

University of South Carolina

Belle W. Baruch Marine Field Laboratory

Georgetown, SC

USC BARUCH MARINE LAB MECHANICAL HVAC REPLACEMENT

PROJECT NUMBER: CP00320788

**JULY 21, 2014**

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Project Number: CP00320788

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# SE-311 Invitation for Minor Construction Quotes

## SCBO NOTES 2, 4 and 5 APPLY TO THIS INVITATION FOR QUOTES

PROJECT NAME: USC Baruch Marine Lab Mechanical HVAC Replacement

PROJECT NUMBER: CP00320788 PROJECT LOCATION: Baruch Marine Lab, Georgetown SC

BID SECURITY REQUIRED? Yes  No

PERFORMANCE BOND REQUIRED? Yes  No

PAYMENT BOND REQUIRED? Yes  No  CONSTRUCTION COST RANGE: \$10,000 - \$20,000

**DESCRIPTION OF PROJECT:**

Furnish and Install one (1) nominal 10 ton hundred percent make-up air commercial rooftop heat pump package HVAC unit at the Baruch Marine Lab in Georgetown, SC. Work includes the removal and disposal of one (1) existing 7.5 ton unit. Include all labor, materials, and equipment necessary for complete start up, turn key operation. All bidders are responsible for visiting the site to review work conditions. Small and Minority Business Participation is strongly encouraged.

A/E NAME: Essex Mechanical Engineers A/E CONTACT: Dwight Jones

ADDRESS: 2572 Apple Valley Road Suite 200 PHONE: 404-365-9482 Fax: 404-365-8163

CITY: Atlanta STATE: GA ZIP: 30319 E-MAIL: djones@cssexco.com

PLANS ON FILE AT: AGC: \_\_\_\_\_  
DODGE: Facilities Center \_\_\_\_\_  
OTHER: \_\_\_\_\_

PLANS MAY BE OBTAINED FROM: <http://purchasing.sc.edu> (See Facilities Construction Solicitations & Awards)

PLAN DEPOSIT AMOUNT: \$0.00 IS DEPOSIT REFUNDABLE? Yes  No

PRE-QUOTE CONFERENCE?  Yes  No MANDATORY ATTENDANCE?  Yes  No

DATE: 8/4/2014 TIME: 10 am PLACE: 22 Hobcaw Rd. Georgetown SC, 29442 (Discovery Center)

AGENCY: University of South Carolina

NAME AND TITLE OF AGENCY COORDINATOR: Ms. Aimee Rish, Procurement Specialist II

ADDRESS: 743 Greene Street PHONE: 803.777.2261 Fax: 803.777.7334

CITY: Columbia STATE: SC ZIP: 29208 E-MAIL: arish@fmc.sc.edu

IFQ CLOSING DATE: 8/12/14 TIME: 1pm LOCATION: 743 Greene St. Col. SC 29208

IFQ DELIVERY ADDRESSES:

**HAND-DELIVERY:**

See Mail

**MAIL SERVICE:**

ATTN: Aimee Rish  
University of South Carolina/Bid Enclosed  
743 Greene Street, Columbia SC 29208

IS PROJECT WITHIN AGENCY CONSTRUCTION CERTIFICATION? (Agency MUST check one)  YES  NO

APPROVED BY: \_\_\_\_\_ (State Engineer) \_\_\_\_\_ (Date)

SE-331  
Quote Form

2011 Edition

*Quotes shall be submitted only on SE-331*

QUOTE SUBMITTED BY: \_\_\_\_\_  
(Offeror's Name)

QUOTE SUBMITTED TO: University of South Carolina  
(Agency Name)

FOR PROJECT: CP00320788 USC Baruch Marine Lab Mechanical HVAC Replacement  
(Number) (Name)

**OFFER**

1. In response to the Form SE-311, *Request for Minor Construction Quotes*, and in compliance with the *Instructions to Bidders* for the above-named Project, the undersigned **OFFEROR** proposes and agrees, if this Quote is accepted, to enter into a Contract with the **AGENCY** in the form included in the Solicitation Documents, and to perform all Work as specified or indicated in the Solicitation Documents, for the prices and within the time frames indicated in the Solicitation and in accordance with the other terms and conditions stated.

2. Pursuant to Section 11-32-3030(1) of the SC Code of Laws, as amended, **OFFEROR** has submitted Bid Security as follows in the amount and form required by the Solicitation Documents:

Bid Bond with Power of Attorney     Electronic Bid Bond     Cashier's Check  
(OFFEROR check one, if Bid Security is required)

3. **OFFEROR** acknowledges the receipt of the following Addenda to the Solicitation documents and has incorporated the effects of said Addenda into its Quote:

ADDENDUM No: \_\_\_\_\_

4. **OFFEROR** agrees that this Quote, including all bid alternates, if any, may not be revoked or withdrawn after the opening of bids, and shall remain open for acceptance for a period of 30 Days following the Quote Date, or for such longer period of time that **OFFEROR** may agree to in writing upon request of the **AGENCY**.

5. **OFFEROR** agrees that from the compensation to be paid, the **AGENCY** shall retain as Liquidated Damages the amount of for each calendar day the actual construction time required to achieve Substantial Completion exceeds the specified or adjusted Contract Time for Substantial Completion, as provided in the Contract Documents.

6. **OFFEROR** herewith submits its offer to provide all labor, materials, equipment, tools of trades and labor, accessories, appliances, warranties and guarantees, and to pay all royalties, fee, permits, licenses and applicable taxes necessary to complete the following items of construction work:

6.1 **BASE BID** \_\_\_\_\_  
(enter BASE BID in figures only)

6.2 **ALTERNATE NO. 1** \_\_\_\_\_ to be ADDED/DEDUCTED from BASE BID.  
(circle one)

6.3 **ALTERNATE NO. 2** \_\_\_\_\_ to be ADDED/DEDUCTED from BASE BID.  
(circle one)

FEIN/SSN: \_\_\_\_\_

SC Contractor's License Number: \_\_\_\_\_

Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Telephone/Fax \_\_\_\_\_

E-mail \_\_\_\_\_

This Quote is hereby submitted on behalf of the Offeror named above.

BY: \_\_\_\_\_  
(Signature of Offeror's Representative)

\_\_\_\_\_  
(Print or Type Name of Offeror's Representative)

ITS: \_\_\_\_\_

USC SUPPLEMENTAL  
CONDITIONS FOR WORK AT THE HOBCAW BARONY, GEORGETOWN S.C.

1. Contractor's employees shall take all reasonable means not to interrupt the flow of student traffic in building corridors, lobbies and stairs. All necessary and reasonable safety precautions shall be taken to prevent injury to building occupants while transporting materials and equipment through the building to the work area. Providing safe, accessible, plywood pedestrian ways around construction may be required if a suitable alternative route is not available.
2. Fraternalization between Contractor's employees and USC students, faculty or staff is strictly prohibited - zero tolerance!
3. USC will not tolerate rude, abusive or degrading behavior on the job site. Heckling and cat-calling directed toward students, faculty or staff or any other person on USC property is strictly prohibited. Any contractor whose employees violate this requirement will be assessed a fine of up to \$500 per violation.
4. Contractor's employees must adhere to the University's policy of maintaining a drug-free and smoke-free/tobacco free workplace.
5. Contractor must sign a Contractor Key Receipt/Return form before any keys are issued. Keys must be returned immediately upon the completion of the work. The Contractor will bear the cost of any re-keying necessary due to the loss of or failure to return keys.
6. A welding permit must be issued by the Resident Safety Officer before any welding can begin inside a building. Project Manager will coordinate.
7. Contractor must notify the University immediately upon the discovery of suspect material such as those potentially containing asbestos or other such hazardous materials. These materials **must not** be disturbed until approved by the USC Project Manager.
8. At the beginning of the project, the USC Project Manager will establish the Contractor's lay-down area. This area will also be used for the Contractors work vehicles. No personal vehicles will be allowed in this area, or in any areas surrounding the construction site that are not regular or authorized parking lots. Personal vehicles must be parked in the perimeter parking lots. The lay down area will be clearly identified to the contractor by the PM, with a sketch or drawing provided to Parking. In turn, the contractor will mark off this area with a sign containing the project name, PM name, Contractor name and contact number, and end date. Where this area is subject to foot traffic, protective barriers will be provided as specified by the PM. The area will be maintained in a neat and orderly fashion. Note that access to the freight lift, wheelchair lift, handicap parking spaces, and the driveway to the well house and fire hydrant at the south end of the building must be kept free at all times.
9. Contractor will be responsible for providing its own temporary toilet facilities.

10. Use of USC communications facilities (telephones, computers, etc.) by the Contractor is prohibited, unless prior arrangements are made with the USC Project Manager.
11. For all projects over \$100,000, including IDC's, an SE-395, Contractor Performance Evaluation, will be completed by the USC Project Manager and reviewed with the GC at the beginning of the project and a copy given to the GC. At the end of the project the form will be completed and a Construction Performance rating will be established.
12. Contractor is responsible for removal of all debris from the site, and is required to provide the necessary dumpsters which will be emptied at least one (1) times per week. Construction waste must not be placed in University dumpsters. The construction site must be thoroughly cleaned with all trash picked up and properly disposed of on a daily basis and the site must be left in a safe and sanitary condition each day. The University will inspect job sites regularly and will fine any contractor found to be in violation of this requirement an amount up to \$1,000.00 daily per violation.
13. Contractor must provide all O&M manuals, as-built drawings, and training of USC personnel on new equipment, controls, etc. prior to Substantial Completion. Final payment will not be made until this is completed.
14. Tree protection fencing is required to protect existing trees and other landscape features to be preserved within a construction area. The limits of this fence will be evaluated for each situation with the consultant, USC Arborist and USC Project Manager. The tree protection fence shall be 6' high chain link fence unless otherwise approved by USC Project Manager. No entry or materials storage will be allowed inside the tree protection zone. A 3" layer of mulch shall be placed over the tree protection area to maintain moisture in the root zone if USC Arborist determines that construction may decrease amount of moisture needed to sustain health of tree(s).
15. All large vehicle traffic to include cranes and material deliveries need to be coordinated with the USC Project Manager or designated official on site. Preferred access of such vehicles will be identified to the contractor as required before access will be granted. A path of minimum size must always be used and marked to reduce the damage to the lawn and landscaping. Items on the property damaged due to unnecessary vehicle traffic will be repaired or replaced at the contractor's expense.
16. Contractor shall water trees and other landscape material as directed by USC Arborist until site is returned to Owner.
17. Where it is necessary to cross walks, tree root zones (i.e., under canopy) or lawns the following measures shall be taken: For single loads up to 9,000 lbs., a 3/4" minimum plywood base shall be placed over areas impacted. For single loads over 9,000 lbs., two layers of 3/4" plywood is required.
18. For projects requiring heavy loads to cross walks, tree root zones or lawns on a regular

basis (as determined by USC Project Manager), a construction entry road consisting of 10' X 16' oak logging mats placed on 12" coarse, chipped, hardwood base. Mulch and logging mats shall be supplemented throughout the project to keep matting structurally functional.

19. Any damage to existing landscaping (including lawn areas) will be remediated at Contractor's expense before final payment is made.
20. Any damage to existing conditions, including but not limited to, of the attic space framing and ductwork, will be remediated at the Contractor's expense at the time of such occurrence and before final payment.
21. All power outages or shut-downs for the transferring of electrical feeds to associated equipment from the existing panels to the new panels are to be coordinated with the USC Project Manager and USC's on site staff. The Contractor is to provide a minimum of 72 hours notice and such work may be required to be done outside of regular working hours (after 4pm) or during the weekend in accordance with USC's requirements with ongoing research and functions occurring within the building during the duration of the project scope. The Contractor is to prepare and provide a phasing plan associated with the anticipated electrical shut downs.
22. The interior spaces of the building are to be protected against storm water intrusion during the project duration. The Contractor is to prepare and provide a phasing plan associated with the sequencing of exposed areas of the roof or provide means of an effective secondary roofing system during the replacement of the existing roof assembly.

### **Contractor Vehicle Requirements on Campus**

1. This project is located on the private property of the Belle W. Baruch Foundation (BWBF). All who access the site are subject to the rules and regulations of the BWBF. Access to the site is through an electronic gate off the main entrance. All contractors and subcontractors will need to sign for cards allowing access to the site. All motorized vehicles on the University campus are expected to travel and park on roadways and/or in parking stalls.
2. All motorized vehicles that leak or drip liquids are prohibited from entering the area. This is an environmentally protected and sensitive research site. No fuel or other potentially hazardous material will be stored on site. All precautions and effort must be taken to ensure that such substances are not spilled when in use. All materials and containers must be removed from the site immediately and all areas must be cleaned at the end of each working day.
3. Contractors, vendors, and delivery personnel are required to obtain prior parking authorization before parking in a designated space. Parking and storage space will be designated by USC Project Manager and or on site officials.
4. Drivers of equipment or motor vehicles that damage university hardscape or landscape

will be held personally responsible for damages and restoration expense. Special provisions will be communicated to the contractor when traversing the single lane access road.

5. Vehicle drivers who park on landscape or drives must be able to produce written evidence of need or emergency requiring parking on same.
6. All vehicles parked on landscape, hardscape, or in the process of service delivery, must display adequate safety devices, i.e. flashing lights, cones, signage, etc.
7. All drivers of equipment and vehicles will be respectful of University landscape, equipment, structures, fixtures and signage.
8. All incidents of property damage will be reported to Parking Services or the Work Management Center.



Project Name: USC Baruch Marine Lab Mechanical HVAC Replacement

Project Number: CP00320788

University of South Carolina

**CONTRACTOR'S ONE YEAR GUARANTEE**

STATE OF \_\_\_\_\_

COUNTY OF \_\_\_\_\_

WE \_\_\_\_\_  
as General Contractor on the above-named project, do hereby guarantee that all work executed under the requirements of the Contract Documents shall be free from defects due to faulty materials and /or workmanship for a period of one (1) year from date of acceptance of the work by the Owner and/or Architect/Engineer; and hereby agree to remedy defects due to faulty materials and/or workmanship, and pay for any damage resulting wherefrom, at no cost to the Owner, provided; however, that the following are excluded from this guarantee;

Defects or failures resulting from abuse by Owner.

Damage caused by fire, tornado, hail, hurricane, acts of God, wars, riots, or civil commotion.

\_\_\_\_\_  
[Name of Contracting Firm]

\*By \_\_\_\_\_

Title \_\_\_\_\_

\*Must be executed by an office of the Contracting Firm.

SWORN TO before me this \_\_\_\_\_ day of \_\_\_\_\_, 2\_\_\_\_ (seal)

\_\_\_\_\_ State

My commission expires \_\_\_\_\_

**DIVISION 1 – GENERAL REQUIREMENTS**

**University of South Carolina**

**Belle W. Baruch Marine Field Laboratory, Georgetown, SC**

**USC Baruch Marine Lab Mechanical HVAC Replacement**

**CP00320788**

**Furnish and Install One (1) Nominal 10 ton 100 percent Make-up Air  
Commercial Rooftop Heat Pump Package HVAC Unit.**

**General Description** – The University of South Carolina is accepting bids for the removal of an existing 7.5-ton rooftop Air Conditioning Systems; and the installation of one (1) new 10-ton self-contained heat pump package rooftop HVAC unit with 100 percent make-up air. This project is located at the Belle W. Baruch Marine Research Laboratory in Georgetown, South Carolina. This facility was constructed in 1991 and is a wooden structure on timber piles directly off the east coast. The HVAC unit to be replaced is located on the roof in the mechanical well. This project requires a complete turnkey installation of the new unit in the same location as the old. Also included are all the necessary electrical and mechanical items required to bring the new 10 ton unit online and in full operation.

The Contractor will be responsible for the following:

**Removal & Disconnection:**

- One (1) existing 7.5 ton HVAC unit from rooftop. Work will require electrical disconnect and disconnect from existing duct system.
- The roof system was recently redone so any and all penetrations must be sealed to include abandoned penetrations following the removal of the old unit.
- Contractor is responsible for any damage to the roof.

- Contractor responsible for any new curbing, or curbing adapters needed to accept the unit to be provided.

**Furnish and Install the following:**

- One (1) new nominal 10 ton hundred percent make-up air commercial rooftop heat pump package HVAC unit.
- Include with the unit two (2) new lockable programmable thermostat controls.
- Any modifications to the existing curb required for new HVAC must first be approved by owner.
- Connect to and test existing electronic smoke detection system in the air return ductworks for fire code compliance. Smoke detection systems **must shut entire HVAC system down** in the event smoke is detected.
- Include new condensate drain network to positively drain on existing roof system into roof scuppers.
- The system must **meet or exceed** the manufacturer's cooling, heating, and ARI Sound Rating performance data as provided below.
- Units shall be equipped with corrosion resistant outside coil material or coils coated with factory applied anti-corrosive coating. Corrosion resistance must meet or exceed ASTM B117.85 standards. This is required by Santee Cooper for units located within ½ mile of ocean front.
- Include all labor, materials, and equipment necessary to remove the existing unit, and install the new unit for complete start-up operation. Heavy equipment may be needed to remove existing unit and install new unit. Any cost associated with leasing, or renting equipment to include any cost associated with the licensed operator must be included within bid.
- Should a crane be used, the operator must be properly licensed and the crane must have all necessary documents to include recent load test in order to be used on government property.

- Include within your bid issuing to the owner all service manuals along with the time required to cross train one facility staff member on digital controls and basic service requirements for the new unit.
- Include a one-year labor and parts warranty.
- Include a 5-year Manufacturer's warranty of HVAC unit submitted with bid.
- Contractor must provide three references on projects completed of similar complexity and magnitude.
- Contractor must submit proposed schedule of installation to include completion date.
- Contractor must possess all required certifications, licenses, and insurance to perform this work.
- The entire membrane roof system was replaced in July of last year and must not be damaged in any way. Any damages due to this work will be the responsibility of the contractor to repair.
- Contractor is responsible for any and all damages to sidewalks, buildings, roof, landscaping, etc. as a result of negligence.

**Minimum System Specification Requirements:**

**NOTE: THE PROPOSED HVAC UNIT MUST MEET OR EXCEED THE MINIMUM SPECIFICATIONS OUTLINED IN THE ATTACHED DOCUMENT PREPARED BY ESSEX MECHANICAL ENGINEERS. SHOULD ANY INFORMATION CONTAINED IN THIS DOCUMENT CONFLICT WITH STANDARD SPECIFICATIONS THE CONTRACTOR HAS THE RESPONSIBILITY TO MEET OR EXCEED THE PERFORMANCE SPECIFICATIONS PROVIDED.**

**SUBSTITUTIONS ARE ALLOWED BUT MUST BE APPROVED AND ACCEPTED BEFORE ANY AWARD CAN BE ISSUED.**

**All bidders are strongly encouraged to visit the site to review existing work conditions. Failure to visit the site will not be an excuse to fulfill the scope outlined in this document. Any contractors requesting to make a site visit outside the scheduled pre-con may contact Paul Kenny at (843) 904-9028.**



**FRONT VIEW OF MARINE RESEARCH FACILITY. RED ARROW SHOWS HVAC LOCATION**



**OVER HEAD VIEW OF MECHANICAL WELL ON ROOF. RED ARROW SHOWS HVAC LOCATION**



**Existing 7.5 ton to be removed and replaced with new 10 ton HVAC unit**



**POSSIBLE LOCATION FOR CRANE LOCATED ON THE SIDE OF BUILDING**

**University of South Carolina  
College of Arts and Sciences  
Baruch Marine Field Laboratory  
Georgetown, South Carolina**

**Make-up Air Handling Unit Replacement**

This work shall include the removal and replacement of a packaged roof top 100% make-up air handling unit located on the roof of the USC Baruch Marine Field Laboratory (BMFL) in Georgetown, South Carolina. Heating and cooling capacities shall be as scheduled below. The air handling unit is located on the flat part of the mansard roof and will need to be lifted onto the roof. Personnel access to the roof is by stairs up to thru Observation Tower. Specific scope of work shall include but not necessarily limited to the following:

1. Coordinate shutdown and replacement of the roof top air handling unit with USC BMFL facilities department. Unit replacement must be planned to accommodate USC BMFL schedule.
2. Provide ½" plywood sheeting around the unit to be replaced for roof protection.
3. Cut off power to the affected unit at the electrical panel board and disconnect power supply to air handling unit.
4. Disconnect condensate drain from the air handling unit.
5. Disconnect supply air ductwork.
6. Remove existing air handling unit. Inspect and clean inside of curb. Confirm that there are no leaks or punctures in the curb flashing.
7. Reinstall new air handling unit on the existing curb. If curb adaptor is required install insulated waterproof curb adaptor before installing the air handling unit. Curb adapter cannot raise the height of the unit more than 8".
8. Reconnect supply air ductwork.
9. Provide new breaker in panel board NH1 located on the roof, extend power wiring in conduit to new air handling unit, and provide a NEMA 3R disconnect switch.
10. Remove the existing thermostat located in the Corridor and provide the following control capability. Replace the existing thermostat with a
11. Provide system start-up and check-out in accordance with manufacturer's recommendations.
12. Provide operator and maintenance training for USC BMFL facilities personnel.
13. Provide copies of shop drawings and operating and maintenance manuals in a bound folder.

	<b>Ent Air</b>	<b>Lvg Air</b>	<b>Sensible MBH</b>	<b>Total MBH</b>	<b>CFM</b>	<b>Htg</b>	<b>Power</b>
AHU-2	105F DB/ 78F WB	54.7F DB/ 54.7F WB	93.6	138.5	1,700	40KW	480V/3Phase

2572 Apple Valley Road, Suite 200  
Atlanta, Georgia 30319 – 3527  
404 365 9482 (tel) • 404.365.8163 (fax)

4611 Hard Scrabble Road, Suite 109-364  
Columbia, South Carolina 29229  
803 273 9910 (tel) • 803 873 9913 (fax)

## SECTION 23 74 13

## DEDICATED OUTDOOR AIR HANDLING UNIT (PACKAGED)

## A. GENERAL

## A.01 SECTION INCLUDES

- A. Packaged outdoor air handling unit.
- B. Heat exchanger.
- C. Refrigeration components.
- D. Unit operating controls.
- E. Roof curb.
- F. Electrical power connections.
- G. Operation and maintenance service.

## A.02 REFERENCES

- A. NFPA 90 A & B - Installation of Air Conditioning and Ventilation Systems and Installation of Warm Air Heating and Air Conditioning Systems. (all)
- B. ETL Listed and Labeled
- C. ANSI/ASHRAE 15 - Safety Code for Mechanical Refrigeration.
- D. Standard for Safety Heating and Cooling Equipment-Third Edition, UL 1995/CSA C22.2 236-05, dated February 18, 2005, with revisions through July 30, 2009.
- E. ANSI/ASHRAE/IESNA 90.1-2010 - Energy Standard for New Buildings Except Low-Rise Residential Buildings.
- F. ANSI Z21.47/UL1995 - Unitary Air Conditioning Standard for safety requirements.
- G. ANSI/NFPA 70-1995 - National Electric Code. (all)



**A.03 SUBMITTALS**

- A. Submit unit performance data including: capacity, nominal and operating performance.
- B. Submit Mechanical Specifications for unit and accessories describing construction, components and options.
- C. Submit shop drawings indicating overall dimensions as well as installation, operation and services clearances. Indicate lift points and recommendations and center of gravity. Indicate unit shipping, installation and operating weights including dimensions.
- D. Submit data on electrical requirements and connection points. Include recommended wire and fuse sizes or MCA, sequence of operation, safety and start-up instructions.

**A.04 DELIVERY, STORAGE and HANDLING**

- A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.
- B. Protect units from physical damage. Leave factory shipping covers in place until installation.

**A.05 WARRANTY**

- A. Provide five year parts and labor warranty from date of shipment.

**A.06 MAINTENANCE SERVICE**

- A. As an alternate provide a price for providing maintenance service as specified below:
  - 1. Furnish complete parts and labor service and maintenance of packaged outdoor air handling unit for one year from Date of Substantial Completion by a service engineer in direct employment of the manufacturer. Agents for the manufactured unit are not acceptable.
  - 2. Provide maintenance service with a two month interval as maximum time period between calls.
  - 3. Include maintenance items as outlined in manufacturer's operating and maintenance data.

4. Submit copy of service call work order or report and include description of work performed.

## A.07 REGULATORY REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for Intended use.
- B. ASHRAE Compliance: 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."

## A.08 EXTRA MATERIALS

- A. Provide one set of additional filters to be installed by the contractor after acceptance by Owner.

## B. PRODUCTS

### B.01 SUMMARY

- A. The contractor shall furnish and install a packaged outdoor air handling unit as indicated by the attached written scope of work and as specified herein. The unit(s) shall be installed in accordance with this specification and perform at the specified conditions as scheduled.

### B. APPROVED MANUFACTURERS

1. Trane Inc.
2. York International Corporation/JCI:
3. Dectron:
4. Desert Aire:

### B.02 GENERAL UNIT DESCRIPTION

- A. Unit furnished and installed shall be self-contained packaged outdoor air

handling unit as described this section of specifications. Unit shall consist of insulated weather-tight casing with compressor(s), air-cooled condenser coil, condenser fans, evaporator coil, hot gas reheat, air filters, supply motors, motor operated outside air damper and unit controls

- B. Before shipment, the unit shall be leak tested, dehydrated, charged with refrigerant (R-410A) and compressor oil, and factory run tested for proper control operation.
- C. The condenser coils must be aluminum fin, mechanically bonded to copper tubing.
- D. Direct-drive, vertical discharge condenser fans must be provided with built-in thermal overload protection.
- E. Unit shall have labels, decals, and/or tags to aid in the service of the unit and indicate caution areas.
- F. Unit shall be dedicated down flow.
- G. Wiring internal to the unit shall be colored and numbered for identification.

## B.03 UNIT CASING

- A. Cabinet: Zinc-coated, heavy gauge, galvanized steel. Exterior surfaces shall be cleaned, phosphatized, and finished with a weather-resistant baked enamel finish. Unit's surface shall be tested 672 hours in a salt spray test in compliance with ASTM B45. Structural members shall be a minimum of 16 gauge with access doors and removable panels of minimum 20 gauge.
- B. Panels: 2" double-wall foamed panel construction throughout the indoor section of unit to provide nonporous, cleanable interior surfaces. All interior seams exposed to airflow shall be sealed.
- C. Insulation: 2" polyisocyanurate Foam metal encapsulated with no exposed edges. Initial R value of 6.6 per inch of thickness.
- D. Cabinet construction shall provide access panels for all parts requiring service.
- E. Cabinet top cover shall be one piece construction or where seams exist, it shall be double-hemmed and gasket-sealed.

- F. Panels: Water- and air-tight hinged panels with handles shall provide access to filters, heating section; optional ERV and power exhaust fan section, supply air fan section, evaporator coil section, and unit control section. Door hardware shall be oriented to allow the door swing to be reversed.
1. Latches with hold down hooks will be factory installed on hinged access doors.
- G. Unit shall include a motor operated outside air damper assembly constructed of galvanized steel, and air foil blades with rubber edge seals. Damper blades shall be designed to have no more than 4 cfm of leakage per sq ft of damper area and shall exceed ASHRAE 90.1 requirements. Linkage shall be concealed out of airstream, within the damper frame to reduce pressure and noise. Damper assembly shall be controlled by a spring return two position for fully modulating actuator. Dampers shall not be sized for air velocities exceeding 2000 fpm.
  - H. Type 304 Stainless steel drain pan sloped in two directions to ensure positive drainage. Pan shall have a minimum depth of 2". Seams exposed to standing water shall be welded liquid tight. Base of pan shall be insulated with 1" thick foam insulation.
  - I. Provide openings either on side of unit or thru the base for power, control and gas connections.
  - J. Optional corrosion inhibiting coatings available for the unit exterior, interior and coils. Interior liner 304 stainless with seams sealed with caulk.
  - K. Coil Coating: Coil will have a flexible epoxy polymer e-coat uniformly applied to all coil surface areas with no material bridging between fins. The coating process will ensure complete coil encapsulation and a uniform dry film thickness from 0.6 – 1.2 mills on all surface areas including fin edges and meet 5b rating cross hatched adhesion per ASTM B3359- 93. Corrosion durability will be confirmed through testing with no less than 5,000 hours salt spray resistance per ASTM B117-90 using scribed aluminum test school coupons
  - L. The base of the unit shall have provisions for forklift and crane lifting

## B.04 POWER WIRING

- A. Field wiring access to be provided thru unit base into isolated enclosure with removable cover.

- B. Power wiring to be single point connection.
- C. Unit shall be factory wired to field wiring terminal block mounted in isolated enclosure.
- D. Factory wired main power disconnect device, overcurrent and SCCA rated for total unit power connection.
- E. Factory installed safety barrier shall isolate all high voltage components, mounted inside electrical compartment, to protect service personnel from incidental contact.
- F. Factory wired Phase monitor shall be included as standard.
- G. Factory to mount and wire 120 volt convenience outlet.

#### B.05 .LOW VOLTAGE CONTROLS

- A. Factory wired 24 volt control system complete with required transformers and fusing.
- B. Main Control Module (MCM) shall prevent simultaneous operation of any modes and shall enable operation in Dehumidification, Cooling, or Heating mode based on programmed settings
- C. MCM shall accept separate setpoints for Occupied and Unoccupied states.
- D. MCM shall control based on dew point design settings for Dehumidification mode, and sensible temperature settings for heating and cooling modes.
- E. MCM shall have onboard clock and scheduling function for occupancy.
- F. MCM shall include non-volatile memory to retain all programmed values without the use of a battery, in the event of a power failure.
- G. Factory installed and wired sensors shall monitor Outdoor Air (OA) temperature, humidity and evaporator leaving air temperature. Supply air sensor shall be furnished with unit. Installing contractor shall install remote mounted supply air sensor in supply air duct and field wire to the unit.
- H. Space temp and humidity sensor shall be furnished and field wired to unit by the contractor.

- I. Fully modulating hot-gas reheat shall be enabled in dehumidification mode and cooling mode with modulation controlled by MCM to maintain (supply air temperature / space temperature).
- J. System controls shall include anti-cycle timing and minimum compressor run/off-times.
- K. Systems controls shall be digital, programmable type with access via factory installed and wired touchscreen, or through portable computer connection. All setpoints, unit functions, and status shall be accessible via the touchscreen or portable computer.
- L. Factory wired smoke detector.
- M. All low voltage field wiring connections shall be made at factory installed low voltage terminal strip.

## B.06 FANS AND MOTORS

- A. Indoor fan shall be direct drive plenum fan, factory installed and wired to on-board Variable Frequency Drive and shall be equipped with slide out service access.
- B. All fan motors shall be premium efficiency ODP and meet the U.S. Energy Policy Act of 2005/10 (EPACT).
- C. All fan motors shall either be permanently lubricated and have internal thermal overload protection.
- D. Outdoor fans shall be direct drive with premium efficiency motors, statically and dynamically balanced, draw through in the vertical discharge position.
- E. Provide shafts constructed of solid hot rolled steel, ground and polished, with key-way, and protectively coated with lubricating oil.

## B.07 MODULATING ELECTRIC HEATING SECTION

- A. The unit shall have fully modulating, SCR controlled, electric heat. The primary heating section will include finned tubular heating elements, automatic and manual cut-outs, low voltage controls, air proving switch, maximum 48 amps per circuit and fusing for heaters over 48 amps.

- B. Heater shall be internal to unit cabinet and downstream of the evaporator fan.
- C. Heater shall be UL or CSA listed and approved and provide single point power connection.

#### B.08 EVAPORATOR CONDENSOR AND REHEAT COILS

- A. Evaporator and hot gas reheat coils shall be constructed of copper tubes mechanically bonded to a configured aluminum plate fin.
- B. Coils shall be leak tested at the factory to ensure pressure integrity. The evaporator coil, reheat coil and condenser coil shall be leak tested to 500 psig and pressure tested to 500 psig.
- C. The condenser coil shall have a fin designed for ease of cleaning.
- D. Evaporator coil shall have six interlaced rows for superior sensible and latent cooling with a maximum of 12 fpi.
- E. Reheat coil shall be fully integrated into the supply air and fan system and capable of delivering design supply air temperature.
- F. To prevent re-hydration of condensate from evaporator coil, the evaporator coil face and the hot gas reheat coil face shall be separated a minimum of six inches.
- G. Condenser coil shall be provided with factory installed hail guards.
- H. Unit shall be equipped with an adjustable 6" filter rack upstream of the evaporator to match the filter requirements specified in the Air Filtration section

#### B.09 CONDENSER SECTION

- A. Outdoor Fans: vertical discharge, direct drive fans constructed of glass reinforced polypropylene blades. Fans shall be low-noise and corrosion resistant. Other fan construction is not acceptable.
- B. Fans shall be statically balanced.

#### B.10 REFRIGERANT CAPACITY CONTROL

- A. Scroll compressors shall be equipped with Refrigerant Capacity Control (RCC) on the lead circuit to modulate compressor capacity during

Dehumidification or Cooling modes to maintain evaporator  
Dehumidification or Cooling setpoint and prevent evaporator frosting or  
freezing. Modulation shall be to 30% of the compressors nominal  
capacity. Hot gas by pass is not acceptable as a capacity control.

- B. The RCC setpoint is factory set, and field adjustable, to maintain desired suction pressure and compressor discharge pressure.
- C. Capacity control for units equipped with digital scroll compressors, or variable speed compressors, shall be accomplished through a 0-10V signal by the MCM to the compressor controls.

## B.11 REFRIGERATION SYSTEM

- A. Compressor(s): All units shall have direct-drive, hermetic, scroll type compressors or digital scroll with centrifugal type oil pumps.
- B. Motor shall be suction gas-cooled and shall have a voltage utilization range of plus or minus 10 percent of unit nameplate voltage.
- C. Internal overloads shall be provided with the scroll compressors.
- D. Each compressor shall have a crankcase heater to minimize the amount of liquid refrigerant present in the oil sump during off cycles.
- E. Each compressor shall be mounted on rubber vibration isolators, to reduce the transmission of noise.
- F. Provide each unit with hermetically sealed refrigerant circuit(s) factory-supplied completely piped with liquid line filter-drier, liquid line charging port, suction and liquid line pressure ports, sight glass, and thermal expansion valve.
- G. Provide each circuit with automatic reset high and low pressure switches for safety control.

## B.12 CONTROL SYSTEM COMPONENTS

- A. Provide a unit mounted control interface module. The interface module with necessary controls and sensors shall all be factory mounted. Through this interface module, all air handling unit controls functions (specified in Sequence of Operation below) shall be performed
- B. Control Functions: Occupied/unoccupied mode, conditioning mode set points, discharge air set point adjustment, and alarm shutdown



- C. Diagnostic Functions: Include supply fan status, filter status, outside air damper status.
- D. Provide capabilities for Boolean Processing and trend logs as well as "templated" reports and logs.
- E. Provide wall mounted thermostat with digital readout.
- F. Provide wall mounted humidistat.
- G. Provide tamper proof/limited access covers for both thermostat and humidistat.

#### B.13 ROOF CURB

- A. Unit shall be installed on the existing 12" high curb. If curb adaptor is required contractor shall provide an insulated curb adaptor. Curb adaptor cannot raise the height of the unit more than 8"
- B. Curb shall be manufactured in accordance with the National Roofing Contractors Association guidelines.

### C. EXECUTION

#### C.01 EXAMINATION

- A. Contractor shall verify that the existing roof curb is ready to receive work and opening dimensions are adequate for the unit.
- B. Contractor shall verify that proper power supply is adequate to supply the unit.

#### C.02 INSTALLATION

- A. Contractor shall install in accordance with manufacturer's instructions.
- B. Mount unit on factory built roof mounting frame providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

#### C.03 MANUFACTURER'S FIELD SERVICES

- A. Factory authorized start up commissioning.
- B. The contractor shall furnish manufacturer complete submittal wiring

diagrams of the package unit as applicable for field maintenance and service.

## D. SEQUENCE OF OPERATIONS

### D.01 DEDICATED OUTDOOR AIR HANDLING UNIT

A. Microprocessor controller – Air Handling Unit shall be controlled by a stand-alone microprocessor based controller with resident control logic. The controller shall have capability to interface with the BAS (BACNET or LONworks) and the inputs and outputs in the points list to accomplish the following temperature control and energy conservation strategies.

1. Occupied Discharge Air Control Mode - All unit functions will be enabled for normal heating and cooling operation to maintain supply air heating /cooling discharge air setpoints.
  2. Occupied Space Temperature Control - When in occupied mode the dedicated unit control shall operate stages of heating, cooling, and dehumidification to maintain space temperature and space dewpoint setpoint. Setpoints may be set by one of the following methods:
    - a. Locally through remote mounted unit ROD
  3. Unoccupied Space Temperature Control - When in unoccupied mode, the dedicated unit control shall operate stages of heating and cooling to maintain space temperature and space dewpoint setpoint. Setpoints may be set by one of the following methods;
    - a. Locally through remote mounted unit ROD
- B. Low Ambient Compressor Lockout - Compressor operation shall be disabled below a user defined outdoor air temperature.
- C. Supply Air Tempering - When the unit is in the heat mode, but not actively heating, outdoor air heat set point will continue heat operation to maintain a minimum discharge air heating temperature setpoint and prevent heater cycling.

END OF SECTION