	CITY OF NORTH CHARLESTON Request for Proposal	Project Number: NC-14-17 Date: June 16, 2017 Procurement Official: Denise Badillo, CPPB, CPPO Phone: (843) 740-5899 E-Mail Address: dbadillo@northcharleston.org	
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DESCRIPTION: HVAC Replacement Project

The Term "Offer" Means Your "Bid" or "Proposal".

SUBMIT OFFER BY **July 11, 2017 @ 10:00AM** See "Deadline for Submission of Offer" provision

QUESTIONS MUST BE RECEIVED BY: **July 3, 2017 @ 4:30 p.m.** See "Questions from Offerors" provision

NUMBER OF COPIES TO BE SUBMITTED: **1 unbound original and 2 copies**

Offers must be submitted in a sealed package. Solicitation Number & Opening Date must appear on package exterior.

SUBMIT YOUR SEALED OFFER TO:
 CITY OF NORTH CHARLESTON
 PROCUREMENT DEPARTMENT
 Attention: Denise Badillo, CPPB, CPPO
 PO Box 190016
 2500 City Hall Lane
 North Charleston, SC 29419
 See "Submitting Your Offer" provision

CONFERENCE TYPE: Pre-Bid DATE & TIME: June 22, 2017 @ 2:00 p.m. As appropriate, see "Conferences - Pre-Bid/Proposal" & "Site Visit" provisions	LOCATION: Felix C. Davis Community Center 4800 Park Circle North Charleston, SC 29406
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AWARD & AMENDMENTS	The award, this solicitation, and any amendments will be posted at the following web address: http://www.northcharleston.org/Business/Do-Business-with-North-Charleston/Request-for-Qualifications.aspx It is the responsibility of the offeror to check for amendments.
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You must submit a signed copy of this form with Your Offer. By submitting a bid or proposal, You agree to be bound by the terms of the Solicitation. You agree to hold Your Offer open for a minimum of ninety (90) calendar days after the Opening Date.

NAME OF OFFEROR <small>(Full legal name of business submitting the offer)</small>	OFFEROR'S TYPE OF ENTITY: <small>(Check one)</small> <input type="checkbox"/> Small (15 employees of less) <input type="checkbox"/> Women <input type="checkbox"/> Minority <input type="checkbox"/> Other _____ <small>(See "Signing Your Offer" provision.)</small>
AUTHORIZED SIGNATURE <small>(Person signing must be authorized to submit binding offer to enter contract on behalf of Offeror named above.)</small>	
TITLE <small>(Business title of person signing above)</small>	
PRINTED NAME <small>(Printed name of person signing above)</small>	
DATE SIGNED	

Instructions regarding Offeror's name: Any award issued will be issued to, and the contract will be formed with, the entity identified as the offeror above. An offer may be submitted by only one legal entity. The entity named as the offeror must be a single and distinct legal entity. Do not use the name of a branch office or a division of a larger entity if the branch or division is not a separate legal entity, *i.e.*, a separate corporation, partnership, sole proprietorship, etc.

PAGE TWO
(Return Page Two with Your Offer)

HOME OFFICE ADDRESS (Address for offeror's home office / principal place of business)	NOTICE ADDRESS (Address to which all procurement and contract related notices should be sent.) (See "Notice" clause)							
	Area Code	Number	Extension	Facsimile				
	E-mail Address							
PAYMENT ADDRESS (Address to which payments will be sent.)	ORDER ADDRESS (Address to which purchase orders will be sent)							
Payment Address same as Home Office Address Payment Address same as Notice Address (check only one)	Order Address same as Home Office Address Order Address same as Notice Address (check only one)							
ACKNOWLEDGMENT OF AMENDMENTS Offerors acknowledges receipt of amendments by indicating amendment number and its date of issue. See "Amendments to Solicitation" Provision	Amendment No.	Amendment Issue Date	Amendment No.	Amendment Issue Date	Amendment No.	Amendment Issue Date	Amendment No.	Amendment Issue Date
DISCOUNT FOR PROMPT PAYMENT	10 Calendar Days (%)	20 Calendar Days (%)	30 Calendar Days (%)	_____ Calendar Days (%)				
PREFERENCES – Not applicable when using an RFP method of source selection.								

PROJECT NO.: NC-14-17

PROJECT NAME: HVAC REPLACEMENT

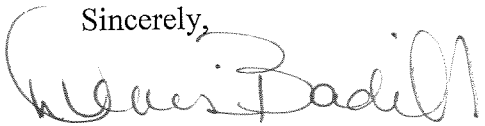
Sealed proposals will be received at North Charleston Purchasing Department, 2500 City Hall Lane, North Charleston, SC 29406 until 10:00 a.m., July 11, 2017 for the replacement of a HVAC system located at Park Circle Community. See attached.

A mandatory pre-bid will be held on June 22, 2017 at the Felix C. Davis Community Center, 4800 Park Circle, North Charleston, SC 29406

The project consist of the design and installation of a new 25 ton gas/electric rooftop HVAC system to cool and heat the Auditorium and the stage of the community center. The rooftop unit shall be ground mounted. Design and construction shall include all work (mechanical, electrical, structural, etc.) to provide a complete system and shall provide a complete and usable facility. Please see attached specifications.

The City reserves the right to reject any and all bids, to waive any technicalities or informalities, and to be the sole judge of the suitability of the item offered for use by the City. Please mark your envelope "SEALED PROPOSAL: NC-14-17 to be opened 10:00 a.m., July 11, 2017. The City is not responsible for proposals delayed in the mail or other delivery service.

Sincerely,

A handwritten signature in dark ink, appearing to read "Denise Badillo", written over a horizontal line.

Denise Badillo
Director of Procurement

GENERAL INFORMATION

This solicitation is intended to promote competition. If the language, specifications, terms and conditions, or any combination thereof restricts or limits the requirements in this solicitation to a single source, it shall be the responsibility of the interested vendor to notify the City of North Charleston, in writing, so as to be received five (5) days prior to the opening date. The solicitation may or may not be changed, but a review of such notification will be made prior to award.

Since this solicitation is a Request for Proposals, which permits discussions and negotiations, award will not be made based on the lowest price submitted. Award will be made to the responsible responsive offeror whose proposal is considered most advantageous to the City based on the following:

Factors and Criteria to be considered in award will be:

- a. Experience with removal and replacement of this type and size unit
- b. Schedule/time line and plan to remove existing equipment and installation of new
- c. References, include company name, contact, email and phone number of contact
- d. Price

The City shall be the sole judge of weights, given these factors.

Only the names of offerors submitting proposals will be revealed. No other information will be disclosed.

AWARD:

Award will be on an all or none basis. Proposals will be analyzed and the award made to the most responsible, responsive Bidder whose Proposal is determined to be most advantageous to the City based on the above evaluation criteria. The City shall be the sole judge of weights, given these factors. Award of a Proposal shall not imply the rejection of any other. The City of North Charleston may reject any or all Proposals without cause or explanation, and without incurring obligation to any Bidder.

SUBMITTING PROPOSALS:

Proposals submitted by fax will not be accepted.

Proposals submitted via mail should be addressed to: City of North Charleston, Purchasing Department, P.O. Box 190016, North Charleston, SC 29419-9016.

Bids hand delivered by courier service should be addressed to: City of North Charleston, Purchasing Department, 2500 City Hall Lane, North Charleston, SC 29406.

Provide one unbound original and two copies of your response.

Proposals shall be assembled as follows:

TAB A - Letter identifying your company, SC Mechanical Contractors License number, years in business, number of employees, contact information for individual able to make decisions/answer questions and signed by such person.

TAB B - Experience – identify projects your organization has performed in the last five (5) years that are similar in size/design/function. Provide a short description of the work performed.

TAB C - Provide your preliminary schedule/time line for removing the existing equipment and replacement of new equipment.

TAB D - Provide the brand, model and cut sheets for your proposed equipment

TAB E – References, provide company name, contact person email and phone number of contact for the projects performed under Tab B.

TAB F - Provide your cost proposal sheet to perform all work as specified. Include a separate Item identifying Alternate #1 – price to replace the total existing ductwork system serving the auditorium in kind. All pricing shall include all cost associated with The project to include labor, materials, equipment, overhead, insurance, permitting, taxes, etc. Cost sheet shall acknowledge all Addenda.

ADDITIONAL INFORMATION:

No oral interpretation will be made to any Bidder as to the meaning of the Bid Documents or any part thereof. All questions or concerns regarding this Invitation to Bid must be submitted in writing. Any inquiry received seven or more days prior to the date fixed for opening of Bids will be given consideration. Every interpretation made to a Bidder will be in the form of an Addendum. In addition, all Addenda will be e- mailed to each person holding Bid Documents, but it shall be the Bidder's responsibility to make inquiry as to the Addenda issued. It is highly recommended that all Bidders contact the Director of Procurement before the bid is due to verify the number of Addenda, if any. All such Addenda shall become part of the Contract and all Bidders shall be bound by such Addenda, whether or not received by the Bidder.

All questions from Bidders shall be directed to Denise Badillo, Procurement Director for the City of North Charleston via e-mail, dbadillo@northcharleston.org no later than close of business Monday, July 3rd 2017 in order for your inquiry to be included in the final Addendum, which will be issued, if necessary to all bides by the end of business on July 6, 2017.

PROPOSAL REJECTION:

Bids may be rejected for any, but not limited to, the following reasons:

- a. If there are any irregularities of any kind which may tend to make the proposal incomplete, indefinite, or ambiguous as to its meaning.
- b. If any proposer adds any provisions reserving the right to accept or reject an award, or to enter into a contract pursuant to an award.
- c. If the bid response does not include catalog cuts and/or data sheets detailing the items offered which will be required for evaluation purposes.
- d. If there is reason to believe that any proposer is interested in more than one proposal on the same item, or that there has been collusion among the proposers.
- e. If a Proposer does not acknowledge all Addenda.
- f. Any Proposals that are received after the time set for opening will be returned unopened to the Proposer.

TIME FOR RECEIVING BIDS:

- a. Proposals received prior to the advertised hour of opening will be securely kept, sealed. The officer whose duty it is to open them will decide when the specified time has arrived, and no Proposal received thereafter will be considered.

OPENING OF PROPOSALS:

At the time and place fixed for the opening of responses, the City will cause to be opened every Proposal received within the time set for receiving Proposals. Proposers and other persons properly interested may be present, in person or by representatives. A Bid Sheet will not be published. Only the names of participating vendors will be released.

RESIDENT VENDOR PREFERENCE:

A Resident Vendor Preference of one percent (1%) of the aggregate bid/proposal amount shall be given to all qualified Resident Vendors in the award of all formal bids/proposals. The Resident Vendor Preference will only be applied in the event that more than one Bidder's equipment is considered equal or suitable for use by the City, including delivery time and any other information obtained from responses, and either Bid would be advantageous to the City.

- a. Any vendor claiming the Resident Vendor Preference must submit a North Charleston Resident Vendor Preference Affidavit and a copy of their current North Charleston business license as part of the vendor's bid/proposal. The affidavit shall be included with

each bid/proposal package furnished to a vendor. Failure of a vendor to return the affidavit and a copy of their current North Charleston business license with their bid/proposal shall disqualify the vendor for consideration of the Resident Vendor Preference.

- b. Nothing in the Resident Vendor Preference program shall be construed as increasing or decreasing the actual price of any bid/proposal. The actual cost which will be paid shall be the same as those bid/proposed. The percentage calculation is used only for award determination.
- c. The bid or proposal shall be awarded to the Resident Vendor if such bid/proposal does not exceed the lowest qualified bid/proposal from a nonresident vendor by more than one percent (1%).
- d. The Resident Vendor Preference shall not exceed a total amount of \$3,000.00 for any one bid or proposal award.
- e. In the event the procurement is to be made pursuant to State or Federal guidelines that prohibit or restrict local preference, then there shall be no local preference used in award.

PERMITS AND LICENSES

The vendor shall, at its own expense, prior to an award and prior to commencing services/operations on behalf of the City or under contract with the City, acquire all necessary permits, licenses and other approvals as required by law to provide the required services and/or actions in conjunction with a contract award with the City. It is recommended that proposers contact the South Carolina Secretary of State's office (www.scsos.com), Charleston County Government, and the City of North Charleston Business License Department to learn of any pertinent requirements. The City shall not interpret the requirements on behalf of the proposer.

Proposers shall obtain all necessary permits and licenses required by state and Federal law and shall remain in compliance with all applicable statutes and pertinent regulations throughout the term of performance. Should any permits or licenses be revoked or lapse during the period of performance, the Procurement Officer shall be notified immediately.

The proposer shall pay all excise taxes, retail taxes and other fees imposed. The proposer assumes full responsibility for payment of all State and Federal taxes for unemployment, pensions or any Social Security legislation for all its employees and will further comply with all requirements that may be specified in regulations hereafter promulgated by the City's administrative officials.

TERMINATION

- a. Termination for Non-Compliance with Drug Free Workplace Act: In accordance with the Drug Free Workplace Act, this contract is subject to immediate termination, suspension of payment, or both, if the Contractor fails to comply with the terms of the Drug Free Workplace Act.
- b. Termination for Cause: If the Contractor fails to perform the work or any separable part thereof in a timely or workmanlike manner in accordance with the Contract Documents, or otherwise fails, in the sole opinion of the City, to comply with any of the terms and conditions of the Contract Documents, then this Contract may be cancelled and terminated by the City at any time prior to delivery of material without advance written notice. Default or breach of any clause of this contract shall constitute "cause" for termination

Further, any act of omission by the Contractor which is contrary to law or public policy shall be considered "cause" allowing termination as provided herein. The City will not be liable for any termination costs where termination is for cause.

- c. Termination for Convenience: The City shall have the right to terminate this Contract for convenience upon ten (10) days advance written notice. In the event that this Contract is terminated or cancelled upon the request and for the convenience of the City, then the City shall pay Contractor for all materials purchased to date on the City's behalf and for the value of services rendered to date (including reasonable profit margin). The City shall not otherwise pay for costs of termination, opportunity costs, or any costs or amounts of other description. As a prerequisite to Contractor receiving payment for goods purchased on City's behalf, the Contractor shall first turn over possession and all right title or other interest in the materials to the City.
- d. Termination for Non-Appropriation of Funds: The City, by written advance notice, may terminate this Contract in whole or in part in the event that sufficient appropriation of funds from any source (whether a Federal, State, City or other source) are not made or sufficient funds are otherwise unavailable, in either case, to pay the charges under this Contract. If this Contract is so terminated, the Contractor shall be compensated for all necessary and reasonable direct costs of performing the work actually provided to the date of such termination. The Contractor will not be compensated for any other costs in connection with a termination for non-appropriation. Contractor will not be entitled to recover any damages in connection with a termination for non-appropriation, including, but not limited to, lost profits.
- e. Termination for Harassment/Discrimination: Neither Contractor, nor any employee or agent of Contractor, shall discriminate against or harass any person because of race, color, religion, sex or national origin. The Contractor shall take affirmative action to ensure that such conduct does not occur. Violation of this clause may result in immediate termination of all contracts between the City and the Contractor "for cause" and may further result in Contractor being suspended or debarred from bidding on future contracts.

PAYMENT CONDITIONS: Payment for material or services will be made thirty (30) days after receipt of material, or 30 days after receipt of invoice, whichever is later, unless a discount is involved.

If the Contractor elects to request partial payments, he shall submit for approval immediately after execution of the Agreement, a carefully prepared Progress Schedule, showing the breakdown of his estimated cost of all work, so arranged and itemized as to meet the approval of the City. After approval by the City, the unit prices established in the breakdown shall be used in estimating the amount of partial payments to be made to the Contractor.

CITY OF NORTH CHARLESTON RESIDENT VENDOR PREFERENCE

AFFIDAVIT

Personally appeared before me _____ who, being duly sworn, certifies that the vendor identified in this bid response meets the following qualifications for the resident vendor preference: Has a principal place of business located within the corporate limits of the City of North Charleston. (A post office box or temporary construction or office trailer shall not be considered a place of business). Has a valid City of North Charleston business license and is in compliance with any state requirements or local ordinances regarding the type of business engaged in.

By this written claim bidder requests that the one percent (1%) resident vendor preference (not to exceed \$3,000.00) be exercised in consideration of contract award of this bid. Failure to complete and return this affidavit and a copy of your current City of North Charleston business license with your bid will result in not being eligible to receive the benefits of the resident vendor preference.

BUSINESS NAME: _____

NORTH CHARLESTON STREET ADDRESS: _____

SIGNATURE: _____ TITLE: _____

Sworn to and subscribed before me at _____ State of _____

this _____ day of _____ 20__.

Signature of Notary Public

Commission Expires

CERTIFICATION OF DRUG FREE WORKPLACE

The contractor certifies that he maintains a drug-free workplace and has or will establish a drug-free awareness program that informs employees about the dangers of workplace drug abuse; the contractor's intent to maintain a drug-free workplace; the existence of any available drug counseling, rehabilitation or employee assistance programs; and the penalties that may be imposed upon employees who abuse controlled substances in the workplace.

In the event of the Contractor's noncompliance with the drug free workplace certification of this contract, this contract may be canceled, terminated, or suspended in whole or in part, and the Contractor may be declared ineligible for further contract awards with the City of North Charleston.

By: _____

Title: _____

Date: _____

Official Address (including Zip Code) _____

CERTIFICATION OF NONSEGREGATED FACILITIES

The Bidder certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not permit his employees to perform their services at any location, under his control where segregated facilities are maintained. The Bidder certifies further that he will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location under his control where segregated facilities are maintained. The Bidder agrees that a breach of this certification will be a violation of the Equal Opportunity clause in any contract resulting from acceptance of this Bid. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and washrooms, restaurants, and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, or national origin, because of habit, local custom, or otherwise.

In the event of the Contractor's noncompliance with nondiscrimination clauses of this contract, this contract may be canceled, terminated, or suspended in whole or in part, and the Contractor may be declared ineligible for further contract awards with the City of North Charleston.

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

By: _____

Title: _____

Date: _____

Official Address (including Zip Code) _____

CERTIFICATION REGARDING ILLEGAL IMMIGRATION

The contractor certifies that he/she will comply with the applicable requirements of Title 8, Chapter 14 of the South Carolina Code of Laws (originally enacted as Section 3 of The South Carolina Illegal Immigration Reform Act, 2008 S.C. Act no. 280) and agrees to provide to the City upon request any documentation required to establish either: (a) that Title 8, Chapter 14 is inapplicable to you and your subcontractors or sub-subcontractors; or (b) that you and your subcontractors or sub-subcontractors are in compliance with Title 8, Chapter 14. Pursuant to Section 8-14-60, "A person who knowingly makes or files any false, fictitious, or fraudulent document, statement, or report pursuant to this chapter is guilty of a felony and, upon conviction, must be fined within the discretion of the court or imprisoned for not more than five years, or both." You agree to include in any contracts with your subcontractors language requiring your subcontractors to (a) comply with the applicable requirements of Title 8, Chapter 14, and (b) include in their contracts with the sub-subcontractors language requiring the sub-subcontractors to comply with the applicable requirements of Title 8, Chapter 14.

By: _____

Title: _____

Date: _____

Official Address (including Zip Code) _____

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Scope of Services

Building Sketch

SPECIFICATIONS

230500	Common Work Results for HVAC
230593	Testing, Adjusting, and Balancing for HVAC
230700	HVAC Insulation
231123	Facility Natural-Gas Piping
232300	Refrigerant Piping
233100	HVAC Ducts and Casings
233713	Diffusers, Registers, and Grilles
238119	Self-Contained Air-Conditioners
260500	Common Work Results for Electrical
260500	Wiring Devices
262816	Enclosed Switches and Circuit Breakers

SCOPE OF SERVICES

This project shall consist of the design and installation of a new HVAC system(s) to cool and heat the Auditorium and the stage of the Felix C. Davis Community Center at Park Circle. Design and construction shall include all work (mechanical, electrical, structural, etc.) to provide a complete system and shall provide a complete and usable facility. All design and construction work shall be in accordance with applicable editions of the International Building Code (IBC), the International Mechanical Code (IMC), the International Plumbing Code (IPC), the International Energy Conservation Code (IECC), the National Electrical Code (NEC), NFPA codes and standards and all state and local codes and standards. The existing system consists of a 25-ton split system and gas furnace which will be replaced, and two 3.5-ton supplemental units which are to remain. The general scope of work is as follows:

A. Work shall include but not be limited to the following:

1. Remove existing 25 ton air handling unit (located in the first floor electrical/mechanical room), existing gas duct furnace (located in second floor mechanical room), existing 25 ton condensing unit (located in the mechanical yard), unit controls, unit refrigeration piping and all appurtenances. Remove and cap existing gas line to existing gas duct furnace. Patch and paint disturbed areas to match existing.
2. Provide new high efficiency 25 ton gas/electric rooftop air conditioning unit. Rooftop unit to be ground mounted on new concrete pad in mechanical yard. Unit shall be provided with the following: curb for horizontal discharge (if required for the proposed unit), high efficiency motors, single point electrical connection, hot gas reheat humidity control, dry bulb economizer with power exhaust, modulating gas heat furnace, motorized outside air dampers, variable frequency drives and inverter rated motors (if required), stainless steel heat exchanger, supply and return smoke detectors, electrical disconnect switch, and hail guards. Unit capacity shall be as follows;

Sensible Cooling Capacity:	170 Mbtuh
Total Cooling Capacity:	312 Mbtuh
Total Air Flow:	11,000 cfm
Outside Air flow:	2,801 cfm
External Static Pressure:	To be determined by the contractor
Total Heating Capacity:	152 Mbtuh
3. Provide unit with demand control ventilation based upon CO2 levels within the space.
4. Provide unit controls with humidity sensor and control to limit the humidity within the space.
5. Remove and modify existing ductwork and provide new ductwork as required for connection of the existing air distribution system to the new installation. All ductwork to

be galvanized steel and to be provided and constructed in accordance with SMACNA low velocity duct construction standards. Ductwork runs to be reviewed during mandatory pre-bid meeting.

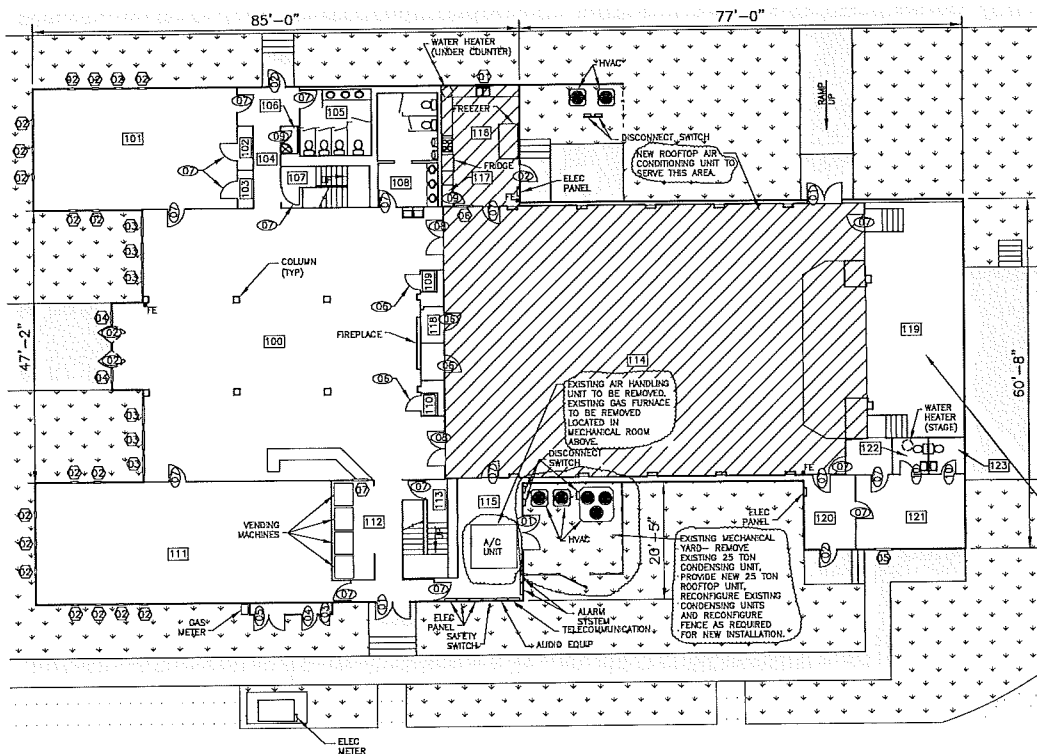
6. Provide new "Armaflex" insulation for new and modified ductwork. Exterior ductwork to be weatherproof and provided with aluminum jacket.
7. Provide new ductwork penetrations in exterior wall, seal weather tight and patch and paint exterior wall to match existing.
8. Verify adequacy of existing gas service line and replace if required. Extend gas service to new rooftop air conditioning unit.
9. Relocate existing condensing units and appurtenances in existing mechanical yard as required for installation of new rooftop unit.
10. Verify adequacy of existing electrical system to support new rooftop air conditioning unit. Provide new breaker in existing electrical panel and extend electrical service to new rooftop air conditioning unit.
11. Provide new duplex receptacle adjacent to each air conditioning unit in the mechanical yard.
12. Relocated and/or modify existing wooden fence around mechanical yard as required for installation of new roof top air conditioning handling unit. Manufacturer's recommended clearances are to be required for all equipment in the mechanical yard.
13. The existing split system air condition units are to remain in service. Modify the existing ductwork for the stage left unit to serve Rooms 120-123 in addition to acting as supplemental feed to the auditorium. Relocated thermostat for this unit into room 121. Disconnect the duct feed from the auditorium unit that currently serves these rooms.
14. Existing duct smoke detectors are to be reused and or replaced as required and connected to the existing building fire alarm system. Duct smoke detectors are to be provided with a test switch.
15. New motorized dampers are to be connected to the new air conditioning unit control system.
16. Test and balance the new installation after installation.

B. General:

1. Contractor shall visit the site and provide a field survey of the existing conditions of the HVAC units, and related systems (to included electrical and fire alarm) serving the auditorium and the stage areas prior to the start of any work.
2. The contractor shall provide signed and sealed mechanical and electrical drawings of the proposed work (if required by the authority having jurisdiction) for permit purposes. Drawings shall include required demolition,
3. The contractor shall generate complete removal and new installation drawings for of the proposed installation for review and approval prior to the start of any procurement and/or installation.
4. The contractor shall provide shop drawings of all proposed equipment for review and approval prior to purchase.
5. Alternate systems to that described above may be proposed; and will be evaluated on a case by case basis.

C. Add/Alternate #1:

Respondents are directed to provide a separate Add/Alternate price to replace the total existing ductwork system serving the auditorium in kind.



ROOM DESCRIPTION			
ROOM	USE	ROOM	USE
[100]	ENTRY APPROX. 2833 SQ. FT.	[112]	HALLWAY / VENDING AREA APPROX. 250 SQ. FT.
[101]	ACTVITY ROOM SOUTH 35'-8" x 20'-1"	[113]	STAIRS APPROX. 100 SQ. FT.
[102]	CLOSET 1'-6" x 8'-5"	[114]	AUDITORIUM 71'-10" x 47'-2"
[103]	CLOSET 1'-6" x 6'-5"	[115]	ELECTRICAL/MECHANICAL 12'-0" x 20'-2"
[104]	HALLWAY APPROX. 136 SQ. FT.	[116]	KITCHEN 11'-6" x 20'-0"
[105]	WOMEN'S RESTROOM 12'-5" x 11'-8"	[117]	KITCHEN CLOSET 2'-0" x 4'-0"
[106]	JANITOR'S CLOSET 2'-11" x 4'-9"	[118]	CLOSET 3'-6" x 4'-3"
[107]	STAIRS APPROX. 110 SQ. FT.	[119]	STAGE APPROX. 950 SQ. FT.
[108]	MEN'S RESTROOM 8'-8" x 19'-9"	[120]	HALLWAY 8'-0" x 11'-8"
[109]	CLOSET 3'-7" x 3'-7"	[121]	GREEN ROOM 18'-8" x 11'-7"
[110]	CLOSET 3'-8" x 3'-5"	[122]	WOMEN'S RESTROOM 5'-8" x 5'-11"
[111]	ACTVITY ROOM NORTH 51'-2" x 19'-7"	[123]	MEN'S RESTROOM 5'-6" x 5'-11"

DOOR LEGEND			
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
[C01]	(2) 3'-0" x 7'-0"	[C05]	2'-8" x 6'-8"
[C02]	3'-0" x 7'-0"	[C06]	3'-0" x 6'-8"
[C03]	1'-11" x 5'-8"	[C07]	(2) 3'-0" x 6'-8"
[C04]	2'-8" x 5'-8"	[C08]	2'-0" x 6'-8"
[C05]	(2) 2'-8" x 5'-8"	[C09]	2'-5" x 6'-8"

WINDOW LEGEND	
SYMBOL	DESCRIPTION
[W01]	3'-1" x 4'-1"
[W02]	1'-3 1/2" x 5'-11"
[W03]	3'-6" x 6'-3"
[W04]	2'-7" x 7'-0"
[W05]	3'-0" x 3'-10"
[W06]	3'-0" x 3'-6"
[W07]	2'-8" x 3'-6"

LEGEND	
GRASS / PLANTING AREA	[Symbol]
CONCRETE	[Symbol]
ASPHALT	[Symbol]
DIRT	[Symbol]
FIRE EXTINGUISHER	[Symbol]
CHAIN-LINK FENCE	[Symbol]
WOOD FENCE	[Symbol]
WATER COOLER	[Symbol]
SINKS	[Symbol]
TOILET	[Symbol]
JANITOR'S SINK	[Symbol]
URINAL	[Symbol]
RANGE	[Symbol]

**FELIX DAVIS COMM. CENTER & REC
OFFICES — FIRST FLOOR**
NTS

11/27/2007
MMY, BDW, AAR

12928.41200-040
FELIX DAVIS COMMUNITY CENTER
4800 PARK CIRCLE
TAX MAP #: 471-14-00-119
11/27/07

SECTION 230500 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Summary: General requirements for motors, hangers and supports, vibration isolation and seismic restraints, and meters and gages.
- B. Submittals: Product Data for materials and equipment specified in this Section.

PART 2 - PRODUCTS

2.1 MOTORS

- A. Motor Characteristics:
 - 1. Motors **1/2HP** and Larger: Three phase.
 - 2. Motors Smaller Than **1/2 HP**: Single phase.
 - 3. Frequency Rating: 60 Hz.
 - 4. Voltage Rating: NEMA standard voltage selected to operate on nominal circuit voltage to which motor is connected.
 - 5. Service Factor: 1.15 for open dripproof motors; 1.0 for totally enclosed motors.
 - 6. Duty: Continuous duty at ambient temperature of 105 deg F (40 deg C) and at altitude of 3300 feet (1005 m) above sea level.
 - 7. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.
 - 8. Enclosure: Unless otherwise indicated, open dripproof.
 - 9. Motors Used with Variable-Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

2.2 HANGERS AND SUPPORTS

- A. Hanger and Pipe Attachments: Factory fabricated with galvanized coatings; nonmetallic coated for hangers in direct contact with copper tubing.
- B. Building Attachments: Powder-actuated-type, drive-pin attachments with pullout and shear capacities appropriate for supported loads and building materials.
- C. Mechanical-Expansion Anchors: Insert wedge-type attachments with pullout and shear capacities appropriate for supported loads and building materials.

2.3 VIBRATION ISOLATION AND SEISMIC CONTROL DEVICES

A. Vibration Supports:

1. Pads Arranged in single or multiple layers of oil- and water-resistant **neoprene** of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.
2. **Restrained** Mounts : Double-deflection type, with molded, oil-resistant fiberglass, rubber or neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and baseplate for bolting to structure. Provide isolator with minimum **0.5-inch (13-mm)** static deflection.
3. Spring Isolators : Freestanding, laterally stable, **restrained**-spring isolators. Provide isolator with minimum **1-inch (25-mm)** static deflection.

B. Vibration Hangers:

1. Elastomeric Hangers : Double-deflection type, with molded, oil-resistant rubber or neoprene isolator elements bonded to steel housings with threaded connections for hanger rods. Provide isolator with minimum **0.5-inch (13-mm)** static deflection.
2. Spring Hangers : Combination coil-spring and elastomeric-insert hanger with spring and insert in compression. Provide isolator with minimum **1-inch (25-mm)** static deflection.

C. Seismic Restraints:

1. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.
2. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.
3. Restraining Cables: **Stainless**-steel cables with end connections made of steel assemblies that swivel to final installation angle and utilize two clamping bolts for cable engagement.
4. Mechanical Anchor Bolts: Seismic-rated, drill-in, and stud-wedge or female-wedge type. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.
5. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 MOTOR INSTALLATION

- A. Anchor motor assembly to base, adjustable rails, or other support, arranged and sized according to manufacturer's written instructions.

3.2 GENERAL PIPING INSTALLATIONS

- A. Install piping free of sags and bends.
- B. Install fittings for changes in direction and branch connections.
- C. Install sleeves for pipes passing through concrete **and masonry** walls, **gypsum board partitions**, and concrete floor and roof slabs.
- D. Exterior Wall, Pipe Penetrations: Mechanical sleeve seals installed in steel or cast-iron pipes for wall sleeves.
- E. Comply with requirements in Division 07 Section "Penetration Firestopping" for sealing pipe penetrations in fire-rated construction.
- F. Install unions at final connection to each piece of equipment.
- G. Install dielectric unions and flanges to connect piping materials of dissimilar metals in gas piping.
- H. Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals in water piping.

3.3 GENERAL EQUIPMENT INSTALLATIONS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components, unless otherwise indicated.
- C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

3.4 CONCRETE BASES

- A. Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

- B. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
- C. Install dowel rods on 18-inch (450-mm) centers around the full perimeter of the base to connect concrete base to concrete floor.
- D. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
- E. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
- F. Install anchor bolts to elevations required for proper attachment to supported equipment.
- G. Use **3000-psi (20.7-MPa)**, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

3.5 HANGERS AND SUPPORTS

- A. Comply with MSS SP-69 and MSS SP-89. Install building attachments within concrete or to structural steel.
- B. Install hangers and supports to allow controlled thermal and seismic movement of piping systems.
- C. Install powder-actuated drive-pin fasteners in concrete after concrete is cured. Do not use in lightweight concrete or in slabs less than 4 inches (100 mm) thick.
- D. Install mechanical-expansion anchors in concrete after concrete is cured. Do not use in lightweight concrete or in slabs less than 4 inches (100 mm) thick.
- E. Comply with requirements in Division 07 Section "Penetration Firestopping" for sealing pipe penetrations in fire-rated construction.
- F. Load Distribution: Install hangers and supports so piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
- G. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
 - 1. Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
 - 2. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.
 - 3. Adjustable Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
 - 4. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
 - 5. Adjustable Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2 (DN 15 to DN 50).

H. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500).
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500), if longer ends are required for riser clamps.

3.6 VIBRATION ISOLATION AND SEISMIC CONTROL DEVICE INSTALLATION

- A. Adjust vibration isolators to allow free movement of equipment limited by restraints.
- B. Install resilient bolt isolation washers and bushings on equipment anchor bolts.
- C. Install cables so they do not bend across sharp edges of adjacent equipment or building structure.

END OF SECTION 230500

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. This Section includes testing and balancing to produce design objectives for air and hydronic systems.
- B. Certified Reports: Submit two copies of reports prepared, as specified in this Section, on approved forms certified by test and balance firm.
- C. TAB Firm Qualifications: Engage a TAB firm certified by **either AABC or NEBB**.
- D. TAB Report Forms: Use standard forms from **AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems"**, **NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems"**, or **TAB firm's forms approved by Architect**.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper test and balance of systems and equipment.
- B. Examine approved submittal data of HVAC systems and equipment.
- C. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.
- D. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- E. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.
- F. Examine HVAC equipment to ensure that clean filters have been installed, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- G. Examine terminal units, such as air terminals, to verify that they are accessible and their controls are connected and functioning.

- H. Examine automatic temperature system components to verify the following:
1. Dampers, valves, and other controlled devices are operated by the intended controller.
 2. Dampers and valves are in the position indicated by the controller.
 3. Integrity of dampers and valves for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.
 4. Automatic modulating and shutoff valves, including two-way valves and three-way mixing and diverting valves, are properly connected.
 5. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
 6. Sensors are located to sense only the intended conditions.
 7. Sequence of operation for control modes is according to the Contract Documents.
 8. Controller set points are set at indicated values.
 9. Interlocked systems are operating.
 10. Changeover from heating to cooling mode occurs according to indicated values.
- I. Report deficiencies discovered before and during performance of test and balance procedures.

3.2 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems", NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.
- C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.
- D. Take and report testing and balancing measurements in **inch-pound (IP)** units.

3.3 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare schematic diagrams of systems' "as-built" duct layouts.
- B. For variable-air-volume systems, develop a plan to simulate diversity.
- C. Determine the best locations in main and branch ducts for accurate duct airflow measurements.
- D. Verify that motor starters are equipped with properly sized thermal protection.
- E. Check for airflow blockages.
- F. Check condensate drains for proper connections and functioning.

- G. Check for proper sealing of air-handling unit components.
- H. Check for proper sealing of air duct system.
 - 1.

3.4 TOLERANCES

- A. Set HVAC system airflow rates within the following tolerances:
 - 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 5 to plus 10 percent.
 - 2. Air Outlets and Inlets: 0 to minus 10 percent.
 - 3.

END OF SECTION 230593

SECTION 230700 - HVAC INSULATION

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data for each type of HVAC insulation material.
- B. Quality Assurance: Labeled with maximum flame-spread index of 25 and maximum smoke-developed index of 50 according to ASTM E 84.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
- B. Mineral-Fiber Blanket Insulation: Comply with ASTM C 553, Type II and ASTM C 1290, Type I.
- C. Mineral-Fiber Board Insulation: Comply with ASTM C 612, Type IA or Type IB. For equipment applications, provide insulation **with factory-applied ASJ**.
- D. Polyolefin Insulation: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials and Type II, Grade 1 for sheet materials.
- E. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
- F. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
- G. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.
- H. Factory-Applied Jackets: When factory-applied jackets are indicated, comply with the following:
 - 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 - 2. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
- I. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

- J. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

PART 3 - EXECUTION

3.1 INSULATION INSTALLATION

- A. Comply with requirements of the Midwest Insulation Contractors Association's "National Commercial & Industrial Insulation Standards" for insulation installation on pipes and equipment.
- B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- C. Insulation Installation at Fire-Rated Wall, Partition, and Floor Penetrations: Install insulation continuously through penetrations. Seal penetrations. Comply with requirements in Division 07 Section "Penetration Firestopping."
- D. Flexible Elastomeric Insulation Installation:
 - 1. Seal longitudinal seams and end joints with adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
 - 2. Insulation Installation on Pipe Fittings and Elbows: Install mitered sections of pipe insulation. Secure insulation materials and seal seams with adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- E. Mineral-Fiber Insulation Installation:
 - 1.
 - 2. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
 - 3. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
 - 4. Blanket and Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
 - 5. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier.
- F. Polyolefin Insulation Installation:
 - 1. Seal split-tube longitudinal seams and end joints with adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
 - 2. Insulation Installation on Pipe Fittings and Elbows: Install mitered sections of polyolefin pipe insulation. Secure insulation materials and seal seams with adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- G. Plenums and Ducts Requiring Insulation:

1. Concealed and exposed supply and outdoor air.
2. Concealed and exposed return air located in nonconditioned space.
3. Concealed and exposed exhaust between isolation damper and penetration of building exterior.

H. Plenums and Ducts Not Insulated:

1. Metal ducts with duct liner.
2. Factory-insulated plenums and casings.
3. Flexible connectors.
4. Vibration-control devices.
5. Factory-insulated access panels and doors.

I. Piping Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawlspaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.2 DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed duct insulation shall be **one of** the following:

1. Flexible Elastomeric: **1 inch (25 mm)** thick.
2. Mineral-Fiber Blanket: **2 inches (50 mm)** thick and **1.5-lb/cu. ft. (24-kg/cu. m)** nominal density.
3. Mineral-Fiber Board: **2 inches (50 mm)** thick and **3-lb/cu. ft. (48-kg/cu. m)** nominal density.
4. Polyolefin: **1 inch (25 mm)** thick.

B. Exposed duct insulation shall be **one of** the following:

1. Flexible Elastomeric: **1 inch (25 mm)** thick.
2. Mineral-Fiber Blanket: **2 inches (50 mm)** thick and **1.5-lb/cu. ft. (24-kg/cu. m)** nominal density.
3. Mineral-Fiber Board: **2 inches (50 mm)** thick and **3-lb/cu. ft. (48-kg/cu. m)** nominal density.
4. Polyolefin: **1 inch (25 mm)** thick.

3.3 HVAC PIPING INSULATION SCHEDULE

A. Refrigerant Suction and Hot-Gas Piping: Insulation shall be **one of** the following:

1. Flexible Elastomeric: **1 inch (25 mm)** thick.
2. Polyolefin: **1 inch (25 mm)** thick.

B. Refrigerant Suction and Hot-Gas Flexible Tubing: Insulation shall be **one of** the following:

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1. Flexible Elastomeric: **1 inch (25 mm)** thick.
2. Polyolefin: **1 inch (25 mm)** thick.

END OF SECTION 230700

SECTION 231123 - FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Minimum Operating-Pressure Ratings:
 - 1. Piping and Valves: **100 psig (690 kPa)** minimum unless otherwise indicated.
- B. Gas System Pressure: One distribution pressure. **More than 0.5 psig (3.45 kPa) but not more than 2.0 psig (13.8 kPa).**
- C. Submittals: Product Data for manufactured products and materials.
- D. Quality Assurance: Comply with **NFPA 54 and International Fuel Gas Code.**

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
 - 1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
 - 2. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
 - 3. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and polyethylene.
- B. PE Pipe: ASTM D 2513, SDR 11.
 - 1. PE Fittings: ASTM D 2683, socket-fusion type or ASTM D 3261, butt-fusion type with dimensions matching PE pipe.
 - 2. PE Transition Fittings: Factory-fabricated fittings with PE pipe complying with ASTM D2513, SDR 11 and steel pipe complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

2.2 SPECIALTIES

- A. Appliance Flexible Connectors:
 - 1. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.

- B. Strainers: ASTM A 126, Class B, cast-iron body, Y-pattern, full size of connecting piping, CWP rating of 125 psig (860 kPa). Include **40**-mesh startup strainer, and perforated stainless-steel basket.
- C. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.
- D. Metallic-Lined Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches (150 mm) wide by 4 mils (0.1 mm) thick, solid yellow color, continuously inscribed with a description of the utility.

2.3 VALVES

- A. General Requirements for Metallic Manual Gas Shutoff Valves: Comply with ASME B16.33.
 - 1. CWP Rating: **125 psig (860 kPa)**.
- B. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.
 - 1. Body: Bronze, complying with ASTM B 584.
 - 2. Ball: Chrome-plated bronze.
 - 3. Stem: Bronze; blowout proof.
 - 4. Seats: Reinforced TFE; blowout proof.
 - 5. Packing: Threaded body packnut design with adjustable stem packing.
 - 6. CWP Rating: 600 psig (4140 kPa).
 - 7. Listing: Valves NPS 1 ((DN 25)) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
 - 8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.
- C. Bronze Plug Valves:
 - 1. Body: Bronze, complying with ASTM B 584.
 - 2. Plug: Bronze.
 - 3. Operator: Square head or lug type with tamperproof feature where indicated.
 - 4. Pressure Class: 125 psig (862 kPa).
 - 5. Listing: Valves NPS 1 ((DN 25)) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
 - 6. Service: Suitable for natural-gas service with "WOG" indicated on valve body.
- D. Cast-Iron, Nonlubricated Plug Valves: MSS SP-78.
 - 1. Body: Cast iron, complying with ASTM A 126, Class B.
 - 2. Plug: Bronze or nickel-plated cast iron.
 - 3. Seat: Coated with thermoplastic.
 - 4. Stem Seal: Compatible with natural gas.
 - 5. Operator: Square head or lug type with tamperproof feature where indicated.
 - 6. Pressure Class: 125 psig (862 kPa).
 - 7. Listing: Valves NPS 1 ((DN 25)) and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.

8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

PART 3 - EXECUTION

3.1 OUTDOOR PIPING INSTALLATION

- A. Comply with requirements in Division 23 Section "Common Work Results for HVAC" for basic piping installation requirements.
- B. Comply with **NFPA 54** and **International Fuel Gas Code** for installation of natural-gas piping.
- C. Install underground, PE, natural-gas piping according to ASTM D 2774.
- D. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Comply with requirements in Division 23 Section "Common Work Results for HVAC" for wall penetration systems.

3.2 INDOOR PIPING INSTALLATION

- A. Comply with requirements in Division 23 Section "Common Work Results for HVAC" for basic piping installation requirements.
- B. Comply with **NFPA 54** and **International Fuel Gas Code** for installation and purging of natural-gas piping.
- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping free of sags and bends and install fittings for changes in direction and branch connections.
- E. Install escutcheons at penetrations of interior walls, ceilings, and floors.
- F. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."
- G. Install gas stops for shutoff to appliances with low-pressure gas supply.
- H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.
- I. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- J. Connect branch piping from top or side of horizontal piping.

- K. Except where prohibited by NFPA 54, install unions in pipes NPS 2 (DN 50) and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.
- L. Install strainer on inlet of each line pressure regulator and automatic or electrically operated valve.
- M. Connect gas piping to equipment and appliances with shutoff valves and unions. Install gas valve upstream from and within 72 inches (1800 mm) of each appliance using gas. Install union or flanged connections downstream from valves.
- N. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to the outdoors and terminate with weatherproof vent cap.
- O. Do not use natural-gas piping as grounding electrode.
- P. Inspect, test, and purge piping according to **NFPA 54** and **International Fuel Gas Code** and authorities having jurisdiction.

3.3 PIPING JOINT CONSTRUCTION

- A. Threaded Joints: Thread pipe with tapered pipe threads complying with ASME B1.20.1.
- B. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators.
- C. Joints in Steel Piping with Protective Coating: Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
- D. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
 - 1. Plain-End Pipe and Fittings: Use butt fusion.
 - 2. Plain-End Pipe and Socket Fittings: Use socket fusion.

3.4 VALVE INSTALLATION

- A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.
- B. Install underground valves with valve boxes.
- C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.
- D. Install anode for metallic valves in underground PE piping.

3.5 OUTDOOR PIPING SCHEDULE

- A. Underground natural-gas piping shall be :
 - 1. PE pipe and fittings joined by heat-fusion, or mechanical couplings; service-line risers with tracer wire terminated in an accessible location.
- B. Aboveground natural-gas piping shall be:
 - 1. Steel pipe with wrought-steel fittings and welded joints.

3.6 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG ((3.45 kPa))

- A. Aboveground, branch piping **NPS 1 (DN 25)** and smaller shall be:
 - 1. Steel pipe with malleable-iron fittings and threaded joints.

3.7 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES MORE THAN 0.5 PSIG ((3.45 kPa)) AND LESS THAN 5.0 PSIG ((34.5 kPa))

- A. Aboveground, branch piping **NPS 1 (DN 25)** and smaller shall be
 - 1. Steel pipe with malleable-iron fittings and threaded joints.

3.8 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

- A. Valves in branch piping for single appliance shall be **one of** the following:

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1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, **full**-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

END OF SECTION 231123

SECTION 232300 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Comply with ASME B31.5, "Refrigerant Piping," and with ASHRAE 15, "Safety Code for Mechanical Refrigeration."

PART 2 - PRODUCTS

2.1 TUBES AND FITTINGS

- A. Copper Tube: ASTM B 88, Types K and L (ASTM B 88M, Types A and B) and ASTM B 280, Type ACR.
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.
- D. Brazing Filler Metals: AWS A5.8.

2.2 REFRIGERANT PIPING SPECIALTIES

- A. Strainers: Welded steel with corrosion-resistant coating and 100-mesh stainless-steel screen with socket ends; 500-psig (3450-kPa) working pressure and 275 deg F (135 deg C) working temperature.
- B. Moisture/Liquid Indicators: 500-psig (3450-kPa) operating pressure, 240 deg F (116 deg C) operating temperature; with replaceable, polished, optical viewing window and color-coded moisture indicator.
- C. Filter Dryers: 500-psig (3450-kPa) operating pressure; 240 deg F (116 deg C) operating temperature; with **replaceable core kit**, gaskets, and **filter-dryer** cartridge.
- D. Refrigerant: ASHRAE 34, **R-410A**.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with requirements in Division 23 Section "Common Work Results for HVAC" for basic piping installation requirements.
- B. Install wall penetration system at each pipe penetration through foundation wall. Make installation watertight. Comply with requirements in Division 23 Section "Common Work Results for HVAC" for wall penetration systems.
- C. Install refrigerant piping and charge with refrigerant according to ASHRAE 15.
- D. Insulate suction lines to comply with Division 23 Section "HVAC Insulation."
- E. Slope refrigerant piping as follows:
 - 1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
 - 2. Install horizontal suction lines with a uniform slope downward to compressor.
 - 3. Liquid lines may be installed level.
- F. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.
- G. Install strainers upstream from and adjacent to solenoid valves, thermostatic expansion valves, and compressors unless they are furnished as an integral assembly for device being protected:
- H. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

3.2 PIPING APPLICATIONS FOR REFRIGERANT R-410A

- A. Suction Lines: Copper, **Type ACR**, annealed- or drawn-temper tubing and wrought-copper fittings with **brazed or soldered** joints.
- B. Hot-Gas and Liquid Lines: Copper, **Type ACR**, annealed- or drawn-temper tubing and wrought-copper fittings with **brazed or soldered** joints.

END OF SECTION 232300

SECTION 233100 - HVAC DUCTS AND CASINGS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Summary: Metal ducts and accessories in pressure classes 2-inch wg (500 Pa) or less and a maximum velocity of 2400 fpm (12 m/s).
- B. Submittals: Product Data for fire and smoke dampers **and Shop Drawings detailing duct layout and including locations and types of duct accessories, duct sizes, transitions, radius and vaned elbows, special supports details, and inlets and outlet types and locations.**
- C. Comply with NFPA 90A for systems serving spaces more than 25,000 cu. ft. (708 cu. m) in volume or building Types II, IV, and V construction more than 3 stories in height.
- D. Comply with NFPA 90B for systems serving spaces less than 25,000 cu. ft. (708 cu. m).
- E. Comply with UL 181 and UL 181A for ducts and closures.

PART 2 - PRODUCTS

2.1 DUCTS

- A. Galvanized Steel Sheet: Forming steel with minimum G60 hot-dip galvanized coating.

Carbon-Steel Sheets: ASTM A 366/A 366M, cold-rolled sheets; commercial quality; with oiled, matte finish for exposed ducts.
 - 1. Adhesive: ASTM C 916, Type I.
 - 2. Mechanical Fasteners: Galvanized steel pin, length required to penetrate liner plus a maximum 1/8-inch (3-mm) projection into the airstream.
- B. Joint and Seam Tape, and Sealant: Comply with UL 181A.
Rectangular Metal Duct Fabrication: Comply with SMACNA's "HVAC Duct Construction Standard" for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.

2.2 ACCESSORIES

- A. Volume-Control Dampers: Factory-fabricated volume-control dampers, complete with required hardware and accessories. Single blade and multiple opposed blade, standard leakage rating, and suitable for horizontal or vertical applications.
- B. Fire Dampers: Factory-fabricated fire dampers, complete with required hardware and accessories. UL labeled according to UL 555, "Fire Dampers."

- C. Ceiling Fire Dampers: Factory-fabricated fire dampers, complete with required hardware and accessories. UL listed and labeled; comply with the construction details for the tested floor/roof-ceiling assemblies as indicated in UL's "Fire Resistance Directory."
- D. Smoke Dampers: Factory-fabricated smoke and fire dampers, complete with required hardware and accessories. UL labeled according to UL 555S, "Leakage Rated Dampers for Use in Smoke Control Systems." Combination fire and smoke dampers shall also be UL labeled for 1-1/2-hour rating according to UL 555, "Fire Dampers."
- E. Flexible Connectors: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.
- F. Flexible Ducts: **Factory-fabricated, insulated, round duct, with an outer jacket enclosing 1-inch- (25-mm-) thick, glass-fiber insulation around a continuous inner liner.**

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Duct System Pressure Class: Construct and install each duct system for the specific duct pressure classification indicated.
- B. Conceal ducts from view in finished and occupied spaces.

Avoid passing through electrical equipment spaces and enclosures.

Support and connect metal ducts according to SMACNA's "HVAC Duct Construction Standard."
- C. Install duct accessories according to details of construction as shown in SMACNA standards.
- D. Install fire and smoke dampers according to manufacturer's UL-approved written instructions.
- E. Install fusible links in fire dampers.

3.2 TESTING, ADJUSTING, AND BALANCING

- A. Balance airflow within distribution systems, including submains, branches, and terminals to indicated quantities.

END OF SECTION 233100

SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submit Product Data, including color charts for factory finishes.

PART 2 - PRODUCTS

2.1 OUTLETS AND INLETS

- 1. Material: **Steel or Aluminum.**
- 2. Finish: **Baked enamel, white or Anodized aluminum.**

- B. Wall and Ceiling Registers:

- 1. Material: **Steel or Aluminum.**
- 2. Finish: **Baked enamel, white Anodized aluminum.**

- C. Wall and Ceiling Grilles:

- 1. Material: **Steel or Aluminum.**
- 2. Finish: **Baked enamel, white Anodized aluminum .**

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Coordinate location and installation with duct installation and installation of other ceiling- and wall-mounted items.
- B. Locate ceiling diffusers, registers, and grilles, as indicated on Drawings. Unless otherwise indicated, locate units on center line of acoustical ceiling panels.

END OF SECTION 233713

SECTION 238119 - SELF-CONTAINED AIR-CONDITIONERS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data.
- B. Comply with ASHRAE 15.
- C. EER: Equal to or greater than that prescribed by ASHRAE/IESNA 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings."
- D. Comply with NFPA 70.
- E. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace refrigeration components that fail in materials or workmanship within **five** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PACKAGED UNITS

- A. Description: Self-contained, factory-assembled, -tested, and -wired unit.
- B. Products:
 - 1. Units shall be manufactured by one of the following:
 - Carrier
 - Trane
 - York
- C. Cabinet: Structural-steel frame and galvanized-steel panels with baked-enamel finish with access doors or panels. Minimum 1/2-inch- (13-mm-) thick, acoustic duct liner on cabinet interior and control panel. **Galvanized steel with corrosion-resistant coating, Stainless-steel drain pan.**
- D. Discharge Plenum: Cabinet extension with directional louvers.
- E. Evaporator Fan: Galvanized steel; double-width, double-inlet, forward-curved centrifugal fan; statically and dynamically balanced. **Belt drive with fan mounted on permanently lubricated bearings or Direct drive with fan and motor resiliently mounted.** Cast-iron or

steel sheaves, dynamically balanced, bored to fit shafts and keyed. Adjustable pitch selected so required rpm are obtained when set at midposition. Motor, multispeed, PSC type, or single speed, ODP polyphase.

- F. Evaporator and Condenser Coil: Seamless copper tubes expanded into aluminum fins; leak tested to 425 psig (2930 kPa).
- G. **Integral** Air-Cooled Condenser: Factory assembled and tested; consisting of condenser coil, fans and motors, and operating controls. Direct-drive propeller-type fans with permanently lubricated motors and built-in thermal-overload protection. Low-ambient control cycle fans and modulates condenser-fan damper assembly to permit operation down to 0 deg F (minus 18 deg C).
 - 1. Annealed-copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; insulated suction line; appropriate fittings at ends, and service valves for both suction and liquid lines.
- H. Compressor: Hermetic **scroll**, 3600 rpm maximum; resiliently mounted with positive lubrication and internal motor protection.
- I. Refrigerant Circuits: Separate circuit for each compressor. Minimum two circuits for units larger than five nominal tons. Equalized expansion valve with replaceable thermostatic element, refrigerant filter-dryer, high- and low-pressure safety switches, thermal overload protection, anti-recycle timer, brass service and charging valves installed in hot-gas and liquid lines, and charged with **R-410A** refrigerant.
- J. Water Coil: Copper tube, with mechanically bonded aluminum fins; two-position control valve; and leak tested to 300 psig (2070 kPa) underwater.
- K. Disposable Filters: **2-inch- (50-mm-)** thick, glass-fiber, **pleated** panel filters.
- L. Control Package: Factory wired and tested, including control-circuit transformer.
 - 1. Thermostat: **Remote**, programmable for occupied/unoccupied periods and temperatures to cycle compressor or heating coil. Provide field wiring for condenser fan operation with compressor.
 - 2. Supply fan **runs continuous during occupied periods, and cycles for night setback when unoccupied**. Opens outdoor-air damper during occupied periods.
 - 3. Motorized Outside-Air Damper: Motorized, two-position blade damper allowing induction of up to 25 percent outside air; with spring-return, low-voltage damper motor.
 - 4. Economizer: Damper assembly allowing induction of up to 100 percent outside air to maintain a selected mixed-air temperature; and exhaust damper with spring-return, low-voltage, modulating damper motor with minimum position adjustment.

2.2 CHARACTERISTICS

- A. Provide with single point electrical connection

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Isolation: Mount cabinet on **rubber-in-shear pads** for minimum **1-inch (25-mm)** static deflection.
- B. Install condensate piping to indirect drain.

END OF SECTION 238119

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Structural Performance: Design, engineer, fabricate, and install hangers and supports **and seismic restraints** to withstand structural loads specified in "Project Conditions" Paragraph below.
- B. Submittals:
 - 1. Product Data: For sleeve seals.
 - 2. Shop Drawings: For **hangers, supports, and seismic restraints** including attachments to the structure, identify hardware and indicate analyses, forces, strengths, materials, and dimensions; signed and sealed by a qualified professional engineer. Professional engineer qualification requirements are specified in Division 01 Section "Quality Requirements."

PART 2 - PRODUCTS

2.1 RACEWAYS

- A. Raceways:
 - 1. EMT: ANSI C80.3, zinc-coated steel, compression fittings.
 - 2. ENT: NEMA TC 13, complying with UL 1653.
 - 3. FMC: Zinc-coated steel.
 - 4. IMC: ANSI C80.6, zinc-coated steel, with threaded fittings.
 - 5. LFMC: Zinc-coated, flexible steel with sunlight-resistant and mineral-oil-resistant plastic jacket.
 - 6. RNC: NEMA TC 2, **Type EPC-40-PVC**, with NEMA TC3 fittings.
 - 7. Raceway Fittings: Specifically designed for raceway type used in Project.
- B. Wireways: Sheet metal sized and shaped, with **screw** covers.
- C. Surface Raceways:
 - 1. Metal: Galvanized steel with snap-on covers. **Prime coating, ready for field painting.**
 - 2. Plastic: PVC, extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections with plastic fasteners.

2.2 CONDUCTORS AND CABLES

- A. Conductors:

1. Conductors, No. 10 AWG and Smaller: Solid or stranded copper.
2. Conductors, Larger Than No. 10 AWG: Stranded copper.
3. Insulation: Thermoplastic, rated at 90 deg C minimum.
4. Wire Connectors and Splices: Units of size, ampacity rating, material, type, and class suitable for service indicated.
5. Type: THHN/THWN

2.3 GROUNDING MATERIALS

- A. Conductors: Solid for No. 8 AWG and smaller, and stranded for No. 6 AWG and larger unless otherwise indicated.
 1. Insulated Conductors: **Copper** wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
 2. Bare, Solid-Copper Conductors: Comply with ASTM B 3.
 3. Bare, Stranded-Copper Conductors: Comply with ASTM B 8.
- B. Ground Rods: Copper-clad steel, sectional type; 3/4 by 96 inches (16 by 2400 mm) in diameter.
- C. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts with clamp-type pipe connectors sized for pipe.
- D. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.4 ELECTRICAL IDENTIFICATION MATERIALS

- A. Raceway Identification Materials: **Snap-around, color-coding bands; flexible, preprinted, color-coded acrylic.**
- B. Conductor Identification Materials: Color-Coding Conductor Tape: Self-adhesive vinyl tape 1 to 2 inches (25 to 50 mm) wide.
- C. Underground-Line Warning Tape: Permanent, bright-colored, continuous-printed, polyethylene tape with continuous metallic strip or core.
- D. Tape Markers for Wire: Vinyl or vinyl-cloth, self-adhesive, wraparound type with circuit identification legend machine printed by thermal transfer or equivalent process.
- E. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
- F. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1.0-mm) galvanized-steel backing; and with colors, legend, and size required for application.

- G. Equipment Identification Labels: Engraved, laminated acrylic or melamine label; punched or drilled for screw mounting. White letters on a dark-gray background; red letters for emergency systems.
- H. Fasteners: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

2.5 SUPPORT AND ANCHORAGE COMPONENTS

- A. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed under this Project, with a minimum structural safety factor of **five** times the applied force.
- B. Steel Slotted Support Systems: Comply with MFMA-3, factory-fabricated components for field assembly, and provide finish suitable for the environment in which installed.
 - 1. Channel Dimensions: Selected for structural loading **and applicable seismic forces**.
- C. Raceway and Cable Supports: As described in NECA 1.
- D. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and fittings.
- E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded malleable-iron body and insulating wedging.
- F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- G. Mounting, Anchoring, and Attachment Components:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud.
 - 2. Mechanical-Expansion Anchors: Insert-wedge-type, **stainless** steel, for use in hardened portland cement concrete.
 - 3. Concrete Inserts: Steel or malleable-iron, slotted-support-system units similar to MSS Type 18; complying with MFMA-3 or MSS SP-58.
 - 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 - 5. Through Bolts: Structural type, hex head, high strength; complying with ASTM A 325.
 - 6. Toggle Bolts: All-steel springhead type.
 - 7. Hanger Rods: Threaded steel.

2.6 SEISMIC-RESTRAINT COMPONENTS

- A. Rated Strength, Features, and Application Requirements for Restraint Components: As defined in reports by **an evaluation service member of the ICC Evaluation Service Program**.
 - 1. Structural Safety Factor: Strength in tension, shear, and pullout force of components used shall be at least **five** times the maximum seismic forces to which they will be subjected.

- B. Angle and Channel-Type Brace Assemblies: Steel angles or steel slotted-support-system components; with accessories for attachment to braced component at one end and to building structure at the other end.
- C. Cable Restraints: ASTM A 603, zinc-coated, steel wire rope attached to steel or stainless-steel thimbles, brackets, swivels, and bolts designed for restraining cable service.
 - 1. Seismic Mountings, Anchors, and Attachments: Devices as specified in "Support and Anchorage Components" Article, selected to resist seismic forces.
 - 2. Hanger Rod Stiffener: **Steel tube or steel slotted-support-system sleeve with internally bolted connections or Reinforcing steel angle clamped** to hanger rod, of design recognized by **an evaluation service member of the ICC Evaluation Program.**
 - 3. Bushings for Floor-Mounted Equipment Anchors: Neoprene units designed for seismically rated rigid equipment mountings, and matched to type and size of anchor bolts and studs used.
 - 4. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for seismically rated rigid equipment mountings, and matched to type and size of attachment devices used.

2.7 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized-steel sheet.
- D. Sleeve Seals: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 - 1. Sealing Elements: **EPDM** or **NBR** interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 - 2. Pressure Plates: **Stainless steel.** Include two for each sealing element.
 - 3. Connecting Bolts and Nuts: **Stainless steel** of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.8 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 GENERAL ELECTRICAL EQUIPMENT INSTALLATION REQUIREMENTS

- A. Install electrical equipment to allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
- B. Install electrical equipment to provide for ease of disconnecting the equipment with minimum interference to other installations.
- C. Install electrical equipment to allow right of way for piping and conduit installed at required slope.
- D. Install electrical equipment to ensure that connecting raceways, cables, wireways, cable trays, and busways are clear of obstructions and of the working and access space of other equipment.
- E. Install required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- F. Install sleeve and sleeve seals of type and number required for sealing electrical service penetrations of exterior walls.
- G. Comply with NECA 1.

3.2 RACEWAY AND CABLE INSTALLATION

- A. Outdoor Raceways Applications:
 - 1. Exposed or Concealed: RNC.
 - 2. Underground, Single Run: RNC or schedule 40 PVC.
 - 3. Connection to Vibrating Equipment: LFMC.
 - 4. Boxes and Enclosures: Metallic, NEMA 250, Type 3R.
- B. Indoor Raceways Applications:
 - 1. Exposed or Concealed: EMT. RNC where exposed to physical damage.
 - 2. Connection to Vibrating Equipment: FMC; in wet or damp locations, use LFMC.
 - 3. Damp or Wet Locations: RMC or schedule 40 PVC.
 - 4. Boxes and Enclosures: Metallic, NEMA 250, Type 1, unless otherwise indicated.
- C. Conceal raceways and cables, unless otherwise indicated, within finished walls, ceilings, and floors.
- D. Install raceways and cables at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Locate horizontal raceway runs above water and steam piping.
- E. Install raceways embedded in slabs in middle third of slab thickness where practical, and leave at least 1-inch- (25-mm-) thick concrete cover.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
 2. Space raceways laterally to prevent voids in concrete.
 3. Install conduit larger than 1-inch (27-mm) trade size, parallel to or at right angles to main reinforcement. Where conduit is at right angles to reinforcement, place conduit close to slab support.
 4. Transition from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.
 - 5.
- F. Install pull wires in empty raceways.
- G. Connect motors and equipment subject to vibration, noise transmission, or movement with a 72-inch (1830-mm) maximum length of flexible conduit.
- H. Install raceways and cables conceal within finished walls, ceilings, and floors unless otherwise indicated.
- I. Install raceways and cables at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Locate horizontal raceway runs above water and steam piping.

3.3 WIRING METHODS

- A. Exposed Feeders, Branch Circuits, and Class 1 Control Circuits, Including in Crawlspace: **Type THHN-THWN, single conductors in raceway.**
- B. Feeders and Branch Circuits Concealed in Ceilings, Walls, Partitions, and Crawlspace: **Type THHN-THWN, single conductors in raceway.**
- C. Feeders and Branch Circuits below Slabs-on-Grade, and underground: **Type THHN-THWN, single conductors in raceway.**
- D. Class 2 Control Circuits: **Type THHN-THWN, in raceway.**

3.4 GROUNDING

- A. Underground Grounding Conductors: Install bare copper conductor, No. **2/0**AWG minimum. Bury at least 24 inches (600 mm) below grade.
- B. Pipe and Equipment Grounding Conductor Terminations: Bolted.
- C. Underground Connections: Welded.
- D. Connections to Structural Steel: **Welded.**

- E. Install grounding conductors routed along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- F. Install ground rods driven into ground until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.
- G. Make connections without exposing steel or damaging coating, if any.
- H. Install bonding straps and jumpers in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
- I. Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
- J. Bond to equipment mounted on vibration isolation hangers and supports so vibration is not transmitted to rigidly mounted equipment.
- K. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells.
 - 1. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - 2. Perform tests by fall-of-potential method according to IEEE 81.
 - 3. Report measured ground resistances that exceed the following values:
 - a. Power and Lighting Equipment or System with Capacity 500 kVA and Less: **10** ohms.
 - b. Power and Lighting Equipment or System with Capacity 500 to 1000 kVA: **5** ohms.
 - c. Power Distribution Units or Panelboards Serving Electronic Equipment: **3** ohm(s).
 - 4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

3.5 IDENTIFICATION

- A. Accessible Raceways and Cables of Auxiliary Systems: Identify the following systems with color-coded, **snap-around, color-coding bands**:
 - 1. Fire Alarm System: Red.
 - 2. Security System: Blue and yellow.
 - 3. Telecommunication System: Green and yellow.
- B. Power-Circuit Conductor Identification: For No. 3 AWG conductors and larger, at each location where observable, identify phase using color-coding conductor tape.

- C. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring.
- D. Warning Labels for Enclosures for Power and Lighting: Comply with 29 CFR 1910.145; identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.
- E. Equipment Identification Labels:
 - 1. Labeling Instructions:
 - a. Indoor Equipment: **Self-adhesive, engraved, laminated acrylic or melamine label.** Provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where 2 lines of text are required, use labels 2 inches (50 mm) high.
 - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label, drilled for screw attachment.
 - c. Elevated Components: Increase sizes of labels and legend to those appropriate for viewing from the floor.
 - 2. Equipment to Be Labeled:
 - a. Panelboards, electrical cabinets, and enclosures.
 - b. Disconnect switches.
 - c. Enclosed circuit breakers.
 - d. Motor starters.
 - e. Push-button stations.
 - f. Contactors.
 - g. Terminals, racks, and patch panels for voice and data communication and for signal and control functions.
- F. Verify identity of each item before installing identification products.
- G. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- H. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.
- I. Install system identification color banding for raceways and cables at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
- J. Color-Coding for Phase **and Voltage Level** Identification, 600 V and Less: Ungrounded **branch-circuit** conductors.
 - 1. Match existing system color coding.

2. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points.
- K. Underground-Line Warning Tape: Continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade.

3.6 INSTALLATION OF HANGERS AND SUPPORTS

- A. Fasten hangers and supports securely in place, with provisions for thermal and structural movement. Install with concealed fasteners unless otherwise indicated.
- B. Separate dissimilar metals and metal products from contact with wood or cementitious materials, by painting each metal surface in area of contact with a bituminous coating or by other permanent separation.
- C. Raceway Support Methods: In addition to methods described in NECA 1, **EMT, IMC, and RMC** may be supported by openings through structure members, as permitted in NFPA 70.
- D. Multiple Raceways or Cables: Install on trapeze-type supports fabricated with steel slotted channel.
- E. Strength of Support **and Seismic-Restraint** Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static **and seismic** loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- F. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods, unless otherwise indicated or required by Code:
 1. To Wood: Fasten with lag screws or through bolts.
 2. To New Concrete: Bolt to concrete inserts.
 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 4. To Existing Concrete: Expansion anchor fasteners.
 5. To Steel: **Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts or beam clamps.**
 6. To Light Steel: Sheet metal screws.
 7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount on slotted-channel racks attached to substrate.
- G. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.7 SEISMIC REQUIREMENTS

- A. Install seismic-restraint components using methods approved by the evaluation service providing required submittals for component.
- B. Install bushing assemblies for anchor bolts for wall- and floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in substrate.
- C. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, upper truss chords of bar joists, or at concrete members.
- D. Accommodation of Differential Seismic Motion: Make flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross expansion and seismic-control joints, where adjacent sections or branches are supported by different structural elements, and where they terminate with connection to electrical equipment that is anchored to a different structural element than the one supporting them as they approach equipment.

3.8 SLEEVE AND SLEEVE SEALS INSTALLATION

- A. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- B. Cut sleeves to length for mounting flush with both wall surfaces.
- C. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.
- D. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and cable unless sleeve seal is to be installed **or unless seismic criteria require different clearance.**
- E. Seal space outside of sleeves with grout for penetrations of concrete and masonry **and with approved joint compound for gypsum board assemblies.**
- F. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 07 Section "Joint Sealants."
- G. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.
- H. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- I. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between cable and sleeve for installing mechanical sleeve seals.

3.9 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Comply with requirements in Division 07 Section "Penetration Firestopping."

END OF SECTION 260500

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data.
- B. Quality Assurance: Wiring devices shall be listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 DEVICES

- A. Convenience Receptacles: NEMA WD 1, NEMA WD 6, Configuration 5-20R, and UL 498.
- B. Duplex GFCI Convenience Receptacles: 125 V, 20 A, straight blade, **feedthrough** type. NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
- C. Wall Plates, Finished Areas: **Smooth, high-impact thermoplastic** fastened with metal screws having heads matching plate color.
- D. Wall Plates, Unfinished Areas: **Galvanized steel** with metal screws.
- E. Wall Plates, Damp Locations: **Cast aluminum** with spring-loaded lift cover, and listed and labeled for use in wet locations.
- F. Finishes:
 - 1. Wiring Devices Connected to Normal Power System **White** unless otherwise indicated or required by NFPA 70 or device listing.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Install devices and assemblies plumb, level, and square with building lines.
- C. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.
- D. Mount devices flush, with long dimension vertical, and grounding terminal of receptacles on top unless otherwise indicated. Group adjacent devices under single, multigang wall plates.

END OF SECTION 262726

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Summary: This Section includes individually mounted, enclosed switches, and circuit breakers and their enclosures.
- B. Submittals:
 - 1. Product Data.
- C. Comply with NFPA 70.
- D. Furnish extra materials described below that match products installed.
 - 1. Spares fuses for fusible switches.

PART 2 - PRODUCTS

2.1 FUSIBLE AND NONFUSIBLE SWITCHES

- A. Fusible Switch, 600 A and Smaller: NEMA KS 1, Type **HD**, with clips or bolt pads to accommodate specified fuses and lockable handle; interlocked with cover in closed position.
- B. Nonfusible Switch, **600** A and Smaller: NEMA KS 1, Type **HD**, lockable handle, interlocked with cover in closed position.

2.2 MOLDED-CASE CIRCUIT BREAKERS

- A. Description: NEMA AB 1, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers: Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
 - 3. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller and let-through ratings less than NEMA FU 1, RK-5.
 - 4. GFCI Circuit Breakers: Single- and two-pole configurations with **5**-mA trip sensitivity.
- B. Features and Accessories:
 - 1. Lugs: Mechanical style **with compression lug kits** suitable for number, size, trip ratings, and conductor material.

2. Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
3. Ground-Fault Protection: **Integrally mounted** relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
4. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage **with field-adjustable 0.1- to 0.6-second** time delay.
5. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.

2.3 ENCLOSURES

- A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.
 1. Outdoor Locations: NEMA 250, Type 3R.
 2. Other Wet or Damp Indoor Locations: NEMA 250, Type 3R

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.
- B. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated.
- C. Comply with mounting and anchoring requirements specified in Division 26 Sections "Hangers and Supports for Electrical Systems" and "Vibration and Seismic Controls for Electrical Systems."

3.2 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 1. Test mounting and anchorage devices according to requirements in Division 26 Sections "Hangers and Supports for Electrical Systems" and "Vibration and Seismic Controls for Electrical Systems."
 2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.

3.3 CLEANING

- A. On completion of installation, vacuum dirt and debris from interiors; do not use compressed air to assist in cleaning.

END OF SECTION 262816