



SBAC Gainesville High School Building 27 HVAC Renovation Gainesville, Florida

Phase: Early Release Package #1
Direct Expansion (DX) Equipment

SBAC Project No. H1710
H2E Project No. 18-71
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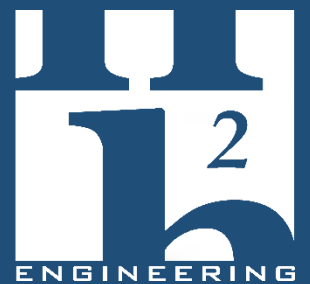
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Early Release Package #1

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Section 1

Technical Specifications





SECTION 230120 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, and other submittals.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that require Engineer's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.
- D. USB Thumb Drive: A data storage device that includes flash memory with an integrated USB interface.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.



- B. Deviations and Additional Information: On an attached separate sheet, prepared on equipment vendor's letterhead, record relevant information, requests for data, revisions other than those requested by Engineer on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- C. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 - 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with approval notation from Engineer's action stamp.
- D. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections. Submittals on USB thumb drives shall be included in the equipment vendor's bid package. The submittals will be reviewed during the bid process. Bids will not be accepted without associated submittal packages.
 - 1. Electronic submittals shall be distributed to the School Board of Alachua County on USB thumb drives in the bid package.
 - 2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:



- a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data in the following format:
 - a. PDF electronic file.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm), but no larger than 30 by 42 inches (750 by 1067 mm) . Sheets sizes of 11 by 17 inches or 24 by 36 inches are preferred by the Owner.
 3. Submit Shop Drawings in the following format:
 - a. PDF electronic file.
- D. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.



PART 3 - EXECUTION

3.1 ENGINEER'S ACTION

- A. Action Submittals: Engineer will review each submittal, make marks to indicate corrections or revisions required, and return it. Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- B. Informational Submittals: Engineer will review each submittal and will not return it, or will return it if it does not comply with requirements. Engineer will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Engineer.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may be returned by the Engineer without action.
- F. Submittals on any particular phase of Work will receive only one review and one re-review (if required). If additional reviews are required beyond these two, the equipment vendor will be charged \$100.00 per hour for review time.

END OF SECTION 230120



SECTION 230150 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties.

1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.



1.4 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
 - 2. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation of a comparable product request. Engineer will notify equipment vendor of approval or rejection of proposed comparable product.
 - a. Use product specified if Engineer does not issue a decision on use of a comparable product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 230120 "Submittal Procedures." Show compliance with requirements.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Deliver specified equipment to Gainesville High School, Building 27, Gainesville, Florida. Equipment start-up shall be conducted on site at Gainesville High School, Building 27, Gainesville, Florida. Coordinate equipment delivery date with School Board of Alachua County's Project Manager, Construction Manager Project Manager, and installing Mechanical Sub-Contractor.
- C. Delivery and Handling:
 - 1. Schedule delivery to minimize long-term storage at Project site, Gainesville High School Building 27, and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- D. Storage:
 - 1. Store products to allow for inspection and measurement of quantity or counting of units.
 - 2. Store materials in a manner that will not endanger Project structure.



3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.6 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.



3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Engineer will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

B. Product Selection Procedures:

1. **Product:** Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions other than from the manufacturers specifically listed will not be considered.
2. **Manufacturer/Source:** Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for equipment vendor's convenience will not be considered.
3. **Products:**
 - a. **Restricted List:** Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions from manufacturers not listed will not be considered unless otherwise indicated.
4. **Manufacturers:**
 - a. **Restricted List:** Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions from manufacturers not listed will not be considered unless otherwise indicated.
5. **Basis-of-Design Product:** Where Specifications name a product, or refer to a product indicated on Drawings/equipment schedules, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

- C. Visual Selection Specification:** Where Specifications include the phrase "as selected by Engineer from manufacturer's full range" or similar phrase, select a product that complies with requirements. Engineer will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration:** Engineer will consider listed manufacturer's request for comparable product to basis-of-design when the following conditions are satisfied. If the



following conditions are not satisfied, Engineer may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of engineers and owners, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 230150



SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on alternating-current power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with NEMA MG 1 unless otherwise indicated.
- B. Comply with IEEE 841 for severe-duty motors.

2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C.
- B. 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.



2.3 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Efficiency: Premium efficient, as defined in NEMA MG 1.
- C. Service Factor: 1.15.
- D. Power factor: 0.80.
- E. Rotor: Random-wound, squirrel cage.
- F. Bearings: Re-greasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- G. Temperature Rise: Match insulation rating.
- H. Insulation: Class F.
- I. Code Letter Designation:
 - 1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
 - 2. Motors Smaller Than 15 HP: Manufacturer's standard starting characteristic.
- J. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 ADDITIONAL REQUIREMENTS FOR POLYPHASE MOTORS

- A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
- B. Motors Used with Variable-Frequency Controllers:
 - 1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width-modulated inverters.

2.5 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
 - 1. Permanent-split capacitor.
- B. Bearings: Pre-lubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.



- C. Motors 1/20 HP and Smaller: Shaded-pole type.
- D. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230513



SECTION 237433 - SPLIT-SYSTEM DEDICATED OUTDOOR AIR CONDITIONING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes ducted split-system air-conditioning units consisting of separate evaporator-fan and condenser components. The following system applications are provided:
 - 1. One hundred percent outdoor air units providing cooling and heating for a neutral outside air application.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, and components.
 - 3. Include wiring diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Field Test Reports: Include startup service reports.
- B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For units to include in emergency, operation, and maintenance manuals. Provide both electronic copy in PDF and hard copy.



1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fan Belts: One set for each belt-driven fan where belt-driven fans are scheduled.
 - 2. Filters: One set for each unit.

1.7 DELIVERY, COORDINATION, AND HANDLING

- A. Comply with requirements in Section 230150 "Product Requirements" for additional requirements.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to replace components of units that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period:
 - a. For Compressor, Parts, and Labor (full; bumper-to-bumper): One year from date of Substantial Completion.
 - b. For Compressor Only: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. AAON
 - 2. Above Air
 - 3. Desert-Aire

2.2 PERFORMANCE REQUIREMENTS

- A. General Fabrication Requirements: Comply with requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment," and Section 7 - "Construction and System Start-up."
- B. Efficiency: Comply with requirements in ASRI920 Standard.
- C. Wind-Restraint Performance:



1. Basic Wind Speed: 130 mph.
2. Minimum 10 lb/sq. ft (48.8 kg/sq. m) multiplied by the maximum area of unit projected on a vertical plane that is normal to the wind direction and 45 degrees either side of normal.

D. Cabinet Thermal Performance:

1. Maximum Overall U-Value: Comply with requirements in ASHRAE/IESNA 90.1.
2. Include effects of metal-to-metal contact and thermal bridges in the calculations.

E. Cabinet Surface Condensation:

1. Cabinet shall have additional insulation and vapor seals if required to prevent condensation on the interior and exterior of the cabinet.
2. Portions of cabinet located downstream from the cooling coil shall have a thermal break at each thermal bridge between the exterior and interior casing to prevent condensation from occurring on the interior and exterior surfaces. The thermal break shall not compromise the structural integrity of the cabinet.

F. Maximum Cabinet Leakage: 1 percent of the total supply-air flow at a pressure rating equal to the fan shut-off pressure.

G. Cabinet Deflection Performance:

1. Walls and roof deflection shall be within 1/200 of the span at the design working pressure equal to the fan shut-off pressure. Deflection limits shall be measured at any point on the surface.
2. Floor deflections shall be within 1/240 of the span considering the worst-case condition caused by the following:
 - a. Service personnel.
 - b. Internal components.
 - c. Design working pressure defined for the walls and roof.

H. Electrical components, devices, and accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 INDOOR UNIT CONSTRUCTION

- A. Casing Construction: Double wall for units 20T and greater. Provide closed cell insulation for units smaller than 20T.
- B. Exterior Casing Material: Galvanized steel with paint finish.
- C. Interior Casing Material: Galvanized steel.
- D. Lifting and Handling Provisions: Factory-installed shipping skids and lifting lugs.



- E. Base Rails: Galvanized-steel rails for mounting on pad as indicated.
- F. Access for Inspection, Cleaning, and Maintenance: Comply with requirements in ASHRAE 62.1.
 - 1. Service Doors: Hinged access doors with gaskets. Material and construction of doors shall match material and construction of cabinet in which doors are installed.
- G. Floor: Reinforced, metal surface; reinforced to limit deflection when walked on by service personnel. Insulation shall be below metal walking surface.
- H. Cabinet Insulation:
 - 1. Type: Flexible elastomeric insulation complying with ASTM C 534, Type II, sheet materials.
 - 2. Thickness: 2 inches (500 mm).
 - 3. Insulation Adhesive: Comply with ASTM C 916, Type I.
 - 4. Mechanical Fasteners: Suitable for adhesive, mechanical, or welding attachment to casing without damaging liner and without causing air leakage when applied as recommended by manufacturer.
- I. Condensate Drain Pans:
 - 1. Shape: Rectangular, with 2 percent slope in at least two planes to direct water toward drain connection.
 - 2. Size: Large enough to collect condensate from cooling coils including coil piping connections, coil headers, and return bends.
 - a. Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.
 - b. Depth: A minimum of 2 inches (50 mm) deep.
 - 3. Configuration: Single wall.
 - 4. Material: Stainless-steel sheet.
 - 5. Drain Connection:
 - a. Located on one end of pan, at lowest point of pan.
 - b. Terminated with threaded nipple.
 - c. Minimum Connection Size: NPS 1 (DN 25).
 - 6. Units with stacked coils shall have an intermediate drain pan to collect condensate from top coil.
- J. Surfaces in Contact with Airstream: Comply with requirements in ASHRAE 62.1 for resistance to mold and erosion.



2.4 SUPPLY FAN

- A. Backward Inclined Airflow Fan Type: Statically and dynamically balanced.
 - 1. Fan Wheel Material: Galvanized hardened steel with anticorrosive paint, mounted on solid-steel shaft.
 - 2. Bearings:: Self-aligning, deep groove ball type, in pillow block housings.
- B. Plenum Fan Type: Single width, non-overloading, with backward-inclined or airfoil blades.
 - 1. Fan Wheel Material: Aluminum; attached directly to motor shaft.
 - 2. Fan Wheel Drive and Arrangement: Direct drive, AMCA Arrangement 4.
 - 3. Fan panel and frame Material: Powder-coated steel, stainless steel, or aluminum.
 - 4. Fan Enclosure: Easily removable enclosure around rotating parts.
 - 5. Fan Balance: Precision balance fan below 0.08 inch/s (2.0 mm/s) at design speed with filter in.
- C. Service Factor for Belt Drive Applications: V-belt drive with matching fan pulley and adjustable, variable pitch motor sheaves and belt assembly with minimum 1.4 service factor.
- D. Motors:
 - 1. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - 2. ECM: Provide electronically commutated motor.
- E. Mounting: Fan wheel, motor, and drives shall be mounted to fan casing with elastomeric isolators.

2.5 EVAPORATOR COIL

- A. Capacity Ratings: Comply with ASHRAE 33 and ARI 410.
- B. Coil Casing Material: Manufacturer's standard material.
- C. Tube Material: Copper.
- D. Tube Header Material: Manufacturer's standard material.
- E. Fin Material: Aluminum.
- F. Fin and Tube Joints: Mechanical bond.
- G. Leak Test: Coils shall be leak tested with air underwater.
- H. Refrigerant Coil Capacity Reduction: Circuit coils for interleaved control.



- I. Refrigerant Coil Suction and Distributor Header Materials: Seamless copper tube with brazed joints.
- J. Coating:
 - a. Factory applied corrosion-resistant coating. Coil shall have a factory applied flexible, epoxy polymer e-coat uniformly applied to all coil surface areas without material bridging between fins. Humidity and water immersion resistance shall be up to a minimum 1,000 and 250 hours respectively (ASTM D2247-92 and ASTM D870-92). Corrosion durability shall be confirmed through testing to no less than 6,000 hours salt spray per ASTM B117-90. Coated coils shall receive a spray-applied, UV-resistant polyurethane topcoat to prevent UV degradation of the e-coat. Coating shall carry a 5 year non-prorated warranty.

2.6 REFRIGERATION SYSTEM

- A. Comply with requirements in ASHRAE 15, "Safety Standard for Refrigeration Systems."
- B. Refrigerant Charge: Factory charged with refrigerant and filled with oil.
- C. Compressors: Variable speed digital scroll compressors with integral vibration isolators, internal overcurrent and overtemperature protection, internal pressure relief, and crankcase heater. Provide a compressor acoustic cover with 1.2-2# density acoustical fiberglass surrounded by durable, weather-proof, flame resistant covering for each compressor.
- D. Refrigerant: R-410A.
 - 1. Classified as Safety Group A1 according to ASHRAE 34.
- E. Refrigeration System Specialties:
 - 1. Expansion valve with replaceable thermostatic or electronic element.
 - 2. Refrigerant dryer.
 - 3. High-pressure switch.
 - 4. Low-pressure switch.
 - 5. Thermostat for coil freeze-up protection during low ambient temperature operation or loss of air.
 - 6. Brass service valves installed in discharge and liquid lines.
 - 7. Liquid line sight glass.
 - 8. Anti-short-cycling timer.
- F. Capacity Control:
 - 1. Modulating or on/off hot gas reheat shall be provided on the lead refrigeration circuit. Refrigeration circuit shall be provided with interlaced hot gas reheat coil, valves, electronic controller, supply air temperature sensor and a dehumidification control signal terminal which allow the unit to have a dehumidification mode of operation, which includes supply air temperature control to prevent supply air temperature swings. Reheat valves shall be factory installed. Reheat line connections shall be labeled, extend beyond



the unit casing and be located near the suction and liquid line connections for ease of field connection. Connections shall be factory sealed with a grommet on the exterior of the unit casing to minimize air leakage.

G. Safety Controls:

1. Compressor motor and condenser coil fan motor low ambient lockout.
2. Overcurrent protection for compressor motor.
3. Automatic-reset timer to prevent rapid cycling of compressor.

2.7 ELECTRIC-RESISTANCE HEATING COIL

A. UL Compliance: Comply with requirements in UL 1995, "Heating and Cooling Equipment."

B. Electric-Resistance Heating Elements:

1. Open-Coil Resistance Wire: 80 percent nickel and 20 percent chromium.
2. Supports and Insulation: Floating ceramic bushings recessed into casing openings; fastened to supporting brackets and mounted in galvanized-steel frame.
3. Heating Capacity: Low density 35 W per sq. in. (54 kW per sq. m), factory wired for single-point wiring connection; with time delay for element staging and overcurrent- and overheat-protection devices.
4. Safety Controls:
 - a. Blower-motor interlock, air-pressure switch.
 - b. Quiet mercury contactors.
 - c. Time delay between steps.
 - d. Integral, non-fused power disconnect switch.
 - e. Integral controls transformer.

2.8 FILTERS

A. General Requirements for Air Filtration Section:

- 1) Comply with NFPA 90A.
- 2) Minimum MERV according to ASHRAE 52.2.
- 3) Filter-Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.

B. Extended-Surface, Disposable Panel Filters:

- 1) Factory-fabricated, dry, extended-surface type.
- 2) Thickness: 2 inches (50 mm).
- 3) Initial Resistance: 0.25 inches wg (Pa).
- 4) Recommended Final Resistance: 1.0 inches wg (Pa).
- 5) MERV according to ASHRAE 52.2: 11.



- 6) Media: Fibrous material formed into deep-V-shaped pleats and held by self-supporting wire grid.
- 7) Media-Grid Frame: Nonflammable cardboard.
- 8) Mounting Frames: Welded, galvanized steel, with gaskets and fasteners; suitable for bolting together into built-up filter banks.

2.9 OUTDOOR UNIT

1. Basis of design is remote condenser. Condensing unit may be submitted as an alternate.

A. Refrigerant condenser coils:

1. Capacity Ratings: Complying with ASHRAE 33 and ARI 410 and coil bearing the ARI label.
2. Tube Material: Copper.
3. Fin Material: Aluminum.
4. Fin and Tube Joint: Mechanical bond.
5. Leak Test: Coils shall be leak tested with air underwater.
6. Coating:
 - a. Factory applied corrosion-resistant coating. Coils shall have a factory applied flexible epoxy polymer e-coat uniformly applied to all coil surface areas without material bridging between fins. Coating process shall ensure complete coil encapsulation and a uniform dry film thickness from 0.8 to 1.2 mils on all surface areas including fin edges. Superior hardness characteristics of 2H per ASTM D3363-92A and a cross-hatch adhesion of 4B-5B per ASTM B3359-93. Impact resistance shall be up to 160 in/lb per ASTM D2794-93. Humidity and water immersion resistance shall be up to a minimum 1000 and 250 hours respectively (ASTM D2247-92 and ASTM D870-92). Corrosion durability shall be confirmed through testing to no less than 6000 hours salt spray per ASTM B117-90. Coated coils shall receive a spray-applied, UV-resistant polyurethane topcoat to prevent UV degradation of e-coat.

B. Condenser Fan Assembly:

1. Fans: Direct-drive propeller type with statically and dynamically balanced fan blades.
2. Fan Motors:
 - a. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - b. Motor Enclosure: Totally enclosed non-ventilating (TENV) or totally enclosed air over (TEAO) enclosure.
 - c. Enclosure Materials: G90 galvanized steel.
 - d. Motor Bearings: Permanently lubricated bearings.
 - e. Built-in overcurrent and thermal-overload protection.
 - f. Efficiency: Premium efficient.
3. Fan Safety Guards: Steel with corrosion-resistant coating.



2.10 ELECTRICAL POWER CONNECTIONS

- A. General Electrical Power Connection Requirements: Factory-installed and -wired switches, motor controllers, transformers, and other necessary electrical devices shall provide a single-point field power connection to indoor unit and outdoor unit.
- B. Enclosure: NEMA 250, Type 3R, mounted on the indoor unit with hinged access door in unit cabinet having a lock and key or padlock and key,
- C. Wiring: Numbered and color-coded to match wiring diagram.
- D. Wiring Location: Install factory wiring outside an enclosure in a raceway.
- E. Power Interface: Indoor and outdoor unit disconnecting means shall be provided by Division 26 and field installed by Division 26.
- F. Factory Wiring: Branch power circuit to each motor and to controls.
- G. Factory-Mounted, Overcurrent-Protection Service: For each motor.
- H. Transformer: Factory mounted with primary and secondary fuses and sized with enough capacity to operate electrical load plus spare capacity.
- I. Controls: Factory wire unit-mounted controls.
- J. Control Relays: Auxiliary and adjustable time-delay relays.

2.11 CONTROLS

- A. Control Wiring: Factory wire connection for controls' power supply.
- B. Control Devices: Sensors, transmitters, relays, switches, detectors, operators, actuators, and valves shall be manufacturer's standard items to accomplish indicated control functions.
- C. Unit-Mounted Status Panel:
 - 1. Cooling / Off / Heating Controls: Control operational mode.
 - 2. Damper Position: Indicate position of outdoor-air dampers in terms of percentage of outdoor air.
 - 3. Status Lights:
 - a. Filter dirty.
 - b. Fan operating.
 - c. Cooling operating.
 - d. Heating operating.
 - e. Smoke alarm.
 - f. General alarm.



- 4. Digital Numeric Display:
 - a. Outdoor airflow.
 - b. Supply airflow.
 - c. Outdoor dry-bulb temperature.
 - d. Outdoor dew point temperature.
 - e. Supply temperature.
 - f. Supply air relative humidity.

D. Refrigeration System Controls:

- 1. Unit-mounted enthalpy controller shall lock out refrigerant system when outdoor-air enthalpy is less than 28 Btu/lb (65 kJ/kg) of dry air or outdoor-air temperature is less than 60 deg F (15 deg C).
- 2. Outdoor-air sensor de-energizes dehumidifier operation when outdoor-air temperature is less than 60 deg F (15 deg C).
- 3. Relative-humidity sensor energizes dehumidifier operation when relative humidity is more than 55 percent.

E. Electric-Resistance Heat Controls:

- 1. Factory-mounted sensor in unit discharge with sensor adjustment located in control panel to control electric coil to maintain temperature.
- 2. Capacity Controls: Modulating SCR.

F. Interface with existing Honeywell DDC System for HVAC: Factory-installed hardware and software to enable the DDC system for HVAC to monitor, control, and display unit status and alarms.

- 1. Hardwired Points:
 - a. Monitoring: On-off status, common trouble alarm.
 - b. Control: On-off operation, supply temperature set-point adjustment.
- 2. ASHRAE 135 (BACnet) communication interface with the existing DDC system for HVAC shall enable the DDC system for HVAC operator to remotely control and monitor the unit from an operator workstation. Control features and monitoring points displayed locally at unit control panel shall be available through the DDC system for HVAC.

PART 3 - EXECUTION

3.1 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

- 1. Complete installation and startup checks according to manufacturer's written instructions.
- 2. Repair leaks and retest until no leaks exist.



3. Inspect units for visible damage to refrigerant compressor, condenser and evaporator coils, and fans.
4. Start refrigeration system when outdoor-air temperature is within normal operating limits and measure and record the following:
 - a. Cooling coil leaving-air, dry- and wet-bulb temperatures.
 - b. Cooling coil entering-air, dry- and wet-bulb temperatures.
 - c. Hot gas reheat coil leaving-air, dry- and wet-bulb temperatures.
 - d. Hot gas reheat coil entering-air, dry- and wet-bulb temperatures.
 - e. Electric reheat coil leaving-air, dry- and wet-bulb temperatures.
 - f. Electric reheat coil entering-air, dry- and wet-bulb temperatures.
5. Simulate maximum cooling demand and inspect the following:
 - a. Compressor refrigerant suction and hot-gas pressures.
6. Inspect casing insulation for integrity, moisture content, and adhesion.
7. Verify that clearances have been provided for servicing.
8. Verify that controls are connected and operable.
9. Verify that filters are installed.
10. Clean coils and inspect for construction debris.
11. Inspect and adjust vibration isolators.
12. Verify bearing lubrication.
13. Clean fans and inspect fan-wheel rotation for movement in correct direction without vibration and binding.
14. Adjust fan belts to proper alignment and tension, if required.
15. Start unit.
16. Inspect and record performance of interlocks and protective devices including response to smoke detectors by fan controls and fire alarm.
17. Operate unit for run-in period.
18. Calibrate controls.
19. Adjust and inspect high-temperature and pressure limits.
20. Verify operational sequence of controls.
21. Measure and record the following airflows. Plot fan volumes on fan curve.
 - a. Supply/outdoor-air volume.
- B. Inspect field-assembled components, equipment installation, and piping and electrical connections for proper assembly, installation, and connection.
- C. After startup, change filters, verify bearing lubrication, and adjust belt tension as required.
- D. Remove and replace components that do not properly operate and repeat startup procedures as specified above.
- E. Prepare written report of the results of startup services.



3.2 ADJUSTING

- A. Adjust initial temperature and humidity set points.
- B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

3.3 DEMONSTRATION

- A. Engage a factory authorized service representative to train Owner's maintenance personnel a minimum of four (4) hours to adjust, operate, and maintain units. Video record the training sessions.

END OF SECTION 237433



SECTION 238127 - SPLIT-SYSTEM AIR CONDITIONING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes split-system air-conditioning units consisting of separate evaporator—compressor-fan and condenser components.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, and components.
 - 2. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.



1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Filters: One set(s) for each air-handling unit.
 - 2. Fan Belts: One set(s) for each air-handling unit fan.

1.7 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ASHRAE Compliance:
 - 1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
 - 2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - "Procedures," and Section 7 - "Construction and System Start-up."
- C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

1.8 DELIVERY, COORDINATION, AND HANDLING

- A. Comply with requirements in Section 230150 "Product Requirements" for additional requirements.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period:
 - a. For Compressor, Parts, and Labor (full; bumper-to-bumper): One year from date of Substantial Completion.
 - b. For Compressor Only: Five years from date of Substantial Completion.



PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following below. Substitutions will not be considered.
1. AAON
 2. Above Air
 3. United CoolAir

2.2 AIR HANDLING UNITS

A. General Description

1. Indoor air handling unit shall include filters, supply fans, DX evaporator coil, modulating hot gas reheat coil, and unit controls.
2. Unit shall have a draw-through supply fan configuration and discharge air horizontally (vertically).
3. Unit shall be factory assembled and tested including leak testing of the coils and run testing of the supply fans and factory wired electrical system.
4. Unit shall have decals and tags to indicate lifting and rigging, service areas, and caution areas for safety and to assist service personnel.
5. Unit components shall be labeled, including pipe stub outs, refrigeration system components and electrical and controls components.
6. Installation, Operation and Maintenance manual shall be supplied within the unit.
7. Laminated color-coded wiring diagram shall match factory installed wiring and shall be affixed to the interior of the control compartment's access door.
8. Unit nameplate shall be provided in two locations on the unit, affixed to the exterior of the unit and affixed to the interior of the control compartment's access door.

B. Construction

1. All cabinet walls and access doors shall be fabricated of double wall, impact resistant, rigid polyurethane foam panels.
2. Unit insulation shall have a minimum thermal resistance R-value of 6.25. Foam insulation shall have a density of 2 pounds/cubic foot and shall be tested in accordance with ASTM D-1929 for a minimum flash ignition temperature of 610°F.



3. Unit construction shall be double wall with G90 galvanized steel on both sides and a thermal break. Double wall construction with a thermal break prevents moisture accumulation on the insulation, provides a cleanable interior, prevents heat transfer through the panel and prevents exterior condensation on the panel.
4. Cabinet shall be painted non-weatherized and constructed of scratch resistant heavy duty galvanized G90 steel. All structural members and access panels shall be electrostatically sprayed and powder-coated.
5. Unit shall be designed to reduce air leakage and infiltration through the cabinet. Sealing shall be included between panels and between access doors and openings to reduce air leakage. Refrigerant piping and electrical conduit through cabinet panels shall include sealing to reduce air leakage.
6. Access to filters, cooling coil, hot gas reheat coil, supply fans and electrical and controls components shall be through hinged access doors. Stainless steel hinges shall be included on the doors.
7. Access doors shall be flush mounted to cabinetry, with stainless steel removable hinges and quarter-turn, zinc cast handles.
8. Units with cooling coils shall include a 304 stainless steel sloped drain pan. Drain pan connection shall be on the same side as the access door.
9. Cooling coils shall be mechanically supported above the drain pan by multiple supports that allow drain pan cleaning and coil removal.
10. Other Features:
 - a. Unit shall include an exterior corrosion protection which shall be capable of withstanding at least 2,500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.

C. Electrical

1. Unit shall be provided with standard power block for connecting power to the unit.
2. Unit shall include a factory installed 24V control circuit transformer.
3. Unit shall be provided with phase and brownout protection which shuts down all electrical components in the unit if the electrical phases are more than 10% out of balance on voltage, the voltage is more than 10% under design voltage or on phase reversal.

D. Supply Fans

1. Unit shall include centrifugal, belt driven, forward-curved supply fan or direct drive plenum fan.
2. Blower and motor assembly shall be dynamically balanced and mounted on rubber isolators.



3. Motor shall be premium efficiency ODP with ball bearings rated for 200,000 hours service with external lubrication points.
4. Variable frequency drive shall be factory wired and mounted in the control compartment. Provide duct mounted supply air static pressure sensor.

E. Cooling Coil

1. Evaporator Coil

- a. Coil shall be designed for use with R-410A refrigerant and constructed of copper tubes with aluminum (copper) fins mechanically bonded to the tubes and galvanized (304 stainless) steel end casings. Fin design shall be sine wave rippled.
- b. Coil with dual circuits shall have interlaced circuitry.
- c. Coil shall have a minimum of 4 rows and a maximum of 14 fins per inch.
- d. Coil shall be helium leak tested.
- e. Coil shall be furnished with a factory installed thermostatic or electronic expansion valves. The sensing bulbs shall be field installed on the suction line immediately outside the cabinet.
- f. Coil shall have external piping connections as shown on drawings. Liquid and suction connections shall be sweat connection. Coil connections shall be labeled, extent beyond the unit casing and be factory sealed with grommets that cover both the interior and exterior of the unit casing, to minimize air leakage and condensation inside the panel assembly.
- g. Coil shall have a factory applied flexible, epoxy polymer e-coat uniformly applied to all coil surface areas without material bridging between fins. Humidity and water immersion resistance shall be up to a minimum 1,000 and 250 hours respectively (ASTM D2247-92 and ASTM D870-92). Corrosion durability shall be confirmed through testing to no less than 6,000 hours salt spray per ASTM B117-90. Coated coils shall receive a spray-applied, UV-resistant polyurethane topcoat to prevent UV degradation of the e-coat. Coating shall carry a 5 year non-prorated warranty.

F. Compressor

1. The compressors shall be variable speed, modulating sealed hermetic digital scroll type, with inherent thermal overload protection and shall be mounted on rubber vibration isolators.
2. Each compressor shall be furnished with a crankcase heater.
3. Provide a compressor acoustic cover with 1.2-2# density acoustical fiberglass surrounded by durable, weather-proof, flame resistant covering for each compressor.

G. Refrigeration System



1. Air handling unit and matching condenser unit shall be capable of operation as an R-410A split system air conditioner.
2. Each refrigeration circuit shall be equipped with thermostatic (electronic) expansion valve type refrigerant flow control.
3. Modulating hot gas reheat shall be provided on the lead (all) refrigeration circuit. Refrigeration circuit shall be provided with (interlaced) hot gas reheat coil, modulating valves, electronic controller, supply air temperature sensor and a dehumidification control signal terminal which allow the unit to have a dehumidification mode of operation, which includes supply air temperature control to prevent supply air temperature swings and overcooling of the space. Modulating reheat valves shall be factory installed (Modulating reheat valves shall be factory provided and field installed). Reheat line connections shall be labeled, extend beyond the unit casing and be located near the suction and liquid line connections for ease of field connection. Connections shall be factory sealed with a grommet on the exterior of the unit casing to minimize air leakage.
4. Refrigeration circuit shall be equipped with a liquid line sight glass.

H. Filters

1. Unit shall include 2 inch thick, pleated panel pre filters with an ASHRAE efficiency of 60% and MERV rating of 11, upstream of the cooling coil.

I. Controls

1. Control panel shall be connected to the air handling unit with a 6 foot low voltage and high voltage connections and shall be mounted in the field.
2. Interface with existing Honeywell DDC System for HVAC: Factory-installed hardware and software to enable the DDC system for HVAC to monitor, control, and display unit status and alarms.
 - a. Hardwired Points:
 - i. Monitoring: On-off status, common trouble alarm.
 - ii. Control: On-off operation, supply temperature set-point adjustment.
 - b. ASHRAE 135 (BACnet) communication interface with the existing Honeywell DDC system for HVAC shall enable the DDC system for HVAC operator to remotely control and monitor the unit from an operator workstation. Control features and monitoring points displayed locally at the unit control panel shall be available through the DDC system for HVAC.
3. Factory Installed and Factory Provided Controller
 - a. Unit controller shall be capable of controlling all features and options of the unit. Controller shall be factory installed in the unit controls compartment and factory tested.



- b. Controller shall be capable of stand alone operation with unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling available without dependence on a building management system.
- c. Controller shall have an onboard clock and calendar functions that allow for occupancy scheduling.
- d. Controller shall include non-volatile memory to retain all programmed values, without the use of an external battery, in the event of a power failure.
- e. With the modulating hot gas reheat, a duct mounted humidity sensor and supply air temperature sensor shall be furnished with the unit for field installation. Suction pressure sensor shall be factory installed. Supply air temperature and return air humidity setpoints, for the dehumidification mode of operation, shall be adjustable.
- f. Variable Air Volume Controller
 - i. Return air temperature sensor shall be factory mounted and wired. Outside air temperature sensor, supply air temperature sensor and supply air duct static pressure sensor shall be furnished with the unit for field installation.
 - ii. Control of supply air flow, for duct static pressure control, shall be with unit controller, factory installed variable frequency drive (electrically commutated motor) and supply air duct static pressure sensor.

2.3 OUTDOOR UNITS

- A. Basis of design is remote condenser. Condensing unit may be submitted as an alternate.
- B. Unit Description: Provide and install as shown on the plans, factory assembled, air-cooled scroll compressor condensing units in the quantity specified. Each unit shall consist of an air-cooled condenser section and isolated control compartment containing: hermetic scroll compressors, control system, suction and liquid connection valves, and all components necessary for safe and controlled unit operation when connected to the specified low side equipment.
- C. Construction:
 - 1. Unit shall be completely factory assembled, piped, and wired and shipped in one section.
 - 2. Unit shall be specifically designed for outdoor application.
 - 3. Paint finish shall be capable of withstanding at least 1000 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.
 - 4. The condenser coil shall be mechanically protected from physical damage by painted galvanized steel louvers covering the full area of the coil.



5. Paint finish shall be capable of withstanding at least 2500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.

D. Condenser:

1. The condenser coils shall consist of seamless copper tubes mechanically bonded into plate type aluminum fins. The fins shall have full drawn collars to completely cover the tubes. A subcooling section shall be an integral part of the main condenser coil.
2. The condenser fan(s) shall be propeller type arranged for vertical air discharge, and driven by a direct drive fan motor. The fan discharge area shall be equipped with a heavy-gauge fan guard.
3. Fan motor(s) shall be weather protected, single-phase, direct drive, 1100 rpm, open drip-proof type.
4. Coils shall have a factory applied flexible epoxy polymer e-coat uniformly applied to all coil surface areas without material bridging between fins. Coating process shall ensure complete coil encapsulation and a uniform dry film thickness from 0.8 to 1.2 mils on all surface areas including fin edges. Superior hardness characteristics of 2H per ASTM D3363-92A and a cross-hatch adhesion of 4B-5B per ASTM B3359-93. Impact resistance shall be up to 160 in/lb per ASTM D2794-93. Humidity and water immersion resistance shall be up to a minimum 1000 and 250 hours respectively (ASTM D2247-92 and ASTM D870-92). Corrosion durability shall be confirmed through testing to no less than 6000 hours salt spray per ASTM B117-90. Coated coils shall receive a spray-applied, UV-resistant polyurethane topcoat to prevent UV degradation of e-coat.
5. Coils shall be copper tubes with copper fins mechanically bonded to the tubes, and 304 stainless steel end casings.

2.4 ACCESSORIES

- A. Automatic-reset timer to prevent rapid cycling of compressor.
- B. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.
- C. Additional Monitoring:
 1. Monitor constant and variable motor loads.
 2. Monitor variable-frequency-drive operation.
 3. Monitor cooling load.
 4. Monitor air distribution static pressure and ventilation air volumes.



PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. Prepare test and inspection reports.

3.2 STARTUP SERVICE

- A. Engage a factory authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.

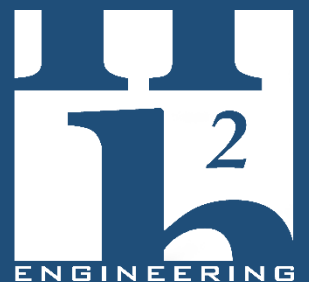
3.3 DEMONSTRATION

- A. Engage a factory authorized service representative to train Owner's maintenance personnel a minimum of four (4) hours to adjust, operate, and maintain units. Video record the training sessions.

END OF SECTION 238127

Section 2

Direct Expansion (DX) Equipment Schedules



DOAS DUCTED SPLIT SYSTEM AIR CONDITIONER SCHEDULE

INDOOR UNIT MARK	OAHU-3E	OAHU-2E
OUTDOOR UNIT MARK	CU-9E	CU-8E
MANUFACTURER	DESERT AIRE	DESERT AIRE
UNIT TYPE	SPLIT SYSTEM	SPLIT SYSTEM
INTEGRATED SEASONAL MRE	8.5	8.2
DESIGN CONDITIONS		
WINTER OUTDOOR-INDOOR (DEG F)	30-70	30-70
SUMMER OUTDOOR DB/WB (DEG F)	84/79	84/79
SUMMER INDOOR DB/WB (DEG F)	75/63	75/63
EVAPORATOR SECTION		
MARK	OAHU-3E	OAHU-2E
LOCATION	EAST SIDE 2ND FLOOR MECH ROOM	EAST SIDE 2ND FLOOR MECH ROOM
MANUFACTURER	DESERT AIRE	DESERT AIRE
MODEL	QV20P	QV25P
SUPPLY AIR (CFM)	3,070	4,400
OUTSIDE AIR (CFM)	3,070	4,400
TOTAL STATIC PRESSURE (IN H2O)	1.7	1.8
EXTERNAL STATIC PRESSURE (IN H2O)	1.2	1.2
FILTERS	2" MERV 11	2" MERV 11
CONDENSATE DRAIN SIZE (IN)	1	1
FAN TYPE	DIRECT; VARIABLE SPEED	DIRECT; VARIABLE SPEED
FAN MOTOR (HP/BHP)	2/1.72	3/2.92
COMPRESSOR (HP)	2 @ 10 HP	2 @ 12.5 HP
UNIT MCA (A)	108	163
UNIT MOCP (A)	110	175
UNIT SCCR (KA)	65	65
UNIT WEIGHT (LBS)	2,569	2,742
ELECTRICAL CHAR (V-PH)	208-3	208-3
TOTAL CAPACITY (MBH)	278.3	364.2
TOTAL SENSIBLE CAPACITY (MBH)	107.5	139.5
AIR ENT COOLING DB/WB (DEG F)	84/79	84/79
AIR LVG COOLING COIL DBWB (DEG F)	55/52.5	55/55.4
HOT GAS REHEAT ENT (DEG F)	55	55
HOT GAS REHEAT LVG (DEG F)	65	65
HEATING SECTION		
TYPE	ELECTRIC	ELECTRIC
LOCATION	UNIT	UNIT
ELECTRICAL CHAR (V-PH)	208-3	208-3
STAGES	SCR CONTROL	SCR CONTROL
AIR ENT HEATING COIL DB (DEG F)	30	30
AIR LVG HEATING COIL DB (DEG F)	55	55
CAPACITY (KW)	25	35
REMOTE CONDENSER SECTION		
MARK	CU-9E	CU-8E
LOCATION	EAST SIDE EQUIPMENT YARD	EAST SIDE EQUIPMENT YARD
MANUFACTURER	DESERT AIRE	DESERT AIRE
MODEL	RC8S015C	RC8S022C
ELECTRICAL CHAR (V-PH)	208-3	208-3
UNIT MCA (A)	16.8	23.6
UNIT MOCP (A)	23	30
UNIT SCCR (KA)	5	5
UNIT WEIGHT (LBS)	829	1186
TOTAL CAPACITY (MBH)	345.0	450.0
QUANTITY OF FANS (NO.)	2	3
REFRIGERANT TYPE	R-410A	R-410A
SUCTION LINE SIZE (IN)	1-3/8	1-5/8
LIQUID LINE SIZE (IN)	1-1/8	1-3/8

NOTES:

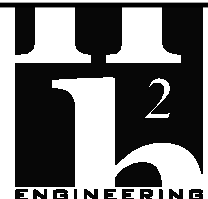
- 1.) REFRIGERANT PIPE SIZING SHALL BE PER THE MANUFACTURER'S RECOMMENDATION
- 2.) UNIT TO MAINTAIN CONSTANT 70 DEG F LEAVING AIR TEMPERATURE DURING COOLING MODE AND 55 DEG F LEAVING AIR TEMPERATURE DURING HEATING MODE
- 3.) PROVIDE UNIT CONTROLLER WITH BACNET MSTP INTERFACE AND ASSOCIATED WIRING FOR TWO-WAY BAS COMMUNICATION WITH EXISTING DDC VENDOR (HONEYWELL).
- 4.) PROVIDE ONE EXTRA SET OF FILTERS FOR THE OWNER AT COMPLETION OF PROJECT
- 5.) PROVIDE STAINLESS STEEL PRIMARY DRAIN PAN WITH FLOAT SWITCH INTERLOCKED TO SHUTDOWN THE UNIT
- 6.) INDOOR AND OUTDOOR UNIT DISCONNECTS FIELD INSTALLED BY DIV 26
- 7.) ELECTRIC HEAT IS SCHEDULED BASED ON 208 VOLT CAPACITY
- 8.) PROVIDE MANUFACTURER WARRANTY: 1ST YEAR BUMPER-TO-BUMPER (COMPRESSOR, PARTS, LABOR), 2ND THRU 5TH YEAR COMPRESSOR ONLY.
- 9.) EQUIPMENT IS PURCHASED UNDER SEPARATE BID PACKAGE. INSTALLING CONTRACTOR SHALL RECEIVE THE EQUIPMENT, OFF LOAD, AND PROTECT PRIOR TO INSTALLATION
- 10.) PROVIDE HIGH EFFICIENCY ECM MOTOR

PROJECT:
SBAC GAINESVILLE HIGH SCHOOL
BUILDING 27 HVAC RENOVATION

DESCRIPTION:
EARLY RELEASE PACKAGE #1:
DIRECT EXPANSION (DX) EQUIPMENT



DATE: 12-12-2018
SBAC #: H1710
PAGE: 1 OF 2



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H2E PROJECT No. **1871**

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Florida Certificate of Authorization #2485

MIXED AIR DUCTED SPLIT SYSTEM AIR CONDITIONER SCHEDULE		
INDOOR UNIT MARK	AHU-3E	AHU-4E
OUTDOOR UNIT MARK	CU-3E	CU-4E
MANUFACTURER	UNITED COOLAIR	UNITED COOLAIR
UNIT TYPE	SPLIT SYSTEM	SPLIT SYSTEM
SEER (BTU/WATT-HR)		
DESIGN CONDITIONS		
WINTER OUTDOOR-INDOOR (DEG F)	30-70	30-70
SUMMER OUTDOOR DB/WB (DEG F)	94/77	94/77
SUMMER INDOOR DB/WB (DEG F)	75/63	75/63
INDOOR UNIT SECTION		
MARK	AHU-3E	AHU-4E
LOCATION	EAST SIDE 2ND FLOOR MECH ROOM	EAST SIDE 2ND FLOOR MECH ROOM
MANUFACTURER	UNITED COOLAIR	UNITED COOLAIR
MODEL	VAR10G3AHA	VAR20G3AHA
SUPPLY AIR (CFM)	5,000	8,800
NEUTRAL OUTSIDE AIR (CFM)	3,070	4,400
TOTAL STATIC PRESSURE (IN H2O)	2.5	2.5
EXTERNAL STATIC PRESSURE (IN H2O)	1.6	1.6
FILTERS	2" MERV 11	2" MERV 11
CONDENSATE DRAIN SIZE (IN)	1	1
FAN TYPE	BELT; VARIABLE SPEED	BELT; VARIABLE SPEED
FAN MOTOR (HP/BHP)	3.14/5	5.2/7.5
UNIT MCA (A)	52.5	99.8
UNIT MOCP (A)	60	135
UNIT WEIGHT (LBS)	775	1620
ELECTRICAL CHAR (V-PH)	208-3	208-3
TOTAL COOLING CAPACITY (MBH)	107.8	239.5
TOTAL SENSIBLE CAPACITY (MBH)	89.6	197.7
AIR ENT COOLING DB/WB (DEG F)	71.9/60.4	72.5/60.8
AIR LVG COOLING COIL DB/WB (DEG F)	55.7/52.8	52.1/51
MODULATING HOT GAS REHEAT ENT (DEG F)	55.6	52
MODULATING HOT GAS REHEAT LVG (DEG F)	65.6	64.6
OUTDOOR UNIT SECTION		
MARK	CU-3E	CU-4E
LOCATION	EAST SIDE EQUIPMENT YARD	EAST SIDE EQUIPMENT YARD
MANUFACTURER	UNITED COOLAIR	UNITED COOLAIR
MODEL	PBC13G3ATA	PBC31G3ATA
ELECTRICAL CHAR (V-PH)	208-3	208-3
UNIT MCA (A)	6.3	11.9
UNIT MOCP (A)	15	15
UNIT WEIGHT (LBS)	534	1125
TOTAL CAPACITY (MBH)	107.8	239.5
QUANTITY OF COMPRESSORS OR STAGES (NO.)	2	2
QUANTITY OF FANS (NO.)	2	4
REFRIGERANT TYPE	R-410A	R-410A
SUCTION LINE SIZE (IN)	NOTE 1	NOTE 1
LIQUID LINE SIZE (IN)	NOTE 1	NOTE 1

NOTES:

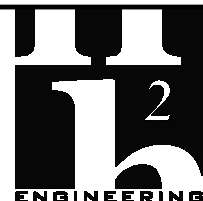
- 1.) REFRIGERANT PIPE SIZING SHALL BE PER THE MANUFACTURER'S RECOMMENDATION.
- 2.) PROVIDE UNIT CONTROLLER WITH BACNET MSTP INTERFACE AND ASSOCIATED WIRING FOR TWO-WAY BAS COMMUNICATION WITH EXISTING VENDOR (HONEYWELL).
- 3.) PROVIDE ONE EXTRA SET OF FILTERS FOR THE OWNER AT COMPLETION OF PROJECT.
- 4.) PROVIDE STAINLESS STEEL PRIMARY DRAIN PAN WITH FLOAT SWITCH INTERLOCKED TO SHUTDOWN THE UNIT.
- 5.) INDOOR AND OUTDOOR UNIT DISCONNECTS FIELD INSTALLED BY DIV 26.
- 6.) PROVIDE MANUFACTURER WARRANTY: 1ST YEAR BUMPER-TO-BUMPER (COMPRESSOR, PARTS, LABOR), 2ND THRU 5TH YEAR COMPRESSOR ONLY.
- 7.) EQUIPMENT IS PURCHASED UNDER SEPARATE BID PACKAGE. INSTALLING CONTRACTOR SHALL RECEIVE THE EQUIPMENT, OFF LOAD, AND PROTECT PRIOR TO INSTALLATION.
- 8.) TOTAL COOLING CAPACITY RATED AT AHRI STANDARD 95 DEG F AMBIENT, 80 DEG F DB/67 DEG F WB ENTERING TEMPERATURE.
- 9.) PROVIDE HIGH EFFICIENCY MOTOR WITH VARIABLE FREQUENCY DRIVE.
- 10.) PROVIDE MICROPROCESSOR CONTROLLER TO HANDLE ALL UNIT FUNCTIONS AND SAFETIES. DESIGN OPERATIONAL INTENT IS MULTI-ZONE VAV WITH MODULATING HOT GAS REHEAT FOR SUPPLY AIR TEMPERATURE RESET.
- 11.) PROVIDE ENTERING AIR AND LEAVING AIR TEMPERATURE SENSORS.
- 12.) PROVIDE ENTERING AIR RELATIVE HUMIDITY SENSOR.
- 13.) PROVIDE REMOTE STATIC PRESSURE SENSOR FOR STATIC PRESSURE CONTROL.
- 14.) PROVIDE MODULATING HOT GAS REHEAT COIL, VALVE, PIPING, AND CONTROLS FOR SUPPLY AIR TEMPERATURE RESET CONTROL.
- 15.) PROVIDE SAFETY CONTROLS AND INTERLOCKS INCLUDING PROOF OF SUPPLY AIRFLOW, FAN FAILURE, HIGH PRESSURE SAFETY CUT-OUT, AND ANTI-SHORT CYCLE TIMER.
- 16.) PROVIDE SUCTION PRESSURE TRANSDUCER.
- 17.) PROVIDE VARIABLE SPEED SCROLL COMPRESSORS.

PROJECT:
SBAC GAINESVILLE HIGH SCHOOL
BUILDING 27 HVAC RENOVATION

DESCRIPTION:
EARLY RELEASE PACKAGE #1:
DIRECT EXPANSION (DX) EQUIPMENT



DATE: 12-12-2018
SBAC #: H1710
PAGE: 2 OF 2



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