

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 23 05 00 – Common Work Results for HVAC
- .2 Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment
- .3 Section 23 05 48 – Vibration and Seismic Control for HVAC Piping and Equipment
- .4 Section 23 05 49.01 – Seismic Protection Systems

1.2 REFERENCES

- .1 American Society of Heating Refrigeration and Air-Conditioning Engineers (ASHRAE)
 - .1 ANSI/ASHRAE/IES Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings.
- .2 CSA Group
 - .1 CAN/CSA-B214, Installation Code for Hydronic Heating Systems.
- .3 Electrical Equipment Manufacturers Association of Canada (EEMAC)
- .4 National Electrical Manufacturers' Association (NEMA)
 - .1 NEMA MG 1, Motors and Generators.

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 pumps, circulators and targeted equipment. Data sheets must include product characteristics, performance criteria, dimensions, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by a professional engineer registered or licensed in Canada and member of OIQ.
 - .2 Submit manufacturer's detailed composite wiring diagrams for control systems showing factory installed wiring and equipment on packaged equipment or required for controlling devices or ancillaries, accessories and controllers.

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 hydronic pumps 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 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, ideally indoors in a dry location or in a clean, dry and well-ventilated area in accordance with manufacturer's recommendations.
 - .2 Store and protect hydronic pumps from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 EQUIPMENT

- .1 Size and select components according to standard: CAN/CSA-B214.

2.2 IN-LINE CIRCULATORS

- .1 Volute: cast iron, radially split, with screwed or flanged suction and discharge connections.
- .2 Impeller: alloy steel or cast bronze.
- .3 Shaft: alloy steel with bronze sleeve bearings and integrated thrust collar.
- .4 Seal assembly: mechanical for service to 120 degrees C.
- .5 Coupling: rigid self-aligning.
- .6 Motor: according to standard NEMA MG 1, with sleeve bearings, speed and power as indicated, minimal efficiency in accordance with Section 23 05 13 – Common motor requirements for HVAC equipment.
- .7 Capacity: as indicated.

2.3 VERTICAL IN-LINE CIRCULATORS

- .1 Volute: cast iron radially split, with tapped openings for venting, draining and gauge connections, with screwed or flanged suction and discharge connections.
- .2 Impeller: alloy steel or cast bronze.
- .3 Shaft: alloy steel with bronze sleeve bearings and integral thrust collar.
- .4 Seal assembly: mechanical for service to 120 degrees C.
- .5 Coupling: rigid self-aligning.
- .6 Motor: according to standard NEMA MG 1, mounted on resilient pads, sheltered, with sleeve bearings, speed and power as indicated, minimal efficiency in accordance with Section 23 05 13 – Common motor requirements for HVAC equipment.

- .7 Capacity: as indicated.

2.4 SINGLE SUCTION CENTRIFUGAL PUMP

- .1 Pump: bronze fitted, with motor.
- .2 Base: common dip rim, cast iron with tapping for draining connection.
- .3 Volute: cast iron, radially split, end suction, screwed suction and discharge, with drain plug, vent cock and suction and discharge pressure gauge tapings.
- .4 Impeller: bronze enclosed type, keyed drive with locking nut or screw.
- .5 Shaft: alloy steel with two point support, machined shoulders for ball bearing mounting.
- .6 Seal assembly: mechanical grease lubricated.
- .7 Coupling: flexible self-aligning.
- .8 Motor: according to EEMAC Class B, squirrel cage, induction, continuous duty, sheltered type, ball bearing, maximum temperature rise 50 degrees C, speed and power as indicated, minimal efficiency in accordance with Section 23 05 13 – Common motor requirements for HVAC equipment.
- .9 Capacity: as indicated.

2.5 DOUBLE SUCTION CENTRIFUGAL PUMP

- .1 General: bronze fitted pump complete with motor.
- .2 Base: common dip rim, cast iron with tapping for draining connection.
- .3 Volute: cast iron, radially split, with suction and discharge nozzles integrally cast in lower half, flanged suction and discharge, with drain plug, vent cock and suction and discharge pressure gauge tapings.
- .4 Impeller: bronze, enclosed, keyed drive.
- .5 Shaft: alloy steel with two point support, machined shoulders for ball bearing mounting.
- .6 Seal assembly: mechanical, grease lubricated.
- .7 Coupling: flexible self-aligning.
- .8 Motor: according to EEMAC Class B, squirrel cage, induction, continuous duty, sheltered type, ball bearing, maximum temperature rise 50 degrees C, speed and power as indicated, minimal efficiency in accordance with Section 23 05 13 – Common motor requirements for HVAC equipment.
- .9 Capacity: as indicated.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for hydronic pump installation in accordance with manufacturer's written instructions.

- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 APPLICATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions and data sheets.

3.3 INSTALLATION

- .1 Install hydronic pumps in accordance with CAN/CSA-B214.
- .2 In line circulators: install as indicated by flow arrows.
 - .1 Support at inlet and outlet flanges or unions.
 - .2 Make sure bearing lubrication points are accessible.
- .3 Base mounted type: supply templates for anchor bolt placement.
 - .1 Include anchor bolts with sleeves. Make sure pumps are leveled, installing the necessary shims and sealing them with mortar grout.
 - .2 Align coupling in accordance with manufacturer's recommended tolerance.
 - .3 Check oil level and lubricate. After run-in, tighten glands.
- .4 Ensure that pump body does not support piping or equipment.
 - .1 For this purpose, provide necessary stanchions or hangers.
 - .2 Refer to manufacturer's installation instructions for details.
- .5 Connect drain tapping to floor drain.
- .6 Install volute venting petcock in accessible location.
- .7 Check rotation prior to start-up.
- .8 Install pressure gauge test cocks.

3.4 START-UP

- .1 General:
 - .1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: General Requirements; supplemented as specified herein.
 - .2 In accordance with manufacturer's recommendations.
- .2 Procedures:
 - .1 Before starting pump, check that the cooling water system's over-temperature and other protective devices are installed and operative.
 - .2 After starting pump, check for proper and safe operation.

- .3 Check installation and operation of mechanical seals and packing gland type seals. Adjust as necessary.
- .4 Make sure there are no obstructions under the base.
- .5 Run pumps for at least 12 continuous hours.
- .6 Verify operation of over-temperature and other protective devices under low and no-flow condition.
- .7 Eliminate air from scroll casing.
- .8 Adjust water flow rate through water-cooled bearings.
- .9 Adjust flow rate from pump shaft stuffing boxes to manufacturer's recommendation.
- .10 Adjust alignment of piping and conduit to ensure adequate flexibility.
- .11 Eliminate conditions which could lead to undesirable phenomena such as cavitation, gas expansion and air flow through pump.
- .12 Adjust pump shaft seals, stuffing boxes and glands.
- .13 Measure pressure drop across strainer when clean and with flow rates as finally set.
- .14 Replace seals if pump used to degrease system or if pump used for temporary heat.
- .15 Verify lubricating oil levels.

3.5 PERFORMANCE VERIFICATION (PV)

- .1 General:
 - .1 Verify performance in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: General Requirements, supplemented as specified herein.
- .2 Verify that manufacturer's performance curves are accurate.
- .3 Ensure valves on pump suction and discharge provide tight shut-off.
- .4 Net Positive Suction Head (NPSH):
 - .1 Application: measure NPSH for pumps operating on open systems and functioning with water at high temperatures.
 - .2 Measure NPSH using procedures prescribed in Section 01 91 13 - General Commissioning (Cx) Requirements.
 - .3 Where procedures do not exist, discontinue PV, report to Departmental Representative and await instructions.
- .5 Multiple Pump Installations - Series and Parallel:
 - .1 Repeat PV procedures specified above for pump performance and pump BHP for combinations of pump operations.
- .6 Mark points of design and actual performance at design conditions as finally set upon completion of TAB.

- .7 Commissioning Reports: in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements and as specified herein.
 - .1 Reports must include a record of points of actual performance at maximum and minimum conditions and for single and parallel operation as finally set.
 - .2 Use Report Forms specified in Section 01 91 13 - General Commissioning (Cx) Requirements: Report Forms and Schematics.
 - .3 Reports must include ump performance curves (family of curves).

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse/recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION