1. HEATING AND COOLING 23 00 10

1. Mount all devices to permit ease of operation, service and replacement.
2. Piping take-offs from mains shall be on a 45° angle from perpendicular.
3. Isolate all expansion tanks with lock shield style valves.
4. Maintain all required clearances as indicated on manufacturer's cut sheets and as required by code authority having jurisdiction.
5. Supply and install all necessary chemical treatment and devices as required for a complete treated and operational system.
6. Install all automatic control valves as supplied by Controls Division 25 09 10.

1. REFRIGERANT PIPING 23 23 00

1. Tubing
    1. Processed for refrigeration installations, deoxidized, dehydrated and sealed.
        a. Hard copper: to ASTM B280, type ACR B.
        b. Annealed copper: to ASTM B280, with minimum wall thickness as per CSA B52 and ASME B31.5.
2. Fittings
    1. Service: design pressure 2070 kPa and temperature 121 degrees C.
    2. Brazed:
        a. Fittings: wrought copper to ASME B16.22.
        b. Joints: silver solder, 15% Ag-80% Cu-5%P or copper-phosphorous, 95% Cu-5%P and non-corrosive flux.
    3. Flanged:
        a. Bronze or brass, to ASME B16.24, Class 150 and Class 300.
        b. Gaskets: suitable for service.
        c. Bolts, nuts and washers: to ASTM A307, heavy series.
    4. Flared:
        a. Bronze or brass, for refrigeration, to ASME B16.26.
3. Pipe Sleeves
    1. Hard copper or steel, sized to provide 6 mm clearance around between sleeve and uninsulated pipe or between sleeve and insulation.
4. Valves
    1. 22 mm and under: Class 500, 3.5 Mpa, globe or angle non-directional type, diaphragm, packless type, with forged brass body and bonnet, moisture proof seal for below freezing applications, brazed connections.
    2. Over 22 mm: Class 375, 2.5 Mpa, globe or angle type, diaphragm, packless type, back-seating, cap seal, with cast bronze body and bonnet, moisture proof seal for below freezing applications, brazed connections.
5. Compliance: comply with manufacturer's written recommendations or Specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.
6. Install in accordance with CSA B52, EPS1/RA/1 and ASME B31.5.
7. Provide means to individually isolate all pieces of equipment. Provide flexible connections at each piece of equipment to mitigate the effects of vibration or equipment movement.
8. Brazing Procedures
    1. Bleed inert gas into pipe during brazing.
    2. Remove valve internal parts, solenoid valve coils, sight glass.
    3. Do not apply heat near expansion valve and bulb.

9. Piping Installation

    1. General:

        a. Soft annealed copper tubing: bend without crimping or constriction.

    2. Hot gas lines:

        a. Pitch at least 1:240 down in direction of flow to prevent oil return to compressor during operation.
        b. Provide trap at base of risers greater than 2400 mm high and at each 7600 mm thereafter.
        c. Provide inverted deep trap at top of risers.
        d. Provide double risers for compressors having capacity modulation.
            i Large riser: install traps as specified.
            ii Small riser: size for 5.1 m/s at minimum load. Connect upstream of traps on large riser.

10. Pressure And Leak Testing

    1. Close valves on factory charged equipment and other equipment not designed for test pressures.

    2. Leak test to CSA B52 before evacuation to 2MPa and 1MPa on high and low sides respectively.

    3. Test Procedure: build pressure up to 35 kPa with refrigerant gas on high and low sides. Supplement with nitrogen to required test pressure. Test for leaks with electronic or halide detector. Repair leaks and repeat tests.

11. Field Quality Control

    1. Site Tests/Inspection:

        a. Close service valves on factory charged equipment.

    2. Ambient temperatures to be at least 13 degrees C for at least 12 hours before and during dehydration.

    3. Use copper lines of largest practical size to reduce evacuation time.

    4. Use two-stage vacuum pump with gas ballast on 2nd stage capable of pulling 5Pa absolute and filled with dehydrated oil.

    5. Measure system pressure with vacuum gauge. Take readings with valve between vacuum pump and system closed.

    6. Triple evacuate system components containing gases other than correct refrigerant or having lost holding charge as follows:

        a. Twice to 14 Pa absolute and hold for 4 h.
        b. Break vacuum with refrigerant to 14 kPa.
        c. Final to 5 Pa absolute and hold for at least 12 h.
        d. Isolate pump from system, record vacuum and time readings until stabilization of vacuum.
        e. Submit test results to Contract Administrator.

    7. Charging:

a. Charge system through filter-dryer and charging valve on high side. Low side charging not permitted.
b. With compressors off, charge only amount necessary for proper operation of system. If system pressures equalize before system is fully charged, close charging valve and start up. With unit operating, add remainder of charge to system.
c. Re-purge charging line if refrigerant container is changed during charging process.

8. Checks:

a. Make checks and measurements as per manufacturer's operation and maintenance instructions.
b. Record and report measurements to Contract Administrator.

9. Manufacturer's Field Services:

a. Have manufacturer of products, supplied under this Section, review Work involved in the handling, installation/application, protection and cleaning, of its products and submit written reports, in acceptable format, to verify compliance of Work with Contract.
b. Provide manufacturer's field services consisting of product use recommendations and periodic Site visits for inspection of product installation in accordance with manufacturer's instructions.
c. Schedule Site visits, to review Work, at stages listed:
    i After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.
    ii Twice during progress of Work at 25% and 60% complete.
    iii Upon completion of the Work, after cleaning is carried out.
d. Obtain reports, within 3 days of review, and submit, immediately, to Contract Administrator.

12. Demonstration

1. Post instructions in frame with glass cover in accordance with CSA B52.

13. Cleaning

1. Perform cleaning operations in accordance with manufacturer's recommendations.

2. On completion and verification of performance of installation, remove surplus Materials, excess Materials, rubbish, tools and equipment.

1. VENTILATION

1. Supply and install a complete ventilation system as indicated on the Drawings and as required by local Codes and authorities. Do all Work to latest SMACNA Standards for applicable duct velocity.

2. On exposed ducts in occupied areas use stainless steel aircraft wire to support ducts**.**

3. System shall include all ducts, fire dampers, transfer air openings, fans, balance dampers, grilles, diffusers and hoods indicated on Drawings and as required by Code.

4. Install all control dampers as supplied by Division 25 09 10 Controls.

5. Provide access doors to comply with Code on both sides of fire dampers, control dampers and all coils. Access doors shall be constructed of 22-gauge Material with flat iron framing complete with sash lock latching and seal.

6. Provide 1” thick acoustic insulation where indicated on Drawings. Minimum 3-5 lbs per cubic foot density with Neoprene coating. Seal all joints and seams.

7. Provide ULC labelled fire dampers and flaps where indicated on Drawings and at all rated separations. Protect ceiling diffusers with CK 2000 thermal blanket.

8. Provide locking splitter and quadrant dampers as indicated on Drawings or as necessary to balance system and reduce objectionable noise.

9. Supply and install flexible duct connections at all air-handling equipment.

10. All open belt drives shall be complete with factory manufactured belt guards.

11. Provide and install drip pans constructed of galvanized iron with soldered joints lined with mastic as required by Drawings and equipment and system operation and configuration.

12. Protect and keep closed open ends of duct systems while under construction to prevent dust and debris penetration.

13. Provide baffles to reduce objectionable noise as directed by the Contract Administrator at no additional cost.

14. Seal all joints in supply, outside and exhaust duct systems with approved water based sealant, including all longitudinal and vertical seams. On exposed ducts, tape both sides of each seam prior to sealing and remove tape after sealant dries for an even, uniform sealant line.

15. Ceiling mounted components shall be installed in accordance with Architectural reflected ceiling plan. Coordinate with all ceiling mounted equipment.

END OF SECTION