

SECTION 23 00 00

HVAC SYSTEM

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work covered by this Section of the specifications includes the furnishing of labor, materials, equipment, transportation, permits, inspections and incidentals and the performing of operations required to install the heating, ventilating and air conditioning systems indicated.

1.2 RELATED DOCUMENTS

- A. The drawings and the specifications including Section 23 05 00 "Supplemental Mechanical General Requirements" are hereby made a part of the work of this section.
- B. Drawings and general provisions of Contract including General and Supplementary Conditions and all Division 1 specification sections.
- C. Provision of waste management: Section 01 74 19, Construction Waste Management and Disposal.

1.3 SUBMITTALS

- A. Substitutions: Your attention is directed to Section 23 05 00-"Substitutions", relative to competition and the (ONLY) notation. Familiarity with this section should be achieved before reading the PRODUCTS section of this specification.
- B. The items for which the submittals paragraph in Section 23 05 00, Supplemental Mechanical General Requirements, apply are as follows:
 - 1. Packaged replacement rooftop air conditioning units (**ALTERNATE #3**).
 - 2. Fans.
 - 3. Minisplit air conditioning units.
 - 4. Variable air volume boxes.
 - 5. Controls.
- C. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- D. Product Data: Submit data on product characteristics, performance criteria and limitations.
- E. Manufacturer's Installation Instructions: Submit procedure for preparation and installation.
- F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

PART 2 PRODUCTS

2.1 MINISPLIT AIR CONDITIONING UNITS

- A. The split system air conditioning units shall be Mitsubishi Model as scheduled, or approved equal by Daikin or Sanyo, wall mounted indoor units with roof-mounted outdoor units,. Cooling capacity shall be based on entering conditions of 75⁰F. EDBT, 67⁰F. EWBT and 95⁰F. ambient. The indoor units shall operate on 208V. and the outdoor units shall operate on 208V.-1 phase power. Furnish with integral condensate pumps by Teel

or Little Giant, refrigerant piping, wiring and condensate piping as recommended by the manufacturer. The air conditioning units shall be suitable for operation at 0°F. outside ambient.

2.2 FANS (EF-#)

- A. Shall be model indicated. The fan shall include housing, fan wheel, shaft, bearings, inlet shroud, motor, mounting support and mounting frame as a factory-assembled unit. An OSHA-approved belt guard shall be included. The fan drive shall have a 1.5 service factor for the maximum rated horsepower. Each fan shall incorporate a backdraft damper or one shall be installed at the discharge (louver).
- B. Bearings shall be precision, flange-mounted self-aligning ball bearings at inlet and discharge. Grease lines shall extend to the exterior of the fan housing.
- C. Submit sound power data for inlet and discharge sound.
- D. Submit fan curves for each fan with the design operating point clearly marked.
- E. Furnish accessories as noted on drawings.

2.3 PACKAGED ROOFTOP AIR CONDITIONING EQUIPMENT (**ALTERNATE #3**)

- A. Provide high efficiency packaged gas-electric air conditioning units and coils of manufacturer, model and performance indicated, Lennox, Trane "Precedent", York, McQuay, Carrier or approved equal. The units shall be a convertible arrangement, suitable for vertical or horizontal duct connections, to replace existing units.
- B. The air conditioning units shall consist of a fan section, gas burners, coil sections, coils, and filter/mixing box section with economizer dampers and barometric relief or powered exhaust as scheduled on drawings. Performance shall be ARI 430 certified. Provide access doors in each section. Furnish with downflow adapter roof curbs, packaged controls and high static pressure drive. Provide with through the base electrical connections. Furnish with unit-mounted disconnect. For replacement units provide adapter curbs to provide compatibility with the existing roof curbs.
- C. Cabinet Construction: Steel reinforced and braced with steel angle framework, factory-assembled, sectionalized fan and coil sections, removable access panels to internal parts. Metal parts galvanized steel or chemically cleaned, phosphatized, primed and finished with enamel topcoat.
- D. Fans: Shall be as scheduled, multiblade centrifugal type, statically and dynamically balanced and tested. Bearings shall be self-aligning, grease lubricated ball type. Fan motor shall be 1800 RPM, open drip-proof or TEFC type, with greasable ball bearings, variable pitch sheave and mounted on an adjustable base. Provide extended grease lines. The fan drive shall have a 1.5 service factor for the maximum rated horsepower. Motors shall be premium high efficiency with minimum motor efficiency conforming to Section 23 05 00 "Electric Motors and Motor Controls". Submit certificate of conformance for motor efficiency.
- E. Coils: Capacities and pressure drops shall be rated in accordance with ARI 410. Coils shall be pressure tested at 300 psig and shall be suitable for 150 psig service.
 - 1. Coils: Copper tubes, aluminum fins and copper headers. Casings shall be 16 gage galvanized steel.

- F. Mixing box section: Outside air and return air dampers shall be "low leak" type. Blade seals shall be neoprene and jamb seals shall be compressible aluminum or stainless steel.
- G. Filters: Provide MERV8 pleated media, CamFarr, or approved equal, 30-35% efficient. Furnish with one (1) initial and two (2) spare sets. Efficiencies shall be as tested in accordance with ASHRAE Standard 52-76.
- H. Submit fan curves for each fan with the design operating point clearly marked.
- I. The compressors shall be direct-drive, scroll or reciprocating hermetic type. Units with two (2) compressors shall have two (2) independent refrigeration circuits. Provide with a five (5) year warranty for parts and labor. Motors shall be suction gas cooled with crankcase heater, low pressure switches, internal temperature and current sensitive motor overloads. Provide with an anti-recycle timer.
- J. The air-cooled condenser shall be of a copper tube and aluminum finned heat exchanger and direct-drive, dynamically and statically balanced fans with permanently lubricated motors and built-in thermal overload protection.
- K. The units shall be provided with packaged controls to meet the specified sequence of operation. Controls shall include all safety devices, damper actuators, CO2 sensor in the return air, "comparative enthalpy" economizer and interlocks, with an interface for the Building Automation System to start/stop the unit, open/close the economizer damper, control the gas furnace / DX cooling and shut down on freeze protection. Coordinate with the BAS.

2.4 VARIABLE AIR VOLUME BOXES

- A. Furnish and install Environmental Technologies Model SDR, Price or Trane Single Duct Variable Air Volume Terminal Units of the sizes and capacities as scheduled. Units must be certified by ARI under Standard 880 and shall bear the ARI seal.
- B. Casing shall be double-wall, constructed of zinc-coated steel, mechanically assembled and sealed to form an air-tight construction: maximum casing air leakage of two(2) percent at 3" WG. The solid inner liner shall be a minimum of 26 gauge galvanized steel. Spot-welded casings are not acceptable.
- C. Insulation shall line the interior casing walls and shall not be less than 1/2" thick dual density fiberglass with 4 p.c.f. skin outer layer. The material shall comply with UL181 and NFPA 90-A with no edges exposed to the airstream. Insulation shall be adhered to the unit casing by an NFPA-90A approved adhesive and a mechanical fastener welded to the unit casing wall.
- D. Valve Assembly shall be manufactured of a 22 gauge air valve body to handle high pressure and a 16 gauge composite damper blade, key attached to a solid shaft. The shaft shall have a position indicator marked on the end for verification of damper position. Two galvanized damper blades shall "sandwich" closed cell foam gasket material providing for minimum valve leakage. Damper leakage shall not exceed two(2) percent of units maximum rated capacity with inlet pressure up to 6" W.G. Damper shall pivot in self-lubricating bearings. The valve assembly shall have built-in maximum and minimum heavy gauge mechanical stops to prevent over-stroking of the damper.
- E. Airflow Sensor shall be equipped with a center averaging chamber and have multi-axis sampling tubes. The sensor shall be designed to provide a differential pressure signal which is amplified at least 2.5 times the normal velocity pressure, over the full capacity range of the terminal. Pressure measuring taps shall be provided external to the unit with an airflow curve for ease of air balancing.

- F. Variable air volume boxes shall be furnished complete with accessories including:
1. Edge-Lock construction shall be provided. The material must comply with UL 181, NFPA 90-A, and shall meet bacteriological standard ASTM-C665 for mold resistance. Units shall have a gasketed access door and must maintain the same construction specifications on the door and opening.

2.5 VARIABLE AIR VOLUME BOX SCHEDULE

Report Date: Dec 06, 2011 03:26 PM

PRICE[®]
Price All-In-One
Terminals Performance Schedule

Job Name: Nephrology Associates
 Job Number: QP00000007
 Customer:
 Entered By:
 Reps Job No: Portland, ME
 Location:
 Engineer:
 Sales Person:

Line	Model	Ta Unit ID	Max (Primary CFM)	Min (Primary CFM)	Differential SP (in.wg)	Min Oper PD (in.wg)	Max Discharge NC	Min Discharge NC	Max Radiated NC	Min Radiated NC	Reheat(CFM)	Capacity kW	Volts	Steps	Current Amps
1	SDVLP5	1-1	7	450	225	0.25	0.05	--	--	--	225				
2	SDVLP5	1-2	7	650	325	0.25	0.1	--	--	--	325				
3	SDVLP5	2-1	7	600	300	0.25	0.09	--	--	--	300				
4	SDVLP5	2-2	7	450	225	0.25	0.05	--	--	--	225				
5	SDVLP5	2-3	12	1000	500	0.25	0.09	--	--	--	500				
6	SDVLP5	3-1	8	750	375	0.25	0.01	--	--	--	375				
7	SDVLP5	3-2	7	450	225	0.25	0.05	--	--	--	225				
8	SDVLP5	4-1	9	850	425	0.25	0.01	--	--	--	425				
9	SDVLP5	4-2	7	400	200	0.25	0.04	--	--	--	200				
10	SDVLP5	4-3	5	200	100	0.25	0.01	--	--	--	100				
11	SDVLP5	4-4	7	600	300	0.25	0.09	--	--	--	300				
12	SDVLP5	4-5	8	600	300	0.25	0.01	--	--	--	300				
13	SDVLP5	1-3	8	750	375	0.25	0.01	--	--	--	375				



**Price All-In-One
Terminals Performance Schedule**

Report Date: Dec 08, 2011 03:26 PM

Job Name: Nephrology Associates Reps Job No:
 Job Number: QP00000007 Location: Portland, ME
 Customer: Engineer:
 Entered By: Sales Person:

Line	Model	Ta Unit	Max	Min	Differential	Min Oper	Max	Max	Min	Min	Reheat(CFM)	Capacity	Volts	Steps	Current
		ID	Size (Primary CHM)	(Primary CHM)	SP (in.wg)	PD (in.wg)	Discharge NC	Radiated NC	Discharge NC	Radiated NC		kW			Amps

Footnotes Legend:

- A - Selections based upon Price as manufacturer.
- B - Sound power levels and NC's are based on tests conducted in accordance with ARI Standard 880-98.
- C - Room NC levels shown include attenuation factors obtained from ARI Standard 885-98.
- D - Check submittal drawings for exact dimensions.
- E - Airflow units are cubic feet per minute, water flow units are US gallons per minute, all temperatures in degrees Fahrenheit, heat loss in feet of water, air pressure drop in inches of water gauge.
- F - Blanks (--) indicate a sound power level of NC under 20.
- G - Water coil performance has been rated and certified in accordance with the edition of ARI Standard 410.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection:

1. Prior to work of this Section, carefully inspect the installed work of other trades and verify that such work is complete to the point where this installation may properly commence.
2. Verify that the heating system may be installed in accordance with pertinent codes and regulations and the reviewed Submittals.

3.2 CLOSING IN WORK

- A. Cover up or enclose work after it has been properly and completely tested and reviewed.
- B. No additional cost to the Owner will be allowed for uncovering or recovering any work that is covered or enclosed prior to required test and review.

3.3 TEST AND ADJUST

- A. After the installation is complete and ready for operation, test the system under normal operating conditions in the presence of the Architect and demonstrate that the system

functions as designed.

- B. Correct defects which develop in operational testing, conduct additional testing until defect free operation is achieved.

3.4 INSTRUCTIONS

- A. On completion of the project, instruct the Owner's representative in the care and operation of the system. The period of instruction shall be for not less than one 8 hour period. The time of instruction shall be arranged with the Owner. In addition to the prime Mechanical Contractor and Owner's representative shall be present and participate in the Owner's instruction.

3.5 REFRIGERATION PIPING

A. Refrigeration Piping:

1. Provide and install refrigeration piping, hangers, and accessories as specified and required. The piping installation shall be performed by a qualified refrigeration mechanic under the direct supervision of the equipment manufacturer. Submit records of tests.
2. Refrigeration piping shall be Type ACR copper tube with brazed joints, or as recommended by the equipment manufacturer, nitrogen-charged equal to BCUP-2 Classification of American Welding Society.
3. The refrigeration system shall be tested as follows:

High pressure Side	300 psi
Low Pressure Side	150 psi
4. Support risers, offsets, and equipment, in an acceptable manner.
5. Piping shall be installed to meet Codes and regulations, applicable to the installation and in accordance with the best practice of the trade. Brazing shall be accomplished while sweeping piping with nitrogen.
6. Refrigerant accessories shall include required valves and fittings to provide a complete installation. Refrigerant suction and hot gas piping shall be insulated with 1/2" thick Armaflex Type AP, or equal, elastomeric unicellular insulation. Exterior insulation shall have .032" thick circumferentially corrugated aluminum jacketing by Childers, solvent-welded ultraviolet resistant PVC jacketing, or approved equal.
7. Parts of the system not factory charged and field installed piping of components shall be evacuated to within .10 MM/Mercury of a perfect vacuum. Break the vacuum to 0 psig with oil-free nitrogen before charging. Hold vacuum overnight for leak test.
8. Provide complete charges of refrigerant and oil to be maintained for the guarantee period.
9. Elbows shall be long radius.
10. The installation shall be in accordance with the above, with equipment manufacturer's instructions, and with established recommended practices.
11. System installation shall include the following:

- a. Pitch lines down in direction of flow a minimum of 1/2 inch per 10 feet.
- b. Trap suction risers as verified with the equipment manufacturer.
- c. Provide service valves on liquid and suction piping at air cooled condensing units.
- d. Maximum filter-dryer pressure drops:
1 psi for liquid line filter-dryer.
- e. Liquid line solenoid valve on each refrigeration circuit.
- f. Thermal expansion valve on each refrigeration circuit.

* END OF SECTION *