

1 General

1.1 INSTRUCTIONS

- .1 Comply with Instructions to Proponents, Enbridge Master Construction Agreement and General Requirements of Division 01.

1.2 RELATED SECTIONS

- .1 Section 00 43 33.20 – Proposed Products Form, Mechanical
- .2 Section 23 05 00 – Common Work Results for HVAC
- .3 Section 23 07 00 – HVAC Insulation
- .4 Section 23 10 00 – Facility Fuel Systems
- .5 Section 23 20 00 – HVAC Piping and Pumps
- .6 Section 23 30 00 – HVAC Air Distribution
- .7 Section 23 40 00 – HVAC Air Cleaning Devices
- .8 Division 25 – Integrated Automation
- .9 Division 26 – Electrical

1.3 DESCRIPTION

- .1 The work of this Section shall include the furnishing of all labour, materials, equipment, and services required for the complete installation, testing and operation of the equipment as indicated on the drawings, or hereinafter specified.
- .2 Provide central HVAC equipment including:
Air-to-air energy recovery equipment

1.4 REFERENCE STANDARDS

- .1 Technical Standards and Safety Act, 2000 and amendments
- .2 CAN/CSA-B149.1-05 Natural Gas and Propane Installation Code
- .3 CSA-B52-05 Mechanical Refrigeration Code
- .4 AHRI, ASME and ASHRAE Standards specified for ratings and performance tests.
- .5 CSA, ULC and governing electrical codes
- .6 Requirements of Local and Provincial Authorities

1.5 QUALITY ASSURANCE

- .1 Gas-fired heating equipment shall be CSA/CGA approved.
- .2 Use welders qualified and licensed by the TSSA.
- .3 Boilers shall comply with the requirements of the Ontario Building Code.
- .4 Heat Exchangers shall be certified in accordance with ASME Code, Section VIII, Division I

- .5 Provide authorized equipment inspection prior to shipment and submit one copy of inspection report to the Consultant.
- .6 The refrigeration manufacturer shall be regularly engaged in production of the specified equipment.
- .7 The manufacturer shall also be one who issues catalogue information with correction factors where published ratings are based on parameters different from those specified.
- .8 Factory leak test air-cooled condenser and evaporator coils in accordance with above referenced agencies.

1.6 MAINTENANCE DATA

- .1 Provide maintenance data for incorporation in operation and maintenance manuals. Include exploded views of components.

1.7 DELIVERY AND STORAGE

- .1 Ship equipment factory dehydrated and sealed with a full charge of refrigerant and lubricating oil.
- .2 Store equipment in protected area.

1.8 PERFORMANCE CRITERIA

- .1 The following are to be used as selection criteria and are to be as specified: Air flow rates, external static pressures, water flow rates. The following are to be equalled or bettered: Coil face velocities, filter face velocities, casing leakage rates. The following are to be met within 10% of specified values: Water pressure drops.

1.9 CERTIFICATION

- .1 Coils shall be certified in accordance with AHRI Standard 410 and bear the AHRI label. Coils exceeding the scope of the manufacturer's certification and/or the range of AHRI's standard rating conditions will be considered provided the manufacturer is a current member of the AHRI Forced Circulation Air-Cooling and Air-Heating Coils certification programs and that the coils have been rated in accordance with AHRI Standard 410.

1.10 WARRANTY

- .1 Replace all refrigerant lost from system(s) due to leaks for an additional one (1) year after normal one year warranty period.
- .2 Warrant refrigeration compressors and compressor motors with five (5) years non-pro-rated for material and labour. Material shall be by equipment manufacturer and labour shall be by Mechanical Trade.
- .3 Warrant electric heaters and gas heat exchangers with 10 years on material by equipment manufacturer, and 5 years on labour by Mechanical Trade.

1.11 SHOP DRAWINGS

- .1 Submit shop drawings for the following:
 - Air-to-air energy recovery equipment

2 Products

2.1 ENERGY RECOVERY VENTILATOR

.1 General Description

- .1 Refer to drawings for configuration

.2 Unit Construction

- .1 Fabricate unit with extruded aluminum channel posts and galvanized panels secured with mechanical fasteners. All access doors shall be sealed with permanently applied bulb-type gasket.
- .2 Panels and access doors shall be constructed as a 2-inch (50-mm) nominal thick; with injected polyurethane foam insulation. R value shall be 6.5 per inch of wall thickness. The outer panel shall be constructed of G90 galvanized steel. The inner liner shall be constructed of G90 galvanized steel. Module to module assembly shall be accomplished with self adhering foam gaskets. Manufacturer shall supply test data demonstrating less than 0.2" deflection for an unsupported 48x48 panel under 30" W.C pressure. Units that cannot demonstrate this deflection are unacceptable.
- .3 Access Doors shall be flush mounted to cabinetry, with minimum of two hinges, locking latch and full size handle assembly.
- .4 All outdoor units will have an 18 gauge roof and gutters. The gutters will cover the entire perimeter of the unit.

.3 Supply / Return Fans

- .1 Provide direct-drive airfoil plenum fan(s). Fan assemblies including fan, motor and sheaves shall be dynamically balanced by the manufacturer on all three planes and at all bearing supports. Manufacturer must ensure maximum fan RPM is below the first critical speed.
- .2 Bearings shall be self-aligning, grease lubricated, ball or roller bearings with extended copper lubrication lines to access side of unit. Grease fittings shall be attached to the fan base assembly near access door. If not supplied at the factory, contractor shall mount copper lube lines in the field.
- .3 Fan and motor shall be mounted internally on a steel base. Provide access to motor, drive, and bearings through hinged access door. Fan and motor assembly shall be mounted on 2" deflection spring vibration type isolators inside cabinetry

.4 Bearings and Drives

- .1 Bearings: Basic load rating computed in accordance with AFBMA - ANSI Standards, L-50 life at 400,000 hours all belt-drive airfoil plenum fans, heavy duty pillow block type, self-aligning, grease-lubricated ball bearings.
- .2 Shafts shall be solid, hot rolled steel, ground and polished, keyed to shaft, and protectively coated with lubricating oil. Hollow shafts are not acceptable.

.5 Electrical

- .1 The air handler(s) shall bear an ETL listing label for the entire assembly. Units with only components bearing third party safety listing are unacceptable.

- .2 On RG sizes 1000 through 18000 all controls shall be located on the side of the unit for ease of servicing. Alternate manufacturers who supply units with controls on roof must supply a permanently installed ladder to access controls, and appropriate safety rails on roof of unit, meeting all applicable OSHA standards.
- .3 Controls must include Self diagnostics with fault and PLC error Code. On board fault detection and diagnostics that senses and alerts when the damper is not operating correctly.
- .4 Wiring Termination: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. All wires shall be number tagged and cross-referenced to the wiring diagram for ease of troubleshooting.
- .5 Fan motors shall be 1800 rpm, totally enclosed fan-cooled (TEFC) type. Motors shall be premium efficiency. Electrical characteristics shall be as shown in schedule.
- .6 Supplier shall provide and mount ABB variable speed drive with electrical characteristics as shown on project schedule.
- .7 Air handler manufacturer shall provide and mount a damper hand-off-auto (HOA) switch.
- .6 Particulate Filters
 - .1 Filter section with filter racks and guides with hinged and latching access doors on front side, for side loading and removal of filters.
 - .2 Filter media shall be UL 900 listed, Class I or Class II.
 - .3 Flat arrangement with 2", 50mm deep pleated panel filters.
- .7 Polarized Media Electronic Air Cleaner
 - .1 Provide Dynamic V8 polarized media non-ionizing electronic air cleaners. SecureAire (ACS) is also acceptable.
 - .2 Tested and certified to meet UL standard 867 and CSA standard C22.2 No. 187-M19986.
 - .3 Capacities, models and configurations as shown on the unit schedule and the contract drawings. Polarized media electronic air cleaner shall provide MERV15 performance power on performance tested using ASHRAE 52.2NC protocol at a third party ASHRAE approved lab. MERV14 performance power off performance tested using ASHRAE 52.2NC protocol at a third party lab ASHRAE approved lab.
 - .4 Dust holding capacity equal to 2.8kg at 0.7inwc pressure drop per 24 in by 24in by 29.5in module.
 - .5 Acceptable filter face velocity shall be less than or equal to 550 fpm.
 - .6 Provide Magnahelic filter gauges for each filter bank flush mounted into unit casing with factory mounted probes.
 - .7 Provide modular filter mounting rack with aluminum frame and screens. Gasketing shall be provided to prevent bypass of unfiltered air.
 - .8 Provide air cleaner with a single point power connection that powers all components including but not limited to polarizing media, and control panel.
 - .9 Provide integral control panel to start and stop polarization. Each control panel shall include transformers, disconnections, breakers, return indicating lights, door interlocks and differential pressure monitoring.

- .10 Provide parallel wired conformally coated rectifiers to convert 24 VAC to 9.5 kVDC for media polarizing.
- .11 Provide electronics warranty commencing on the date of initial start-up and five (5) year not to exceed eighteen (18) months from shipment
- .8 Dual Core® Energy Recovery
 - .1 Unit shall be equipped with Dual Core® energy recovery technology. The unit shall be 90% efficient (sensible +-5%) at equal airflow in winter and up to 80% sensible in summer. It shall also provide up to 70% latent recovery. Unit shall accomplish this recovery without a defrost cycle that will reduce the effectiveness of the device. Devices employing defrost cycles that bypass the energy recovery device, or reduce the effectiveness are not acceptable. Energy recovery device shall not require frost protection in applications down to -40 degrees.
 - .2 Energy Cores shall be Generation 3, comprised of precisely corrugated high grade aluminum. Maximum allowable face velocity across heat exchangers shall be 450 fpm. Heat exchanger face velocities exceeding 500 fpm are not acceptable.
 - .3 Switchover damper section shall be comprised of multi section low leakage dampers operated by fast acting electric actuators only. RG 1000-6500 shall have damper switching times of 0.75 seconds. RG 7500-18000 shall have damper switching times of 1.5 seconds. Dampers that do not switch within the specified times without objectionable noise are not acceptable. Single blade damper sections are not acceptable. Each damper shall control one of the 4 airways, upper-horizontal, lower-horizontal, forward-vertical and rear-vertical. Dampers shall be capable of orienting to close off outside air to the building without needing external shut off dampers. Dampers shall also be capable of orienting to allow 100% recirculation of air without using heat recovery device for off peak or unoccupied heating modes. During a Morning warm up cycle both energy core sections must be able to be charged at the same time using recirculation air. Units incapable of these operations without extra ductwork are not acceptable.
 - .4 Recovery cycles shall be controlled by internal programmed thermostats measuring both supply and exhaust air, and optimizing performance of both heat recovery and free cooling modes.
- .9 External Dampers
 - .1 External Damper Leakage: Leakage rate shall be less than two tenths of one percent leakage at 2 inches static pressure differential. Leakage rate tested in accordance with AMCA Standard 500.
- .10 Refer to schedules on drawings for equipment model and capacity.

3 Execution

3.1 INSPECTION

- .1 Upon delivery, inspect components for damage or gas loss and report to Consultant in writing. Wait for written instruction.

3.2 ENERGY RECOVERY VENTILATOR

- .1 Rig and set in place air handling cabinets as herein specified. Make all duct connections as required and shown on drawings. Level all units. Remove all hold down straps.
- .2 Bolt and gasket sections of air handling units together as required.
- .3 Humidifier to be piped as called for in the drawings and specification complete with drain valve and drain and vent valve on each coil vent.
- .4 Provide and install drain lines complete with deep traps as required from drain pans.

- .5 Install filter gauges in accordance with manufacturer's recommendations. Provide zeroing valve on gauges.
- .6 Check and re-align all access doors and hinges to ensure smooth operation through the entire range of travel.
- .7 Upon start-up, each fan motor is to be checked for fan rotations, and A draw for each phase. Amp readings are to be marked on the fan scroll.
- .8 All belt drives are to be re-adjusted for tension and alignment.
- .9 All pipe and conduit penetrations to the casing are to be thoroughly sealed and caulked to prevent air leakage.
- .10 Any floor penetrations are to be thoroughly sealed to ensure the water-tightness and integrity of the entire floor.
- .11 Note requirements for vibration isolation indicated in Section 23 05 00.

3.3 COOLING COIL DRAIN LINES

- .1 Provide insulated drainage piping from all cooling coil drain pans to nearest floor drain.

3.4 START-UP OF EQUIPMENT

- .1 The manufacturer of this equipment will forward to the Mechanical Trade a check list of recommended procedures for piping and starting up the equipment. This procedure will be followed exactly by the Mechanical Trade and the manufacturer will issue his guarantee to the Mechanical Trade on receipt of a signed letter stating that all steps have been carried out. The manufacturer shall notify the Consultant of the issuing of the guarantee. The manufacturer shall provide all necessary wiring diagrams to the Refrigeration Trade showing the necessary interlocks between equipment.
- .2 This system will be completely tested with all controls in place and operational, to ensure absolute integrity of the variable volume heating and cooling system with all other building environmental controls.
- .3 Provide one year operations service at no cost to the Owner.

END OF SECTION