Part 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Process cooling equipment.

1.2 REFERENCES

.1 American National Standards Institute/Air Movement and Control Association (ANSI/AMCA)

.1 ANSI/AMCA 210/ASHRAE 51, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.

.2 American National Standards Institute/Air-Conditioning, Heating and Refrigeration Institute (ANSI/AHRI)

.1 AHRI 450, Performance Rating of Water-Cooled Refrigerant Condensers, Remote Type.
.2 ANSI/AHRI 495, Performance Rating of Refrigerant Liquid Receivers.
.3 ANSI/AHRI 520, Performance Rating of Positive Displacement Condensing Units.
.4 AHRI 710, Performance Rating of Liquid Line Driers.

.3 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)

.1 ASHRAE 17, Method of Testing for Capacity Rating of Thermostatic Refrigerant Expansion Valves.
.2 ASHRAE 15, Safety Standard for Refrigeration Systems.

.4 American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME)

.1 ASME B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes.
.2 ASME B16.29, Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
.3 ASME B31.5, Refrigeration Piping and Heat Transfer Components.
.4 ASME B16.34, Valves Flanged Threaded and Welding End.

.5 American National Standards Institute/American Welding Society (ANSI/AWS)

.1 ANSI/AWS A5.8/A5.8M-2004, Specification for Filler Metals for Brazing and Braze Welding.

.6 American Society of Mechanical Engineers (ASME)

.1 ASME Boiler and Pressure Vessel Code,.

.7 ASTM International

.1 ASTM B 280, Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

.8 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-19.13-M87, Sealing Compound, One Component, Elastomeric, Chemical Curing.

.9 CSA International

.1 CSA B52-05 SMART, Mechanical Refrigeration Code.
.2 CAN/CSA-O80 Series, Wood Preservation.

.10 Environment Canada, Environmental Protection Service (EPS)

.1 EPS 1/RA/2, Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit submittals in accordance with Section 21 05 01.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for cooling equipment and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit diagrams of field installation, internal wiring and piping for field assembly, with refrigerant flows, pipe sizes, pressure drops in equipment and suction lines.

1.4 QUALITY ASSURANCE

.1 Process refrigeration manufacturer: regularly engaged in production of specified equipment, and issues catalogue information with correction factors where published ratings are based on parameters different from those specified.

.2 Installation: performed by certified refrigeration mechanics/technician.

.3 Installation must comply with requirements listed in EPS 1/RA/2.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to the Site in original factory packaging, labelled with manufacturer's name and address.

.3 Ship equipment factory dehydrated and sealed with dry nitrogen with tracer or full charge of refrigerant where permitted by authorities having jurisdiction and charge of lubricating oil.

.4 Storage and Handling Requirements:

.1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect cooling equipment from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

1.6 WARRANTY

.1 Contractor hereby warrants that refrigerant piping system loss of refrigerant and satisfactory operation of welded hermetic compressor will for minimum 1 year after start-up.

Part 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

.1 Outdoor-mounted, air-cooled condensing unit suitable for on-the-ground installation. Unit shall consist of a hermetic scroll air-conditioning compressor(s) assembly, an air-cooled coil, propeller-type condenser fans, and a control box. Unit shall discharge supply air upward as shown on Contract drawings. Unit shall be used in a refrigeration circuit matched with a duct evaporator DX coil.

2.2 CONDENSING UNIT (CU-1)

.1 Condensing unit: Factory assembled, single piece, air-cooled condensing unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, compressor and direct drive motor, hermetic motor compressor assembly, condenser, propeller-type condenser fans, a control box, nitrogen holding charge, service valves piped, ready for external connection to evaporator, and complete with hardware and fasteners. Unit shall be used in refrigeration circuit with a dedicated air handling unit complete with direct-expansion coils.

.2 Quality Assurance:

.1 Unit performance shall be rated in accordance with latest edition of AHRI Standard 340/360.
.2 Unit construction shall comply with latest edition of ASHRAE 15.
.3 Base unit shall be constructed in accordance with UL standards and CSA.
.4 Design pressure shall be 650 psig.
.5 Unit shall be functionally checked at the factory.
.6 Unit shall be manufactured in a facility registered to ISO 9001 manufacturing quality standard.

.3 Delivery, Storage and Handling:

.1 Unit shall be shipped as single package only, and shall be stored and handled according to unit manufacturer's recommendations.

.4 Warranty:

.1 Provide 1 year warranty period starting from substantial completion date.

.5 General:

.1 Factory-assembled, single piece, air-cooled condensing unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, compressor, holding charge, and special features required prior to field start-up.

.6 Unit Cabinet:

.1 Unit cabinet shall be constructed of galvanized steel, bonderized and coated with a prepainted baked enamel finish.

.2 A heavy-gauge roll-formed perimeter base rail with forklift slots and lifting holes shall be provided to facilitate rigging.

.7 Condenser Fans:

.1 Condenser fans shall be direct driven, propeller type, discharging air vertically upward.

.2 Fan blades shall be balanced.

.3 Condenser fan discharge openings shall be equipped with PVC-coated steel wire safety guards.

.4 Condenser fan and motor shaft shall be corrosion resistant.

.8 Compressor:

.1 Compressor shall be of the hermetic scroll type.

.2 Compressor shall be mounted on rubber grommets.

.3 Compressors shall include overload protection.

.4 Compressors shall be equipped with a crankcase heater.

.5 Compressor shall be equipped with internal high pressure and high temperature protection,

.9 Condenser Coils:

.1 Standard Aluminum fin – Copper Tube Coils:

.1 Standard evaporator and condenser coils shall have aluminum lanced plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed.

.2 Evaporator coils shall be leak tested to 150 psig, pressure tested to 450 psig, and qualified to UL 1995 burst test at 1775 psig.

.3 Condenser coils shall be leak tested to 150 psig, pressure tested to 650 psig, and qualified to UL 1995 burst test at 1980 psig.

.10 Refrigeration Components:

.1 Refrigeration circuit components shall include liquid line service valve, suction line service valve, a full charge of compressor oil, and a partial holding charge of refrigerant.

.11 Controls and Safeties:

.1 Minimum control functions shall include:

.1 Control wire terminal blocks,

.2 Compressor lockout on auto-reset safety until reset from thermostat,

.3 Each unit shall utilize the Comfort Alert Diagnostic Board that provides:

.1 System Pressure Trip fault code indication,

.2 Short Cycling fault code indication,

.3 Locked Rotor fault code indication,

.4 Open Circuit fault code indication,

.5 Reverse Phase 3 fault code indication,

.6 Welded Contactor fault code indication,

.7 Low Voltage fault code indication,

.8 Anti-short cycle protection,

.9 Phase reversal protection.

.2 Minimum unit safety devises which are equipped with automatic reset (after resetting first at thermostat), shall include:

.1 High discharge pressure cutout,

.2 Low pressure cutout.

.12 Operating Characteristics:

.1 Total Capacity: 3 tons,

.2 Saturated Suction Temperature: 9.5ºC,

.3 Entering Air Temperature DB: 25.5ºC,

.4 Entering Air Temperature WB: 17.4ºC,

.13 Electrical Requirements:

.1 To be confirmed by electrical.

.14 Controls:

.1 Thermostat to be supplied by Contractor and installed by others.

.15 Approved Product:

.1 Daikin DX13SA (or approved equal in accordance with B7).

2.3 DIRECT EXPANSION REFRIGERANT COILS:

.1 Serpentine type, arranged to prevent trapping of oil.

.1 Liquid distributers to ensure even distribution of liquid refrigerant to all circuits.
.2 Silver solder or braze joints in refrigerant tubing.
.3 Evacuate and charge coil with nitrogen and seal before sending to site.
.4 Tubes: aluminum.
.5 Fins: aluminum.
.6 Headers: aluminum.
.7 Pressure tests: to Canadian Refrigeration Code. Dehydrated. Sealed with nitrogen charge.

.8 Approved Product:

.1 Daikin CAUF (or approved equal in accordance with B7).

2.4 DRAIN PANS

.1 Construction: Aluminum. Rounded corners.

.2 Insulation: external foam type, minimum 13 mm thick.

.3 Drain connection: in bottom at low point.

.4 Installation: slope without sag minimum 1% to ensure no standing water at any time or at any point.

.5 Dimensions: minimum 75 mm from upstream face of coil to 150 mm beyond downstream face of coil or eliminator and to include return bends and headers.

Part 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for process cooling equipment installation in accordance with manufacturer's written instructions.

.2 Visually inspect substrate in presence of Contract Administrator.

.3 Inform Contract Administrator of unacceptable conditions immediately upon discovery.

.4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Contract Administrator.

3.3 INSPECTION

.1 Upon delivery, inspect components for damage or gas loss and report to Contract Administrator in writing.

3.4 ACCESSIBILITY

.1 Provide clearance around equipment and components for observation of operation, inspection, service and maintenance without removal of any equipment, components or piping.

.2 Install access doors in equipment and ducts, and as necessary to provide accessibility.

3.5 INSTALLATION

.1 Provide appropriate protection apparatus.

.2 Install systems and related controls in accordance with reviewed shop drawings.

.3 Drains:

- .1 Install drains to permit removal of condensate and allow cleaning of coils.
- .2 Run drain lines to floor drains or outside.

.4 Locate vibration and noise isolation as indicated.

- .1 Where units are supplied with sound attenuator, conform to manufacturer's instructions.
- .2 Ensure adequate base or foundation.

.5 Install disconnect switch adjacent to each unit, (disconnect switch by electrical).

.6 Thermal expansion valves:

- .1 Mount thermal expansion valve bulb on suction line at evaporator outlet. If suction line rises after bulb, precede rise with P-trap.
- .2 Suction line to be horizontal, pitched for drainage from bulb location.
- .3 If suction line rises after bulb, precede rise with P-trap.
- .4 Connect external equalizer to suction line immediately downstream of thermal expansion valve bulb, midway on pipe diameter, to sense refrigerant liquid and gas.

.7 Accessories:

- .1 Install as indicated.
- .2 Standard:
  - .1 Ball check isolating valves at receiver sight glass.
  - .2 Charging valve for high and low side filter drier, solenoid valve and thermostatic expansion valve.

3.6 FIELD QUALITY CONTROL

.1 Pressure and leak testing:

- .1 Perform leak test before evacuating system.
- .2 Meet requirements of CSA B52, but not less than gauge pressure of 2 MPa high side and 1 MPa low side.
- .3 Use non ozone depleting gas as tracer with dry nitrogen to develop pressure.

.4 Compressors with refrigerant holding charge to remain isolated from system.
.5 Protect accessories when performing test.
.6 Build 35 kPa initial pressure in high and low side and add dry nitrogen to field test pressure.
.7 Test for leaks with detector.
.8 Repair leaks and retest.

3.7 CLEANING

.1 Reclaim refrigerant by pumping down through filtration system.

3.8 DEHYDRATION

.1 Carry out work in presence of Contract Administrator.

.2 Evacuate using two stage vacuum pump with gas ballast on second stage capable of pulling vacuum of 0.05 mm minimum.

.1 Fill pump with fresh dehydrated oil.

.3 Do not use refrigerant compressors to pull vacuum.

.4 Maintain ambient temperature of 13 degrees C minimum throughout refrigeration system for 12 hours minimum before and during dehydration.

.5 Connect high vacuum hose or seamless copper tubing jumper lines to both high and low pressure sides.

.1 Line size: 6 mm minimum nominal outside diameter for units up to 70 L internal volume and 12 mm minimum nominal outside diameter for larger units.

.6 Install thermo couple vacuum gauge to measure system pressure.

.1 Locate manual isolating valve between pump and gauge and take readings only with system isolated from pump.

.7 When compressor/condensing unit has refrigerant holding charge intact, service valves to remain closed during evacuation.

.1 Evacuate any equipment received with dry air, wrong refrigerant, or lost holding charge.

.8 Evacuate field installed system 3 times as follows: twice to 1.5 mm and hold for 4 hours minimum.

.1 Break vacuum to gauge pressure of 14 kPa each time with refrigerant.
.2 .Continue pumping, for final evacuation, through 12 hours minimum after reaching 0.5 mm.
.3 After completion of final evacuation, isolate pump from system and make graphic record of rate of any increase in vacuum reading which may take place inside following hours.
.4 Continue readings until vacuum has stabilized.
.5 Provide Contract Administrator with 3 copies of graphic record.

.6 Charge through filter drier.
.7 Use receivers or other technology to contain CFC-13 or other ozone depleting refrigerant used for triple evacuation.
.8 If this is not possible, an alternative to triple evacuation such as vacuum evacuation should be employed.

3.9 CHARGING

.1 Give initial charge through high side charging valve with pressure gauge and new filter-drier installed in connection to charging valve.

.2 Charge only amount of refrigerant necessary for proper operation of refrigeration system.

.1 Close liquid charging valve when amount has been charged.
.2 Observe sight glass near receiver outlet, with system in operation, to recheck.

.3 Re-purge charging line, when refrigerant container must be changed during charging process.

.4 Permit low side charging only for charging small amounts in gaseous state.

.5 Provide 3 days notice of leak testing, dehydration and charging.

.6 Prime oil separator with operating charge of compressor oil.

3.10 START-UP AND ADJUSTMENT

.1 Provide necessary instruments, gauges and testing equipment required.

.1 Adjust controls, to obtain design requirements and manufacturer's ratings.

.2 Ensure that insulation of refrigerant piping and accessories completed.

.3 Test and record cooling apparatus entering and leaving air temperatures, dry bulb and wet bulb.

.4 Test and record voltage and running amperes and compare to motor nameplate data, and starter heater rating against design requirements.

.1 Check each phase which must be accurate to nearest 100 VA.

.5 Ensure that refrigerant temperatures are accurate to within 0.5 degrees C of design requirements.

.6 Set and adjust automatic control system to achieve required sequence of operations in co-operation with Contract Administrator.

.7 Bring equipment into operation, trial run and make up any loss of oil and refrigerant.

3.11 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by process cooling equipment installation.

END OF SECTION