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Tacoma, Washington 98402
(253) 798-7456

ADDENDUM NO. 01 - BID NO.1907
SPRINKER RECREATION CENTER DEHUMIDIFICATION SYSTEM REPLACEMENT

ADDENDUM DATE: June 27, 2017

BID DUE DATE: JUNE 30, 2017

To all Bidders: Attention is called to the following items effective June 27, 2017, which shall be added to, deleted from, or revised from the CONTRACT DOCUMENTS for Pierce County Bid #1907, thereby incorporating the addendum as part of the CONTRACT DOCUMENT

1. Question:

- **Is there an engineer's estimate?**
- **Answer:** The engineer's estimate for this project is \$460,000.00 (Not Including Sales Tax).

2. Question:

- **Who is the electric service provider for the building?**
- **Answer:** Elmhurst Electric.

3. Question:

- **What equipment can be used on the ice?**
- **Answer:** Equipment up to 5,000 lbs can be operated on the ice. Equipment operated on the ice must have large or wide tires to prevent it from creating ruts in the ice sheet.

4. Question:

- **Who has been used in the past to dispose the chemicals in the existing Dehumidifiers?**
- **Answer:** Northern Environmental (see Specification Revisions below for contact information)

5. Scope Clarification:

- **Demo and removal associated with the demo and removal of the existing dehumidification unit on the north side of the ice rink:** In addition to the scope of work shown in the drawings and specification, demo slab and turn fencing over to Owner. See complete requirements at Drawing revisions to Sheet M1.1 below.

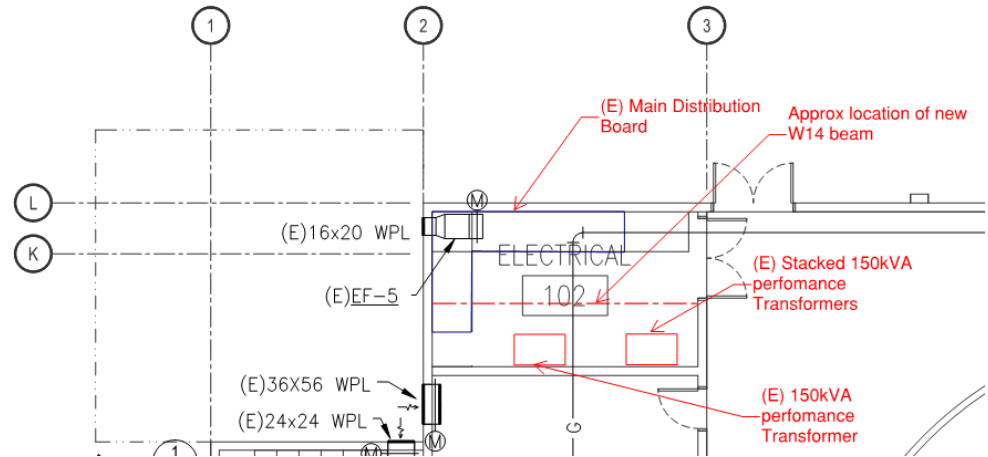
6. Revisions:

- **The following revisions have been made to the specification sections:**

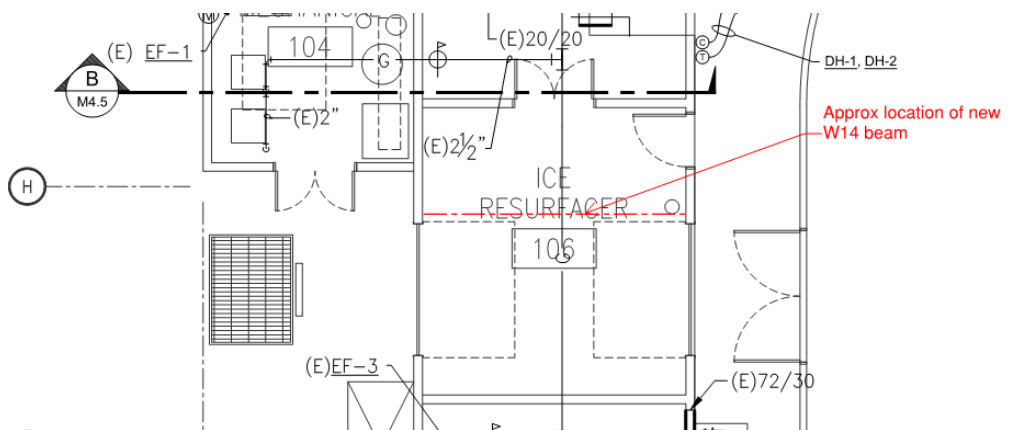
1. Section 01 11 00
 - a. Paragraph 1.3, D, 1, **ADD** the following: "A General Permit (Permit number 863531) has been applied for with the County, and is expected to be ready for pickup by the Contractor at Notice to Proceed."
2. Section 20 05 03
 - a. Paragraph 3.01H, **ADD** the following: "The existing dehumidifiers contain Lithium Chloride, which needs to be disposed of properly. In the past, the County has used the following company to handle such disposal: Northern Environmental, 2661 N Pearl Street #145, Tacoma, WA 98407"
3. Section 20 05 19
 - a. **DELETE** Pages 6 and 7.
4. Section 23 37 00
 - a. Paragraph 2.04C, **REVISE** to read as follows : "C. Wall Return Grille (WRG): Aluminum heavy duty grille, 3/8-inch blade spacing, 0-degree deflection, 16-gauge border, 14-gauge blades. Titus 30RL, or equal."
 - b. Paragraph 2.03, **ADD** the following: "D. Drum Louver (DL): Aluminum construction, split vane type, with adjustable vertical blades and rotating drum body. Unit shall have outer frame borders 1-1/4-inch wide, with mitered corners, and perimeter gasket to prevent air leakage. itus DL-SV Series (or approved equal)."
5. Section 23 81 46
 - a. **REPLACE** entire section with the attached (7 pages).
6. Section 25 50 00
 - a. Paragraph 1.06,J,3, **DELETE** text "40 hours" in the first line.
 - b. Paragraph 1.06,J,5, **DELETE** paragraph.
 - c. Paragraph 2.02,A, **ADD** the following: "Contact Sheri Ojendyk (425) 251-9680."
 - d. Paragraph 3.01,G, **REVISE** to read as follows: "G. Dehumidifiers: Dehumidifiers to be supplied with temperature and humidity transmitter and CO2 monitor; Div 25 contractor shall mount close to or in the return duct. Provide access to controls. In addition, provide a CO and NO2 monitor to be mounted 18-inches to 32-inches above the floor close to the resurfacer access door to the ice sheet. Provide suitable protective guard for sensor."
 - e. Paragraph 3.02, **ADD** the following: "C. Relief Air Motorized Dampers: Commanded position."
7. Section 25 90 00
 - a. **REPLACE** entire section with the attached (5 pages).

- **The following revisions have been made to the Drawings:**

1. Sheet M0.2, Air Inlet & Outlet Schedule, **ADD** the following: “WRG; Wall Return Grille; Titus 30R; Aluminum Double Deflection Type”
2. Sheet M1.I: Near Grid 13-L, **ADD** Demolition of existing 6-inch thick concrete pad at Existing DH-3, and Salvage and remove the chain link fence and gate surrounding the unit in a manner that it can be reused by the owner. This includes the surface mount brackets for the fence posts. Store the salvaged chain link fence and gate in the contractor laydown area.
3. Sheet ME4.1, in Ice Elec 102, **ADD** locations of existing transformers, Main Distribution Board, and W14 beam as shown in the not to scale sketch below:



4. Sheet ME4.1, in Electrical 102: **ADD** the following note: “To accommodate new W14 installation, Remove and offset 3 each existing conduits, 2”C(4#3/0 CU CU GND). These existing conduits serve performance transformers located within the space that the Owner is not using at this time but will in the future. Also, remove and offset 2-inch schedule 40 steel gas line and ¾-inch domestic cold water line up to accommodate new W14 installation”
5. Sheet ME4.1, in Ice Resurfer 105, **ADD** location of W14 beam as shown in the not to scale sketch below:



6. Sheet ME4.1, in Ice Resurfer 105: **ADD** the following note: “At Contractor’s option, the new W14 may be installed just north of the overhead doors. To accommodate new W14 installation, Cut and offset existing 2-inch Non-potable water line , 1-inch natural gas line, and 3 ea 3/4-inch conduits with 4#10. Included in bid”

7. Sheet M4.2: East of DH-2: **ADD** the following note: "Demo the existing conduit and circuit serving the convenience outlet on the wall above the roof to allow the new HVAC duct; outlet may remain but conduit needs to be re-routed. Assume 50 feet ¾-inch conduit with 4#10 in bid."
8. Sheet M4.2, near grid 2, at return grille for DH-1 and return grille for DH-2, **ADD** the following note: 30x48 WRG 5500"
9. Sheet M4.2, near grid 13-L, **REVISE** the note at the existing return opening to read: "Provide new 32x32 WRG 2000 at the location of the existing, mount a 32x32 motorized damper behind, and mount a 32x32 Wall Louver on the outside. "
10. Sheet M4.2, near grid 13-L, **REVISE** the note at the existing supply opening to read: "Provide 30x30 WRG 2000 at location of supply duct, mount a 30x30 motorized damper behind, and mount a 30x30 Wall Louver on the outside."
11. Sheet M4.2: **ADD** the following General Notes:
 1. New duct penetrations are at the same locations as existing, but the ducts are taller. Provide added sawcutting at supply and return penetrations through walls. Existing duct widths are the same as existing to avoid the need to revise structural framing, but the return connections ducts are 20-inches taller than the existing (52"H vs 32"H), and the supply connections are 4-inches taller (34"H vs 30"H).
 2. Ductwork routed outside the building shall be cross-broken on the top for drainage and shall have 2-inch lining.
12. Sheet M4.4, Lower Roof Plan – Demo: **REVISE** the note regarding the existing support frame below the existing units to indicate that the existing supports frames are existing to be re-used, as noted on the structural plans.
13. Sheet M4.4: **ADD** the following General Notes:
 1. Rigidly anchor DH-1 and DH-2 to support frames. Either weld at three locations per side, or provide clips, three on each side of each unit, welded to support frame, and bolted to the base frame of the DH units.
 2. Stair treads shall be of galvanized steel, min 3 treads (run of 9" and rise of 8" each), welded to the access platform.
14. Sheet S1.0, Detail 4: **ADD** Access Platform (ref Sheet M4.4) via the following: Extend W10x12 frame for the access platform using similar detailing method as the platform for the dehumidifiers. Provide W10x12 beam on the west edge with 4" pipe post over each W14x22 roof beam. Provide W10x22 cross beam extension in line over the roof beams. Create ledger support for the planking.
15. Sheet S1.0, **ADD** the following General Note: "The new W14s are to be installed at an elevations below the roofdeck (approx. 4 feet, to be field verified). The 4-inch X-Strong pipes will be longer than shown here to suit, with an added 3x3x1/4 angle between the two posts just below the roofline. Otherwise, bid as shown on these plans."

7. Additional Information:

- **Pre-Bid Meeting Sign In Sheet:** Attached to this addendum is the Pre-Bid Sign in Sheet from the Pre-Bid Meeting on Tuesday, June 20th at 1:00pm.

Thank you for your continued interest in serving Pierce County.

/s/KEN MATTHEWS
Purchasing Agent

PLEASE INDICATE YOUR RECEIPT OF THIS ADDENDUM BY INDICATING ON THE BID FORM

ATTACHMENTS:

Attachment A – Section 23 84 16

Attachment B – Section 25 90 00

Attachment C – Pre-bid Sign In Sheet

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.
- B. Requirements of Section 20 05 00 apply to this Section.

1.02 WORK INCLUDED

- A. Dehumidifiers.
- B. Start-Up.
- C. Owner Training.

1.03 SUBMITTALS

- A. General: Submittals shall comply with Section 20 05 00.
- B. Product Data: Submit manufacturer's product information on all products. Provide information showing dimensions and locations of all connections.
- C. Performance Data: Submit performance data for units, showing moisture removal performance as a function of indoor coil dry bulb and wet bulb temperatures and indoor coil airflow rates; fan performance (cfm versus ESP); and information on filters and accessories. Provide information showing dimensions and locations of all connections.

1.05 QUALITY ASSURANCE

- A. Listing: Units shall be UL or ETL listed and labeled.
- B. Ratings: Units' moisture removal performance shall be rated in accordance with ANSI/AHRI 910.
- C. Codes: Unit construction shall be designed to conform to applicable codes and standards. Unit efficiency shall comply with code (and exceed code as indicated).
- D. Operating Ability: Unit shall be able to operate and remove moisture between entering air conditions of 68 deg F at 50% RH and 0 deg F at 50% RH.
- E. Support: Local support for unit operation shall be provided within 24hrs

1.06 WARRANTY

- A. Unit: Entire unit shall be warranted to be free of all manufacturing defects and meeting all Contract Document requirements for a period of one year after project substantial completion.

1.07 REFERENCES

- A. ANSI/ASHRAE 52.2: Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.
- B. ANSI/ASHRAE 62: Ventilation for Acceptable Indoor Air Quality.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Products shall comply with Section 20 05 00, Paragraph 2.01, Acceptable Manufacturers.
- B. Units: Arid Ice (Contact Todd Bradley at 248-568-4646).

2.02 DEHUMIDIFIERS

- A. Type: Single packaged desiccant type dehumidifier, with natural gas reactivation and natural gas post heat. Configuration as shown on drawings.
- B. Capacity: Units shall have minimum moisture removal capacities as scheduled on the drawings at the conditions shown, and shall be rated in accordance with ANSI/AHRI standards.
- C. General: Units shall be fully factory assembled and shall be complete with casing, fans, gas heat exchanger, piping, wiring, disconnect, controls, and all other accessories required to be ready for field connections and operation.
- D. Unit Casing: Shall be constructed of minimum 18 gauge G-90 Galvanized steel. Unit base shall be constructed of minimum 12 gauge G-90 Galvanized steel. Access panels shall be easily removable, be gasketed and insulated, and shall provide access to all internal parts and components. Supply air section shall be internally insulated with minimum 2" thick polymer closed cell foam insulation. All screws or holding devices shall be of cadmium plated construction or stainless steel to resist corrosion. Unit shall have knockouts for utility and control connections with rubber grommets. Evaporator coil shall have condensate drain pan constructed of 20 gauge stainless steel, welded watertight, sloped to drain, with minimum 1" male pipe thread drain connection to outside unit. Drain pan shall comply with ASHRAE 62.
- E. Desiccant Dehumidifying Assembly: Unit shall remove moisture from unit's supply airstream with desiccant heat wheel. Shall be sized for full airflow volume.
 - 1. Drive: Shall include a variable speed motor connected to a full perimeter sprocket and chain drive.
 - 2. Media: Silica gel type desiccant on fiberglass substrate, able to withstand up to 500 degrees F DB without loss of mechanical integrity. Media may be washed in non-alkaline water without loss of performance.
 - 3. Frame: Rotor frame shall be comprised of full depth welded 10 gauge steel spokes with 10 gauge media retention strip and 4140 CRS "drawn over mandrel" thick wall hub.
 - 4. Rotor Bearings: Shall be sealed 200,000 hour rated non-maintenance type, pre-loaded and pre-lubricated for high temperature environments. Rotor bearings shall require press fit to rotor hub and shall be supplied with the rotor.
 - 5. Rotor Seal: Shall be "viton" dual wiper extruded seals with a rated life expectancy of 87,600 hours; silicone seals or composite silicone/rulon seals will not be acceptable due to the limited life expectancy. Seals shall be performance-rated at differential pressure of up to 8"wc.

6. Gauges: Differential pressure gauges shall be furnished for desiccant rotor process and reactivation air streams
- F. Reactivation Heating Burner: Direct fired gas burner, full modulating type, min 20:1 turn down ratio. Reactivation burner controls shall include upstream and downstream temperature sensors to actively limit burner capacity in the event of an abnormal airflow condition in order to prevent overheat of the desiccant without shutting off the burner. Full reactivation capacity shall be available with inlet air down to 45°F. "Fail-capable" mode shall provide limited dehumidification performances in the even of a failure of either reactivation temperature sensor. A safety high temperature limit and airflow proving system shall also be provided.
- G. Post Heating Heater: Indirect gas fired heat exchanger for desiccant reactivation, with modulation of heat based on leaving air temperature. Shall be 2-stage. Heat exchanger are to be constructed of 409 stainless steel. Burner shall include airflow proving switch, and high temperature limit switch. Electronic safety combustion controls shall be supplied complete with ultra-violet flame scanner to monitor the pilot and main flame. A programming relay similar to Honeywell R7895 shall be furnished. It shall be utilized to provide intermittent type gas-electric ignition and pre-ignition purge timer.
- H. Supply Fan: Plenum centrifugal type, direct drive driven; statically and dynamically balanced at factory. Fan bearings shall be sealed, permanently lubricated ball bearing type. Motor shall be TEFC class B insulated, continuous duty, permanently lubricated type with built-in auto-reset thermal overload protection. Provide with 1-inch deflection vibration isolation.
- I. Reactivation Fan: Plenum centrifugal type, direct drive driven; statically and dynamically balanced at factory. Fan bearings shall be sealed, permanently lubricated ball bearing type. Motor shall be TEFC class B insulated, continuous duty, permanently lubricated type with built-in auto-reset thermal overload protection.
- J. Filters: Unit shall have front accessible filters of hinged side access door(s) to access filters, with latches (or similar devices) requiring no tools to open. Unit shall have filter frame assembly for holding filters sizes (or filter face area) as scheduled on the plans. Filters shall be medium efficiency, pleated panel, disposable type, with a MERV 8 efficiency rating when evaluated under ASHRAE 52.2.
- K. Electrical Power: Unit shall be for use with power of voltage/phase scheduled on the plans. Units shall have single source power entry, and shall require only one field power connection and power source. All necessary terminal blocks, fuse blocks, fuses, wiring, junction boxes, control power transformers, and electrical devices, shall be factory installed within the unit to provide power to all unit devices requiring power. All unit wiring shall be color coded and labeled and numbered to match unit wiring diagram. Unit shall have access door to allow access to unit electrical section.
- L. Controls:
 1. General: Unit shall have factory installed microprocessor based controls which allow for the Division 25 control system to control unit fan, moisture removal. Unit shall be furnished with all necessary relays, starters, wiring terminal strips, timers, safety devices, to provide the sequence of operation specified below in conjunction with the Division 25 control system, while allowing unit's safeties to protect unit components. Unit controller shall include an LCD (or equivalent) display indicating setpoints, actual operating conditions, and alarms. Controls shall include temperature sensor and relative humidity sensor for ductwork mounting.

2. Supply Fan VFD:
 - a. Type: Adjustable frequency and voltage variable speed controller, pulse width modulated type.
 - b. Controller: Shall be housed in a NEMA 1 (or better) enclosure, and shall provide 6 to 60 Hz adjustable torque output. Standard Features:
 1. Start-stop speed selection.
 2. Manual speed potentiometer.
 3. Input fuses.
 4. Insensitive to incoming power phase sequence.
 5. Adjustable volts/Hertz.
 6. Output frequency stabilized to + 0.5% of set speed for +10% to - 5% change in line voltage of 15 degrees C change in ambient temperature.
 7. Three-phase output voltage regulated to + 1% of rated voltage with +10% to -5% variations in plant power.
 8. Standard off-the-shelf, NEMA B and synchronous motors (3600, 1800, 1200 rpm) usable without derating controller.
 9. Automatic shutoff under output short circuit conditions or when load current exceeds 150% of maximum output amps (RMS).
 10. Input fuses.
 11. Line transient protection to prevent power line transients from harming the controller.
 12. Relay contact to provide external signal for alarm and run condition.*
 13. Monitor lamps (or LCD display) indicating: power on, zero speed, enabled, unit failure (with type indicated).
 14. Hand-Off-Auto switch.
 15. Auto restart after power outage.
 16. Isolated Process control Follower - accepts 0 to 5 mA, 1 to 5 mA, 4 to 20 mA, 10 to 50 mA, 0 to 10 V D-C or 25 to 250 V D-C signal.
 17. Input Disconnect (meeting NEC requirements for unit power disconnect).
 18. Output Contactor - for positive motor disconnect.

- 19. Output Overloads - using individual phase bimetallic thermal sensors.
- 20. Ammeter - ampere scale depending upon drive rating.*
- 21. Voltmeter -0 to 500 volt (460 volt drives); 0 to 750 volts (575 volt drives).*
- 22. Frequency Meter - 0 to 120 Hz scale.

* Not required on units serving fans under 2 hp.

- c. VFD shall be for use with specified equipment. Unit shall accept appropriate control signal and provide for variable speed operation of unit served.
- d. System shall be fully compatible with motors furnished, and shall be free of audible noise exceeding an NC of 45 in any octave band.

3. Sequence of Operation:

- a. On/Off: System shall be off until enabled by the Division 25 control system.
- b. Fan: Once unit is enabled, its fan shall operate continuously until unit is commanded off.
- c. Dehumidification: Unit shall accept a 4-20 mA or 0-15 VDC (coordinate with Division 25) from the Division 25 control system to indicate level of dehumidification required.

4. Division 25 Interface: Unit shall have terminal strip (and associated controls) for connection of Division 25 wiring, via A BACnet mc/tp interface card. Unit controls shall allow for:

- a. Enable unit operation when “common” and “On” terminals are interconnected by the Division 25 control System.
- b. Dehumidifier operation via a 4-20 mA or 0-15 VDC signal from the Division 25 control system.
- c. Unit provided with remote operator interface panel for each unit to be remote located in resurfacer room for monitoring all unit control functions and faults

5. Control Safeties: In addition to code required safeties, unit shall have safety controls to prevent operation that may be unsafe or damage the unit. Such safeties shall as a minimum include low refrigerant pressure and high refrigerant pressure.

M. Accessories:

- 1. Air Inlet Hoods: Min 16 Gauge G-90 galvanized steel. Provide with bird screen.
- 2. Outside Air Damper: Frame shall be a minimum of 13 gauge galvanized steel,

welded and properly reinforced for rigidity and squareness, with minimum 16 gauge galvanized steel blades. Shall be leakage Class 1. Provide with motorized actuator.

3. Remote Annunciator to provide visual indication of unit operation and alarms. Locate on the first floor. NEMA 1 remote panel shall be supplied with a minimum of the following indicator lights: POWER ON, CALL FOR DEHUMIDIFICATION, REACTIVATION AIR FLOW, SUPPLY AIR FLOW and REACTIVATION FAULT. A unit ON-OFF switch shall be provided on the remote control. Shall also include remote temperature and humidity setpoint dial-type adjustment knobs, and ventilation mode selector knob.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: Install in accordance with manufacturer's written instructions and code.
- B. Location: Install all equipment as shown on the drawings. Prior to selecting unit final location, confirm that: proper unit clearances and access will be provided; confirm location and installation details with other trades.
- C. Complete Connections: Connect and install all items shipped loose with units; provide and connect all utilities and accessories as required for proper unit operation. Provide p-traps on unit condensate connections and pipe to drain.
- D. Anchors: Anchor and seismically restrain units to the building structure.

3.02 START-UP

- A. General: Initial start-up shall be done by the manufacturer's authorized service representative following the manufacturer's written start-up procedures. Subsequent checks shall be done by technicians familiar with and experienced with the type of equipment being checked.
- B. Initial Start-Up:
 1. Initial Checks: Prior to operating units, checks shall be made to insure that all equipment, piping, and controls are connected and operating properly. As a minimum, check for: proper voltage and phases, correct system refrigerant charge, correct electrical connections, complete control connections, all unit safety devices properly set and connected, fans rotating correctly, coils clear of obstructions, filters installed, and other items as listed by the manufacturer are properly provided/connected and operating to insure safe and proper unit operation. Confirm with balancer that unit airflows are correct or are within an acceptable range for subsequent start-up to occur.
 2. Start-Up: Operate unit in various modes and conditions to confirm proper operation. Check unit amperage draw, unit entering and leaving air temperatures and humidity (before and after all coils). Check operation of safeties (where possible). Verify that no unusual conditions are present and that unit is operating properly.

3. Written Report: When all of the above checks have been completed, a written report shall be provided. This report shall list all units checked, items checked, check results, any items which may impair proper unit operation, and the name and phone number of the actual individual(s) doing the check. The report shall include a statement stating whether or not all units are operating as specified. Separate data/record sheets shall be provided for each unit.
- C. 72 Hour Checks: Provide checks in accordance with manufacturer's instructions; as a minimum review the following: unit supply fan is operating properly; unit cycles properly; no safeties have tripped; no vibration or other unusual conditions are present; heat can be rejected as intended. Check and record unit supply air and return air temperatures and humidities. Submit a written record of checks made and results.
- D. One Week Check: After the system has been in full operation for one week: Observe the general operation of the system, to confirm units are operating properly. Submit a written record of checks made and results.

3.03 OWNER TRAINING AND INSTRUCTION

- A. General: After all testing and adjustments have been satisfactorily completed, the Owner shall be provided with operator instructions (including start-up, shut-down, operation and maintenance, and repair instructions) by the manufacturer's authorized service representative.
- B. Time Period: Instruction period shall be for a minimum of four (4) hours.
- C. Instruction and notification shall comply with Section 20 05 00.

3.04 END OF WARRANTY REVIEW

- A. General: Within 30 days of end of project warranty period, provide inspection and review of unit operation. Arrange mutually agreeable timing of review with Owner. Review shall be performed by the manufacturer's authorized service representative.
- B. Review: Observe unit operation and perform (as a minimum) the manufacturer's recommended annual service inspection.
- C. Written Report: Submit a written report of findings.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.
- B. Requirements of Section 20 05 00 apply to this Section.

1.02 WORK INCLUDED

- A. Control System Design.
- B. Control System Sequence of Operation.

1.03 SUBMITTALS

- A. General: Comply with Section 20 05 00.
- B. Sequences: Submit complete description of sequence of operation for all systems. Sequence submitted shall not be a direct copy of the sequence specified herein, but shall be written to reflect the actual control sequence provided and to more closely match the actual programming used.
- C. Programming: Submit copy of system programming logic. Submit programming manuals to allow interpretation and review of programming symbols and logic modules.

1.04 GENERAL REQUIREMENTS

- A. Modifications: Software, graphics, and sequences shall be revised and updated as necessary to reflect Owner or Engineer desired changes. Contractor to include in bid no less than 4 hours of control technician's/programmer's time to accomplish the required system modifications.
- B. Sequence Terminology: Wherever the control sequences refer to an article, device or piece of equipment in the singular number, such reference shall mean to include as many of such articles, devices, or equipment as are shown on the plans, required for the sequence, or required to complete the installation. Wherever the control sequence refers to an operating stage in the singular number, such reference shall mean to include as many stages as are specified for the equipment and shall mean analog (i.e. proportional) type control where specified for the equipment (reference drawings and equipment specifications).

PART 2 - PRODUCTS

NOT USED

PART 3 - INSTALLATION

3.01 GENERAL

- A. DDC: All sequences shall be provided by the DDC control system, unless specifically noted otherwise.

- B. Additional Sequences: See Section 25 50 00 for system requirements that relate to control sequences and drawings for additional control sequences.
- C. Complete System: Provide all devices as required to allow for automatic control as specified herein. Provide complete system with sequences of operation as specified herein. Provide all control interconnections between indoor and outdoor units, and on equipment.
- D. Time Control:
1. Control system shall provide time schedules for occupied/unoccupied mode switching for all items having occupied/unoccupied modes, and for all items indicated as having time schedule control.
 2. Provide independent occupied/unoccupied mode schedules and optimum start (i.e. warm-up) cycles for each HVAC unit, all fans indicated as having time control, and all mechanical equipment.
 3. Provide seasonal (i.e. time of year) control for all mechanical equipment.
 4. Provide a single Holiday Schedule or Master Holiday schedule for logical equipment groups as directed by the owner at submittal time and during the owner training. At the end of the warranty period readjust the grouping of equipment as directed by the owner.
- E. Adjustability: All setpoints and differentials shall be adjustable. Setpoints indicated are initial settings.
- F. Hand-Off-Auto Control: Provide all control devices and connections to allow Hand-Off-Auto (HOA) control of all controlled items; where unit starters or VFD's provide HOA control no additional controls are required, but controls shall be arranged to allow for HOA controls.
- G. Warm-up Control: Control system optimum-start controls shall provide warm-up switching for all items indicated as having a warm-up cycle.
- H. Various thermostats, motorized dampers, and other devices are not shown on the drawings but are required per the sequence of operation specified. Coordinate with Engineer for location of all such devices prior to installing. Indicate proposed locations on submittals.
- I. Confirm Settings: Confirm with Owner all setpoints, all time schedules, and all other adjustable programming parameters before substantial completion.
- J. Demand Response Setpoint: Provide ability via toggle at system graphics (or binary input to the system) for global space thermostat setpoint adjustments of: 2 deg F increase of cooling setpoints; 2 deg F decrease of heating setpoints.
- K. Alarms: Provide alarms for the following:
1. Status of item does not equal commanded status (where proof of status is monitored, e.g. supply fan not proven on when commanded on).
 2. Equipment in alarm (where equipment alarm state is monitored).
 3. System response is not consistent with commanded response (e.g. air handling unit SA temperature is not less than MA temperature and unit is commanded to cooling).
 4. Freezestat alarm.

5. Safety device alarm.
 6. Space temperature in alarm range (15 deg F or more above cooling setpoint; 15 deg F or more below heating setpoint).
 7. Sensor failure (out of range).
- L. Fire/Smoke Shutdown:
1. Smoke Detector: Provide necessary conduit, wiring, and accessories to shutdown each unit upon activation of that unit's smoke detectors. Connections shall be hardwired; independent of any control system logic, so that failure of control system or loss of control system will in no way prevent the shutdown of each unit. In addition to shutting down the unit with the alarmed smoke detector, all equipment interlocked or served by that unit shall be off. Other units shall also shut-off as required to avoid building pressure differentials and similar undesirable effects. Upon reset of alarmed device, system shall automatically return to normal, provide time delay start of all equipment 2 KW and greater (already controlled by EMCS), to minimize electrical surges.
 2. Fire Alarm System: Shut-down all air handling equipment covered by when the building fire alarm system goes into alarm. Contacts in the fire alarm system are available for this purpose. Such shut-down shall include all equipment in the alarmed zone, all equipment outside the alarmed zone but served by equipment in the alarmed zone, all equipment serving the alarmed zone and any other units as necessary to avoid undesirable effects such as excessive building pressurization, air movement from one zone to another, etc. This added shut-down may be accomplished by use of control logic and is not required to be hardwired but shall be of a fail-safe nature so as to provide the necessary shut-down in case of control failure. Reset shall be same as that specified for hard-wired unit smoke-detector shut-down.
- M. Thermostats/Humidistats:
1. Setpoints: Shall be adjustable at operator's workstation, with initial settings as follows unless indicated otherwise:

Occupied Heating	60 degrees F
Unoccupied Heating	55 degrees F
Occupied Cooling	65 degrees F
Unoccupied Cooling	60 degrees F

Humidity: 32 to 35 Dewpoint.

3.02 DEHUMIDIFIERS DH-1 and DH-2 – SEQUENCE OF OPERATION

- A. General:
1. Units internal controls shall control unit's reactivation heating, desiccant dehumidifier, fans, and system dampers, in proper sequence to provide a supply air that will satisfy humidity conditions. (existing RPU-1 will address heating and cooling of the space).
 2. Controls shall evaluate the space deviation from setpoint and rate of change of this deviation to determine operation to satisfy setpoint without excess variation in space temperatures.
- B. Occupied Mode:

1. Fan: Supply fan shall run continuously.
2. Reactivation Heating: Upon call for dehumidification, gas burner heat shall be modulated to reactivate desiccant (preliminary setpoint is 284 degrees F).
3. Post Heating: Upon call for heating or dehumidification, Heating shall be staged to provide a discharge air temperature to satisfy setpoint (initial setpoint is 60 degrees F).
4. Ventilation/OA Dampers: Outside air dampers shall be open. CO2 controls shall modulate the OA damper to maintain the space CO2 level setpoint; initial setpoint shall be 600 ppm. Upon entering the occupied mode the OA damper shall initially open to a position that provides 50% of the minimum OA flow indicated on the plans. Coordinate with balancer for OA damper positions that meet the flow settings. OA damper shall not close below a position that provides 50% of the minimum OA flow indicated on the plans (unless noted otherwise).
5. Desiccant Dehumidifier Drive Motor: Upon call for dehumidification, motor shall engage. When not called for dehumidification, by pass dampers shall open and drive motor shall be off.

C. Unoccupied Mode:

1. Fan: Supply fan shall run only when called for heating or dehumidification. Shall be off otherwise
2. Reactivation Heating: Upon call for dehumidification, gas burner heat shall be modulated to reactivate desiccant (preliminary setpoint is 284 degrees F).
3. Post Heating: Upon call for heating or dehumidification, Heating shall be staged to provide a discharge air temperature to satisfy setpoint (initial setpoint is 60 degrees F).
4. Ventilation/OA Dampers: Shall be closed.
5. Desiccant Dehumidifier Drive Motor: Upon call for dehumidification, motor shall engage. When not called for dehumidification, by pass dampers shall open and drive motor shall be off.

3.03 MISCELLANEOUS

A. Relief air motorized dampers:

1. Manual Intermittent: Shall open when manually called via graphics, and when enabled in manual mode, shall close after a 2-hour period.
2. Automatic: Shall modulate open in proportion to the amount of outside air called for the DH units (if HD outside air is zero, relief motorized dampers shall be closed). Also shall open when the space is above 70 degrees, if required by IAQ controls provided with the dehumidification system.
3. Provide an option for future calendar scheduling.

END OF SECTION