



23 00 00 Heating, Ventilating, Air Conditioning (HVAC)

1.0 General

- .1 Mechanical equipment schedules shall appear on the drawings including all performance, sizing and selection data.

in place to remove major equipment such as chillers and boilers such as roof hatches or removable roof or wall sections.

- .8 Mechanical rooms not located on the lowest level shall have waterproof floors.
- .9 Provide 110v outlets for portable service equipment.
- .10 Provide adequate lighting for servicing.
- .11 Roof mounted equipment, and the path leading to the equipment, must be protected from the roof edge with guardrails when within 3 metres (10 feet) of the edge. Ladders are not permitted to access roof mounted equipment.

3.0 Valving - General

- .1 Sufficient valving should be provided to isolate the services on each level, and each major branch.
- .2 Drain valves shall be provided at the bottom of all building risers, storage tanks, heaters, and system low spots. Drain valves shall consist of a hose bibs with a cap on a chain or shall be piped to drain. Drain valves shall be located to provide maximum effectiveness. Preferred manufacturers: Jenkins, Crane, or Zurn.
- .3 Isolation (shut-off) valves shall be provided for servicing pressure reducing valves, major components of the systems, individual floor mains, risers, and fixtures. Isolation valves shall be Victualic, Zurn or Watts.
- .4 Hot water, chilled water, and steam control valves shall be sized for 100%, and not 33% and 66%.
- .5 Kitz valves are not permitted.

4.0 Ventilation

- .1 Outdoor air requirements for ventilation shall comply with ASHRAE Standard 62 "Ventilation for Acceptable Indoor Air Quality", and the Ontario Building Code.
- .2 Operable windows shall not be used to meet fresh air requirements.
- .3 Return air shall be ducted to the return fan. Ceiling return plenums shall not be used.
- .4 Emphasis is drawn to the University's requirement for quiet operation of all mechanical heating and air handling systems. With respect to this requirement careful attention should be given to the selection and design of equipment, in particular: air velocities, fan design and selection, unit ventilators, unit heaters, pumps etc.
- .5 In existing installations with steam coils; Ventilation systems shall use steam preheat coils with integral face and bypass dampers. Where possible, steam coils shall be piped vertically.

5.0 Heating and Cooling

- .1 For new construction and major renovations, geothermal shall be used as the primary source of building heating and cooling unless shown not to be technically feasible. Geothermal system to be sized to meet peak cooling load.

- .8 Frequently insufficient drain valves are provided. Drain valves shall be provided at the bottom of all building risers, main ventilation system coils, convertors, pumps, cooling towers, expansion tanks, storage tanks, water chillers and system low spots.
- .9 Drain valves shall be provided with a hose bib or piped to drain.
- .10 Drain valves shall be located for maximum effectiveness and convenience.
- .11 Air vents shall be provided at the top of all building risers, system and equipment high spots, coils convectors, heaters, expansion lines, pumps and storage tanks.
- .12 Isolation valves shall be provided for pressure reducing valves, major components of systems, individual floor mains, risers, entrance heaters, force flow heaters and fan coil units.
- .13 Strainers shall be installed ahead of PRV's, pumps, and control valves.
- .14 In general, hot and chilled water piping shall be threaded or welded. Grooved pipe joining methods shall only be used on: Condenser water; Chilled water within mechanical rooms; Hot water within mechanical rooms.
- .15 Grooved pipe joining methods should be used at water chiller evaporator and condenser ends to facilitate disassembly.
- .16 Cooling coils shall have fittings to allow compressed air to be blown through coils for winter lay up.

7.0 Water Specialties - Heating and Cooling

- .1 Heating and cooling system expansion tanks shall be equipped with water level gauges that are conveniently located and easy to read, and a bladder to separate the air from the water. Tanks shall have bottom connections and have full acceptance bladders.
- .2 Cooling coil drain pans shall be all welded and constructed of stainless steel.
- .3 Cooling coil bases and supports shall be protected against corrosion.
- .4 Pipe system filters shall be installed across pumps in closed loop heating, cooling and condenser systems. Filter housings by Filterite (model LM0) and Filterite filter cartridges (model RL0A10T) are preferred.
- .5 Chilled water and condenser water pumps shall be started by chiller control systems and not by the BAS.
- .6 Cooling towers shall have stand-alone controls. They shall not be controlled by the BAS.

8.0 Piping Valves & Fittings - Steam & Condensate

- .1 Valves shall meet the requirements of the Manufacturers Standardization Society: iron gate valves to M55-SP-70, iron globe and angle valves to M55-SP-85, iron swing check valves to M55-SP-71, and bronze gate, globe, angle and check valves to M55-SP-80.
- .2 Steam piping and fittings shall normally be seamless and schedule forty (SCH.40) black steel to ASTM A106 Grade B.
- .3 Condensate piping and fittings;



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- a. Within the building envelope; shall normally be seamless and schedule eighty (SCH.80) black steel to ASTM A106 Grade B.
 - b. Outside the building envelope; shall normally be seamless and schedule forty (SCH.40) stainless steel to ASTM A312 TP 304L.
- .4 Strainers shall be installed ahead of PRV's, traps, and control valves.
 - .5 Drain valves shall be provided at condensate tanks and shall be located for maximum effectiveness and convenience.
 - .6 Isolation valves shall be provided for pressure reducing valves, major system components and building mains. The main line isolation valve, as it enters the building, shall be double

- .1 Circulating pumps shall have gauges to indicate both low and high side pressures. Pressure gauges should be provided with pressure snubbers to protect gauges from pulsations in pressure.
- .2 Heating and cooling pumps shall be duplex type and equipped with automatic pump change over controls.
- .3 Vertical in-line pumps 1 HP (0.75 KW) and larger should have a split type spacer coupling and have seal flushing connections complete with filter, sight flow indicator, and quarter-turn shut-off valves.
- .4 When size & pressure permit, in-line pumps with mechanical seals are preferred. Mechanical seals should be of the outside type and should be Durametalllic or equal.
- .5

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Last Updated:

.12 Vessels shall be provided for the storage of the full refrigerant charge of the largest chiller.

14.0 HVAC Water Treatment

.1 Water treatment shall be provided for all closed water systems. Systems shall include water filters. Queen's University currently engages SUEZ with contact information given below:

SUEZ
Sebastian Ratzinger, E.I.T.
Account Manager
Mobile: 613-267-0737
Email: sebastian.ratzinger@suez.com

.2 Pipe system filters shall be installed across pumps in closed loop heating, cooling and condenser systems.

.3 Water treatment systems for cooling towers shall use the conductivity method of control.

.4 Piping System Flushing & Cleaning Chemical

a. To remove oil, mill scale, and oxides from piping and equipment, all new piping to be pre-operationally cleaned using Ferroquest FQ7103.

.5 Closed Heat Transfer System Treatment (Heating and Chilled Water Loops)

a. Chemical Treatment: Corshield NT4207, nitrite-based corrosion inhibitor for mild steel and yellow metal corrosion inhibition. For systems containing aluminum, use Corshield OR4407.

b. Enameled steel or cast-iron by-pass feeders. Neptune BF-2/BF-5 or equivalent.

c. By-pass filter with flowrate of 3-5% of the total system flow rate.

d. Mild steel corrosion coupon rack.

.6 Cooling Tower System Treatment

a. Chemicals and chemical feed equipment to control scale, corrosion and microbial fouling in open evaporative cooling tower system.

b. Chemical feed equipment:

i. RediFeed RF-500 solid product dissolver

ii. Water treatment controller: Walchem W100/W600 or TrueSense Ready,Set, Go II. Must include flow switch and conductivity probe.

iii. Chemical dosing pumps: Walchem EZB Series or Prominent Beta/B including foot valves, injection quills and required tubing.

iv. Make-up water meter.

c. Treatment Chemicals:

i. Solid products: Continuum AT901 (scale & corrosion inhibitor) and Biobrom C-100G (biocide).

ii. If liquid products are required: Gengard GN8142 (scale & corrosion inhibitor), Spectrus OX1205c (oxidizing biocide), and Spectrus NX1100 (non-oxidizing biocide).

d. Mild steel corrosion coupon rack.

15.0 Heat Exchangers for HVAC



.1 For building perimeter he4



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liner of 22 gauge (0.85mm) minimum should be provided over insulated areas in filter sections.

- .3 Access doors should be provided at the following locations: mixing sections; damper sections; upstream and downstream of heating and cooling coils; humidifiers; cooling compressors; and fans and motors.

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- .7 It is the responsibility of both the controls contractor and equipment suppliers to insure the proper operation of valves, dampers and linkages.
- .8 Damper operators shall not be mounted in the air stream. Damper operators shall be easily accessible for adjustment, maintenance and replacement.

20.5 Dampers

- .1 Outdoor air dampers should be thermally insulated. Basis of design to be: TAMCO Series 9000 dampers.

20.6 Refrigerant Compressors

- .1 Compressor sections and electrical control panels should have hinged and gasketed access doors.
- .2 Each compressor should have "rotalock" service valves on the suction and discharge lines for easy removal.

20.7 Filters

- .1 Final supply air filters to have a MERV rating of 14 or higher.
- .2 Filters shall be placed upstream of supply fan preheat coils.
- .3 Filters shall provide a minimum atmosphere dust spot efficiency of 35%.
- .4 Manometers similar to the Dwyer Photohelic style shall be provided across filter banks to show the resistance to air flow through the filters. Gauges must have capability to be remotely monitored.
- .5 Manometers shall be provided with auxiliary contacts for monitoring of high pressures by the BAS.
- .6 Bag filters shall be rigid and shall not be constructed of glass fibre. A plastic filter is preferred for easy handling. A Camil - Durafil 2V is a good product. Units with bag filters
-filter.
- .7 Where possible filters shall be front loading.
- .8 Replaceable media filters should be enclosed in permanent galvanized metal frames with metal retainers on both sides.
- .9 One set of spare filters should be provided.
- .10 Filters must be easily accessible and serviceable.

21.0 Air and Water Source Unitary Heat Pumps

- .1 Heat pumps shall not be located in the ceiling space. All heat pumps to be located in mechanical rooms or mechanical closets mounted on the floor with adequate service clearances.
- .2 Fans to have quick connect pig tail for ease of changeout.

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