
Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 1 - General requirements
- .2 Section 11 40 10 - Food service - Stock equipment
- .3 Section 11 40 20 - Food service - Custom equipment
- .4 Section 23 38 13 - Commercial exhaust hoods

1.2 REFERENCES

- .1 American National Standards Institute/American Society of Mechanical Engineers
(ANSI/ASME)
 - .1 ANSI/ASME B16.26-2006, Cast Copper Alloy Fittings for Flared Copper Tubes.
 - .2 ANSI/ASME B16.29-2007, Wrought Copper and Wrought Copper Alloy Solder
 Joint Drainage Fittings-DWV.
- .2 American National Standards Institute/National Fire Protection Association
(ANSI/NFPA)
 - .1 ANSI/NFPA 255-2006, Standard Method of Test of Surface Burning
 Characteristics of Building Materials.
- .3 ASTM International
 - .1 ASTM A 167-99(2009), Standard Specification for Stainless and Heat-Resisting
 Chromium-Nickel Steel Plate, Sheet, and Strip.
 - .2 ASTM A 240/A 240M-11a, Standard Specification for Chromium and
 Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and
 for General Applications.
 - .3 ASTM A 480/A 480M-11a, Specification for General Requirements for
 Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
 - .1 Finish for sheet: No. 4 Finish-General purpose polished finish, one or
 both sides.
 - .4 ASTM A 653/A 653M-10, Standard Specification for Steel Sheet, Zinc-Coated
 (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .5 ASTM B 88M-09, Standard Specification for Seamless Copper Water Tube
 [Metric].
 - .6 ASTM B 280-08, Standard Specification for Seamless Copper Tube for Air
 Conditioning and Refrigeration Field Service.
 - .7 ASTM E 84-11a, Standard Test Method for Surface Burning Characteristics of
 Building Materials.
 - .8 ASTM E 162-11a, Standard Test Method for Surface Flammability of Materials
 Using a Radiant Heat Energy Source.

- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-19.13-M87, Sealing Compound, One-Component, Elastomeric, Chemical Curing.
- .5 CSA International
 - .1 CSA C22.2 No.137-M1981(R2004), Electric Luminaires for Use in Hazardous Locations.
- .6 CSA B-52 - Mechanical refrigeration code.
 - .1 Use latest version available.
- .7 Society of Automotive Engineers (SAE)
- .8 Underwriters' Laboratories of Canada
 - .1 CAN/ULC-S704-11, Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
 - .2 CAN/ULC-S705.1-2001, Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Material Specification.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for walk-in freezers and coolers and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
 - .2 Indicate on drawings:
 - .1 Construction details of equipment by drawings and manufacturers' literature.
 - .2 Roughing-in requirements for mechanical and electrical services.
 - .3 Installation details.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for walk-in freezers and coolers for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect walk-in freezers and coolers from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.6 INCLUDING WORKS

- .1 Equipment : works include labor, shipping, establishment, start up, supply and installation of the equipment described in this section.
- .2 Food services drawing for walk-in coolers and freezers and refrigeration system are part of this section.

Part 2 Products

2.1 WALK-IN COOLERS AND FREEZERS (MATERIALS AND MANUFACTURING)

- .1 Fabricating walk-in cold rooms consists in assembling panels made with two (2) sheets of 0.6 mm thick colourbond steel, pressed and verified for uniformity. The perimeter of each panel is tongued and grooved and formed to the panel itself to ensure a perfect seal joint ready to be fully sealed with silicone product. All corners will be 90 ° angled to ensure rigidity and all panels shall be perfectly aligned. No wooden component will be accepted.
- .2 Drill the openings in the walls, floors and ceilings of the cold rooms in order to pass the cooling pipes, the drainage, the electrical conduits and the sprinklers. On completion, the kitchen equipment manufacturer should verify all the openings done in the insulated panels and apply pressure injected insulation, and then caulk with silicone for a fully compliant installation.
- .3 Provide and install electrical wiring inside the walls for the lighting, heating cables for the doors and other accessories, and completely connected to a common junction box installed on top of the cold rooms, as shown on the food service plans.
- .4 Provide and install removable panels to close the gap between the top of the cold room and the false ceiling or the upper slab of the building, as well as vertical slats to close the free space between the cold room walls and the adjacent walls. They must have the same finish as the cold rooms and the upper panels must be perforated to ensure adequate ventilation above the rooms where required. The need to provide perforated top panels or vertical closure strips to ensure adequate ventilation, or if horizontal closure strips are required between the top of rooms and adjacent walls to create plenums to help for the air circulation between the panels of cold room walls and the walls / floor of the building.

- .5 Provide anchors fitted with non-conductive rods and link them to the ceilings of the building in order to support the ceilings of the cold rooms having more than 3500 mm in length or width. In addition, supply and install white polyethylene caps to cover the ends of apparent bolts in the inside of the cold rooms and align the support plates parallel to the ceiling joints.
- .6 Submit to Departmental Representative for verification, details of prefabricated cold rooms before placing the ordering.
- .7 Galvanized steel sheet: commercial grade to ASTM A 653/A 653M, with zinc coating conform to ASTM A 653/A 653M. White polyurethane or white Adventica smooth paint finish inside and outside walk-in cold rooms.
- .8 Sealant : to CAN/CGSB-19.13, colour to match panel.
- .9 Insulation for panels and screeds: to CAN/ULC-S705.1, Class 3, poured type foamed-in-place polyurethane (urethane), 75 mm thick.
- .10 Walk-in door construction: 1980 mm high units, same construction and insulation as the walls. Doors are recessed and installed in wide panel sections; openings are fitted with a thermal break on the perimeter. Provide a thermoplastic gasket with magnetic steel strip in center, on top and each side of door, and a sliding adjustable sweep gasket at the bottom. The magnetic force of the gasket must maintain the door fully closed and airtight. These gasket joints must be resistant to oil, grease, water, solar light and be replaceable.
 - .1 Hardware: all hardware must be satin chrome finish. Each door must have two (2) hinges with stainless steel pin and spring assisted nylon cam bushing for self closing of door. The handle must cut the magnetic force of the gasket and must be designed to receive a padlock (not included) and equipped with a device to open the door from the inside, even when padlocked from the outside.
 - .2 Door view port: for walk-in cold rooms at 2 °C and more, supply and install a 380 x 510 mm frost-free thermo-pane heated window.
 - .3 Door closer: supply and install an exterior hydraulic closer to ensure full self closing of door in the last 75 mm run.
 - .4 Supply and install heating cables around every door opening in walk-in cold rooms. The cables must release enough heat to prevent condensation and frost formation in both -18° C and 2° C walk-in cold rooms. Heating cables are fitted with a protection fuse and are factory installed inside the door receiving panels. The cables are concealed behind removable stainless steel strips on all four sides including sill; electrical wiring must be complete and run to the common junction box on top of walk-in cold rooms.
- .11 Control module: Supply and install, for each walk-in cold room, a fully electronic digital alarm system complete with numerical display to indicate any abnormal temperature variation. Electrical wiring must be complete and run to the common junction box on top of each walk-in cold room. Alarm system must display the following features :
 - .1 A keyboard that displays the temperature of the room and gives high / low temperature alarms, with display in Fahrenheit or Celsius, depending on the selection made on the keyboard, with reading accuracy to within one degree

- .2 An emergency alarm, activated by a lighted button located inside the cold room, and a door open alarm, triggered when the door is open for longer than the time set by the user. Each alarm shall trigger a distinctive tone on the keyboard.
 - .3 Storage of the highest and lowest temperatures reached, to report any abnormal change in the temperature.
 - .4 Two lighting controls, including a keyboard key outside the cold room and a pushbutton inside, which can be configured in "Manual" mode, "Power Saving" mode that turns off lights after a period set by the user or "Automatic mode" which turns on the lights at the opening of the door and turn off after a preset time once the door is closed.
 - .5 Connecting of heating cables to the control module, in order to adjust the setpoint, depending on ambient conditions.
- .12 Additional panic alarm system: Supply and install additional buzzer fully connected to the button inside each room. This alarm will be installed on top of the rooms will have a clearly perceptible distinctive ring outside the room.
 - .13 No floor panels for cold rooms, walls attached directly to the building floor, with a concealed rail.
 - .14 Floor for freezer rooms :
 - .1 Floor panels shall be connected to walls using the same assembly methods as described above. They must be reinforced and shall include the following :
 - .1 Top plate: galvanized steel, 1.6 mm thick, waterproof.
 - .2 Reinforcement under the top plate, consisting of marine plywood, 13 mm thick.
 - .3 62 mm thick foam-in-place insulation.
 - .4 Bottom plate: galvanized steel, 0.6 mm thick.
 - .5 Galvanised steel shims of 25 mm for air circulation.
 - .2 On top of galvanized steel floor, supply and install a 13 mm thick fibro cement "Hardibacker" panel, screwed to floor to receive floor finish supplied and installed by others. Coordinate thickness of plywood to avoid all interferences with door sill and bottom of door.
 - .3 At entrance doors to walk-in freezer rooms, provide door sill in extruded aluminium to cover the heating cable.
 - .15 Panel mounting: The edges of each panel shall have male and female eccentric assembling devices to ensure a strong erection of the rooms at a maximum distance of 40 mm from all walls, columns or ceiling of the building. Access to these devices to be done from the interior of the rooms and holes covered with push plugs. All panels shall be installed at a 90° angle to ensure rigidity and perfect alignment.
 - .16 Fluorescent lights: to CSA 22.2 No.137 Class III Hazardous Locations.
 - .1 Lighting: each section of « Walk-in » door panel must have a control module as described previously, on the handle side and connected to the junction box provided on top of cold room door. Provide and install all the frost-free incandescent lamp inside the cold rooms, complete with a wire steel type

protection, and all the fluorescent fixtures equipped with T5HO fluorescent tubes, with electronic ballast, brand « Kason », model no 1810EZ, or equivalent to be approved, designed for instant start and operation up to a temperature of -28° C. The number of fixtures is shown on drawings, but before they are installed as shown, it is imperative to coordinate with the refrigeration contractor the exact positioning of the unit coolers, because the location of the latter takes precedence over the positioning lighting fixtures. It is important to avoid any conflict between the locations of the various accessories, in order not affect the optimal operation of refrigeration systems. In addition, where there is more than one entrance door for a cold room, each door must be fitted with a multiple-way switch allowing turning on or off all lighting inside the cold room. If necessary, provide additional fixtures required to yield the equivalent of 16 W/m² with T5HO fluorescent lighting and provide, with each fixture, all appropriate fluorescent tubes. The electrical contractor must supply and install all tubings and wiring to connect lighting fixtures.

- .17 Pressure relief port : For rooms at -18 ° C and less, supply and install a heated pressure relief port to compensate for air expansion and contraction when door is opened or closed. Electric wiring must be supplied and installed up to the common junction box on top of cold room by the electrical contractor.

2.2 WALK-IN COLD ROOM : N°16

- .1 Quantity : 1
- .2 Scope of works :
 - .1 Supply and install 1 prefabricated walk-in cold room, including walls and ceiling, complete with 1 door built 1980 mm in higher and 915 mm in width, with a window.
 - .2 Supply and install a smooth base for concealed anchor the walls of the room will have no insulated floor. This rail will be securely anchored to the floor and caulked, as shown on the plans to allow the walls to install and provide a seal foolproof.
 - .3 Supply and install reinforcements inside the walls where the wall will be fixed bumper.
- .3 Bumpers :
 - .1 Supply and install, at the bottom of each door, two (2) sides, a stainless steel plate 1.6 mm thick, finished No. 4, 1016 mm high.
 - .2 Supply and install bumper or door stops.
- .4 General construction: see section 2.1 of this specification section.

- .5 Note: The installer of the cold room has a responsibility to ensure that the plant is perfectly level and in line with good practice. Although the floor under the cool room is requested at the installer is required to provide the necessary shims to adjust perfectly all panels of the room in the event the need for a slight adjustment. However, note that no piece of wood or other materials galvanized steel will be accepted. The manufacturer should also make sure to seal all openings between the panels and the floor so as to ensure that the cold room is completely sealed.

2.4 WALK-IN COLD ROOM : N°23

- .1 Quantity : 1
- .2 Scope of works :
- .1 Supply and install 1 prefabricated walk-in cold room, including walls and ceiling, complete with 1 door built 1980 mm in higher and 915 mm in width, with a window.
 - .2 Supply and install a smooth base for concealed anchor the walls of the room will have no insulated floor. This rail will be securely anchored to the floor and caulked, as shown on the plans to allow the walls to install and provide a seal foolproof.
 - .3 Supply and install reinforcements inside the walls where the wall will be fixed bumper.
- .3 Bumpers :
- .1 Supply and install, at the bottom of each door, two (2) sides, a stainless steel plate 1.6 mm thick, finished No. 4, 1016 mm high.
 - .2 Supply and install bumper or door stops.
- .4 General construction: see section 2.1 of this specification section.
- .5 Note: The installer of the cold room has a responsibility to ensure that the plant is perfectly level and in line with good practice. Although the floor under the cool room is requested at the installer is required to provide the necessary shims to adjust perfectly all panels of the room in the event the need for a slight adjustment. However, note that no piece of wood or other materials galvanized steel will be accepted. The manufacturer should also make sure to seal all openings between the panels and the floor so as to ensure that the cold room is completely sealed.

2.3 WALK-IN FREEZER ROOM : N°32

- .1 Quantity : 1
- .2 Scope of works :
- .1 Supply and install 1 prefabricated walk-in cold room, including walls and ceiling, complete with 1 door built 1980 mm in higher and 915 mm in width, without a window.

- .2 Provide over the entire floor area, the fiber cement panels 13 mm thick. These panels will be installed according to the manufacturer's recommendations for both the type of fasteners used only in the amount and how to install these fasteners. Prior to ordering these panels coordinate with the general contractor specific requirements the supplier of flooring that will be installed inside the cold room to ensure their compatibility. Important: In any case, the level of finished floor inside the room must not be lower or higher than the threshold. It is important to coordinate perfectly thickness of cement board and flooring, and before the manufacturing floor panels and door sills.
 - .3 Supply and install when the flooring has been installed, and if the site conditions require, a transition ramp stainless steel properly sized, closed and sealed on all sides, the full width of the door sill, for the difference of level between it and the floor of the adjacent room.
 - .4 Supply and install shims 25 mm thick over the entire area of the cold room.
 - .5 Supply and install reinforcements inside the walls where the wall for bumpers.
 - .6 Supply and install an external access ramp, 1220 mm wide, 1000 mm long and ± 120 mm high, perfectly adapted to the height of the freezer room threshold. On top of the ramp, provide a 20 mm thick marine plywood and gray recycled plastic reinforcements below (Replast), 38 mm thick, installed at intervals of about 210 mm over the entire length of the ramp and on the ends 3 sides. The ramp shall be securely attached to the floor of the adjacent room to prevent movement and the lower end shall be beveled to sit flat on the floor.
Coordination: Before manufacturing, coordinate perfectly the width, length and the total height to avoid interference with the threshold of the freezer door. Also perfectly seal all joints, including the one with the freezer room and those at the junction of the adjacent floor. The flooring shall be installed by others on top of the ramp.
- .3 Bumpers :
- .1 Supply and install, at the bottom of each door, two (2) sides, a stainless steel plate 1.6 mm thick, finished No. 4, 1016 mm high.
 - .2 Supply and install bumper or door stops.
- .4 Related works (by others) :
- .1 Supply and install, inside the walk-in cold rooms, a finish floor identical to the one outside the walk-in cold rooms and so on top of the ramp and seal the joints of the cement boards.
- .5 General construction: see section 2.1 of this specification section.
- .6 Note: The installer of the cold room has a responsibility to ensure that the plant is perfectly level and in line with good practice. Although the floor under the cool room is requested at the installer is required to provide the necessary shims to adjust perfectly all panels of the room in the event the need for a slight adjustment. However, note that no piece of wood or other materials galvanized steel will be accepted. The manufacturer should also make sure to seal all openings between the panels and the floor so as to ensure that the cold room is completely sealed.

2.5 WALK-IN COLD ROOM : N°126

- .1 Quantity : 1
- .2 Scope of works :
 - .1 Supply and install 1 prefabricated walk-in cold room, including walls and ceiling, complete with 1 door built 1980 mm in higher and 915 mm in width, with a window.
 - .2 Supply and install a smooth base for concealed anchor the walls of the room will have no insulated floor. This rail will be securely anchored to the floor and caulked, as shown on the plans to allow the walls to install and provide a seal foolproof.
 - .3 Supply and install reinforcements inside the walls where the wall will be fixed bumper.
- .3 Bumpers :
 - .1 Supply and install, at the bottom of each door, two (2) sides, a stainless steel plate 1.6 mm thick, finished No. 4, 1016 mm high.
 - .2 Supply and install bumper or door stops.
- .4 General construction: see section 2.1 of this specification section.
- .5 Note: The installer of the cold room has a responsibility to ensure that the plant is perfectly level and in line with good practice. Although the floor under the cool room is requested at the installer is required to provide the necessary shims to adjust perfectly all panels of the room in the event the need for a slight adjustment. However, note that no piece of wood or other materials galvanized steel will be accepted. The manufacturer should also make sure to seal all openings between the panels and the floor so as to ensure that the cold room is completely sealed.

2.6 REFRIGERATION EQUIPEMENTS (GENERAL)

- .1 General requirements:
 - .1 Tenderers must reflect the requirements and site conditions. They will among others visit every document of the client (or project manager) to take notice, if applicable, the phasing of work, the work environment to the site, and any other requirements particular might influence their submission.
 - .2 All refrigeration systems must be of the same brand.
 - .3 Exigences particulières pour l'entrepreneur en réfrigération :
 - .1 The refrigeration contractor that will perform the specified work will be able to respond to a service call within four (4) hours and send a technician to complete the repair within 24 hours.
 - .2 The refrigeration contractor that will perform the specified work must respect the layout of equipment as presented in the plans. If site conditions prevent the refrigeration contractor to comply with layout plans provided, it shall notify the engineer in writing before making any changes.

- .3 The equipment must be manufactured and installed by a company whose employees are qualified for the manufacture and installation of prefabricated cold rooms, and who, during the five (5) years, has acquired recognized expertise in this field.
- .4 In addition, the refrigeration contractor will provide qualified personnel with Certificate of Qualification as refrigeration mechanic and hold a valid license issued by the Régie du bâtiment du Québec in the sub-category : 15.10 – Refrigeration or/and in the category 1.3 – All buildings or in the following sub-category:
 - .1 15.5 – Plumbing
 - .2 16 – Electrical and/or 17.1 Instrumentation and control systems
- .5 Reference standards :
Unless otherwise indicated, execute work to the requirements of ACNOR standard B52, and in compliance with prescribed ARI, ASME and ASHRAE requirements for testing criteria and performance.
- .4 Scope of work: supply and install all refrigeration mechanisms shown on the drawings and described in this part of the specifications. Without limitation, work includes the following main accessories :
 - .1 Refrigeration systems : Condensing units and evaporators
 - .2 Refrigeration piping and its thermal insulation
 - .3 All drain piping for evaporators up to the open drain near, and so heating cables for drain piping, insulation and sacketting
 - .4 Refrigerant and refrigeration oil
 - .5 Accessories for refrigeration systems, filter dryers, sight glass, solenoid valves, expansion valves, regulators, etc.
 - .6 Automatic controls, electronic thermostats, defrost timers, defrost relays, etc.
 - .7 Starters and all the required wiring connecting between the different components of the systems, ready for hook-up by Division 16.
- .5 Verification: before ordering, submit to Representative of the Ministry for verification a digital copy in PDF format of compressor, evaporator data and control sheets for each system, and so the data sheets of the insulation and jacketing to be installed. These data sheets must be includes in the booklets of the stock equipments. After approval of submitted documents by the Representative of the Ministry, the contractor must provide all copies to the professional and to the general contractor; these documents must have precedence on the work site.
- .6 Booklets for installation, maintenance and operation and « As built » documents :
at work completion, the kitchen equipment manufacturer must hand out to the owner three (3) booklets and one (1) electronic copy on CD or on a USB key aggregating all systems with the clearly identified specifications concerning their installation, maintenance and operation and also all documents marked «As built».

- .7 Warranty:
- .1 At work completion, the kitchen equipment manufacturer shall issue a one-year (1) certificate of guarantee (parts and labour), effective from the provisional date of acceptance of the work and covering all the refrigeration mechanisms, including the compressors, evaporators and other accessories that are included. In addition, compressors shall be guaranteed for an additional four-year (4) period which does not include labour for their replacement. This extended guarantee applies to new units only.
 - .2 In the course of the one-year (1) warranty period, the kitchen equipment manufacturer must respond to all service calls free of charge where his responsibility is involved.
- .8 Refrigeration systems to provide and install, completely autonomous, with a condensing unit mounted on a galvanized steel base and air forced evaporator attached to the ceiling of the concerned cold or freezer room.
- .1 Condensing unit: including a compressor, a water-cooled condenser, a liquid tank and all other necessary elements mounted on a base made of galvanized steel, with anti-vibration pads. The system must be designed to work 16-18 hours a day to evaporation prescribed at an ambient temperature of 35 degrees Celsius. Service valves to be installed at the discharge and suction of the compressor, and the outlet fluid reservoir.
 - .1 Semi-hermetic compressor adapted to cold rooms.
 - .2 Liquid receiver:
 - .1 The design pressure, materials, testing and welding safety valves shall conform to ASME standards for boilers and pressure vessels and ARI-495 standard for refrigerant liquid accumulator tanks.
 - .2 The storage tank must have an overcapacity of 20% compared to the volume of refrigerant to evacuate or a capacity meeting the requirements of the provincial code. This capacity must be expressed in kilograms of liquid refrigerant at a temperature of 32°C.
 - .3 Tanks will be equipped with a safety valve type fuse to prevent excessive refrigerant pressure within the system. For each system, the Contractor shall verify the capacity of the liquid, depending on the capacity of the system, and will, if necessary, install a required capacity.
 - .3 Condensers : Water cooled condensers.
- .10 Evaporators :
- .1 Cooling units: evaporators are standard cooling units with copper tubing, aluminium fin coils, white aluminium body, readily accessible fans and motors, and permanent lubricated motors. Units for walk-in cold rooms at 0 °C and lower must be fitted with electric heating elements for defrosting.
 - .2 All evaporators will be equipped with a disconnect switch preinstalled on the unit by the manufacturer for disconnecting refrigeration and fans.

- .11 Evaporator supports: evaporator will be securely attached to walk-in cold room ceiling on steel supports such as «Unistrut» to distribute the weight of the equipment and using 304 stainless steel threaded rods and nuts for refrigerated rooms and fiberglass threaded rods for frozen rooms (nylon threaded rods will not be accepted).
- .12 Refrigeration piping :
 - .1 Required quality: piping must be copper, type « ACR », flexible where 16 mm OD and smaller is required. Elsewhere, use rigid 19 mm and larger piping « ACR » type in compliance with ASTM B88M and ASTM B280 standards. Piping must be deoxidized and dehydrated at plant and have plugged ends. Pipes to be clearly marked by manufacturer for refrigeration purposes.
 - .2 Joints, couplings, elbows:
 - .1 Fittings meet the requirements of ASME B16.26 and ASME B16.29.
 - .2 Single and Double Elbows: type large radius.
 - .3 Minimize the number of bends and joints.
 - .3 Piping diameter size: the diameter of refrigeration lines shall be determined according to horizontal and vertical travel distances, operating temperature, refrigeration capacity and to the constraints encountered for each system.
 - .4 Suction line: suction line must have a minimum velocity of 750 FPM for horizontal runs and 1500 FPM for those verticals. Velocity should never exceed 3000 FPM and comply with recommended pressure loss.
 - .5 Liquid line: velocity in liquid line should be between 50 and 250 FPM. Velocity should never exceed 300 FPM and comply with recommended pressure loss.
 - .6 Pressure loss: pressure loss in piping shall be more or less equivalent to 2°F for all refrigeration lines.
 - .7 Installation: the services of certified refrigeration installers are required to carry out the installation and testing of the refrigerant piping. Piping shall be laid in proper alignment and parallel near walls and ceilings, and display the specified slope. Install the horizontal piping to have a minimum slope of 1:240 (1/16'' : 1'-0'') to wards the condensing unit for oil return.
 - .8 Piping supports: supports for uninsulated vertical and horizontal piping and insulated vertical piping shall be type «Cush-A-Clamp» complete with fasteners, thermostatic joints and steel supports. The supports and bracket will be in steel with «electro-chromate» finish for indoor installation and stainless steel for outdoor installations.

Provide space for the insulation on suction and discharge lines as required. Supports for insulated horizontal piping shall be «Insuguard» brand and must be appropriate size. The piping must be supported by metal channels «Unistrut» type every 1800 mm maximum, to the ceiling of building, with threaded steel rods. When a support fastens insulated pipe, support must be large enough to accommodate insulation without excessive compression.

- .9 Piping above evaporator: where piping runs above walk-in cold room ceiling, an oil trap must be installed at the end of each evaporator, on the suction line.
- .10 Risers: suction side risers must be fitted with a P-trap at each 4.5 m.
- .13 Piping insulation:
 - .1 All suction lines shall be insulated over its entire length up to compressor service valve. Discharge and liquid condensate lines shall be insulated between the condensing unit and the condenser.
 - .2 All evaporators drain piping located inside cold rooms shall be insulated.
 - .3 Perform all insulation work according to manufacturer's recommendations regarding installation of insulation material and its finish.
 - .4 The materials used shall have a flame-spread rating no more than 25 and a smoke development rating not more than 50, according to CAN/ULC-S102.
 - .5 Flexible mechanical insulation, elastomeric foam, unicellular sheet and roll compliant with CSA/ONGC-51.40-M80 and amendments of August 83.
 - .6 Acceptable products: «Armstrong», «Armaflex» type AP or equivalent to be approved.
 - .7 Flexible insulation thickness for applications as follows :
 - .1 Walk-in cold rooms at 0 °C and over : 13 mm thick;
 - .2 Walk-in cold rooms at 0° C and lower : 20 mm thick.Furthermore, all refrigeration pipes and evaporators drain conduits running through walls of walk-in cold room shall be sealed on both sides with an approved sealant.
 - .8 Vertical piping: the vertical suction piping must be equipped with a siphon every 3.65 m (12 feet).
- .14 Jacketing :
 - .1 PVC jacketing: all refrigeration suction lines and evaporators drain piping which are located inside walk-in rooms must be covered with a PVC jacketing in accordance with ONGC51-GP-53M, white color, 0.38 mm thickness. Additional features:
 - .1 With insulating sleeve for fitting, one-piece, pre-molded and form-fitting the liner.
 - .2 Acceptable products: «PROTO» or equivalent to be approved.
 - .3 Use a solvent specially designed to bond joints.
 - .2 Aluminum jacketing: insulated refrigeration piping located outside the building on all non-accessible or visible public areas. Additional features:
 - .1 Aluminum alloy, compliant with CSA HA, serie M1980, stucco finish, 0,5mm thickness.
 - .2 Longitudinal slip joints and end joints overlap of 50mm wide.
 - .3 Exterior surfaces coated at the factory with a protective coating and corrosion barrier with stainless steel mechanical fasteners.
 - .4 Jacketing for fittings with stamped elements in aluminum alloy of 0.5 mm (0.02 ") thick, into two parts.
 - .5 Joints sealed with stainless steel collars.

- .6 Acceptable products: «ITW» or equivalent to be approved.
- .3 Alumaguard jacketing: use the insulated refrigeration piping outside the building in a lower dimension to 2.5 inches.
- .15 Evaporator drain piping: the evaporator drain piping shall be in rigid copper, type L, 20mm minimum diameter. Evaporator drain piping shall reach the open floor drain of the building provided for this purpose. In addition, the evaporator drain piping installed inside walk-in cold room under 0°C shall be equipped with a heating cable «Raychem WinterGard Wet» model H612 120Volts or H622 220Volts depending on application.
- .16 Accessories :
 - .1 Thermostatic expansion valve: one thermostatic expansion valve «balanced port» type to be installed on each evaporator for each cold room system. Where the expansion valve is of the external equalizer type, it is mandatory that the equalizer be connected to the suction pipe at evaporator's discharge. On walk-in freezer, the thermostatic expansion valve must be equipped with a MOP feature.
 - .2 Solenoid valve: to be installed on the liquid line of each system as close as possible to the thermostatic expansion valve to prevent endless pumpdown. This valve must be installed vertically onto a horizontal run and control with refrigeration controller.
 - .3 Vibration suppressor: Install vibration suppressor parallel to the compressor, same diameter as piping and installed on the suction and discharge lines (as required) of each compressor. Weldings must be executed with a material complying with best practice.
 - .4 Filter-dryer: one filter-dryer must be installed on the liquid line of each system. The filter-dryer must be of same diameter as the piping and sealed one-piece, with solder connections.
 - .5 Liquid and humidity indicator: one liquid and humidity indicator must be of same diameter as the piping and installed on the liquid line, just next to the filter-dryer.
 - .6 Suction line accumulator: one suction line accumulator shall be installed on the suction line, close to the compressor, in order to prevent liquid slugging.
 - .7 Head pressure controls: adjustable head pressure regulators kit must be supply for all condensing unit installed outdoor or for remote condensing units.
 - .8 Non-fused disconnect: one non-fuse disconnect of required capacity, installed on the electrical panel of each condensing unit.
- .17 Controls :
 - .1 Supply and install temperature and defrost controllers brand "Full Gauge" model "TC-940RI" for each refrigeration system. Each controller will complete management and will be installed in front of concerned cold room, 150 mm (6 ") below the finished ceiling, inside a mounting box" Full Gauge GB-01 "or integrated into the front of the equipment. Controllers can be connected to the building regulation to send an external alarm if there is a temperature problem. The high voltage (120v

or 240v power) and low voltage (24v control) wiring must pass through separate electrical conduits. Provide relays to protect the contacts of the controller.

- .1 Control must support the management of refrigeration, temperature, defrost, fans, external alarms.
- .2 Provide one (1) day training for personnel designated by the customer. They must understand how to use and functionality of the controller according to their specific needs.
- .3 Supply and install for all cold storage controllers of the same brand.
- .4 For low and medium temperature systems setting defrost cycles must be from 1 to 6 cycles every 24 hours for a minimum of 4 hours between each. For high temperature, frequency and number of shutdowns performed by the timer system will be programmed according to the application and need. However, a minimum of 4 hours is required between each stop period. In addition, identify the source of electricity in each clock.

OR

- .2 Supply and install temperature and defrost controllers brand "KE-2 EVAP" model "20178" for each refrigeration system, including all necessary for proper functioning of the system accessories (temperature sensors return air, probe coil and auxiliary probe model "20199" to use as a second probe coil. Controllers can be connected to the building regulation to send an external alarm if there is a temperature problem. Controller should be installed in front of the cold room, 150 mm (6") below the finished ceiling. See location on drawings.
 - .1 Supply and install controllers on aluminium mounting boxes "KE-2", model No. 20687.
 - .2 Control must support the management of refrigeration, temperature, defrost, fans, external alarms.
 - .3 Provide one (1) day training for personnel designated by the customer. They must understand how to use and functionality of the controller according to their specific needs.
 - .4 Controllers must perform demand defrost, but if they are programmed schedule mode, see thi important settings to follow. For systems of low and medium temperature setting defrost cycles must be from 1 to 6 cycles every 24 hours for a minimum of 4 hours between each. For high temperature, frequency and number of shutdowns performed by the timer system will be programmed according to the application and need. However, a minimum of 4 hours is required between each stop period. In addition, identify the source of electricity in each clock
18. Provide and install for each walk-in freezer room, 15 minutes delay timers «Intermatic» model «FF15MC» or equivalent to be approved. The contractor shall ensure electrically disconnect both fans and liquid line solenoid (compressor).

-
- .19 Electrical:
- .1 All electrical or control wiring from outside walk-in rooms or refrigeration equipment must be in electrical metallic tubing (EMT). Flexible cables such as «BX» are not accepted.
 - .2 All electrical or control wiring inside walk-in rooms or refrigeration equipment must be «Teck» type or in electrical rigid PVC conduit, humidity sealed and waterproof.
 - .3 All electrical or control wiring outside the building must be «RW» type installed in electrical rigid conduit, humidity sealed and waterproof.
 - .4 All electrical wiring shall meet local electrical code.
 - .5 All control wiring must be shielded «FT4» type.
 - .6 Maximum permissible fill in electrical conduit is 40%, regardless the voltage or wire size.
 - .7 All junction boxes must be securely fastened to the building structure or equipment, depending on the situation.
 - .8 All junction boxes must be sealed from inside with silicone when there is a transition of electrical wiring between inside and outside of walk-in rooms to prevent any transfer of heat and moisture. Coordinate and seal any openings through cold and freezer rooms, including those made by others.
- .20 Identification of equipment and piping
- .1 Standards
 - .1 Performance of work: to CAN / CGSB 24.3-92 standard unless otherwise noted.
 - .2 Plates CSA certification and ULC: according to the requirements of these organizations.
 - .3 Standards and customer requirements, if applicable.
 - .2 Nameplates manufacturers:
 - .1 Each piece of equipment must be fitted with a metal nameplate mechanically fastened and with lettering projecting or withdrawal.
 - .2 The plates shall indicate the following: model, manufacturer, serial number, voltage, frequency of the supply current, number of phases and engine power.
 - .3 The plates so that they can be read easily. They should not be painted or covered with insulation.
 - .3 Identification :
 - .1 Put a nameplate on each cold room and each condensing unit concerned. The number of the refrigeration system and the room number must be marked on each plate. Add to condensing units colored stickers indicating the type of refrigeration used.
 - .2 Colors
 - .1 Black lettering on white background (unless otherwise specified in the relevant code).

.3 Construction

- .1 Main Features: 3 mm (1/8 ") thick, laminated plastic or white anodized aluminum, matte finish, squared corners, letters accurately aligned and machine engraved into the core.

.4 Location

- .1 The plates must clearly identify appropriately devices and networks, and they must be installed to be clearly visible for easy reading from the floor level.

.5 Pipping

.1 Identification

- .1 In accordance with CAN / CGSB 24.3-92 standard.
- .2 Identify the fluid conveyed through a literary legend and colors of primary and secondary classification, and then the direction of fluid flow by means of arrows.

.2 Dimensions

.1 Dimensions :

- .1 Legend: Block capitals. Size according to following table :

Outside diameter of pipe or insulation (mm)	Size of letter (mm)
30 (1 1/4")	13 (1/2")
50 (2")	19 (3/4")
150 (6")	32 (1 1/4")
250 (10")	63 (2 1/2")
Plus de 250 (10")	88 (3 1/2")

.2 Primary background color marking:

- .1 On valves and accessories: 500mm (20") length.
- .2 Other locations: 1000mm (39") length.

.3 Secondary background colors markings: 50 mm (2") wide installed on primary color marking, 75 mm (3") from one end.

.4 Arrows:

- .1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.

- .2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.
- .3 Use double-headed arrows where flow is reversible.
- .3 Materials for background colour marking, legend, arrows:
 - .1 Paint: comply with CAN/CGSB 1-GP-60M.
 - .2 Tape: pressure sensitive [plastic-coated cloth] [vinyl] with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150 degrees C and intermittent temperature of 200 degrees C. Place the tape on clean and free of dust or grease surfaces. Install the tape around the pipe, overlapping the ends on a length equal to the diameter of the pipe.
 - .3 Label: waterproof plastic, heat resistant. Attached to tubes and pipes of 20mm (3/4") or less of nominal diameter.
 - .4 Acceptable products: «W.H.», «Brady Inc.», «Seton Name Plate Corp», «VMAP».
- .4 Table
 - .1 Piping identification

KEY MILESTONES FOR PIPE	LEGEND FOR LABELS TAPS	PRIMARY COLOR	SECONDARY COLOR
Refrigerant type, statut and number	FRIG. LIQ. R-404A FRIG. ASP. R-404A	Yellow	Black

- .2 Characters and arrows:
 - .1 Black or white contrasting color to the primary color.
- .5 Put an identification of the piping at the following locations plate:
 - .1 On long pipes in open areas, boiler rooms, equipment rooms, service shafts and tunnels, so that there is at least one plate that can be seen easily from any location within operating areas or walkways. Put plates at intervals not exceeding 5 m.
 - .1 Almost every place where the pipe changes direction.
 - .2 In each room where the pipe (at least one plate) passes.

- .3 On each side of visual obstacles or places where it is difficult to follow the route of the pipes.
- .4 On each side of .5 any separation, for example, walls, partitions or floors.
- .5 In areas where pipes are concealed in a gully, a service shaft, or other confined space, entry and departure points and near each access opening.
- .6 At the points of departure and arrival of each pipe, and nearly every piece of equipment.
- .7 Immediately upstream of the main valves / valves with manual or automatic control. Where this is not possible, the identification plate put as close as possible to the tap valve, preferably on the upstream side.
- .8 Place the caption so we can easily read from usual operating areas and all easily accessible points.
- .9 Position descriptions perpendicular to the line of the more practical view, taking into account the place is usually the operating personnel, lighting conditions, reduced visibility, color or legends caused by dust and dirt, and the risk of accidents to persons required to read them.
- .10 In the case of underground pipes, the warning tape positioned along the entire length of the route of the pipeline to about 300 mm from ground level.

.21 Paint:

- .1 Liquid line must be painted white inside walk-in rooms and when visible outside it, except in mechanical rooms.
- .2 Apparent Evaporator drain pipe: painted white, down to open drain.
- .3 Note: Paint should be applied perfectly without burr or drip.

2.7 REFRIGERATION SYSTEM NO 201

- .1 Quantity : 1
- .2 Cold room concerned : no 16
- .3 Temperature : 2°C.

- .4 Condensing unit: 1 unit with semi-hermetic compressor, water cooled, brand "REFPLUS" or "KEEPRITE" or "LARKIN". This unit will include the following items pre-assembled at the factory:
- .1 Semi-hermetic compressor brand "BITZER" model « 2KC-05.2Y »
 - .2 Water condenser brand « STANDARD REFRIGERATION » model « ELT-100 ».
 - .3 Filter dryer and sight glass.
 - .4 Suction accumulator.
 - .5 Electric panels with non-fused disconnect.
 - .6 Liquid receiver capacity adapted to site conditions, with isolation valves.
 - .7 Electrical wiring installed in sealed ducts.
 - .8 High and low pressure control with automatic reset
 - .9 The elastomer insulation "Armaflex" entire suction line.

In addition, the following should be included:

- .10 Extended 4 year compressor warranty.
 - .11 Support galvanized steel at two levels of capacity suitable for equipment with leg angle. No condensing units 201a and 202a are installed on the support.
 - .12 Supply and install 3 ways water regulating valve on the system.
- .5 Evaporator : 1 low profile unit with 2 fans, brand « REFPLUS » model « LSA1081 », or "KEEPRITE" model « KLP211MA » or « LARKIN » model « LCA6110 ». Evaporator will be a white finish (no aluminum finish).
- .6 General description: see section 2.6 of this section.
- .7 Installation: condensing unit (compressor) installed in the mechanical room concerned on two levels support, galvanized steel. Evaporator hangs from the ceiling of the room in question. The anchors must be secured with brackets type "Unistrut".

2.8 REFRIGERATION SYSTEM NO 202

- .1 Quantity : 1
- .2 Cold room concerned : no 23
- .3 Temperature : 2°C.
- .4 Condensing unit: 1 unit with semi-hermetic compressor, water cooled, brand "REFPLUS" or "KEEPRITE" or "LARKIN". This unit will include the following items pre-assembled at the factory:
 - .1 Semi-hermetic compressor brand "BITZER" model « 2GC-2.2Y »
 - .2 Water condenser brand « STANDARD REFRIGERATION » model « ELT-200 ».
 - .3 Filter dryer and sight glass.

- .4 Suction accumulator.
- .5 Electric panels with non-fused disconnect.
- .6 Liquid receiver capacity adapted to site conditions, with isolation valves.
- .7 Electrical wiring installed in sealed ducts.
- .8 High and low pressure control with automatic reset
- .9 The elastomer insulation "Armaflex" entire suction line.

In addition, the following should be included:

- .10 Extended 4 year compressor warranty.
- .11 Support galvanized steel at two levels of capacity suitable for equipment with leg angle. No condensing units 201a and 202a are installed on the support.
- .12 Supply and install 3 ways water regulating valve on the system.
- .5 Evaporator : 1 low profile unit with 2 fans, brand « REFPLUS » model « LSA1301 », or « KEEPRITE » model « KLP214MA » or « LARKIN » model « LCA6135 ». Evaporator will be a white finish (no aluminum finish).
- .6 General description: see section 2.6 of this section.
- .7 Installation: condensing unit (compressor) installed in the mechanical room concerned on two levels support, galvanized steel. Evaporator hangs from the ceiling of the room in question. The anchors must be secured with brackets type "Unistrut".

2.9 REFRIGERATION SYSTEM NO 203

- .1 Quantity : 1
- .2 Fezzer room concerned : no 32
- .3 Temperature : -18°C.
- .4 Condensing unit: 1 unit with semi-hermetic compressor, water cooled, brand "REFPLUS" or "KEEPRITE" or "LARKIN". This unit will include the following items pre-assembled at the factory:
 - .1 Semi-hermetic compressor brand "BITZER" model « 2HC-1.2Y »
 - .2 Water condenser brand « STANDARD REFRIGERATION » model « ELT-100 ».
 - .3 Filter dryer and sight glass.
 - .4 Suction accumulator.
 - .5 Electric panels with non-fused disconnect.
 - .6 Liquid receiver capacity adapted to site conditions, with isolation valves.
 - .7 Electrical wiring installed in sealed ducts.
 - .8 High and low pressure control with automatic reset
 - .9 The elastomer insulation "Armaflex" entire suction line.

In addition, the following should be included:

- .10 Extended 4 year compressor warranty.
- .11 Support galvanized steel at two levels of capacity suitable for equipment with leg angle. No condensing units 203a and 204a are installed on the support.
- .12 Supply and install 3 ways water regulating valve on the system.
- .5 Evaporator : 1 low profile unit with 2 fans, brand « REFPLUS » model « LSE0881 », or “KEEPRITE” model « KLP209LE » or « LARKIN » model « LCE694 ». Evaporator will be a white finish (no aluminum finish).
- .6 General description: see section 2.6 of this section.
- .7 Installation: condensing unit (compressor) installed in the mechanical room concerned on two levels support, galvanized steel. Evaporator hangs from the ceiling of the room in question. The anchors must be secured with brackets type "Unistrut".

2.10 REFRIGERATION SYSTEM NO 204

- .1 Quantity : 1
- .2 Cold room concerned : no 126
- .3 Temperature : 2°C.
- .4 Condensing unit: 1 unit with semi-hermetic compressor, water cooled, brand "REFPLUS" or “KEEPRITE” or “LARKIN”. This unit will include the following items pre-assembled at the factory:
 - .1 Semi-hermetic compressor brand “BITZER” model « 2JC-07.2Y »
 - .2 Water condenser brand « STANDARD REFRIGERATION » model « ELT-150 ».
 - .3 Filter dryer and sight glass.
 - .4 Suction accumulator.
 - .5 Electric panels with non-fused disconnect.
 - .6 Liquid receiver capacity adapted to site conditions, with isolation valves.
 - .7 Electrical wiring installed in sealed ducts.
 - .8 High and low pressure control with automatic reset
 - .9 The elastomer insulation "Armaflex" entire suction line.

In addition, the following should be included:

- .10 Extended 4 year compressor warranty.
- .11 Support galvanized steel at two levels of capacity suitable for equipment with leg angle. No condensing units 203a and 204a are installed on the support.
- .12 Supply and install 3 ways water regulating valve on the system.

- .5 Evaporator : 1 low profile unit with 3 fans, brand « REFPLUS » model « LSA1601 », or “KEEPRITE” model « KLP317MA » or « LARKIN » model « LCA6160 ». Evaporator will be a white finish (no aluminum finish).
- .6 General description: see section 2.6 of this section.
- .7 Installation: condensing unit (compressor) installed in the mechanical room concerned on two levels support, galvanized steel. Evaporator hangs from the ceiling of the room in question. The anchors must be secured with brackets type "Unistrut".

Part 3 Execution

WALK-IN COLD ROOM

3.1 EXAM

- .1 Verification of Conditions: Before proceeding with the installation of cold storage, to ensure that the condition of the surfaces / materials previously implemented under other sections or contracts are acceptable and can perform the work in accordance with manufacturer's written instructions.
 - .1 Visually inspect surfaces / materials in the presence of the representative of the department or the food service consultant or architect.
 - .2 Immediately notify Departmental Representative or foodservice consultant or architect of unacceptable conditions detected.
 - .3 Start the installation work only after correcting unacceptable conditions and received written Departmental Representative or food service consultant or architect approval

3.2 INSTALLATION

- .1 Provide appropriate protective equipment.
- .2 Carry out installation in accordance with written in this section of the specifications requirements.
- .3 Install panels and other elements of alignment, plumb, square and level; align all joints. Joints and intersecting elements must fit precisely, be square and well secured.
- .4 Identify discharge ports formed in the floor of the freezer room and to ensure that the underlying vapor is perforated to permit the flow of water towards the discharge pipes and ventilation.
- .5 Prevent electrolytic reaction between the metal and the concrete by applying a bituminous paint layer on metal surfaces, in accordance with manufacturer's instructions surfaces.
 - .1 Allow to dry before applying the plaster floor panels in place.
- .6 Unless otherwise indicated, install cold rooms at a minimum of 50 mm from the wall of the building.
 - .1 Fasten floors to the building wall or the floor in accordance with manufacturer's instructions.

- .7 Seal the perimeter of the floor finish once it is set up on the floor of the cold room.
- .8 Fill concrete or grout zero shrinkage the space between the edge of the floor boards and the edge of the low-floor and bring the same level as the floor slab with a trowel.
- .9 Cut or drill holes in the panels needed to install or move equipment, piping and electrical and mechanical connections.
- .10 With plugs flush, removable white plastic, close holes access key for the assembly.
- .11 Ask finishing panels and removable tapes and angles recovery.
- .12 For floors, monitor the installation or operation of the thresholds, heating cables and urethane foam.

3.3 SETTING

- .1 Remove protective coatings, submit material to test and make adjustments.

3.4 CLEANING

- .1 Cleaning up work: perform cleanup in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at the end of each workday.
 - .2 Clean equipment and devices in accordance with Section 01 45 00 - Quality Control.
 - .3 Touch up damaged coatings and finishes.
- .2 Final Cleaning: upon completion remove materials / surplus equipment, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste according to standards.
 - .1 Remove bins and recycling bins from site and dispose of materials at appropriate facilities.

3.5 PROTECTION

- .1 Protect equipment and installed components against damage during construction.
- .2 Repair damage to adjacent materials and equipment for the installation of walk-in coolers and walk-in freezers.

REFRIGERATION EQUIPEMENT

3.6 COOPÉRATION

- .1 The contractor must ascertain, with the general contractor, that the proposed localization of all devices, tubes, pipes and conduits do not interfere with other components and that each device, tube, pipe or conduit is installed where required and the global appearance must be accepted.
- .2 In no circumstance must the contractor ask for extras to his contract as a result of his failure to coordinate his work with that of other trades.

3.7 DRILLINGS

- .1 The contractor must be responsible for all wall and floor throughs for the installation of the refrigeration, plumbing and electrical conduits needed for his systems, except drillings in the roof and in exterior walls.
- .2 Before drilling, the contractor must consult with the general contractor and make sure that he will not damage other electrical, plumbing or ventilation conduits concealed in walls, ceilings or floors.
- .3 After completion of all conduit installation, the contractor must adequately seal all thrust in compliance with related sections, and especially in fire-resisting partitions. Perfect coordination overall with general contractor is mandatory.

3.8 HOOK-UPS

- .1 Electrical: all devices herein specified must be complete and supplied with all electrical accessories such as: motors, controls, contactors, etc. All internal electrical connections for each system are integral part of this specification, so the electrical trade will only have to supply power and hook up the compressors to the main switch installed in the panel, and so the evaporators.
- .2 Piping for evaporator drainage : all drain piping must always be installed in accordance with the following requirements, under penalty of being redone at the expense of the contractor :
 - .1 A trap, according to the rules of the art, is required for each evaporator drainage.
 - .2 It should never have two siphons in series on the same drain piping.
 - .3 Provide a slight slope of 1/4 "per foot up to the outside of the cold room and down the pipe outside, near the open drain provided near.
 - .4 Always provide a mechanical joint in order to replace the evaporator or for servicing.
 - .5 When the drain piping must pass through walls of the cold rooms, insulate and seal perfectly, free of burrs, the perimeter of the pipe, on both sides of the walls.

3.9 FIXATION OF EQUIPMENTS

- .1 All refrigeration equipment shall be secured to the respective locations must comply with the guidelines issued either by the architect and / or engineer foodservice / cooling and / or structural engineer (including seismic). The equipment concerned is primarily condensing units and evaporators, but are not limited therewith.

3.10 PRESSURE AND LEAK TEST

- .1 Carry out leak test before vacuumizing. Comply with requirements of CSA B52 standard; nevertheless, gauge pressure on the high pressure side shall not be lower than 2 MPa and pressure on the low side must not be lower than 1 MPa.
- .2 Use gaseous refrigerant as leak-detecting fluid and dry nitrogen to raise pressure.
- .3 Compressors with refrigerant fluid dead charge must remain segregated from the system. Protect all accessories elements during testing.
- .4 Initial system pressure: initial gauge pressure in refrigerant fluid on both high and low pressure sides shall be 35 kPa. Add dry nitrogen for on-site testing.
- .5 Carry out leak tests using leak detector.
- .6 Repair identified leaks and re-test.

3.11 DEHYDRATION

- .1 Vacuumize using a two-stage vacuum air suction system fitted with a gas injection device at second stage and with the capacity to create 0,05 mm ideal vacuum. Pump must be filled with new oil and dehydrated.
- .2 It is forbidden to carry out vacuumizing using refrigeration compressors.
- .3 Ambient system temperature must be equal to or higher than 13 °C for at least 12 hours prior to dehydration and during dehydration.
- .4 Flexible by-pass : use high-vacuum flexible piping or unsoldered copper piping fitted to high and low pressure sides. Nominal outside diameter of by-pass tube shall not be smaller than 6 mm for 70 litre capacity appliances or less (interior volume), and no smaller than 10 mm or 12 mm for appliances with interior volume larger than 70 litres.

- .5 To measure system pressure, install a thermocouple vacuum gauge fitted with an mm scale. Install a manual cut-off valve between pump and vacuum gauge and make readings only when system has been segregated from pump.
- .6 When dead charge in compressor-condenser system is intact, service valves must remain shut at start-up of vacuum. Appliances containing dry nitrogen, an improper refrigerant fluid or where loss of dead charge has occurred, the carter shall be heated during vacuumizing.
- .7 Vacuumizing of appliances installed on site must be carried out in two steps; in the two first operations, pressure must reach 1,5 mm and be maintained at this level for a three (3) hour period. Each time pressure gauge reads 14 kPa, break vacuum using an environmentally friendly gas. To carry out the last vacuumizing operation, maintain pumping over at least a four (4) hour period after reaching the 0,5 mm pressure. At the completion of the third phase, segregate pump from the rest of the system and prepare a graph displaying vacuum rate of increase likely to occur in the subsequent hours. Keep on logging data until vacuum has stabilized. Provide engineer with three (3) copies of vacuum test statement. When system is charged, run the refrigerant fluid through the filter-dryer.

3.12 INITIAL FILLING OPERATION

- .1 The initial filling of refrigerant fluid must be introduced through the filling valve on the high pressure side. A new gauge and a new filter-dryer must be fitted onto the filling valve.
- .2 The quantity of refrigerant fluid introduced shall not exceed the quantity required for the good operation of the system. When the filling operation is over, shut the filling admission valve. When the system is operational and working, check for the presence of refrigerant fluid through the sight glass near liquid receiver outlet.
- .3 Where the refrigerant fluid container must be changed during filling operation, flush once more the filling tube.
- .4 The filling operation on the low pressure side is allowed only when a small quantity of refrigerant fluid needs to be introduced in gaseous state. Measure and record the total refrigerant charge added in the system.
- .5 A two-day (2) advance notice must be given before proceeding to leak test, dehydration and filling operation.
- .6 Prime the oil separator using compressor's service oil.

3.13 START-UP AND AJUSTMENT

- .1 Supply all instruments, measuring devices and tools required to carry out testing. Set controls so that everything complies with manufacturers' design requirements, calculations and features.
- .2 Ensure that insulation of refrigerant piping and all accessories elements has been completed.
- .3 Carry out testing of refrigeration systems and log following data: air temperature at both admission and outlet, temperature using dry bulb thermometer and wet bulb thermometer.
- .4 Check and log operating voltage and amperage and compare with same as displayed on motor identification plate. Check and record technical data of starter heating element and ensure they are in compliance with design data. Voltage for each phase shall be within 100 VA.
- .5 Ensure that refrigerant fluid temperatures are within 0,5 °C of design temperatures.

- .6 Complete a refrigeration start-up report for each refrigeration system. Provide and submit to Food Service Consultant and integrate into the operating and maintenance manuals.
 - .1 Use refrigeration start-up report provided in Appendix C, the presentation of any other document will be refused for the final approval of the work.
- .7 In collaboration with manufacturer's representative, adjust automatic control system so that the sequence of various devices complies with requirements.
- .8 Start-up equipment and proceed with operational test; replace any oil or refrigerant loss.
- .9 Refrigerant: the kitchen equipment manufacturer must provide initial oil and refrigerant charges and, if need be, additional charges throughout warranty period.

END OF SECTION