ADDENDUM NO. 2

Project: **RFQ/RFP No. 17/18-02MO, Clean Energy Jobs Act Proposition 39 HVAC Design Build Services at Irvine High School**

Date: **February 14, 2018**

To any and all concerned parties:

This addendum adds to or modifies the contract documents for the above project. This addendum shall supersede all previously issued specifications, addenda and any other written or verbal direction. The modifications within this addendum shall be made part of the contract documents and shall be subject to all applicable requirements thereto:

ITEM 2.01 NEW – Attachment D – HVAC Specifications V2

Delete – Attachment D - HVAC Specifications

Insert – Attachment D - HVAC Specifications V2 – *attached hereto*

ITEM 2.02 Clarifications to Contractors' Questions

2.02.1. Question: Where can we obtain a copy of the attendees at today's job walk?

Answer: A list of attendees at the job walk has been uploaded to Irvine USD's web page: https://iusd.org/about/departments/business-services/purchasing/current-bids-and-requests-proposals-rfps/prop-39-hvac

2.02.2. Question: Also, where can I obtain the as-builts set?

Answer: As build sets have been uploaded to the Irvine USD's web page: https://iusd.org/about/departments/business-services/purchasing/current-bids-and-requests-proposals-rfps/prop-39-hvac

2.02.3. Question: Please provide the existing control contractors name and contact information.

Answer: Existing control contractor is Mesa Energy Systems:
Evan Domingue, evan_domingue@emcor.net, (949) 285-3631

2.02.4. Question: Please provide the existing fire alarm contractor name and contact information.

Answer: The alarm contractor name is Simplex.

2.02.5. Question: When comparing weights of new equipment vs. existing weights, are we to take in consideration? Economizers etc. or just base equipment weights?

Answer: The weight of existing equipment is understood to be accurate for the configuration. The proposed equipment should include base weights any proposed options or add-ons (i.e. economizer, higher efficiency coils, adapter curbs). Adhere to prevailing Title 24 code requirements when specifying additional equipment options.

2.02.6. Question: During the HVAC replacement/rigging, will the school be able to be completely empty of staff and students to allow for use of a helicopter instead of crane?

Answer: It is currently understood that the site will be unoccupied by students and faculty during construction. Irvine USD may issue a notice to all staff to ensure sites are closed to non-essential project related personnel during crane/heli-operations and rigging.

2.02.7. Question: Is Alternate fan coil manufacture ok to use such as Magic Air or Alliance?

Answer: New units are included in Attachment D - HVAC Specifications V2; Aaon, Magic Air, and Alliance.

2.02.8. Question: Condensate drain lines will we need to replace all PVC drain or just to point of connection?

Answer: Condensate Drain lines to be replaced from the air handling unit to the roof drain.

2.02.9. Question: Per addenda #1, Item 1.03 states baseline weight for the existing air handling units to be assumed as 500lbs. Has the district affirmed this value or performed a structural capacity check on the two buildings? This is to confirm that if our proposed units are within the +5% weight increase, we do not need to go to DSA.

Answer: After researching the existing equipment extensively, without having removed a unit to sample the weight, it is the Districts current understanding that 500lb is a close estimate. Contractor should proceed to proposed equipment within 5% as such. Upon proceeding to Design Phase, it is the Contractors responsibility to perform their own due diligence to field verify the existing equipment weight. The District does not plan to engage DSA.

2.02.10. Question: Per drawing “ihs_hvac_as_builts_original_construction_0”, sheet M-1 states all units on buildings A & B (H & S in this RFP), “all roof mounted AHUs have sound traps between the outside air intake and the unit, providing an average band attenuation of 30 dba.” How does the district want to address this in relation to the new proposed units?

Answer: Proposed output dba should not exceed that of existing.

2.02.11. Question: It's been identified that not every existing air-handling unit has a chilled water control valve. Is it required to only replace the existing control valves currently serving the existing units, or does the district intend to install new control valves on each new system? If so, how does the district intend to control any increased count in new valves? Does the district require us to get associated costs from their controls contractor?

Answer: All replaced units will be equipped with independently operating chilled water control valves. Each unit should have its own control valve, so if there are units without control valves, then additional valves will need to be included. The cost to connect and commission the new control valves to the existing EMS should be coordinated with the controls contractor and included in the proposed price.

2.02.12. Question: Should the district's controls contractor be involved in this project? If so, what is their scope of work?

Answer: The District controls contractor should be engaged during reconnection and commissioning of the new/proposed units to the EMS.

2.02.13. Question: Now that the Air Dynamics air handling unit has been removed from the scope, does the district still require an architect to be a part of this project? If so, does the district already have an architect assigned or do they have a preferred list of architects in mind?

Answer: An architect is not required for this project. The District is aiming for like-for-like replacements for all existing John Zink units outlined in the scope of work and does not plan to engage DSA for this project.

2.02.14. Question: As part of the design, does the district require an engineer's stamp of approval (for both mechanical and electrical)?

Answer: Engineer's stamp of approval is NOT required for final as-built drawings.

2.02.15. Question: During the site walk it was found in multiple locations that the existing insulation for the piping on the roof was partially damaged or missing. How does the district intend to address this?

Answer: Refer to Attachment A: Scope of Work. For proposal uniformity, only include work specifically outlined in Attachment A: Scope of Work. If any ancillary valves or insulation require replacement, these points will be evaluated during the preconstruction meeting.

2.02.16. Question: The scope of work calls for pre-construction engineering services, where should this cost be associated regarding the pricing summary sheets?

Answer: Contractor may elect to disaggregate pre-construction engineering services at their own discretion or distribute the total cost of pre-construction in their per unit pricing. If Contractor does elect to disaggregate pre-construction, use sheet "Special

Rental-Transport Costs" from Attachment C to create a new line item that states "Preconstruction" and input corresponding labor/material/OH&P/Misc. cost.

2.02.17. Question: Will there be any summer school classes held during the RFP suggested time of construction?

Answer: The spaces included in the Scope of Work will not have Summer sessions.

2.02.18. Question: Attachment D – HVAC Specifications look like they are for packaged units (example, section 2.4 Coils refers to refrigerant coils, and section 2.6 is about gas furnaces). Please provide clarification and/or a new spec for the proposed units.

Answer: Reference Attachment D – HVAC Specifications V2.

2.02.19. Question: Per the specifications, are Carrier, Trane and York the only accepted manufacturers?

Answer: Reference **Response 2.02.7**.

2.02.20. Question: If the shut off valves are not in good condition and do not hold, how does the district intend to address this issue?

Answer: Refer to **Response 2.02.15**.

2.02.21. Question: Per code, air-side economizers are only required where the unit is greater than 54,000 Btuh. Considering the importance of the +5% weight increase, is this a district requirement or will outside air intakes be sufficient?

Answer: With the removal of the Air Dynamics equipment, all equipment is rated 3T (36kBtuh). Reference **Response 2.02.5.**

SECTION 23 74 13

Packaged, Outdoor, Central-Station Air-Handling Units

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the furnishing, installation, and connection of packaged, outdoor, central-station air-handling units.

1.2 SUMMARY

A. This Section includes packaged, outdoor, central-station air-handling units (rooftop units) with the following components and accessories:

1. Chilled water coils
2. Hot water coils.
3. Economizer outdoor- and return-air damper section.
4. Integral, space temperature controls.
5. Roof curbs.

B. Related Sections include the following:

1. Division 23 Section "Indoor Indirect-Fuel-Fired Heating and Ventilating Units" for outdoor units providing 100 percent tempered outdoor air with heat exchangers.
2. Division 23 Section "Indoor, Direct Gas-Fired Heating and Ventilating Units" for outdoor units providing 100 percent tempered outdoor air without heat exchangers.
3. Division 23 Section "Packaged, Outdoor, Heating and Cooling Makeup Air-Conditioners" for outdoor equipment air conditioning 100 percent outdoor air to replace air exhausted from a building.

1.3 DEFINITIONS

A. DDC: Direct-digital controls.

B. ECM: Electrically commutated motor.

C. Outdoor-Air Refrigerant Coil: Refrigerant coil in the outdoor-air stream to reject heat during cooling operations and to absorb heat during heating operations. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.

D. Outdoor-Air Refrigerant-Coil Fan: The outdoor-air refrigerant-coil fan in RTUs. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.

E. RTU: Rooftop unit. As used in this Section, this abbreviation means packaged, outdoor, central-station air-handling units. This abbreviation is used regardless of whether the unit is mounted on the roof or on a concrete base on ground.

F. Supply-Air Fan: The fan providing supply air to conditioned space. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

G. Supply-Air Refrigerant Coil: Refrigerant coil in the supply-air stream to absorb heat (provide cooling) during cooling operations and to reject heat (provide heating) during heating operations. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

H. VVT: Variable-air volume and temperature.

1.4 SUBMITTALS

A. Product Data: Include manufacturer's technical data for each RTU, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.

B. Wiring schematic and connection diagram

C. LEED Submittals:

1. Product Data for Credit EA 4: Documentation required by Credit EA 4 indicating that equipment and refrigerants comply.
2. Product Data for Prerequisite EQ 1: Documentation indicating that units comply with ASHRAE 62.1-2004, Section 5 - "Systems and Equipment."

D. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

E. Detail mounting, securing, and flashing of roof curb or adapters to roof structure if required. Indicate coordinating requirements with roof membrane system.
1. Detail fabrication and attachment of wind and seismic restraints and snubbers. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors
2. Retain paragraph and subparagraphs below if required by wind design criteria applicable to Project

F. Field quality-control test reports.

G. Operation and Maintenance Data: HVAC equipment to include emergency, operation, and maintenance manuals.

H. Warranty: Special warranty specified in this Section.

1.5 PERFORMANCE REQUIREMENTS

A. Design Conditions:
   1. New roof mounted equipment must be accompanied with a curb adapter (as applicable)
   2. Condensing units shall be mounted on 4” concrete pads
   3. Metal enclosure shall be painted to match the adjacent wall color, or as specified by the client

B. Wind-Restraint Performance:
   1. The new units will be attached to the curbs or adapters to match the existing conditions and per the local codes for wind load.

C. Seismic Performance: RTUs shall withstand the effects of earthquake motions determined per the local codes.

   1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

D. Completed System Readiness Checklists provided by the Commissioning Agent and completed by the contractor, signed by a qualified technician and dated on the date of completion.

1.6 QUALITY ASSURANCE

A. ARI Compliance:

   1. Comply with ARI 210/240 and ARI 340/360 for testing and rating energy efficiencies for RTUs.
   2. Comply with ARI 270 for testing and rating sound performance for RTUs.

B. ASHRAE Compliance:

   1. Comply with ASHRAE 15 for refrigeration system safety.
   2. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
   3. Comply with applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

D. NFPA Compliance: Comply with NFPA 90A and NFPA 90B.

E. UL Compliance: Comply with UL 1995.

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components of RTUs that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Compressors: Manufacturer's standard, but not less than five (5) years from date of Substantial Completion.
2. Warranty Period for Gas Furnace Heat Exchangers: Manufacturer's standard, but not less than five (5) years from date of Substantial Completion.
3. Warranty Period for Solid-State Ignition Modules: Manufacturer's standard, but not less than three (3) years from date of Substantial Completion.
4. Warranty Period for Control Boards: Manufacturer's standard, but not less than three (3) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide custom HVAC replacement equipment by one of the following:

1. Carrier Corporation.
2. Trane; American Standard Companies, Inc.
3. YORK International Corporation.
4. Aaon
5. Magic Air
6. Alliance

2.2 GENERAL

A. Roof top units (RTU) shall be fabricated from insulated, solid double-wall galvanized steel without any perforations in draw-through configuration. Galvanizing shall be hot dipped conforming to ASTM A525 and shall provide a minimum of 0.275 kg of zinc per square meter (0.90 oz. of zinc per square foot) (G90). Aluminum constructed units may be provided subject to District approval and documentation that structural rigidity is equal or greater than the galvanized steel specified.

B. LEED-NC Prerequisite EQ 1 requires compliance with ASHRAE 62.1-2004. ASHRAE 62.1-2004, Section 5.14 - "Access for Inspection, Cleaning, and Maintenance," sets requirements for equipment access. If applying for LEED certification, comply with requirements in ASHRAE 62.1-2004.

C. The contractor and the RTU manufacturer shall be responsible for insuring that the unit will not exceed the allocated space per unit, including required clearances for service and future overhaul or removal of unit components. All structural, piping, wiring, and ductwork alterations of units, which are dimensionally different than those specified, shall be the responsibility of the contractor at no additional cost to the District.

D. RTUs shall be fully assembled by the manufacturer in the factory in accordance with the arrangement shown on the drawings. The unit shall be assembled into the largest sections possible subject to shipping and rigging restrictions. The correct fit of all components and casing sections shall be verified in the factory for all units prior to shipment. All units shall be fully assembled, tested and then split to accommodate shipment and job site rigging. Lifting lugs or shipping skids shall be provided for each section to allow for field rigging and final placement of unit.

E. The RTU manufacturer shall provide the necessary gasketing, caulking, and all screws, nuts, and bolts required for assembly.

F. Gaskets: All door and casing and panel gaskets and gaskets between air handling unit components, if joined in the field, shall be high quality which seal air tight and retain their structural integrity and sealing capability after repeated assembly and disassembly of bolted panels and opening and closing of hinged components. Bolted sections may use a more permanent gasketing method provided they are not disassembled.

G. Structural Rigidity: Provide structural reinforcement when required by span or loading so that the deflection of the assembled structure shall not exceed 1/200 of the span based on a differential static pressure of 8 in. w.g. or higher.

H. Coil Treatment: Epoxy Immersion Coating–Electrically Deposited: The multi-stage corrosion-resistant coating application comprises of cleaning (heated alkaline immersion bath) and reverse-osmosis immersion rinse prior to the start of the coating process. The coating thickness shall be maintained between 0.6-mil and 1.2-mil. Before the coils are subjected to high-temperature oven cure, they are treated to permeate immersion rinse and spray. Where the coils are subject to UV exposure, UV protection spray treatment comprising of UV-resistant urethane mastic topcoat shall be applied. Provide complete coating process traceability for each coil and minimum five years of limited warranty. The coating process shall such that uniform coating thickness is maintained at the fin edges. The quality control shall be maintained by ensuring compliance to the applicable ASTM Standards for the following:

1. Salt Spray Resistance (Minimum 6,000 Hours)
2. Humidity Resistance (Minimum 1,000 Hours)
3. Water Immersion (Minimum 260 Hours)
4. Cross-Hatch Adhesion (Minimum 4B-5B Rating)
5. Impact Resistance (Up to 160 Inch/Pound) ion

I. Casing Surfaces (Exterior and Interior): All exposed and accessible exterior and interior metal surfaces shall be protected with a water-reducible acrylic with stainless steel pigment spray-applied over the manufacturer's standard finish. The spray coating thickness shall be 2-4 mils and provide minimum salt-spray resistance of 1,000 hours (ASTM B117) and 500 hours UV resistance (ASTM D4587).

2.3 BASE

A. RTUs shall be completely self-supporting for installation on roof curb.

B. The RTU bases not constructed of galvanized material shall be cleaned, primed with a rust inhibiting primer, and finished with rust inhibiting exterior enamel.

2.4 CASING

A. RTU casing shall be entirely double wall insulated panels, integral of or attached to a structural frame. Construction shall be such that removal of any panel shall not affect the structural integrity of the unit. Casing finished shall meet salt-spray test as specified in paragraph 2.1.C.10. All casing and panel sections shall be tightly butted and gasketed. No gaps of double wall construction will be allowed where panels bolt to air handling unit structural member. Structural members, not covered by the double wall panels, shall have equivalent insulated double wall construction.

B. Double wall galvanized steel panels, minimum 51 mm (2 inches) thick, constructed of minimum 1.3 mm (18 gauge) outer skin and 1.0 mm (20 gauge) solid or perforated inner skin to limit wall, roof and floor deflection to not exceed an L/240 ratio when the unit casing is pressurized to (±5 in. w.g.). Deflection shall be measured at the midpoint of the panel height. Total housing leakage shall not exceed 1% of rated cfm when the unit casing is pressurized to (±5 in. w.g.). The outer (skin) and inner panels shall be solid.

C. Blank-Off: Provide blank-offs as required to prevent air bypass between the AHU sections, around coils, and filters.

D. Insulation: Insulation shall be injected CFC free foam encased in double-wall casing between exterior and interior panels such that no insulation can erode to the air stream. Insulation shall be 50 mm (2 inch) thick, and 48 kg/m3 (3.0 lb/ft3) density with a total thermal resistance (R-value) of approximately 2.3 m.K/W (13.0 hr-ft2 OF/BTU). Units with less than 50 mm (2 inch) of insulation in any part of the walls, floor, roof or drain pan shall not be acceptable. The insulation shall comply with NFPA 90-A for the flame and smoke generation requirements.

E. The thickness of insulation, mode of application, and thermal breaks shall be such that there is no visible condensation on the exterior panels of the AHU.

F. Casing panels shall be secured to the support structure with stainless steel or zinc-chromate plated screws and gaskets installed around the panel perimeter. Panels shall be completely removable to allow removal of fan, coils, and other internal components for future maintenance, repair, or modifications. Welded exterior panels are not acceptable.

G. Access Doors: Provide in each access section and where shown on drawings. Show single-sided and double-sided access doors with door swings on the floor plans. Doors shall be a minimum of 50 mm (2 inches) thick with same double wall construction as the unit casing. Doors shall be a minimum of 600 mm (24 inches) wide, unless shown of different size on drawings, and shall be the full casing height up to a maximum of 1850 mm (6 feet). Doors shall be gasketed, hinged, and latched to provide an airtight seal. The access doors for fan section, mixing box, coil section shall include a minimum 150 mm x 150 mm (6 inch x 6 inch) double thickness,

with air space between glass panes tightly sealed, reinforced glass or Plexiglas window in a gasketed frame.

1. Hinges: Manufacturers standard, designed for door size, weight and pressure classifications. Hinges shall hold door completely rigid with minimum 45 kg (100 pound) weight hung on latch side of door.
2. Latches: Non-corrosive alloy construction, with operat¬ing levers for positive cam action, operable from either inside or outside. Doors that do not open against unit operating pressure shall allow the door to ajar and then require approximately 0.785 radian (45 degrees) further movement of the handle for complete opening. Latch shall be capable of restraining explosive opening of door with a force not less than 1991 Pa (8 inches water gage).
3. Gaskets: Neoprene, continuous around door, positioned for direct compression with no sliding action between the door and gasket. Secure with high quality mastic to eliminate possibility of gasket slipping or coming loose.

H. Provide sealed sleeves, metal or plastic escutcheons or grommets for penetrations through casing for power and temperature control wiring and pneumatic tubing. Coordinate with electrical and temperature control subcontractors for number and location of penetrations. Coordinate lights, switches, and duplex receptacles and disconnect switch location and mounting. All penetrations and equipment mounting may be provided in the factory or in the field. All field penetrations shall be performed neatly by drilling or saw cutting. No cutting by torches will be allowed. Neatly seal all openings airtight.

I. Roof of the unit shall be sloped to have a minimum pitch of 1/4 inch per foot. The roof shall overhang the side panels by a minimum of three inches to prevent precipitation drainage from streaming down the unit side panels.

J. Casing finished shall meet ASTM B117, 500-hour salt spray test, using 20 percent sodium chloride solution. Immediately after completion of the test, the coating shall show no sign of blistering, wrinkling, or cracking, no loss of adhesion, and the specimen shall show no sign of rust creepage beyond 1/8-inch on either side of scratch mark.

K. Unit floor shall be level without offset space or gap and designed to support a minimum of 488 kg/square meter (100 pounds per square foot) distributed load without permanent deformation or crushing of internal insulation. Provide adequate structural base members beneath floor in service access sections to support typical service foot traffic and to prevent damage to unit floor or internal insulation. Unit floors in casing sections, which may contain water or condensate, shall be watertight with drain pan.

L. Condensate Drain Pan: Drain pan shall be designed to extend entire length of cooling coils including headers and return bends. Depth of drain pan shall be at least 43 mm (1.7 inches) and shall handle all condensate without overflowing. Drain pan shall be double wall construction, Type 304 stainless steel and have a minimum of 50 mm (2 inch) insulation, and shall be sloped to drain. Drain pan shall be continuous metal or welded watertight. No mastic sealing of joints exposed to water will be permitted. Drain pan shall be placed on top of casing floor or integrated into casing floor assembly. Drain pan shall be pitched in all directions to drain line.

1. An intermediate condensate drip pan shall be provided on stacked cooling coils and shall be constructed of type 304 stainless steel with copper downspouts factory piped to main

condensate pan. Use of intermediate condensate drain channel on upper casing of lower coil is permissible provided it is readily cleanable. Design of intermediate condensate drain shall prevent upper coil condensate from flowing across face of lower coil.

2. Drain pan shall be piped to the exterior of the unit. Drain pan shall be readily cleanable.
3. Installation, including frame, shall be designed and sealed to prevent blow-by.

2.5 HOUSED CENTRIFUGAL FANS

A. Fans shall be minimum Class II construction, factory balanced and rated in accordance with AMCA 210 or ASHRAE 51. Provide self-aligning, pillow block, regreasable ball-type bearings selected for a B(10) life of not less than 40,000 hours and an L(50) average fatigue life of 200,000 hours per AFBMA Standard 9. Extend bearing grease lines to motor and drive side of fan section. Fan shall be located in airstream to assure proper air flow.

B. Provide internally vibration isolated fan, motor and drive, mounted on a common integral bolted or welded structural steel base with adjustable motor slide rail with locking device. Provide vibration isolators and flexible duct connections at fan discharge to completely isolate fan assembly. Allowable vibration tolerances for fan shall not exceed a self-excited vibration maximum velocity of 0.005 m/s (0.20 inch per second) RMS, filter in, when measured with a vibration meter on bearing caps of machine in vertical, horizontal and axial directions or measured at equipment mounting feet if bearings are concealed. Vibration measurements shall be taken on each motor bearing housing in the vertical, horizontal, and axial planes (5 total measurements, 2 each motor bearing and 1 axial).

2.6 FAN MOTOR, DRIVE, AND MOUNTING ASSEMBLY (HOUSED CENTRIFUGAL FANS)

A. Fan Motor and Drive: Motors shall be premium energy efficient type, as mandated by the Energy Policy Act of 2005

B. Fan drive and belts shall be factory mounted with final alignment and belt adjustment to be made by the Contractor after installation.

2.7 PLENUM FANS – SINGLE AND/OR MULTIPLE FANS IN AN ARRAY

A. Fans shall be Class II (minimum) construction with single inlet, aluminum wheel and stamped air-foil aluminum bladed. The fan wheel shall be mounted on the directly-driven motor shaft in AMCA Arrangement 4. Fans shall be dynamically balanced and internally isolated to minimize the vibrations. Provide a steel inlet cone for each wheel to match with the fan inlet. Locate fan in the air stream to assure proper flow. The fan performance shall be rated in accordance with AMCA 210 or ASHRAE 51.

B. Allowable vibration tolerances for fan shall not exceed a self-excited vibration maximum velocity of 0.005 m/s (0.20 inch per second) RMS, filter in, when measured with a vibration meter on bearing caps of machine in vertical, horizontal and axial directions. The fan wheel shall meet or exceed guidelines in AMCA 801-92 for dynamic balancing requirements. The complete fan assembly balance shall be tested using an electronic balance analyzer with a tunable filter and stroboscope. Vibration measurements shall be taken on each motor bearing

housing in the vertical, horizontal, and axial planes (5 total measurements, 2 each motor bearing and 1 axial).

C. Multiple fans shall be installed in a pre-engineered structural frame to facilitate fan stacking. All fans shall modulate in unison, above or below the synchronous speed within the limits specified by the manufacturer, by a common control sequence. Staging of the fans is not permitted. Redundancy requirement shall be met by all operating fans in an array and without the provision of an idle standby fan.

D. Fan Motor, Drive and Mounting Assembly: Fan Motors shall be premium energy efficient type, as mandated by the Energy Policy Act of 2005

2.8 MIXING BOXES

A. Mixing box shall consist of casing and outdoor air and return air dampers in opposed blade arrangement with damper linkage for automatic operation. Dampers shall be of ultra-low leak design with metal compressible bronze jamb seals and extruded vinyl edge seals on all blades. Blades shall rotate on stainless steel sleeve bearings or bronze bushings. Leakage rate shall not exceed 1.6 cubic meters/min/square meter (5 cfm per square foot) at 250 Pa (1 inch water gage) and 2.8 cubic meters/min/square meter (9 cfm per square foot) at 995 Pa (4 inches water gage).

2.9 FILTER SECTION

A. Filters including one complete set for temporary use at site shall be provided independent of the RTU. The RTU manufacturer shall install filter housings and racks in filter section compatible with filters furnished. The RTU manufacturer shall be responsible for furnishing temporary filters (pre-filters and after-filters, as shown on drawings) required for RTU testing.

B. Factory-fabricated filter section shall be of the same construction and finish as the RTU casing including filter racks and hinged double wall access doors.

C. Minimum arrestance per ASHRAE 52.1, and a minimum efficiency reporting value (MERV) per ASHRAE 52.2.

1. Glass Fiber: Minimum 80 percent arrestance, and MERV 5.
2. Pleated: Minimum 90 percent arrestance, and MERV 7.

2.10 COILS

A. Coils shall be mounted on hot dipped galvanized steel supports to assure proper anchoring of coil and future maintenance. Coils shall be face or side removable for future replacement thru the access doors or removable panels. Each coil shall be removable without disturbing adjacent coil. Cooling coils shall be designed and installed to insure no condensate carry over. Provide factory installed extended supply, return, drain, and vent piping connections.

1. Water Coils

2.11 DAMPERS

A. Outdoor-Air Damper: Linked damper blades, motorized damper and filter.

B. Outdoor- and Return-Air Mixing Dampers: Parallel- or opposed-blade galvanized-steel dampers mechanically fastened to cadmium plated for galvanized-steel operating rod in reinforced cabinet. Connect operating rods with common linkage and interconnect linkages so dampers operate simultaneously.

1. Damper Motor: Modulating with adjustable minimum position.
2. Relief-Air Damper: Gravity actuated or motorized, as required by ASHRAE/IESNA 90.1-2004, with bird screen and hood.

C. DDC to incorporate dry bulb economizer control

D. DDC unit controller in zone temperature control mode shall provide the following economizer control based on outside air temperature when EMS network communications are lost

1. Low OA temp lockout = 35 deg F
2. High OA temp lockout = 65 deg F
3. DDC controller shall support integrated economizer operation, i.e., the unit shall be able to economize while also providing mechanical cooling, if economizer can't fully satisfy the zone cooling load.
4. If economizer is available, and the zone is in the cooling mode, the OA damper shall modulate to supply discharge air temperature control (setpoint = 55 deg F).
5. If economizer is not available, the OA damper shall be at Minimum Position during occupied times and fully closed during unoccupied times

E. DDC unit controller shall provide a service test mode. This operating mode shall allow a service contractor to force RTU into cool, heat, economizer, fan, for local troubleshooting control and for independent testing and verification of the unit in the field during start-up commissioning. A BACnet Binary Value object shall indicate to the EMS when the unit is in service test mode.

F. Communication from unit controller to connect with pre-existing DDC Andover Energy Management System.

G. All operational functionalities described in previous sections shall be automatically executed at equipment start-up to ensure proper operation.

2.12 ELECTRICAL POWER CONNECTION

A. Provide for single connection of power to unit with control-circuit transformer with built-in overcurrent protection.

2.13 CONTROLS

A. Connect and recommission installed RTUs with pre-existing DDC Andover Energy Management System.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine existing curbs, duct attachments and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of RTUs.

B. Examine existing RTUs to verify actual locations of piping and duct connections before equipment installation.

C. Examine roofs for suitable conditions where RTUs will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

E. Roof Curb Adapters: Install on curbs if required and coordinate roof flashing with roof construction specified in Division 07 Section "Roof Accessories." Secure RTUs to upper curb rail, and secure curb base to roof framing with anchor bolts.

3.2 CONNECTIONS

A. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or existing condensate piping.

B. Install piping adjacent to RTUs to allow service and maintenance.

1. Gas Piping: Comply with applicable requirements in Division 23 Section "Facility Natural-Gas Piping" Connect gas piping to burner, full size of gas train inlet, and connect with union and shutoff valve with sufficient clearance for burner removal and service.

3.3 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. Report results in writing.

B. Perform tests and inspections and prepare test reports.

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. Report results in writing.

C. Tests and Inspections:

1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Remove and replace malfunctioning units and retest as specified above.

3.4 STARTUP SERVICE

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

B. Complete installation and startup checks per manufacturer's written instructions and do the following:

1. Inspect for visible damage to unit casing.
2. Inspect for visible damage to furnace combustion chamber.
3. Inspect for visible damage to compressor, coils, and fans.
4. Inspect internal insulation.
5. Verify that labels are clearly visible.
6. Verify that clearances have been provided for servicing.
7. Verify that controls are connected and operable.
8. Verify that filters are installed.
9. Clean condenser coil and inspect for construction debris.
10. Clean furnace flue and inspect for construction debris.
11. Connect and purge gas line.
12. Remove packing from vibration isolators.
13. Inspect operation of barometric relief dampers.
14. Verify lubrication on fan and motor bearings.
15. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
16. Adjust fan belts to proper alignment and tension.
17. Start unit per manufacturer's written instructions.

    a. Start refrigeration system.
    b. Do not operate below recommended low-ambient temperature.
    c. Complete startup sheets and attach copy with Contractor's startup report.

18. Inspect and record performance of interlocks and protective devices; verify sequences.
19. Operate unit for an initial period as recommended or required by manufacturer.
20. Perform the following operations for both minimum and maximum firing. Adjust burner for peak efficiency.

    a. Measure gas pressure on manifold.
    b. Inspect operation of power vents.
    c. Measure combustion-air temperature at inlet to combustion chamber.
    d. Measure flue-gas temperature at furnace discharge.
    e. Perform flue-gas analysis. Measure and record flue-gas carbon dioxide and oxygen concentration.
    f. Measure supply-air temperature and volume when burner is at maximum firing rate and when burner is off. Calculate useful heat to supply air.

21. Calibrate thermostats.

22. Adjust and inspect high-temperature limits.
23. Inspect outdoor-air dampers for proper stroke and interlock with return-air dampers.
24. Start refrigeration system and measure and record the following when ambient is a minimum of 15 deg. F (8 deg. C) above return-air temperature:

    a. Coil leaving-air, dry- and wet-bulb temperatures.
    b. Coil entering-air, dry- and wet-bulb temperatures.
    c. Outdoor-air, dry-bulb temperature.
    d. Outdoor-air-coil, discharge-air, dry-bulb temperature.

25. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
26. Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve.

    a. Supply-air volume.
    b. Return-air volume.
    c. Relief-air volume.
    d. Outdoor-air intake volume.

27. Simulate maximum cooling demand and inspect the following:

    a. Compressor refrigerant suction and hot-gas pressures.
    b. Short circuiting of air through condenser coil or from condenser fans to outdoor-air intake.

28. Verify operation of remote panel including pilot-light operation and failure modes. Inspect the following:

    a. High-temperature limit on gas-fired heat exchanger.
    b. Low-temperature safety operation.
    c. Filter high-pressure differential alarm.
    d. Economizer to minimum outdoor-air changeover.
    e. Relief-air fan operation.
    f. Smoke and fire alarms.

29. After startup and performance testing and prior to Substantial Completion, replace existing filters with new filters.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain RTUs. Refer to Division 01 Section "Demonstration and Training."

--- End Section 23 74 13 ---