission of the Engineer. The Electrical Trade is responsible for patching where he does cutting. Patching shall be done to the satisfaction of the Engineer.
- F. Roughing-In: Receptacles, switches, and other similar items shall align vertically or horizontally with each other, hose bibbs, thermostats, the building structure and features thereof when it appears obvious and logical that they should. All mounting heights shall be within the limits of Commonwealth of Virginia USBC and ADAAG.
- G. Damage to Other Work: The Electrical Trade is responsible for damage to other work caused by his work or workmen. Repairing of damaged work shall be done by the Trade who installed the work, and as directed by the Engineer; the cost of which shall be paid for by the Electrical Trade.

SNOW CREEK ES 2CR HVAC UPGRADES

1.13 ASBESTOS:

- A. Asbestos Free Materials: The intention of these drawings and specifications is that there be no asbestos containing materials installed on this project. To the best of the Engineers' knowledge, none of the material or equipment specified herein or shown on the drawings contains asbestos. The Contractor shall make every effort to prevent any asbestos materials from being installed in or used on the construction of the project. At the completion of the project, the Contractor shall certify by letter that to the best of his knowledge, no asbestos containing materials were used for or in the construction of this project.
- B. Existing Materials:
 - 1. Discovery: If during the construction of this project, work involving friable asbestos is suspected, or encountered, all work in this area shall be discontinued and the Owner or the Owner's representative, shall be notified immediately and the Owner with his own forces or by separate contract shall be responsible for complete investigation, removal, and disposition of the friable asbestos hazard in accordance with applicable laws and regulations. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, he shall make such claim as provided elsewhere in the contract documents.
 - 2. Removal: All work involving the removal of friable asbestos will be done under a separate contract.

1.14 GRAPHICS DATABASE:

- A. This project's Computer Aided Design & Drafting (CADD) drawing files may be obtained directly from the Engineer for use in preparing computer graphics specific to this project. See Appendix A at the end of this Section for Letter of Indemnification and ordering instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND MATERIALS:

- A. General: Manufacturers and materials shall be as specified in subsequent sections of these specifications and as noted on the drawings. Similar types of equipment shall be the products of the same manufacturer unless specified otherwise.

2.2 SLEEVES AND INSERTS:

- A. General: Sleeves and inserts shall be provided and correctly located in the structure, as required for the work.
- B. Inserts shall be steel and of proper size for loads encountered.

2.3 ACCESS DOORS:

- A. Provide for all junction boxes or any item requiring access. Doors shall be of sufficient size and so located that the concealed items may be serviced or completely removed and replaced. Doors required for work shall be furnished as a part of this Division to the General Contractor for installation. Doors in acoustic tile ceilings shall be furnished in

multiples of tile sizes. Doors are not required in exposed grid type ceilings where tiles are removable. Doors shall be metal access doors with cam lock, style to match ceiling or wall construction. Doors occurring in rated construction shall be fire rated U.L. labeled access doors correlated to preserve the integrity of the rated construction. Doors shall be prime finish steel except those in toilets, shower rooms, locker rooms, kitchens and other similar areas shall be aluminum with natural anodized finish. Doors shall match the access doors in Division 23 and meet the acceptance of the Engineer.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. General: Materials and equipment shall be installed in accordance with manufacturer's instructions to conform to the details and application as specified in subsequent sections of these specifications and indicated on the drawings.
- B. Supports: Provide necessary supports for all equipment and appurtenances as required; this includes, but is not limited to, frames or supports for items such as lighting fixtures, disconnect switches, junction boxes, conduit, motor starters, outlet boxes, and other similar items requiring supports.
- C. Sleeves: Provide sleeves for all conduits passing through concrete or masonry walls, partitions, concrete slabs or beams installed during construction of the wall, partition, slab or beam. Sleeves placed horizontally in walls or in any position in beams shall be standard weight ASTM A53 steel pipe of length equal to the thickness of the wall or beam. Sleeves in floors with waterproof membrane shall be provided with flanges or flashing rings and shall be clamped or flashed into the membrane. All sleeves shall be of sufficient diameter to allow installation of conduit except sleeves on lines subject to movement, which shall clear the conduit at least one inch all around. Sleeves for insulated wiring and conduit, penetrating fire (and smoke) rated partitions and shall have seals as specified in Section 26 05 43 and shall be sealed in accordance with the terms of U.L. Listed Through-Penetration Firestop Systems (XHEZ) as published in the U.L. Fire Resistance Directory. Penetrations shall exactly conform to details of the Firestop System indicated for the type of partition, wall and floor construction encountered. All firestopping of sleeves for electrical work shall be provided under Division 26.
- D. Temporary Requirements: Openings in equipment shall be kept capped at all times until connection is made to the system. The ends of all conduits and equipment openings shall be kept capped properly with approved devices. Approved devices are items such as specially molded plastic caps and sheet metal caps.
- E. Access Doors: Provide access doors for all concealed electric equipment, pull boxes, junction boxes or any item requiring access. Doors shall be of sufficient size and so located that the concealed items may be serviced or completely removed and replaced. Doors required for Electrical work shall be furnished by the Electrical Trade, to the Contractor for installation. Doors in acoustic tile ceilings shall be furnished in multiples of tile sizes. Doors are not required in exposed grid type ceilings where tiles are removable.
- F. Painting: All work under this Division shall be painted in accordance with Section 26 05 53, Identification for Electrical Systems.

3.2 EXISTING WORK AND DEMOLITION:

- A. Electrical Demolition: Remove all existing electrical conduits, wiring, junction boxes, outlets, lighting fixtures, wiring devices, unused panelboards, etc., indicated for demolition. Additional amounts of demolition may be required to accommodate desired renovations and new construction. Not all demolition may be shown on the drawings. All existing electrical equipment not indicated for demolition shall remain in place.
- B. Equipment and Fixtures Removed: The Owner will select and retain such existing electrical equipment and materials which are indicated to be removed and not reused, as he desires. All other existing equipment and materials indicated to be removed, and not reused shall become the property of the Contractor, who shall remove them from the premises within the time frame specified under other Divisions of this Contract Document.
- C. Equipment and Fixtures Relocated: All existing lighting fixtures and other electrical equipment and materials indicated to be relocated shall be disconnected, removed, and relocated. All electrical equipment and materials shall be protected from damage during demolition. Install new phase, neutral and grounding conductors, if grounding conductor is not already present, in each feeder and branch circuit to be reworked, from the panelboard to the outlet.
- D. Power Interruption: Attention is called to the fact that the existing facility shall remain in operation throughout the construction period. All necessary temporary arrangements shall be made as required to keep all electrical circuits in continuous operation during this period except for scheduled outages for circuit change-overs. The outage shall be kept to the minimum and carefully scheduled to suit the Owner.
- E. Mechanical Equipment: All existing mechanical equipment being removed or relocated under this contract shall be disconnected electrically, both power and control wise, so that the Mechanical Trade can remove or relocate same.
- F. Miscellaneous: In all altered portions of the buildings, the Electrical Trade shall remove or alter as necessary all existing electrical work that does not fit with the new construction. All existing work or areas that are not altered shall be reconnected as required. Where indicated changes to non-electrical facilities require minor electrical changes, these changes shall be accomplished even if not specifically indicated. Only a small portion of the existing work is shown on the drawings. Contractors submitting proposals shall visit the site to determine the scope of work under this heading as no additional compensation will be granted because of existing conditions even though the existing conditions may not be indicated on the drawings. Contractor shall thoroughly inspect the electrical systems in reworked areas and bring to the attention of the Engineer all defective or unserviceable material not scheduled for removal or replacement. Demolition shall not begin until the work schedule is approved by the Owner. The work shall be scheduled to prevent any disruption to the normal operations of the building. Refer to other Divisions for work phasing.

3.3 FIELD QUALITY CONTROL:

- A. System Readings: Certain system voltage and current readings shall be taken, the values recorded and submitted in triplicate to the Engineer. Two complete sets of readings are required, one under no load and one under maximum available load. The current and voltage shall be recorded on each phase (plus voltage between all phases) at each branch circuit panelboard being modified. Additional spot readings shall be made if required. Resistance of grounding system shall be tested and recorded. Forms for submitting this report may be obtained from the Engineer's office. A sample form is bound herewith.

SNOW CREEK ES 2CR HVAC UPGRADES

- B. Equipment Readings: Voltage and amperage readings on each phase of each motor circuit and each resistance heater circuit installed under this contract shall be measured, the values recorded, and submitted in triplicate to the Engineer. Also record motor nameplate data, actual motor heater protective device ratings and all other data necessary for selection of heater device.
- C. Verification [V]: Upon completion of the project, the Contractor shall submit a separate letter of certification (or compliance) to the OwnerEngineer that each of the following systems or equipment functions properly, conforms to all requirements of these specifications and all requirements of the manufacturer of the systems.
 - 1. Section 26 50 00, Lighting.

3.4 MANUFACTURER'S ASSISTANCE:

- A. Qualified technical representatives of manufacturers shall be available to visit the project and provide required assistance for any problems or trouble areas of any systems, material or equipment used in the project. Manufacturer's engineering assistance shall also be available for above problems or trouble areas. The Contractor shall purchase all materials, equipment or systems with these services included in the purchase price or otherwise be prepared to have the above service provided when needed or requested by the Engineer without additional compensation. Where one manufacturer's equipment constitutes the majority of the components or devices to make a system, the manufacturer's technically qualified representative shall inspect and accept the completed installation whether or not especially requested by the Engineer.

3.5 INSTRUCTION OF OWNER'S REPRESENTATIVE:

- A. The Electrical Trade shall instruct the representative of the Owner in the proper operation and maintenance of all elements of the Electrical systems. Competent representatives of the Contractor shall spend such time as necessary to fully prepare the Owner to operate and maintain the Electrical systems.

3.6 CONSTRUCTION STATUS REPORT:

- A. Each item of discrepancies noted on Construction Status Report prepared by the Engineer shall be answered in detail in writing by the Contractor before payment can be recommended.

SCHEDULE OF ABBREVIATIONS:

Electrical Abbreviations:

A	-	AMP	EN	-	EXISTING OUTLET WITH	MP SW	-	MOTOR PROTECTIVE
ABV	-	ABOVE			A NEW DEVICE AND			SWITCH
AC	-	AIR CONDITIONING OR			WIRING	MS	-	MOTOR STARTER
		ARMOR CLAD	ENG	-	ENGINE	MTD	-	MOUNTED
ACB	-	AIR CIRCUIT BREAKER	EO	-	EXISTING OUTLET	MTS	-	MANUAL TRANSFER
ACI	-	AMERICAN CONCRETE	EQUIP	-	EQUIPMENT			SWITCH
		INSTITUTE	EP	-	EXPLOSION-PROOF	MW	-	MEGAWATTS
ACS	-	ABOVE COUNTER	EP SW	-	ELECTRO- PNEUMATIC	NC	-	NORMALLY CLOSED
		SPLASHBACK			SWITCH	NCS	-	NURSES CALL SYSTEM
ADAAG	-	AMERICANS WITH	ER	-	EXISTING RELOCATED	ND	-	NEW DEVICE IN
		DISABILITIES ACT	ERL	-	ENVIRONMENTAL			EXISTING OUTLET
AEIC	-	ASSOC OF EDISON			RESEARCH LABS	NEC	-	NATIONAL ELECTRIC
		ILLUMINATING CO'S.	ESC	-	ELECTRIC SEQUENCE			CODE
AFF	-	ABOVE FINISHED			CONTROLS	NEMA	-	NATIONAL ELECTRICAL
		FLOOR	ETL	-	ELECTRICAL TESTING			MANUFACTURERS
ANSI	-	AMERICAN NATIONAL			LAB			ASSOCIATION
		STANDARDS INSTITUTE	EWC	-	ELECTRIC WATER	NESC	-	NATIONAL ELECTRICAL
ASME	-	AMERICAN SOCIETY OF			COOLER			SAFETY CODE
		MECHANICAL ENG.	EXP	-	EXPANSION	NFPA	-	NATIONAL FIRE
ASTM	-	AMERICAN SOCIETY	FA	-	FIRE ALARM			PROTECTION ASSOC
		FOR TESTING AND	FIN FL	-	FINISHED FLOOR	NIC	-	NOT IN CONTRACT
		MATERIALS	FIXT	-	FIXTURE	NEUT	-	NEUTRAL
ATS	-	AUTOMATIC TRANSFER	FL	-	FLOOR	NO	-	NORMALLY OPEN
		SWITCH	FLA	-	FULL LOAD AMPS	OCB	-	OIL CIRCUIT BREAKER
AUTO	-	AUTOMATIC	FLUOR	-	FLUORESCENT	OPR	-	OPERATED
AUX	-	AUXILIARY	FS	-	FILLER SECTION	OS	-	OIL SWITCH
BALL	-	BUILDING ACOUSTICS	FU	-	FUSE	OSHA	-	OCCUPATIONAL
		AND LIGHTING LABS	GBM	-	GROUND BUS MODULE			SAFETY & HEALTH ACT
BAT	-	BATTERY	GEC	-	GROUNDING	P	-	POLE
BIL	-	BASIC INSULATION			ELECTRODE	PA	-	PUBLIC ADDRESS
		LEVEL			CONDUCTOR	PB	-	PULLBOX
BOCA	-	BUILDING OFFICIALS	GEN	-	GENERATOR	PC	-	PHOTOCELL (PEC)
		AND CODE ADMIN.	GF	-	GROUND FAULT	PD	-	PLUG DUCT
BRK	-	BREAKER	GND	-	GROUND	PE	-	PNEUMATIC ELECTRIC
CAP	-	CAPACITORS	GRS	-	GALVANIZED RIGID	PM	-	PLUG MOLD
CABO/MEC	-	COUNCIL OF AMER.			STEEL CONDUIT	PNL	-	PANEL
		BLDG. OFFICIALS MDL	HOA	-	HAND-OFF-AUTOMATIC	PS	-	PLUG STRIP
CB	-	CIRCUIT BREAKER	HP	-	HORSEPOWER	PT	-	POTENTIAL
		(CRT BRK)	HPS	-	HIGH PRESSURE			TRANSFORMER
CBM	-	CERTIFIED BALLAST			SODIUM	PW	-	PART WINDING (MOTOR
		MANUFACTURERS	HV	-	HIGH VOLTAGE			STARTER)
CCCT	-	CROSS CURRENT	HW	-	HOT WATER	PWR	-	POWER
		COMPENSATION	HZ	-	HERTZ	R	-	REMOVE
		TRANSFORMER	IB	-	IN BASEBOARD	RR	-	REMOVE & REINSTALL
CF	-	COIL FAN	IBS	-	IN BASE OF SHELVES	R&C	-	REMOVE DEVICE & CAP
CMU	-	CONCRETE MASONRY	ICEA	-	INSULATED CABLE			OUTLET
		UNIT			ENGINEERS	REC	-	RECEPTACLE
CND	-	CONDUIT (COND)			ASSOCIATION	RHC	-	RE-HEAT COIL
CNDCT	-	CONDUCTOR	ICL	-	IN COUNTER LIP	RLY	-	RELAY
COMB	-	COMBINATION	ICS	-	IN COUNTER	SEC	-	SECONDARY
CONC	-	CONCRETE			SPLASHBACK	SGA	-	SURGICAL GAS ALARM
CONTR	-	CONTRACTOR	IEEE	-	INSTITUTE OF	S/N	-	SOLID NEUTRAL
CPT	-	NEUTRAL GROUNDING			ELECTRICAL AND	S/O	-	SPACE ONLY
		TRANSFORMER			ELECTRONICS ENG'S	SP	-	SINGLE POLE
CRT	-	CIRCUIT	IGC	-	ISOLATED GROUNDING	ST	-	SINGLE THROW
CS	-	CORNER SECTION			CONDUCTOR	SURF	-	SURFACE
CT	-	CURRENT	IMC	-	INTERMEDIATE METAL	SUSP	-	SUSPENDED
		TRANSFORMER			CONDUIT	SW	-	SWITCH
CUH	-	CABINET UNIT HEATER	INCAND	-	INCANDESCENT	SYNCH	-	SYNCHRONIZE
CW	-	COLD WATER	INTLK	-	INTERLOCK	TC	-	TIME CLOCK
DB	-	DOORBELL	ITL	-	INDEPENDENT TESTING	TEL	-	TELEPHONE
DF	-	DRINKING FOUNTAIN			LABORATORIES	TIA	-	TELE-
DH	-	DOOR HOLDER	JB	-	JUNCTION BOX			COMMUNICATIONS
DISC SW	-	DISCONNECT SWITCH	KV	-	KILOVOLTS			INDUSTRY ASSOC
		(D.S.)	KVA	-	KILOVOLTS-AMPS	TRANS	-	TRANSFORMER (XFMR)
DO	-	DRAW OUT	KVARS	-	KILOVAR	TYP	-	TYPICAL
DP	-	DOUBLE POLE	KW	-	KILOWATT	UCL	-	UNDER COUNTER LIP
DT	-	DOUBLE THROW	LA	-	LIGHTNING ARRESTOR	UFAS	-	UNIFORM FEDERAL
DW	-	DISHWASHER	LV	-	LOW VOLTAGE			ACCESSIBILITY
E	-	EXISTING (EXST)	MAX	-	MAXIMUM			STANDARDS
EA	-	EACH	MC	-	METAL CLAD	UH	-	UNIT HEATER
EC	-	ELECTRIC CONVECTOR	MDH	-	MAGNETIC DOOR	UL	-	UNDERWRITERS LAB
EEL	-	EDISON ELECT. INST.			HOLDER	UV	-	UNIT VENTILATOR
EGC	-	EQUIPMENT	MECH	-	MECHANICAL	V	-	VOLT
		GROUNDING	MFG	-	MANUFACTURER	VDOT	-	VIRGINIA DEPARTMENT
		CONDUCTOR	MIN	-	MINIMUM			OF TRANSPORTATION
EIA	-	ELECTRONIC	MH	-	MANHOLE	W	-	WATTS
		INDUSTRIES ASSOC.	MO	-	MOTOR OPERATED	WH	-	WALL HEATER
ELEC	-	ELECTRIC	MOD	-	MOTOR OPERATED	WM	-	WIRE MOLD
					DAMPER	WP	-	WEATHERPROOF
EMER	-	EMERGENCY (EM)	MP	-	MAIN PANEL	Y	-	WYE
EMT	-	ELECTRICAL METALLIC				1	-	PHASE
		TUBING						

END OF SECTION 260500

SNOW CREEK ES 2CR HVAC UPGRADES

ELECTRICAL TEST DATA REPORT								
Ascent Engineering Group 5228 Valleypointe Pkwy, Suite #4 Roanoke, VA 24019					PROJECT: _____ _____ _____ _____			
Electrical Contractor: _____ Date tests were made: _____ Date Submitted: _____								
Current Characteristics: _____ Volts _____ Phase _____ Wires								
Type voltmeter used: _____ When calibrated: _____ Type ammeter used: _____ When calibrated: _____								
Service ground - Resistance in ohms _____ Resistance test must be made with hand crank, magneto type, megger.								
PANEL	VOLTAGE - NO LOAD		VOLTAGE - MAX. LOAD		MAX. LOAD AMPERAGE			
	PH TO PHASE	PHASE TO GND	PHASE TO PHASE	PH - GND	PH A	PH B	PH C	NEUT

SNOW CREEK ES 2CR HVAC UPGRADES

MOTOR OVERLOAD PROTECTION

REQUIRED ON ALL PHASES
(SEE N.E.C. SECT. 430 FOR
MAX. PERCENT ALLOWABLE)

NOTES:

- 1. IDENTIFY EACH MOTOR THUS: CWP-1, H&V-1, F-1, ETC. SAME AS SHOWN ON DWGS.
- 2. SMALL MOTORS MAY BE RATED THUS: HP, WATTS OR FLA.
- 3. ALL DATA BY ELECTRICAL CONTRACTOR.
- 4. SERVICE FACTOR -- IF NOT AVAILABLE ENTER DEGREE C. RISE.
- 5. MOTOR CONTROLLER TYPE -- FVNR, RVPW, 2-SPD/1W, 2-SPD/2W, Y/Δ, MANUAL, ETC.
- 6. MOTOR PROTECTION -- INCLUDE COPIES OF HEATER TABLES WITH THIS REPORT.

PROJECT:

CONTRACTORS:

GEN.:

MECH.:

ELEC.:

DATE:

EQUIP. MARK (1)	MOTOR DATA						MOTOR CONTROLLER		N.E.C.	MOTOR PROTECTION (6)		
	HP (2)	VOLTS	PHAS E	N'PLATE AMPS	SERVIC E FACTOR (4)	RUN AMPS*	TYPE (5)	NEMA SIZE	MAX. % ALLOWED	MIN. & MAX. AMPS	HEATER NO.	MFGR.

*AS MEASURED WITH AMMETER AT SITE.

SNOW CREEK ES 2CR HVAC UPGRADES

APPENDIX A LETTER OF INDEMNIFICATION

Project Name:

Project Location:

The Contractor may obtain from Ascent Engineering Group a CD-ROM or electronic mail version of the projects Revit / CADD database. All seals, details, schematics, tables, controls, etc. will be deleted. All drawings will be provided in Autocad™ 2014 format.

Ascent Engineering Group reserves all rights to the original drawing files.

The Recipient agrees, to the fullest extent permitted by the law, to hold harmless and indemnify Ascent Engineering Group, as defined in the Bid Documents, from and against all claims, liabilities, losses, damages, and costs, including but not limited to attorney's fees, arising out of or in any way connected with the use, modification, misinterpretation, misuse, or reuse by the Recipient or others of the machine readable information and data provided by Ascent Engineering Group under this Agreement. The foregoing indemnification applies, without limitation, to any use of the project documentation on other projects, for additions to this project, or for completion of this project by others, excepting only such use as may be authorized, in writing, by Ascent Engineering Group.

The electronic drawing files are not part of the Contract Documents for the Project. The Recipient assumes all risks associated with the use of the transmitted files. Ascent Engineering Group will not be responsible for any differences in the information included in the transmitted files and the information shown on the Contract Documents. Modifications to the Contract Documents made before or during construction may or may not be included in the transmitted electronic drawing files.

The Recipient further agrees that the drawing files will only be used in graphics preparation for the above-referenced project.

Company Name of Recipient: _____

Recipient's Designated Representative: _____

Title: _____

Signature: _____

Address: _____

Return to: Ascent Engineering Group
5228 Valleypointe Parkway, Suite 4
Roanoke, VA 24019
AEG # 22270

SNOW CREEK ES 2CR HVAC UPGRADES

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PART 1 - GENERAL:

1.1 RELATED DOCUMENTS:

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

1.2 WORK INCLUDED:

- A. Wires and Cables, Under 600 Volts.
- B. Connectors and Lugs, Under 600 Volts

1.3 RELATED WORK:

- A. Division 23 – Mechanical
- B. Section 26 05 26 – Grounding And Bonding For Electrical Systems
- C. Section 26 05 33 – Raceway And Boxes For Electrical Systems
- D. Section 26 05 36 – Cable Management For Electrical Systems
- E. Section 26 05 53 – Identification For Electrical Systems
- F. Division 28 – Electronic Safety and Security

1.4 REFERENCES:

- A. All wire, cables, connectors and lugs shall be U.L. listed for the application intended, and meet NEMA applicable standards.
- B. All wiring methods shall meet with NFPA applicable codes.

1.5 CONDUCTOR CODING:

- A. Color Code Conductors of 208Y/120-volt system power and lighting conductors as follows:

Neutral	White
Ground	Green
Phase A	Black
Phase B	Red
Phase C	Blue

- B. No. 12 and No. 10 conductors shall have continuous insulation color. Color code conductors larger than No. 10 which do not have continuous insulation color by application of at least two laps of colored tape on each conductor at all points of access. Tape shall be "Scotch," "Highland," or "Timflex," vinyl plastic electrical tape No. 35, or accepted equal. Wrap-around "Brady" markers or shrinkable PVC sleeving with hot-stamped lettering may be used and shall state the appropriate conductor identification.

SNOW CREEK ES 2CR HVAC UPGRADES

- C. Number code all control and instrumentation wiring at all points of access.

1.6 CONDUCTOR SIZES:

- A. All conductor sizes (AWG) are based on copper.

1.7 SUBMITTALS:

- A. Submit shop drawings and product data in accordance with Section 26 05 00.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. All wires and cables shall be as manufactured by General Cable, Capital Wire & Cable, Carol Cable, American Insulated Wire, Southwire, Senator, Rome, Cerro Wire and Cable, Circle Wire & Cable.
- B. All connectors and lugs shall be as manufactured by T & B, Buchanan, 3M, Burndy, or accepted equal.

2.2 MATERIALS AND TYPE:

- A. Wiring, Power and Control:
 - 1. General:
 - a. Conductors shall be **soft annealed copper** unless otherwise indicated.
 - b. All conductors #8 AWG or larger shall be stranded (except in surface raceway SR, all conductors shall be stranded).
 - c. All power wiring shall be #12 AWG minimum unless otherwise indicated.
 - d. All control wiring shall be #14 AWG minimum for NEC Class I and #16 AWG minimum for NEC Class II, **extra fine stranding**.
 - e. All insulation shall be rated for 600 volts unless otherwise indicated.
 - 2. Building Wiring: Conductors shall be type "THWN-2" or "THHN" unless otherwise indicated. "THHN" shall not be used in damp or wet locations.
 - 3. Flexible Metal Conduit (Liquidtight) Connections and Motor Starter Enclosures: Power and line voltage control wiring Type MTW stranded copper unless otherwise indicated for all motor connections, HVAC equipment, transformers, all other equipment subject to movement and vibration, and motor starter enclosures.
- B. Motor Connections:
 - 1. Connection lugs shall be Thomas and Betts, Series 54200.
 - 2. Insulation shall be motor stub splice insulators, Thomas and Betts, Series MSC, or Raychem MCK.
- C. Connectors and Lugs, 600 Volts and Under:
 - 1. Material: Copper, or suitable copper alloy, for all current carrying parts and all parts coming in contact with conductors.

SNOW CREEK ES 2CR HVAC UPGRADES

2. Connectors and Lugs, No. 8 and Larger Conductors: Compression type T & B "Color-Keyed", or accepted equal by Burndy or Kearney. Mechanical compression lugs furnished with equipment are acceptable. Provide insulating covers or heat shrinkable insulators where required.
3. Connectors, No. 10 and Smaller Conductors: Permanently indented self-insulated pressure connectors T & B, Buchanan, or accepted equal. Snap-on insulating caps are acceptable insulation. "Scotch-loks" by the 3M Company, "Wing-Nut" by Ideal, "Legrands" by Pass & Seymour (P&S) are acceptable wing type wire connectors.
4. Lugs, No. 10 and Smaller Conductors: Permanently indented or compression type by Buchanan, Burndy, T & B, or accepted equal. Washer head screw terminals without lugs are acceptable on neutral bars, circuit breakers, wiring devices and other equipment, unless otherwise indicated. Mechanical compression lugs furnished with equipment are acceptable.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Clean out raceway system before pulling wire.
- B. Thoroughly inspect all existing raceway systems for burrs, deformation, rust, water, and other hazards. Inform Engineer in writing of any raceway conditions that would be detrimental to wiring, or not in compliance with Codes or practices. All existing raceways shall meet the requirements of Section 26 05 33.
- C. Utilize an approved compound as required to facilitate pulling wires and cables, unless otherwise indicated.
- D. 600 Volts and Under Wiring Methods:
 1. Conductor Ties:
 - a. Inside each enclosure, other than outlet and junction boxes, conductors shall be bundled and trained utilizing T & B "Ty-Rap", 3M Brand Cable Ties, Tyton Cable Ties, or accepted equal, ties. All Switchboards, Panelboards, Motor Starters, Disconnects, etc. require at least one (1) conductor tie for each circuit entering and each circuit leaving the Panelboard, Motor Starter and Disconnect.
 2. Conductor Sizes:
 - a. Line Voltage Power Wiring: No. 12 AWG minimum. Circuits and feeders larger than 20 amp. to have conductors sized for equal or greater ampacity than their protective device ratings unless otherwise indicated. All wires for 20 amp. circuits shall be #10 on runs 100 feet to 250 feet, #8 on runs 251 feet to 500 feet and #6 on runs 501 feet and above.
 - b. Control Wiring:
 - 1) 120 Volt: If not carrying motor current, No. 14 AWG unless otherwise indicated, or required by load or distance encountered.
 3. Terminal Strips: Where equipment does not have terminal strips, provide terminal strips to terminate and splice control, power limited and communication cables. Indicate wire numbers on strip with indelible pen.
 4. Conductor Identification:
 - a. Wire Markers:

SNOW CREEK ES 2CR HVAC UPGRADES

- 1) Identify lighting and receptacle branch circuit wiring by panelboard name and circuit number at all accesses.
 - 2) Identify motor branch circuit wiring by circuit number and phase at all accesses.
 - 3) Identify all control wiring with a unique number for each wire.
- b. Color Code: Color code conductors to designate neutral conductor, ground conductor and phase conductors as described in Part 1 of this Section.
5. Splices:
 - a. No splices shall be made in any conductor beyond the exterior walls of the Building, except in exterior pullboxes, and where approved by the Engineer.
6. Motor Connections: Shall use connection lugs with motor stub splice insulators.
7. Each applicable system shall have a separate conduit system unless the applicable system's manufacturer, Codes and Regulations permit other systems conductors to be installed in the same conduit.

END OF SECTION 260519

PART 1 - GENERAL:

1.1 RELATED DOCUMENTS:

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

1.2 WORK INCLUDED:

- A. Power Limited Shielded Cable

1.3 RELATED WORK:

- A. Division 23 - Mechanical
- B. Section 26 05 26 – Grounding And Bonding For Electrical Systems
- C. Section 26 05 33 – Raceway And Boxes For Electrical Systems
- D. Section 26 05 36 – Cable Management For Electrical Systems
- E. Section 26 05 53 – Identification For Electrical Systems
- F. Division 28 – Electronic Safety and Security

1.4 REFERENCES:

- A. All wire, cables, connectors and lugs shall be U.L. listed for the application intended, and meet NEMA applicable standards.
- B. All wiring methods shall meet with NFPA applicable codes.

1.5 CONDUCTOR SIZES:

- A. All conductor sizes (AWG) are based on **copper**.
- B. Number code all control and instrumentation wiring at all points of access.

1.6 SUBMITTALS:

- A. Submit shop drawings and product data in accordance with Section 26 05 00.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. All connectors and lugs shall be as manufactured by T & B, Buchanan, 3M, Burndy, or accepted equal.
- B. All **power limited shielded twisted pair** shall be as manufactured by Manhattan, Belden, Alpha, West Penn, Anixter [S].

2.2 MATERIALS AND TYPE:

A. Wiring, Power and Control:

1. General:

- a. All control wiring shall be #14 AWG minimum for NEC Class I and #16 AWG minimum for NEC Class II, **extra fine stranding**.
- b. All insulation shall be rated for 600 volts unless otherwise indicated.

2. Plenum rated power limited twisted pair cable.

- a. For Remote Control, Signaling and Power-Limited Circuits as per NEC-725 for Class 2 and 3 circuits.

- 1) General: Cable shall be UL classified, Subject 13, non-conduit application in ceiling air plenum in accordance with NEC 725 and as specified below.
- 2) Control and Instrumentation (24 volt) (Heating, Ventilating and Air Conditioning): Control and instrumentation (24 volt) shall be the minimum of two (2) #16 twisted pair configuration, type CL2P and CL3P insulated stranded tinned copper conductors with 1-1/2 minimum lay, flame retardant, low smoke insulation as required by Class, insulated jacket, color coded, 100% aluminum polyester tape shield, #18 AWG tinned copper drain wire or as indicated otherwise herein.
- 3) Control and Instrumentation (Heating, Ventilating and Air Conditioning): Thermocouple extension wire shall be compatible with the specific thermocouple material and shall have the same features as "(2)", except the wire shall meet ANSI standard MC96.1 (Temperature Measurement Thermocouples) and have proper amount of pairs for the application.
- 4) Direct Digital Control System: Wiring between pilot relays, sensors, DDC's and control processing unit shall have proper amount of pairs and be the type as required by Digital Control System installed by temperature control system trade, and shall have similar features of "(2)".
- 5) Other Systems: Wiring on the applicable systems load side shall be gauge, pairs and shield as required by the applicable system's manufacturer and shall have similar features as to "(2)". Provide shield if required by applicable system's manufacturer or Codes.

- b. For Fire Protective Signaling System Circuits per NEC-760:

- 1) The cable shall be UL Classified, Subject 13, non-conduit application in ceiling air plenum in accordance with NEC 760 and as specified below.
- 2) Cable features shall be twisted pair configuration, type FPLP, color coded, solid tinned copper conductor, flame retardant, low smoke

insulation, 100% aluminum polyester tape shield complete with tinned copper drain wire. The quantity of pairs, gauge and shielding requirements shall be determined by the fire alarm system manufacturer. Provide shield if required by the fire alarm system's manufacturer or codes.

3. Power limited twisted pair cable (Not for air plenums):
 - a. For Remote Control, Signaling and Power-Limited Circuits as per NEC-725 for Class 2 and 3 circuits.
 - 1) General: Cable shall be UL classified for non-conduit application in ceiling void (non-air plenum) in accordance with NEC 725 and for application in multi system common raceway in accordance with NEC 725 and as specified below.
 - 2) Control and Instrumentation (24 volt) (Heating, Ventilating and Air Conditioning): Control and instrumentation (24 volt) shall be the minimum of two (2) #16 twisted pair configuration, insulated stranded tinned copper conductors with 1-1/2 minimum lay, types CL2 or CL3, or riser type cables CL2R or CL3R, as required by Class, insulated, jacket, color coded, 100% aluminum polyester tape shield, #18 AWG tinned copper drain wire or as indicated otherwise herein.
 - 3) Control and Instrumentation (Heating, Ventilating and Air Conditioning): Thermocouple extension wire shall be compatible with the specific thermocouple material and shall have the same features as "(2)", except the wire shall meet ANSI standard MC96.1 (Temperature Measurement Thermocouples) and have proper amount of pairs for the application.
 - 4) Direct Digital Control System: Wiring between pilot relays, sensors, DDC's and control processing unit shall have proper amount of pairs and be the type as required by Digital Control System installed by temperature control system trade, and shall have similar features of "(2)".
 - 5) Other Systems: Wiring on the applicable systems load side shall be gauge, pairs and shield as required by the applicable system's manufacturer and shall have similar features as to "(2)". Provide shield if required by applicable system's manufacturer or Codes.
 - b. For Fire Protective Signaling System Circuits per NEC-760:
 - 1) The cable shall be UL Classified for non-conduit application in ceiling void in accordance with NEC 760 and as specified below.
 - 2) Cable features shall be twisted pair configuration, type FPL or riser type FPLR as required, color coded, insulated solid tinned copper conductor, insulated jacket, 100% aluminum polyester tape shield complete with tinned copper drain wire. The quantity of pairs, gauge and shielding requirements shall be determined by the fire alarm system manufacturer. Provide shield if required by the fire alarm system's manufacturer.
4. Terminal Strips shall be 600 volt barrier type with marking strip suitable for marking with indelible pens.
5. Pulling compound shall be U.L. listed.
6. Wire markers shall be wrap-around tags made of shrinkable PVC sleeving with hot-stamped blocks or slip-on beads.

3.1 INSTALLATION:

- A. Clean out raceway system before pulling wire.
- B. Thoroughly inspect all existing raceway systems for burrs, deformation, rust, water, and other hazards. Inform Engineer in writing of any raceway conditions that would be detrimental to wiring, or not in compliance with Codes or practices. All existing raceways shall meet requirements of Section 26 05 33.
- C. Utilize an approved compound as required to facilitate pulling wires and cables, unless otherwise indicated.
- D. 600 Volts and Under Wiring Methods:
 - 1. Conductor Ties:
 - a. All power limited cable shall be bundled and trained for each system in the ceiling voids. Each bundle shall be supported from the structure with proper metallic (Caddy) clamp or hanger at the required distances. Proper type of T & B Halar™ cable ties are permitted for use in air plenums.
 - 2. Conductor Sizes:
 - a. Control Wiring:
 - 1) 120 Volt: If not carrying motor current, No. 14 AWG unless otherwise indicated, or required by load or distance encountered.
 - 2) 30 Volts or Under: No. 16 AWG unless otherwise indicated, or required by load or distance encountered.
 - 3. Control and instrumentation wiring specified in Division 23 shall be furnished and installed as follows:
 - a. All line voltage control wiring, 101 volts, 60 Hertz or higher voltage shall be provided under Division 26.
 - b. All low voltage control raceways and wiring, 100 volts and lower voltages and thermocouple extension wiring, shall be provided under Division 23, according to Section 26 05 33 and Section 26 05 23 product and material requirements, and installation methods.
 - 4. Direct Digital Control System wiring specified in Division 23 shall be furnished and installed as follows:
 - a. All line voltage control wiring, 101 volts, 60 Hertz or higher voltage, wired through the Digital Control System; and 120 volts, 60 Hertz power source wiring to the Direct Digital Control System shall be provided under Division 26.
 - b. All low voltage control wiring (100 volts and lower voltages) for the Direct Digital Control System shall be provided under Division 23, in the manner as noted above for control and instrumentation wiring.
 - 5. Plenum Rated (and Non-Plenum) Power Limited Shielded Twisted Pair Cable:
 - a. All plenum rated (and non-plenum) shielded power limited cable shall be installed in accordance with NEC Article 725, 760 or 800 on the "load" side of the applicable system.
 - b. Provide proper number, shielding and size of wires as required for operation of the applicable system in accordance with the manufacturer's instructions and applicable NFPA codes.

- c. Raceway Requirements:
 - 1) Where an accessible ceiling system or demountable partitions are installed; hollow spaces in casework are available; or similar accessible void is available; a conduit system will not be required. If a conduit system is not utilized cables shall be installed using the specified "Open Wire Management" system.
 - 2) Where cable is in inaccessible ceiling voids, in inaccessible wall void, penetrates a floor or wall, or exposed on wall or at ceiling, the cable shall be in conduit.
 - 3) Where partial, detached or "floating" ceilings are provided or no finished ceiling is provided, the cable shall be in conduit, terminating in an accessible ceiling void.
 - 4) The above conduits shall terminate in an accessible void and shall be bushed to prevent damage to cable. All conduits shall also be grounded to the BGES.
 - d. Wiring splices are to be avoided to the extent possible, and if needed, they must be made only in accessible junction boxes and shall be crimp connected.
 - e. Transposing or changing color coding of wires shall not be permitted.
 - f. Wire nut-type connections are not acceptable. All connections shall be made on terminal strips (in boxes or cabinets).
 - g. All conductors shall be labeled on each end with "E-Z markers" or equivalent.
 - h. Conductors in cabinets shall be carefully formed and harnessed so that each drops off directly opposite to its terminal.
 - i. Cabinet terminals shall be numbered and coded. All controls, function switches, etc., shall be clearly labeled on all equipment panels.
 - j. All connections to components and equipment shall be made with crimp type terminal connections, or method approved by applicable systems manufacturer.
 - k. All wiring shall be checked and tested to ensure that there are no grounds, opens or shorts.
 - l. Ground all shields only at termination point (originating).
 - m. If shield is not to be grounded, pull shield back over cable jacket and insulate with heat shrink tubing to prevent accidental grounding.
 - n. Install cable connectors on all power limited cables entering enclosures except where cable is in protective conduit.
 - o. All cables installed in ceiling voids shall be attached to or supported from a vertical surface, a structural member or electrical conduit with a Caddy flexible cable support, bridle ring or cable clamp; or specified conductor tie (plenum rated where required). Absolutely **do not** support from ceiling system or fixture support wires **except** where accessing a ceiling mounted device. The cable(s) shall **not** block lay-in lighting fixtures, ceiling mounted HVAC equipment or ceiling tiles in order to allow **full** access to the ceiling void.
- 6. Terminal Strips: Where equipment does not have terminal strips, provide terminal strips to terminate and splice control, power limited and communication cables. Indicate wire numbers on strip with indelible pen.
 - 7. Conductor Identification:
 - a. Wire Markers:

SNOW CREEK ES 2CR HVAC UPGRADES

- 1) Identify all control wiring with a unique number for each wire.
- b. Splices:
 - 1) No splices shall be made in any conductor beyond the exterior walls of the Building except in exterior pullboxes, and where approved by the Engineer.
 - 2) Shielded power limited cable for Digital Control System wiring shall be splice free between sensors, DDC's and central processing unit.
8. Each applicable system shall have a separate conduit system unless the applicable system's manufacturer, Codes and Regulations permit other systems conductors to be installed in the same conduit.

END OF SECTION 260523

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 WORK INCLUDED:

- A. Equipment Grounding Conductor (EGC)

1.3 RELATED WORK:

- A. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables
- B. Section 26 05 23 – Control Voltage Electrical Power Cables
- C. Section 26 05 33 – Raceway and Boxes for Electrical Systems
- D. Section 26 05 36 – Cable Management for Electrical Systems

1.4 REFERENCES:

- A. NFPA 70 (NEC), Article 250

1.5 DESCRIPTION:

- A. An insulated equipment grounding conductor, color coded per section 26 05 19, and the NEC, shall be provided for each alternating current circuit without exception.

1.6 TESTS:

- A. The equipment grounding conductor shall be tested for continuity and proper bonding to metallic equipment enclosures, outlet boxes, wiring devices and similar items.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Equipment Grounding Conductor (EGC):
 - 1. Provide a separate insulated grounding conductor, color-coded as per Section 26 05 19, enclosed in the same raceway with the phase conductors for all alternating current circuits, even though not necessarily shown on the drawings.

SNOW CREEK ES 2CR HVAC UPGRADES

2. The equipment grounding conductor shall be secured to the equipment enclosure at the source of power and at the apparatus being served by the alternating current supply.
3. The minimum size for the grounding conductor shall be as specified in Table 250.122 of N.E.C.
4. Existing alternating current circuits: If an equipment grounding conductor is not present in the existing feeder or branch circuit to be reworked, Division 26 shall provide new phase, neutral and grounding conductors from the related panelboard to the indicated outlet.

END OF SECTION 260526

PART 1 - GENERAL:

1.1 RELATED DOCUMENTS:

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

1.2 WORK INCLUDED:

- A. Rigid Conduit (Heavy Wall, Intermediate Metal Conduit, Electrical Metallic Tubing)
- B. Flexible Conduit (Liquidtight and "Greenfield")
- C. Surface Raceway (SR) and Wireway
- D. Fittings for Conduits, Flexible Metal Conduit, Surface Raceway (SR), Wireway.
- E. Pull Boxes
- F. Junction Boxes
- G. Outlet Boxes

1.3 RELATED WORK:

- A. Section 26 05 36 - Cable Management for Electrical Systems
- B. Section 26 05 53 – Identification For Electrical Systems
- C. Section 26 09 23 – Lighting Control Devices
- D. Section 26 27 26 – Receptacles
- E. Section 26 50 00 – Lighting
- F. Division 28 – Electronic Safety and Security

1.4 SUBMITTALS:

- A. Submit shop drawings and product data in accordance with Section 26 05 00.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Rigid Heavy Wall Conduit (GRS): Essex, Allied Tubing, Republic, Steelduct, Triangle, L.T.V., Wheatland, or accepted equal.

SNOW CREEK ES 2CR HVAC UPGRADES

- B. Intermediate Metal Conduit (I.M.C.): L.T.V., Berger Industries, Inc., Allied Tubing, or accepted equal.
- C. Electrical Metallic Tubing (E.M.T.): TrueColor by Allied or accepted equal.
- D. Liquidtight Flexible Metal Conduit: Anaconda "Sealtite", O.Z./Gedney "Flex-Guard", Electri-Flex Co. "Liquid-Tight", or accepted equal.
- E. Galvanized Single Strip Steel Flexible Conduit: American Flexible Conduit, Anaconda, Electri-Flex Co., or accepted equal.
- F. Fittings (All fittings to be same materials as specified for conduit):
 - 1. Rigid Heavy Wall and Intermediate Metal Conduit Fittings: O.Z., T & B, Efcor, Berger Industries, or accepted equal.
 - 2. Electrical Metallic Tubing Fittings: T & B, Raco, Steel City, O.Z./Gedney, Berger Industries, Inc. or accepted equal.
 - 3. Flexible Metal Conduit Fittings: T & B, O.Z./Gedney, Midwest, Steel City, or accepted equal.
 - 4. Conduit "L's": Crouse Hinds, Killark, O.Z./Gedney, Shamrock Conduit Products, or accepted equal.
 - 5. Cable Supports: O.Z. type M, or accepted equal.
 - 6. Fire Wall and Smoke Partition Seals:
 - a. O.Z. type CFS fire seals or T & B "Flame Safe" Fire Stop System or 3M Brand Fire Barrier Penetration Sealing System #7904, 3M Brand Fire Barrier Caulk CP-25 and Putty 303, Nelson "Flameseal" fire stop putty, or accepted equal for each conduit or cable as required [S].
 - b. Wiremold FlameStopper™ FS series Thru-Wall Fitting, STI EZ-Path, or other accepted equal for installation of power limited cabling through fire wall [S].
 - 7. Insulated Throat Metallic Bushings: O.Z./Gedney Type B or BLG, T & B nylon insulated metallic, or acceptable equal by Efcor. Provide grounding lug type where required.
- G. Wireway: Square D or equal by Walker, or Hoffman.
- H. **Surface Raceway:** Surface metal raceway and fittings shall be by the Wiremold Co. or acceptable equal by Walker and Mono-Systems [S].
- I. Pull and Junction Boxes: General Metals, Electromate Mfg. Corp., Hoffman, or accepted equal.
- J. Outlet Boxes: Appleton, Raco, Steel City, or accepted equal.
- K. Outlet Box Brackets: E-Z Mount Bracket Co., Inc., Vinton, Virginia 24179 (703-345-3000), or accepted equal by Caddy, Raco.

2.2 MATERIALS AND USE:

- A. Rigid Heavy Wall Conduits (GRS): Of mild steel tube, electro or hot-dipped galvanized and U.L. labeled.

SNOW CREEK ES 2CR HVAC UPGRADES

- B. Intermediate Metal Conduit (I.M.C.): Of mild steel tube in sizes 3/4" to 4", hot-dipped galvanized or electro-galvanized and U.L. labeled. Refer to limitations under Part 3 - EXECUTION.
- C. Electrical Metallic Tubing (EMT): Of mild steel tube in sizes 3/4" to 4" hot-dipped galvanized or electro-galvanized and U.L. labeled. Refer to exceptions under Part-3.
- D. Flexible Metal Conduit:
 - 1. Liquidtight flexible metal conduit: Flexible galvanized steel tubing covered with extruded liquid-tight jacket of PVC and a continuous copper bonding conductor wound spirally between the convolutions. Refer to limitations in Part 3 - EXECUTION.
 - 2. Galvanized single strip steel flexible conduit (Commercial Greenfield): UL 1 listed. Refer to limitations in Part 3 - EXECUTION.
- E. Fittings:
 - 1. For Rigid and Intermediate Conduit: Couplings to be galvanized or sherardized steel. Double galvanized steel locknuts shall be used where required by code. Single locknut and bushing may be used elsewhere. Insulated throat metallic bushings to be installed on all rigid conduit terminations where such bushings are required by NEC to protect the wires from abrasion. Use ground lug type where required.
 - 2. For E.M.T.: Steel set screw connectors, permanently indented or gland compression type. **Do not use cast metal type.**
 - 3. For Flexible Metal Conduit: Standard liquidtight fittings for liquidtight conduit. Standard steel flexible metal conduit fittings for standard flexible metal conduit.
 - 4. Conduit "L's": Galvanized steel, threaded, "LB" or "LBD".
 - 5. Cable Supports: To be installed for the support of all conductors and cables as per NEC Article 300-19.
 - 6. Fire Resistance Rated Wall and Smoke Partition Seals:
 - a. Provide fire-seals for each conduit or cable passing through fire rated walls and floors where the floor, wall or smoke partition has a rating up to three (3) hours in accordance with Manufacturer's application data. All penetration systems shall have been tested per ASTM B14-88 fire test and UL listed for "Through-Penetration Fire Stop System".
 - b. Provide UL approved thru-wall fittings for passage of power-limited cabling where cable tray, path of cable hooks, or other major cable pulling route intersects fire wall. The system shall expand rapidly where exposed to fire or high temperature to provide the required firestopping. The fittings shall be complete with built-in firestopping material and through-wall penetration. Each penetration shall be equivalent size of a 4" conduit sleeve or greater and shall remain fully accessible to add or remove cables without disturbing the firestopping material. The fittings shall have been UL-tested and meet the requirements of ASTM E814 UL1479 and shall be rated for 4 hours. Fittings shall be UL approved for use in air plenums.
 - 7. Conduit Expansion Joints: O.Z. mechanical type, or accepted equal, on each conduit run crossing building expansion joint.

F. Surface Raceway:

1. The raceway shall consist of a base and cover section factory assembled and designed to accommodate pulling conductors through the raceway. Raceway shall be U.L. labeled.
2. The base section shall have a nominal material thickness of .040" and be manufactured of zinc plated or galvanized steel. 6000 base shall be .060" thickness.
3. The cover section shall have a nominal material thickness, as listed below, and be painted with a baked enamel finish which is capable of being over-painted in the field if required.

Mark	Series	Cover Thickness
SR2	Wiremold 200	.025"
SR5, SR7	Wiremold 500, 700	.040"

4. Raceway dimensions shall be as follows:

Mark	Series	Dimensions
SR2	Wiremold 200	1/2" W x 11/32" H
SR5	Wiremold 500	3/4" W x 17/32" H
SR7	Wiremold 700	3/4" W x 21/32" H

5. Fittings:
 - a. General: A full complement of fittings must be available including, but not limited to, bushings to prevent wire abrasion, single and multiple gang boxes to accommodate device installation, adapters from conduit to raceway, transitions to both larger and smaller surface metal raceways, receptacle covers, wiring device brackets, take-off connectors, pre-wired receptacle harnesses, 90 degrees elbows, tees, fixture boxes and flexible sections to allow uninterrupted continuation of raceway along semi-circular or curved surfaces.
6. Refer to limitations under PART 3 - EXECUTION.

G. Wireway:

1. Wireways shall be listed to meet UL 870.
2. Wireway covers and troughs shall be constructed from a minimum of 14 gauge steel before finishes are applied. The end flanges shall be constructed from ten gauge steel. All lengths and fittings shall have smooth, rounded edges to prevent damage to wire and cable insulation. Wireway shall be furnished without knockouts.
3. Wireway covers shall have oil-resistant closed cell gasketing for sealing purposes. A solid oil-resistant neoprene joint gasket shall be used between flanges for rigidity when sections and fittings are bolted together.
4. A gasketed captive hinged connector which interlocks with the covers shall be used at each joint. The connector shall be such that the covers cannot be closed and latched without closing the sealing connector.
5. Wireway shall be provided with quick-release cover latches which hold the cover securely in place when closed. Latches shall have provision for a sealing wire to be used when covers and latch are in the closed position.
6. Wireway covers shall be secured to the troughs with leaf type hinges which all allow full opening access to the wireway interior.
7. Provide NEMA-1, NEMA-3R, NEMA-4X, NEMA-12 or other NEMA enclosure where required by NEC or environmental conditions.

SNOW CREEK ES 2CR HVAC UPGRADES

- H. All boxes to be sherardized or galvanized (after fabrication) sheet steel code gauge boxes.
- I. The minimum size of all boxes shall conform to the requirements of the National Electrical Code, unless noted to be larger on the drawings, and shall have adequate braces and supports.
- J. Pull and Junction Boxes: All boxes shall have screw-on or hinged covers. All flush mounted boxes shall have 3/4" overlapping covers with flush-head cover retaining screws and covers in finished areas shall be prime coated with paint.
- K. Outlet Boxes:
 - 1. All boxes shall have ears turned in. Multiple gang boxes must be one piece type (not built-up). Provide 3/8" (or larger if required) fixture stud in all fixture boxes. Provide appropriate covers as required, including 3/4" deep plaster ring covers where plaster may be encountered. Provide vapor proof outlet boxes for vapor proof fixtures. Provide size and type of boxes as required by location and N.E.C., except where exposed masonry occurs, use one piece "tile boxes". All boxes shall be 4" square boxes with "tile rings" unless noted otherwise or where larger sizes are required. All outlet boxes requiring hangers shall be hung with metal hangers.
 - 2. **All exposed boxes below ceiling level shall be cast type FS or FD.**
- L. Stud Wall Outlet Box Brackets: Provide #E-Z 1-4, #E-Z 4-1116 or #E-Z 23-1 outlet box brackets with extension brackets or acceptable equal.
- M. Outlet Box Bar Hangers: Provide adjustable or solid bar metal hangers by Appleton Electric Manufacturing or accepted equal.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Provide raceway systems to achieve required distribution, switching and circuit control. All wires for all systems shall be installed in rigid metal raceways and terminated in boxes or cabinets, unless otherwise specified herein as partial conduit or non-conduit installation. Allow for making connections to all outlets, motors, etc., indicated and check plans to insure that all outlets, etc., have a designated circuit. Notify the Engineer of any discrepancies found.
- B. Conduit runs are not shown on the drawings, unless specifically noted or indicated otherwise.
- C. Conceal all (new) raceways (in existing and new construction) except where specifically noted on drawings or permitted as exposed. Runs in mechanical room areas may be exposed. Exposed conduit must be run parallel with the building walls and supported in a neat substantial manner. Refer to surface raceways under PART 3 - EXECUTION.
- D. **Cap** raceway systems during course of construction and thoroughly clean inside before installation of conductors.
- E. Provide a completely separate raceway system for all emergency lighting and exit sign circuits as required by N.E.C.
- F. No rigid raceway for line voltage wiring shall be smaller than 3/4", except for flexible conduit, unless specifically indicated otherwise. The Electrical Trade shall size all other

SNOW CREEK ES 2CR HVAC UPGRADES

raceways based on the N.E.C. and verify the sizes shown on the drawings, increasing same if required by local authorities and/or codes.

- G. All conduit feeding from one building area to another shall remain within the confines of the building, unless shown or noted otherwise on the drawings.
- H. Field made conduit bends shall be made with an acceptable bending machine or conduit bender.
- I. Flexible Metal Conduit:
 - 1. Liquidtight flexible metal conduit cannot be used in an air plenum ceiling void. Standard galvanized single strip steel flexible conduit shall be used in air plenum ceiling void.
 - 2. Liquidtight flexible metal conduit for **all** flexible connections, **plus** all short motor connections, transformers and all equipment subject to movement or vibration and where permitted by the Engineer. For flexible connections in an air plenum ceiling void, flexible metal conduit shall be substituted for liquidtight flexible metal conduit.
 - 3. Galvanized single strip steel flexible conduit (6' maximum length) limited to use as the flexible connection to recessed lighting fixture assemblies (*only*) (and in existing wall voids).
- J. Rigid Metal Heavywall Conduit (GRS):
 - 1. All joints shall be properly threaded and made tight in standard conduit couplings.
 - 2. All thread conduits or nipples are not acceptable.
 - 3. All conduit cuts shall be square, made with a hacksaw or approved cutting machine, and reamed after threading and before installation to remove burrs.
 - 4. All threads, both field-cut and factory-cut, not otherwise protected, shall be painted after installation with two coats of asphaltum paint if concealed and two coats of primer base paint if installed in an exposed location.
 - 5. Clamps to be malleable two (2) hole galvanized iron and hangers to be rod type steel.
- K. Intermediate Metal Conduit (IMC):
 - 1. Applicable specifications for installation of rigid metal conduit applies to IMC.
 - 2. IMC can be substituted for GRS per the NEC.
- L. Electrical Metallic Tubing (EMT):
 - 1. Applicable specifications for installation of rigid metal conduit applies to E.M.T.
 - 2. E.M.T. shall **not** be used underground, cast in concrete, exposed on exterior of buildings, and exposed interior locations below 8'-0" (above finished floor).
 - 3. E.M.T. may be routed down exposed interior walls to top of panelboards, motor starters, disconnect switches, light switches, etc.
 - 4. E.M.T. is permitted in electrical and mechanical equipment rooms, per detail on drawings.
- M. Supports: Provide metallic supports as required for the proper installation of the raceway or conduit systems and all other equipment installed under this contract. **Wire shall not be used to support or tie down any conduit system.**

SNOW CREEK ES 2CR HVAC UPGRADES

- N. Empty Conduits: Pull #12 stranded gauge galvanized fishing wires or stranded nylon line through all empty conduits for all systems. These wires or lines to remain in the conduits.
- O. Exposed Masonry: Where wall finish is exposed masonry, raceways shall be so placed in wall that the masonry unit can be neatly set around it with minimum cutting and without injury to the exposed masonry face.
- P. Wireways:
 - 1. Furnish and install a complete lay-in wireway system where required. Wiring capacity shall be determined by NEC unless larger dimensions are indicated.
 - 2. Wireway lengths and fittings shall be securely bolted together with same size slotted paint cutting hex-headed shoulder bolts and hex nuts with captive external tooth lock washers which maintain electrical ground continuity across the joint. Each joint shall be gasketed between end flanges. The sealing cover connector shall be installed so as to be held captive and maintain the lay-in ability of the wireway.
 - 3. Wireway shall be installed in accordance with the National Electrical Code requirements.
 - 4. Wireways shall be supported at intervals not exceeding five feet unless specially approved for supports at greater intervals. The ten-foot straight sections of wireway shall be Underwriters Laboratories, Inc. listed for support at ten-foot intervals.
- Q. Surface Raceway:
 - 1. Install surface raceway in accordance with manufacturer's recommendations and instructions. Raceway capacity shall be determined by NEC unless larger capacity is indicated.
 - 2. Refer to drawings and elevations for routing of all surface raceways and multi-outlet systems.
 - 3. Surface raceway systems shall be limited to the applications and locations indicated below:
 - a. Existing solid masonry or concrete walls without furred out drywall, plaster lathe, paneling or other wall covering or if the furred out space is less than the dimension of a conduit or metal clad cable, surface raceway shall be permitted.
 - b. Existing hollow core masonry walls where indicated. All other hollow core masonry walls shall have recessed outlets unless cores are blocked with mortar or structural member.
 - c. Unless otherwise indicated, route all surface one-piece raceways vertically to floor or ceiling with no horizontal runs except under whiteboards, tackboards, windows, or casework. Short horizontal runs shall be permitted with two (2) surface raceway outlets less than 48" apart.
- R. Pull and Junction Boxes: Provide all necessary pull and junction boxes where indicated or required by National Electrical Code. Certain pull and junction boxes may be shown on the drawings for specific design reasons but is not to preclude the fact that additional boxes will be required to conform to codes and good practice.
- S. Outlet Boxes:
 - 1. General: All outlet boxes shall be set flush or set to meet the N.E.C. requirements; otherwise box extensions shall be installed. Mounting heights of all outlets shall be as indicated on the drawings, specified herein, or as permitted on the job. Support all boxes to maintain alignment and rigidity. Clean boxes of all foreign matter prior

SNOW CREEK ES 2CR HVAC UPGRADES

to installation of wiring and/or devices. Adjacent outlet boxes shall be aligned horizontally at the same height, or vertically in the same line, as required.

2. Wall Outlets:

- a. Where the outlet boxes are shown back-to-back in the walls of 6" or less in thickness, the boxes shall be offset horizontally. Through-the-wall outlet boxes shall not be permitted. Outlet boxes, indicated to be installed side-by-side in the same wall, shall be located 6" apart. All boxes shall be rigidly secured in the wall.
- b. Steel Outlet boxes in fire walls and fire separation assemblies shall be installed in accordance with Virginia USBC 704.1.1 and 714.1.6.1 respectively. Therefore outlet box openings cannot exceed 16 square inches per outlet with 100 square inches limit per 100 square feet of wall area. Where outlet boxes are shown in opposite sides of the wall or assembly, the boxes shall be separated by a horizontal distance of not less than 24 inches.

3. Exposed Masonry: The outlet boxes shall be placed in the wall to allow the masonry unit to be neatly set around the box, with the minimum of cutting and without injury to the exposed masonry face. The dimensioned heights of the outlets in the exposed masonry walls are intended to mean to the nearest masonry joint.

4. Stud Walls: The outlet boxes shall utilize the wall brackets and extensions as required. The Electrical Trade shall coordinate with the dry wall or plaster lathe installation trade for fastening the outboard part of bracket to prevent any movement of the outlet box within the wall cavity.

5. Ceiling Outlets: All flush mounted ceiling outlet boxes shall be supported by adjustable or solid bar metal hangers or directly supported by threaded steel rods or stud type fasteners.

6. Local Switch Outlets: Prior to the installation of the local switch outlet boxes, the Contractor shall verify the door swings to insure the proper location of the box. This outlet shall be installed with a minimum of 4" of separation from door jamb trim. Refer to typical elevation for mounting outlet boxes at doors.

T. Conduit Termination: All rigid heavy wall metal conduits (G.R.S, I.M.C. and E.M.T.) shall terminate with locknut and bushing in all boxes, cabinets, panels, etc. Where a grounding means is not provided in the box, cabinet, panel, etc. provide a locknut and grounding bushing.

END OF SECTION 260533

PART 1 - GENERAL:

1.1 RELATED DOCUMENTS:

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

1.2 WORK INCLUDED:

- A. Wall Brackets

1.3 SUBMITTALS:

- A. Submit shop drawings and product data on all equipment specified in this section in accordance with Section 26 05 00. Provide installation shop drawings in accordance with 3.01.B.3 below.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Open Wire Management Hardware:
 - 1. Brackets, Wall Metallic "C" shaped hanger by Mono-Systems, Inc. (The Hook).

2.2 MATERIALS AND USE:

- A. Wall Brackets: Wall brackets shall be multi-use "C" shaped hanger with 9/32 (7mm) diameter holes on four (4) sides. The center space shall provide the required cross section area for the cable being supported. The bracket shall be 6063-T6 aluminum with extruded box beam design (19mm x 12mm x 2mm thick walls), one (1) inch radii turns, smooth and free from sharp edges, two (2) 7mm holes in long side, one (1) 7mm hole in both short sides, and mounted with 6mm (1/4") hardware or supported with rod and clamps from structure.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Wall Brackets: The metallic "C" shaped wall (or ceiling) brackets shall be wall mounted or suspended on a minimum of 24" centers for the support of Data, telephone, fire alarm, telephone communication and direct digital controls system (Division 23) wiring and cabling. Wall brackets shall be installed in continuous and even rows, above each replaced ceiling, spaced as indicated above. Coordinate installation of wall brackets with piping, ductwork, conduits, etc. All wall brackets shall be readily accessible for installation

SNOW CREEK ES 2CR HVAC UPGRADES

of low voltage wiring systems. Fire alarm cabling shall be located in a separate, dedicated pathway and shall not share a pathway (hook) with other systems.

END OF SECTION 260536

PART 1 - GENERAL:

1.1 RELATED DOCUMENTS:

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

1.2 WORK INCLUDED:

- A. Prepare and paint Division 26 equipment supports and miscellaneous materials located in Equipment Rooms, Mechanical Rooms, and other utility areas housing mechanical and/or electrical equipment.
- B. Identification of conduits, junction boxes, pull boxes, cabinets, motor starters, disconnect switches, motor protective switches, and Division 26 system enclosures.

1.3 RELATED WORK:

- A. Division 23 – Mechanical
- B. Section 26 05 00 – Common Work Results For Electrical
- C. Section 26 05 33 – Raceway And Boxes For Electrical Systems
- D. Section 26 05 36 – Cable Management For Electrical Systems
- E. Section 26 28 16 – Enclosed Switches And Circuit Breakers
- F. Division 28 – Electronic Safety and Security

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 WORKMANSHIP:

- A. The work shall be accomplished by qualified mechanics skilled in the painting trade. Painting of equipment and other materials shall not commence until all testing is complete and systems are ready for operation. Materials shall be evenly spread, and smoothly flowed on without runs or sags. Each coat shall be thoroughly dry before application of succeeding coats.

3.2 PREPARATION OF SURFACE:

- A. Surfaces to be identified shall be completely dry before applying paint. Metal surfaces shall be cleaned with mineral spirits before applying materials. Rust and scale shall be removed by wire brushing or sanding.

SNOW CREEK ES 2CR HVAC UPGRADES

3.3 IDENTIFICATION OF PIPES AND EQUIPMENT:

- A. After identifying is completed, operating and control parts of the equipment and systems such as disconnect switches, motor starters and control cabinets shall be properly identified with laminated engraved plastic nameplates fastened with sheet metal screws, bolts or permanent adhesive. Pressure sensitive tape is **not** acceptable. Identification symbols or designations shall be the same as shown on the contract documents.
- B. Boxes; Concealed and Surface Mounted: Each junction box, pullbox or similar enclosure shall be **neatly** identified by handwritten marking which shall indicate service contained, and circuit numbers. Hand written letters shall be upper case (Capital) not less than one-half inch high and written with a black permanent marker.
- C. Conduit:
1. Conduit shall be TrueColor EMT for all EMT conduit utilized (277/480V – orange, 120/208(240) – blue, fire alarm – red, low-voltage – white). Other conduit types shall have color bands painted on each conduit were exposed or accessible. . Bands shall be six inches wide and shall be placed along the conduit run immediately preceding the passage of the conduit through walls, ceiling or floor, and at each equipment connection or junction box. Where sub-bands are specified, they shall be two inches wide and centered in the color band. Adjacent to each color band, the abbreviation of the name of the service contained in the conduit shall be **neatly** hand written. Hand written letters shall be one-half inch high upper case, applied with black permanent marker. Color bands shall be pressure sensitive tape a minimum of 2" wide. Each color band will require wraps as necessary to provide the full 6" wide band with or without the 2" sub band.
 2. In lieu of hand written names of the pipe service, the Contractor may use vinyl "snap around" markers as manufactured by Seton, Bunting, Brady and Thomas & Betts (T&B).
 3. Color Banding:

<u>System</u>	<u>Abbrev./Color</u>	<u>Color Band</u>	<u>Color Sub-Bands</u>
120/208 Volts (Normal)	208V/Black	Black	Yellow
Fire Alarm	FA/Red	Red	Black
Direct Digital Control	DDC/Black*	Black	Blue

END OF SECTION 260553

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SNOW CREEK ES 2CR HVAC UPGRADES
SECTION 260923 – LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 WORK INCLUDED:

- A. Low Voltage Lighting Controls
 - 1. Wallpods
 - 2. Daylighting Sensors
 - 3. Occupancy Sensors
- B. Low Voltage Lighting Control Equipment
- C. Plates

1.3 RELATED WORK:

- A. Section 26 05 23 – Control Voltage Electrical Power Cables
- B. Section 26 05 33 – Raceway And Boxes For Electrical Systems
- C. Section 26 50 00 – Lighting

1.4 REQUIREMENTS:

- A. NEC 406

1.5 SUBMITTALS:

- A. Submit shop drawings, product data and wiring device samples in accordance with Sections 26 05 00.
- B. Submit Operation and Maintenance Manuals in accordance with Section 26 05 00.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Low Voltage Lighting Controls and Equipment [S] shall be as manufactured by:
 - 1. nLight (Sensorswitch),
 - 2. Hubbell,
 - 3. Lutron

SNOW CREEK ES 2CR HVAC UPGRADES

B. Wiring Device Plates [S] and Blank Plates [S] shall be as manufactured by:

1. Bryant,
2. Hubbell,
3. Cooper Crouse-Hinds,
4. Pass & Seymour (P&S)

Note: Plates provided with low voltage wallpods shall NOT be used. Utilize specified wall plates.

C. Automatic Lighting Controls shall be as manufactured by:

1. nLight (Sensorswitch),
2. Hubbell,
3. Lutron

2.2 MATERIALS AND TYPE:

A. All wallpods shall be as indicated on drawings and specified hereinafter.

B. LED Line-Voltage Dimmers:

1. Dimmers shall be line voltage slider type (minimum 2000W @ 120 volts with preset button and 3-way capability, unless indicated otherwise. Dimmer shall be compatible with the type of dimming driver provided. Dimmers shall be by Lutron or acceptable equal to coordinate with the specified dimming drivers.

C. Plates: For all systems unless indicated otherwise.

1. For Concealed Work: Stamped stainless steel type 302 with satin finish.
2. For F.S. or F.D. Boxes (Interior Only): Die cast covers with gaskets, as manufactured by Crouse-Hinds, Appleton, Red Dot or acceptable equal.
3. Screws: Heads to match plate material and finish.
4. Provide blank plates for all unused outlets.
5. **Note: plates provided with low voltage wallpods shall NOT be used. Utilize specified wall plates.**

D. Wiring Device and Plate Colors: Engineer will review and accept color of wiring devices and plates. Contractor shall allow for selection from "standard" colors (grey, white, ivory, brown) of wiring devices in his bid proposal.

E. All pilot lights shall be neon or L.E.D. type with Red color glass, unless otherwise noted. Lamp to be sized to adequately illuminate under daylight conditions. Incandescent pilot lights are not acceptable. LED conversion lamps are acceptable in incandescent lampholders.

F. Low Voltage Lighting Controls:

1. Low Voltage Lighting Controls shall all have the following features:
 - a. Fully addressable and compatible with Sensorswitch nLight control CAT-5e network.
 - b. Complete with power supply and 2 RJ-45 ports.

SNOW CREEK ES 2CR HVAC UPGRADES

- c. Shall be configured and engraved as specified here-in and as indicated on the drawings.
 - d. 5 year product warranty.
 - e. Low Voltage On/Off control Wallpods:
 - 1) 1, 2 or 4 channel on/off.
 - 2) Operating temperature 14°F to 160°F.
 - 3) Sensorswitch nLight nPODM or accepted equal by Hubbell or Lutron.
 - f. Low Voltage Dimming and On/Off control Wallpods:
 - 1) 1, 2 or 4 channel raise/lower with 0-10V dimming control.
 - 2) 1, 2 or 4 channel on/off.
 - 3) Operating temperature 14°F to 160°F.
 - 4) Sensorswitch nLight nPODM DX or accepted equal by Hubbell or Lutron.
- 2. DayLighting Sensors, Low Voltage [O&M] [S]:
 - a. Remotely configurable and upgradeable.
 - b. Automatic Set-Point Calibration.
 - c. Blink-back Set-Point (in footcandles).
 - d. Set-Point (0-200 fc)
 - e. Sunlight Discount Factor (1-8)
 - f. Occupied Bright Level (0-100%)
 - g. Unoccupied Dim Level (0-100%)
 - h. Photocell On/Off Transition Time (45 sec. – 25 min.)
 - i. Adaptive cloud delay to prevent cycling on cloudy days.
 - j. Push-Button Programmable.
 - k. Full On/Off switching control.
 - l. Recessed Ceiling Applications: Sensorswitch nLight nRM ADCX series or accepted equal by Hubbell or Lutron.
 - m. Surface Ceiling Applications: Sensorswitch nLight nCM ADC series or accepted equal by Hubbell or Lutron.
- 3. Occupancy Sensors, Low Voltage [O&M] [S]:
 - a. Recessed Ceiling Mounted:
 - 1) Dual technology; passive infrared and ultrasonic.
 - 2) Full 360° operation.
 - 3) Assorted lens choices for desired motion coverage.
 - 4) Minimum 24' diameter small motion coverage at 9' ceiling height.
 - 5) Minimum 48' diameter large motion coverage at 9' ceiling height.
 - 6) Sensorswitch nLight nRM PDT 9 (small motion) or nRM PDT 10 (large motion) or acceptable equals by Hubbell/Unenco, or Lutron.
 - b. Surface Ceiling Mounted:
 - 1) Dual technology; passive infrared and ultrasonic.

SNOW CREEK ES 2CR HVAC UPGRADES

- 2) Full 360° operation.
 - 3) Assorted lens choices for desired motion coverage.
 - 4) Minimum 24' diameter small motion coverage at 9' ceiling height.
 - 5) Minimum 48' diameter large motion coverage at 9' ceiling height.
 - 6) Sensorswitch nLight nCM PDT 9 (small motion) or nCM PDT 10 (large motion) or acceptable equals by Hubbell/Unenco, or Lutron.
 - c. Wall Switch:
 - 1) Dual technology; passive infrared and ultrasonic.
 - 2) Full 180° operation.
 - 3) Minimum 40' diameter small motion detection.
 - 4) Switching and dimming control.
 - 5) Sensorswitch nLight nWSX PDT LV series or acceptable equals by Hubbell/Unenco, or Lutron. Include raise/lower dimming control option (DX) where required.
- G. Low Voltage Lighting Control Equipment:
1. Low Voltage Lighting Equipment Components shall all have the following features:
 - a. Fully addressable and compatible with Sensorswitch nLight control CAT-5e network.
 - b. Complete with power supply and 2 RJ-45 ports.
 - c. Shall be configured and labeled as specified here-in and as indicated on the drawings.
 - d. 5 year product warranty.
 2. Power/Relay Packs for Low Voltage Lighting Control [O&M] [S]:
 - a. Select the proper Power/Relay from the selection below.
 - b. Linear Power/Relay Packs with dimming:
 - 1) For lighting fixtures capable of 0-10V dimming control that are not nLight capable from the factory.
 - 2) Maximum load 16A.
 - 3) Sensorswitch nLight nPP16 D Series Power Packs or acceptable equals by Hubbell/Unenco, or Lutron.

- c. Secondary Relay Pack with phase control dimming:
 - 1) For lighting fixtures requiring low voltage dimming control that are not 0-10V compatible.
 - 2) For 2 wire ballast or 3 wire dimmable ballast.
 - 3) Dimming ranges: High (0-100%), Low (0-100%).
 - 4) Dimming offset: (-200% to 200%).
 - 5) Requires CAT-5e power.
 - 6) Sensorswitch nLight nSP5 PCD series lighting control relay or acceptable equals by Hubbell/Unenco, or Lutron.
- d. For Switching of LED:
 - 1) Maximum Load 16A.
 - 2) Combination unit includes power supply for up to 80ma. of bus load.
 - 3) Sensorswitch nLight nPP16 series or acceptable equals by Hubbell/Unenco, or Lutron.
- e. For switching of line voltage non nLight lighting loads:
 - 1) Maximum Load 16A.
 - 2) Sensorswitch nLight nSP16 series slave relay pack or acceptable equals by Hubbell/Unenco, or Lutron.
- f. For switching of low voltage non nLight lighting loads:
 - 1) Maximum Load 1A @ 40 VAC/VDC.
 - 2) Sensorswitch nLight nAR 40 series auxiliary low voltage relay or acceptable equals by Hubbell/Unenco, or Lutron.
- 3. Power Supplies [O&M] [S]:
 - a. Power Supplies shall all have the following features:
 - 1) Power supplies shall operate on 120V and 277V power.
 - 2) Plenum Rated.
 - 3) Complete with elongated chase nipples for direct connection through a ½" knock-out to a standard junction box.
 - b. For Bus and System Power over CAT-5e (80ma): Sensorswitch nLight nPS 80 series or acceptable equals by Hubbell/Unenco, or Lutron.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. All wiring devices shall be mounted at elevations indicated.
- B. Local switches shall be coordinated with the door swings to insure the proper location of the switch. Local switches shall be a minimum of 4" from door jamb trim. Refer to elevation for mounting outlet boxes at doors.
- C. Install plates on all outlets and wiring devices, with all four edges in continuous contact with finished wall surfaces without the use of mats or similar devices. Plaster fillings will

SNOW CREEK ES 2CR HVAC UPGRADES

not be permitted. Plates shall be installed with an alignment tolerance of 1/16 inch. The use of sectional device plates will not be permitted.

- D. Where the wall opening for a wall or casework outlet box is larger than a standard plate cover, repair the outlet opening to accept a standard size plate. "Jumbo" or "Junior Jumbo" device plates are not acceptable.
- E. Low Voltage Dimming and ON/OFF Control System: Provide all components and wiring necessary for a complete and functioning Low Voltage Dimming and ON/OFF control system as indicated. Furnish and Install all wallpods, occupancy sensors, lighting sensors, power supplies and dimming controls, cat 5e cable and miscellaneous appurtenances necessary for each complete and operating system. Drawing symbols indicate which lighting zones and spaces are to have low voltage (0-10V) Dimming and ON/OFF controls.
- F. Daylighting Sensors and Controls: Daylighting sensors are shown in spaces with LED fixtures. Daylighting sensors and controls shall sense and dim these lighting fixtures via nLight CAT 5e network control of the fixtures. Dimming shall begin with fixtures located closest to exterior fenestration, and work inward in the space a minimum of 15' as appropriate for even total illumination of the space (A combination of daylighting and controlled lighting). In all cases daylighting control strategies must comply with the IECC.
- G. Occupancy Sensing and Control: The low voltage lighting control system shall be programmed as follows:
 - 1. When an occupant first enters a space with lighting enabled (fixtures off), the space shall illuminate to the 50% lighting power level. This requirement is based on ASHRAE 90.1, 2010 and applies to all spaces except those listed in Paragraph 9.4.1.a through d.
 - 2. At all times, the occupant's manual control of the space (via wallpods or network control) will override automatic controls.
- H. Vacancy Sensing and Control: In spaces containing occupancy sensors with a 'vs' designation, occupancy sensors shall be programmed as vacancy sensors (wallpod 'on,' occupancy sensor 'off').
- I. All solid state line voltage dimmers shall have dedicated neutral wiring from the panelboard to the fixture.
- J. Photocells shall be installed with view window oriented to the North and away from direct or reflected artificial or natural light sources. Mount photocell(s) 1'-6" above roof on conduit fitting and connected to circuits indicated.
- K. Lighting contactors shall be installed in a NEMA enclosure rated for the environment encountered.
- L. Furnish nlight software with floorplan layout for each school which allows programming and control of installed nlight devices.

END OF SECTION 260923

SNOW CREEK ES 2CR HVAC UPGRADES

SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 WORK INCLUDED:

- A. Fuses [S]

1.3 RELATED WORK:

- A. Section 26 28 16 – Enclosed Switches And Circuit Breakers
- B. Section 26 29 00 – Low-Voltage Controllers

1.4 SUBMITTALS:

- A. Submit product data in accordance with Section 26 05 00.
 - 1. Product Data: Submit application, technical, and installation data.

PART 2 - PRODUCTS [O/M]

2.1 MANUFACTURERS:

- A. All Fuses shall be as manufactured by Cooper Industries, GEC Alsthon, Littlefuse, Gould-Shawmut (Nippon Mining). [S] [O/M]

2.2 MATERIALS AND TYPE:

- A. Motor Fuses: Rejection type **C** class RK-1, dual element, time-delay, current limiting, cartridge type, by 300™ Low-Peak Yellow™ by Bussman, Lolp© by CEFCo, Power-Pro® by Littlefuse, "AMP-TRAP 2000" by Gould-Shawmut (Nippon Mining), with a minimum interrupting rating of 200,000 amperes rms symmetrical.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Fuses for motor circuits shall be sized in accordance with the fuse manufacturer's sizing chart for "**motor running overload protection**", unless otherwise required for a specific motor. All other fuses for other than motor circuits shall be of size and type as required by the connected equipment manufacturer's written instructions unless otherwise indicated.

SNOW CREEK ES 2CR HVAC UPGRADES

Labels indicating size and type of replacement fuses shall be glued to inside of door on all fusible switches and fusible motor starters.

3.2 SPARE FUSES:

- A. 600 Amp Fuses and Smaller: Furnish spare fuses not to exceed 10% of each rating with a minimum of three (3) per rating.
- B. Contractor shall deliver the spare fuses with invoice to the Owner's Maintenance Operations Center.

END OF SECTION 262813

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 WORK INCLUDED:

- A. Disconnect Switches
- B. Circuit Breakers

1.3 RELATED WORK:

- A. Section 26 05 53 – Identification For Electrical Systems
- B. Section 26 20 00 – Low-Voltage Electrical Distribution
- C. Section 26 28 13 – Fuses
- D. Section 26 29 00 – Low-Voltage Controllers

1.4 REFERENCES:

- A. All disconnect switches and circuit breakers shall meet and comply with applicable sections of U.L., N.E.C. and NEMA.

1.5 SUBMITTALS:

- A. Submit shop drawings and product data in accordance with Section 26 05 00.
 - 1. Shop Drawings for Disconnect Switches shall include:
 - a. Scale drawing of enclosure and internal components.
 - b. Roughing-in requirements.
 - 2. Circuit Breaker shop drawings shall include:
 - a. Frame type and ampere rating.
 - b. Trip amperage.
 - c. Interrupting rating in RMS symmetrical amps.
 - d. Accessories.
 - 3. Product Data: Submit application, technical, and installation data.
- B. Submit Operation and Maintenance Manuals in accordance with Section 26 05 00.

SNOW CREEK ES 2CR HVAC UPGRADES

PART 2 - PRODUCTS [O/M]

2.1 MANUFACTURERS:

- A. All disconnect switches shall be Square D (Group Schneider) Class 3110 Heavy Duty Visible-Blades® safety switches, General Electric Spec-Setter® Heavy Duty Type TH (to 600A), and Type TC (800A & 1200) safety switches [S][O/M], Cutler-Hammer/Eaton Heavy Duty Type DH series safety switches, and Siemens Vacu-Break VBII™ Heavy Duty safety switches.

2.2 MATERIALS AND TYPE:

- A. Disconnect Switches [S] [O/M]: Rated for voltage encountered, poles and amperage as required. Heavy Duty, NEMA enclosures, fusible for rejection type class R fuses only, solid neutral assembly, equipment grounding kit, unless otherwise indicated. Refer to NEMA type under PART 3 - EXECUTION.
- B. Molded Case Circuit Breakers (MCCB) [S] [O/M]:
 - 1. Ratings and special features shall be as scheduled.
 - 2. Trips shall be thermal magnetic with inverse time delay and instantaneous time-current characteristics.
 - 3. Circuit breakers shall have removable lugs. Lugs shall be UL listed for copper and aluminum conductors. Breakers shall be UL listed for installation of mechanical screw-type lugs and compression type lugs.
- C. Fuses: Provide specified fuses, sizes as required.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Provide disconnect switches for all motors and appliances for the project where required by the National Electrical Code; and rated for the voltage encountered complete with required poles, amperage rating and all accessories. Not all disconnect switches required by NFPA-70 are necessarily indicated on the drawings.
- B. All roof mounted fans shall have a disconnect switch (device) mounted under the hood by the Mechanical Trade. This switch (device) shall be wired in series with the firestats on the fans.
- C. Provide rain-tight NEMA-3R, NEMA-4, NEMA-4X, explosion-proof or other NEMA enclosures for switches where required by NEC and environmental conditions.
- D. Certain fusible disconnect switches shall be fully U.L. Service Equipment rated and labeled as indicated by the electrical distribution system.

SNOW CREEK ES 2CR HVAC UPGRADES

3.2 FIELD QUALITY CONTROL:

- A. Technical Assistance: The electrical gear manufacturer's representative shall generally provide installation supervision of this equipment if requested by the contractor.

END OF SECTION 262816

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 WORK INCLUDED:

- A. Lighting Fixtures

1.3 RELATED WORK:

- A. Section 26 05 00 – Common Work Results For Electrical
- B. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables
- C. Section 26 05 23 – Control Voltage Electrical Power Cables
- D. Section 26 05 26 – Grounding And Bonding For Electrical Systems
- E. Section 26 05 33 – Raceway And Boxes For Electrical Systems

1.4 REFERENCES:

- A. The complete fixture and installation method including the lamps, fixture construction, ballast, sockets, wiring, raceway, suspension system, fixture environment shall be in accordance with:
 - 1. Uniform Statewide Building Code for the Commonwealth of Virginia.
 - 2. N.E.C.
 - 3. Fixture and application use listed by U.L. Inc.
 - 4. Where applicable, all lamps shall meet the National Energy Policy Act (EPCA) of 1992.
 - 5. All above references shall be current issue in effect at time of bid.

1.5 SUBMITTALS:

- A. Submit shop drawings and product data in accordance with Section 26 05 00.
 - 1. Shop Drawings shall include:
 - a. Photometrics.
 - b. Dimensions.
 - c. Roughing-in requirements.
 - d. Point by point footcandle study for exterior post lighting.
 - 2. Product Data: Submit application, technical, and installation data.

SNOW CREEK ES 2CR HVAC UPGRADES

- B. Submit Operation and Maintenance Manuals in accordance with Section 26 05 00.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. **Lighting Fixtures:** Lighting fixture manufacturer's names and catalog numbers are noted on drawings and are used to designate the type, general design, size, quality, etc., of fixtures desired [S][O/M][V].
- B. **Lamps [S]:**
 - 1. LED: Lamps, with electronic drivers, as scheduled on the drawings.
 - 2. LED Emergency Drivers: LED Emergency Drivers shall be by IOTA and provide 20W of constant output power with a nominal output of 2000 lumens and a 90-minute maximum runtime.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Provide lighting fixtures complete with all required lamps, plates, rings, hangers, trim and all accessories necessary for a complete and secure installation. The number of lamps and lamp wattage is indicated as a prefix to the fixture type number. Contractor shall verify that the lighting fixtures' and ballasts' voltage conforms with the installation, the designated circuit voltage and the lighting fixture schedule.
- B. All fixtures shall be adequately supported by fixture studs, conduit stems, steel rods or bar hangers. Fixtures shall not be mounted to or suspended from any mechanical system unless otherwise indicated.
- C. Before fixture order is placed, the Contractor will be responsible for checking type of ceiling in all spaces to determine if fixture type indicated is correct to fit ceiling encountered and if exposed fixture finish indicated is correct.
- D. All recessed LED light fixtures mounted in lay-in ceilings shall be fastened to the adjacent T-bars by Caddy #515 fasteners, or accepted equal. Support outlet boxes and fixtures from building structure independent of associated ceiling suspension system. Where a recessed 2' x 4' lay-in fixture is indicated, the Electrical Trade shall provide a minimum of two (2) auxiliary support wires at the diagonal corners of the recessed fixture. These auxiliary support wires shall be equal to or greater than the support wires for the ceiling system and capable of supporting the fixture if the ceiling system support wires were compromised. The auxiliary support wires shall attach **directly** to the fixture, at the fixture manufacturer's indicated locations. These wires shall be attached and supported from the structure in the same manner as the ceiling system support wires. Where support wires are attached to the structural steel above the ceiling system, utilize CADDY catalog number 4H24 flange clamps or equal at the point of attachment to the structural steel.
- E. The combined fixture body and enclosure for classroom use shall meet the V.C.P. Criteria of the Commonwealth of Virginia's Department of Education. Complete E.T.L., E.R.L., B.A.L.L., or I.T.L. photometric test data shall be submitted with the fixture shop drawing.

END OF SECTION 265000

SNOW CREEK ES 2CR HVAC UPGRADES
SECTION 283100 - FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 WORK INCLUDED:

- A. An extension of a complete Automatic/Manual Microprocessor Based Fire Alarm system.

1.3 RELATED WORK:

- A. Division 26 – Electrical

1.4 QUALITY ASSURANCE

- A. Source Quality Control: Materials and equipment shall be new, unused and U.L listed for use as a Fire Protective Signaling System. The Fire Alarm System shall be listed and on file with the U.L. Certificate of Compliance upon completion of the system.
- B. The system and components shall be supplied by one single manufacturer of established reputation and experience who shall have produced similar apparatus and who shall be able to refer to similar installations rendering satisfactory service.
- C. The installing trade shall furnish the services of the Fire Alarm System manufacturer's authorized technical representative who is qualified in the installation and operation of the system being provided, and who shall be qualified and experienced in the inspection, testing, and maintenance of fires alarm systems. This local authorized technical representative shall be:
 - 1. Factory trained and certified by manufacturer of the system being installed. Fire Alarm Trade shall submit letter of certification and proof of continuing education.
 - 2. An on-site National Institute for Certification in Engineering Technologies (NICET) Fire Alarm certified **Level 3** Senior Engineering Technician to supervise on-site NICET certified personnel.
 - 3. Trained and qualified personnel employed by and organization listed by a national and Virginia recognized testing laboratory (U.L.) for the servicing of maintaining and testing of fire alarm systems.
- D. Certification shall be submitted verifying the Fire Alarm Trade is the manufacturer's authorized dealer and installer has NICET certified personnel (indicate levels) and whose local project office is listed in the U.L. Fire Protection Equipment Directory.
- E. The installing Trade shall furnish the services of the Fire Alarm System manufacturer's authorized technical representative who is qualified in the installation and operation of the system being provided, and who is listed and on file with the Underwriters Laboratories (U.L.) Inc. The above Fire Alarm System manufacturers authorized technical representative shall be hereinafter known as the Fire Alarm Technician and

SNOW CREEK ES 2CR HVAC UPGRADES

his employer as the Fire Alarm Trade. The Fire Alarm Technician and his employer shall be capable of providing Underwriters Laboratories Follow-Up Service to identify that the fire alarm system is installed, tested and maintained in accordance with U.L.'s requirements and issue a U.L. Certificate of Compliance and NFPA-72 Record of Completion. The Fire Alarm Technician shall supervise the hook-up, final testing and adjustment of the system, and provide instruction to the Owner's representative. The Fire Alarm System installation shall include wiring, components, connections, adjustment, testing and certification. The Installing Trade shall provide conduit, junction boxes and pull boxes as indicated, and required by Fire Alarm System manufacturer drawings or Fire Alarm Trade instructions. The Fire Alarm Trade shall furnish an low voltage wiring, special back boxes, cabinets, enclosures and similar items to the Electrical Trade for installation by the electrical trade in accordance with the fire alarm system manufacturer's drawings, Fire Alarm Trade instructions, and as indicated.

- F. The Fire Alarm Trade shall also furnish a list of similar or equal installations and shall show company experience in this type of work.

1.5 REFERENCES:

- A. The complete installation, including additions and modifications, shall be in accordance with:
 - 1. Uniform Statewide Building Code for the Commonwealth of Virginia (2009 IBC).
 - 2. National Electrical Code Article 760 & 800.
 - 3. National Fire Protection Association Standard 72, 13.
 - 4. ASME/ANSI 17.1 (2008).
 - 5. Listed by Underwriters Laboratories, Inc.
 - 6. ASME/ANSI 117.1 (2003).
 - 7. All of the above references shall be current issue in effect at time of bid.
 - 8. Authority having jurisdiction's regulations, mandates and certification processes that are either part of applicable local government ordinance or applicable state law.

PART 2 – PRODUCTS – Not used.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. The Fire Alarm Trade shall be responsible for all arrangements for testing and approval of the Fire Alarm System by the Authority having jurisdiction before the Fire Alarm System is accepted by the Project Manager.

3.2 INSTALLATION:

- A. General: The Fire Alarm Trade shall provide all new equipment, accessories and material required for the installation of the fire alarm system in accordance with the specifications and drawings. Any material and/or equipment necessary for the proper

SNOW CREEK ES 2CR HVAC UPGRADES

operation of the system that is not specified or described herein shall be deemed part of this specification.

B. Wiring Methods:

1. All wiring methods shall be in accordance with NFPA-70, Article 760, and all other codes specified herein.
2. Provide proper number and size of wires as required for proper operation of the system in accordance with the system's manufacturer's instructions and the above codes.
3. All non-power limited wiring shall be installed in a separate conduit system, as specified in Section 26 05 19.
4. All shielded power limited cable shall be installed in a partial conduit system per NEC Article 760 and as specified in Section 26 05 23 for plenum and non-plenum applications.
5. No wiring other than that directly associated with fire alarm detection, alarm or auxiliary fire protection functions shall be permitted in fire alarm conduits, (except in the cable tray, in accordance with the NEC and if permitted by the TIA/EIA standards for compatibility with other listed TIA/EIA systems).
6. Wiring splices are to be avoided to the extent possible, and if needed they must be made only in junction boxes and shall be crimp connected.
7. Transposing or changing color coding of wires shall not be permitted.
8. Crimped type connections are not acceptable for final connections at terminating locations.
9. All conductors shall be labeled on each end with "E-Z markers" or equivalent.
10. Conductors in cabinets shall be carefully formed and harnessed so that each drops off directly opposite to its termination.
11. Cabinet terminals shall be numbered. All controls, function switches, etc., shall be clearly labeled on all equipment panels.
12. All connections to panels, devices and detectors shall be made with screw terminal connections, or method approved by fire alarm manufacturer.
13. All wiring shall be checked and tested to insure that there are no grounds, opens or shorts.
14. All fire alarm addressable signal line circuits (SLC) shall be Style 6 (pre-1988 Class A). Return circuit route shall **not** be in the same conduit.
15. All fire alarm signal line circuits, and other wiring leaving the building location shall have surge arresters or transient protectors as required by U.L., NEC and equipment manufacturer.
16. All fire alarm systems' wiring 100 volts and less is part of Division 28. All fire alarm systems' wiring 101 volt and above is part of Division 26.
17. All boxes, conduits, etc., shall be of proper size, as determined by the Fire Alarm System Trade, shall be clearly marked for easy identification, continuously grounded together and bonded to the existing building grounding electrode system (BGES). The Fire Alarm Trade shall furnish special boxes to the Electrical Trade for installation by the Electrical Trade.
18. All wiring shall be in conduit.

3.3 TECHNICAL ASSISTANCE:

SNOW CREEK ES 2CR HVAC UPGRADES

- A. Instruction: The Fire Alarm Technician shall instruct the Authority having jurisdiction and the Owner and Fire Department personnel on the correct operation of the system after the installation is completed.

3.4 FIELD QUALITY CONTROL:

- A. General: Upon completion of the installation, the Fire Alarm Systems Technician shall perform all necessary tests and adjustments.
- B. After completion of all tests and adjustments listed above, the Fire Alarm Trade shall submit the following information to the Design Engineers.
 - 1. "As-built" conduit layout diagrams including wire color code and/or tag number.
 - 2. Complete "as-built" wiring diagrams.
 - 3. Detailed catalog data on all installed system components.
 - 4. Copy of the test report described in Par. B.
 - 5. Provide laminated C size drawings of the system layout in the MDF Room
- C. Final tests and inspection shall be held in the presence of the Project Manager and to his or her satisfaction. The Fire Alarm Trade shall supply personnel and required auxiliary equipment for this test without additional cost.
- D. The completed smoke detection system installed as a part of this project shall be tested to insure that it is operating properly. This test will consist of exposing the installed units to a standard fire test. Failure of the devices to sense the smoke shall be considered a failure of the system and all detectors in that system shall be readjusted or replaced. Acceptance of the system shall also require a demonstration of the stability of the system. This shall be adequately demonstrated if the system operates for a ninety (90) day test period without any unwarranted alarms. Should an unwarranted alarm(s) occur, the Fire Alarm Trade shall readjust or replace the detector(s) and begin another ninety (90) day test period. As required by the Design Engineers, the Fire Alarm Trade shall recheck the detectors using the fire test after each readjustment or replacement of detectors. This test shall not start until Owner has obtained beneficial use of the building under tests.
- E. If the requirements provided in the paragraph above are not completed within one (1) year after beginning the tests described therein, the Fire Alarm Trade shall replace the system with another acceptable manufacturer and the process repeated until acceptance of the equipment by the Design Engineers, Owner and Project Manager.
- F. After completion of all tests and adjustments listed above, the Fire Alarm Trade shall turn over the Fire Alarm System data disk to the Owner. The data disk will be considered to be the property of the Owner upon acceptance of the Fire Alarm System by the Project Manager.

END OF SECTION 283100

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