

Div 22 - Plumbing Design Guidelines 2025 06 02 (4)

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### **General Use of Guidelines:**

Dalhousie University Design Guidelines provide assistance to consultants during the planning, and design phases of the University's expansions and renovations. The Guidelines do not relieve a consultant from any professional responsibility, duty or due diligence to design elegant, functional, efficient and low maintenance facilities.

Facility owners have preferred materials and requirements that make the task of maintaining facilities less costly. Dalhousie understands this is a balance between capital and operating cost. The Guidelines are not intended to be the only acceptable solution. Dalhousie expects consultants to bring modern and innovative ideas, materials and methods to the University. If these Guidelines do not allow these new ideas then the consultant is to make a request in writing to the Dalhousie Project Manager for an exception to the guidelines. Necessary reasoning and/or calculations shall accompany the request. The exception request will be reviewed internally and either rejected or accepted. The consultant will document this rational and/or justification for each exception in the Basis of Design. The University Guidelines may be updated subsequently.

These documents provide design guidelines only, and are not intended for use, in whole or in part, as a specification. Do not copy the guidelines verbatim in specifications or in notes on drawings. Refer questions and comments regarding the content and use of these documents to the Dalhousie University Project Manager. The Guidelines are intended to be read in conjunction with the local codes and regulations, and in no way are to be considered as a code replacement. The codes and regulations represent the minimum acceptable standard. Where the design guidelines differ from the building codes and other applicable codes and standards, the more stringent of the requirements shall be applied.

### **Maintaining the Guidelines:**

The Design Guidelines are created and maintained by Dalhousie's Facilities Management Department. Any enquiries about the Guidelines should be directed to Facilities Management, Director of Projects, Central Services Building. Dalhousie encourages design specialists and other interested parties to provide their input and suggestions based on their experience.

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MECHANICAL CONSULTANT COMPLIANCE CHECKLIST

	C	NC	NA
<b>General Requirements</b>			
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3. Energy Efficiency			
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(C – Compliant; NC – Non-Compliant; NA – Not Applicable)



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Net Increase in:

Plumbing Fixture units:

COLD = \_\_\_\_\_

HOT = \_\_\_\_\_

TOTAL = \_\_\_\_\_, GPM = \_\_\_\_\_

Building Heating Loads:

BTU/HR = \_\_\_\_\_

GPM = \_\_\_\_\_, LBS/HR = \_\_\_\_\_

*The Engineer has verified the existing building systems are adequate for additional capacity noted above.*

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Consultant Name

Consultant Signature

Date YYYY MM DD

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Project Manager Name

Project Manager Signature

Date YYYY MM DD

**Note:** *If the Guidelines or part of cannot be attained or fulfilled (i.e. NC or NA) during the design process, the Consultant should provide reason(s) why such Guidelines are not met. Any modification or alterations to the design guidelines will need to be agreed/accepted by Facilities Management prior to inclusion in the design.*

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### General Requirements

#### 1. Warranties

- A. Standard 12-month warranty for a project begins at Substantial Performance. Systems and or equipment that is not considered complete at the time of the project's (or trade's) Substantial Performance shall be noted as such on the Substantial Performance Certificate's Punch List. Warranty for this equipment (or system) shall be one year from the date upon which it is removed from the Punch List.
- B. Extended warranties are available for many pieces of equipment and/or products from the manufacturer. Dalhousie requires suppliers/manufacturers to provide such extended warranties directly to the Owner in the name of Dalhousie University. A list of such warranties will be reviewed with the Owner at time of shop drawing submission.
- C. The designer shall recommend any extended warranties (including labour) and/or service agreements to the Owner. In all cases, these shall be listed as alternative prices to the base project on the bid form.

#### 2. Equipment Capacity

- A. Electrical Motors
  - a. No electrical motor shall operate in excess of 80% of its FLA at peak design conditions. If a VFD is applied, at this condition it shall not exceed 48 Hz.
  - b. Under no circumstances shall a motor, by design and/or at design operation, ever exceed 48 Hz.

#### 3. Energy Efficiency

- A. Variable speed drives should be used for all 3 phase motors that would traditionally require a starter. Specification must state that the associated rebate is to be payable to the University.
- B. Heat Recovery Systems, where practical, are preferred wherever possible.

#### 4. Efficiency Nova Scotia Rebates

- A. Energy efficiency must be considered and equipment specifications must align with those identified by Efficiency Nova Scotia as eligible for Business Energy Rebates. The rebates include but are not limited to the following categories:
  - a. Compressed Air
  - b. Hot Water Heating
  - c. Motors & Variable Speed Drives

The specifications identified by Efficiency Nova Scotia are available on their website <https://www.efficiencyns.ca/business/products/>

#### 5. Equipment Isolation

- A. All equipment shall be able to be individually isolated (mechanically & electrically).

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### **6. Placement of Equipment and Equipment Access**

- A. As necessary the Designer shall summarize all work necessary to place equipment or systems into existing spaces. Including but not limited to wall removals, door removals, special cranes, knock down equipment.
- B. The ability to service equipment, including necessary permanent platforms, shall be reviewed with the Project Manager as part of the shop drawing review/approval. Exceptions to the manufacturer's recommended clearance requirements, shall be identified during the shop drawing review/approval stage by the designer.
- C. The internal dimension of all access doors and panels must be a minimum of 12" x 18". Access doors shall be hinged with a positive locking mechanism.
- D. Equipment shall not be placed closer than 3 meters (2 meters from the roof edge plus 1 meter for servicing room) from the edge of any roof. If this is not possible, appropriate engineered barriers shall be provided.
- E. Equipment should be located with consideration of snow accumulation, entry into equipment and removal. As well as protected from University snow removal operations. Where snow accumulation is inevitable, designer is to complete a structural analysis.
- F. Equipment to be placed on the roof must include a detailed drawing of sleepers, penetrations, etc. It is the responsibility of the Designer to ensure the detailed drawing is signed off by a qualified roofing professional and ensure roof warranties are not voided by works carried out.

### **7. Mechanical Rooms:**

- A. Provide floor drains and floors sloped to the drains.
- B. It is preferred that Mechanical rooms not be used as an air plenums. Exceptions are to be presented to the University for the Project Manager's approval.

### **8. Special Procedures for Third Party Equipment Integration Into Campus BMS:**

- A. Division 01 35 13.01 to 13.03 deals with third party equipment that has a microprocessor based controller whose information is to be integrated into the campus' Building Management System (BMS); Johnson Controls Metasys for Halifax campuses and Delta Controls enteliWEB for Bible Hill. The mechanical and/or electrical consultant are responsible to identify equipment that is to be integrated and make reference to these three Division 1 sections in that equipment's specification section so M&E suppliers do not miss this critical information.
  - a. In each equipment's specification section the consultant shall;
    - i. Identify the objects that are to be integrated for the equipment that the design is based on.
      - 1. Preceding the list shall be a statement of *"including but not limited to. The owner reserves the right to modify the list if the equipment supplied is different than that which the design is based on, or the software that the design is based on has changed, or during the*

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*mockup information provided during the design is inconsistent with what comes through the integration.”*

ii. In the Shop Drawing section include the statement:

1. *At the supplier's cost, including that of the Campus BMS Company, Supplier must install/mock up a live installation and integrate it into the Campus BMS to demonstrate that it meets the BACnet specification. Failure to integrate successfully will result in rejected shop drawings.*

B. Process for defining objects to be integrated:

BMS Contractor will work with the Consultant and the University to:

Obtain the object list from the University's inventory of previous integrations

Or

For Equipment / Systems not previously integrated, Building Management System (BMS) Contractor shall facilitate the following process and when completed, turn over to the University the outcomes for archiving and future implementation.

1. Obtain from the Equipment / System supplier a summary of what information can be integrated complete with detailed descriptions of what each piece of information means.
2. Obtain from the Equipment / System supplier the Sequence of Operation for each System that is to be integrated.
3. The University will review Items 1 & 2 and advise BMS Contractor what is to be integrated and displayed on Graphics.
4. If BMS Contractor needs to integrate more information than requested by the University, it shall be placed in the All Items Tab of the BMS.
5. Facilitate and participate in joint training with the supplier for the Integrated Equipment / System to ensure what was integrated is understood, appropriately documented and displayed in the BMS.

The above process shall apply for any firmware/software changes to previously integrated equipment. In this case, only the 'changes' are to be submitted for the University's consideration.

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### 22 05 53 Identification for Piping and Equipment

1. Refer to the Facilities Management Website for the separate guideline for Mechanical Identification.

### 22 05 19 Meters and Gauges for Plumbing Piping

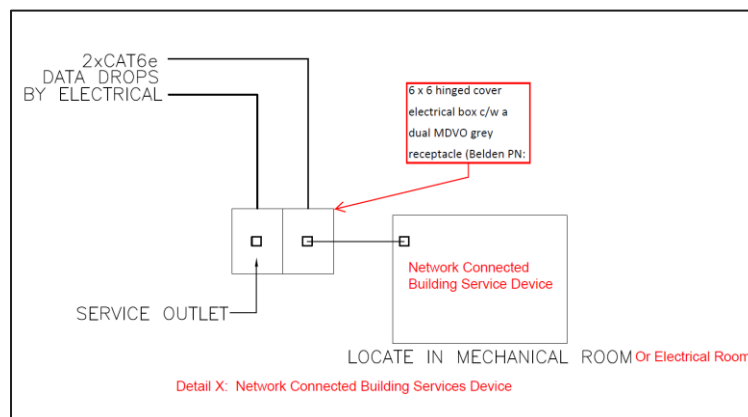
#### 1. General Requirements:

- A. All utility expenditures in new buildings shall be metered and connected via electronic data conversion to the applicable University Building Management and Control System (Johnson Controls Metasys or Delta EnteliWEB) and the University's Energy Management Information System (EMIS).
- B. These are the units and their compulsory units of measurement;
 

a. Electricity Demand	Kilowatts kW
b. Electricity Consumption	Kilowatt hours kWh
c. Water	Litres/Min
d. Condensate	Litres/Min
e. Chilled Water	Kilowatt hours (kWh)
f. Hot Fluid (Water, Glycol/Water)	Kilowatt hours (kWh)
g. Steam	Lbs/hour
h. Solar Thermal (air or water)	Kilowatt hours (kWh)

#### 2. Electricity:

- A. ION meter(s) physically installed and connected to the University Network via:



- B. ION meter added to Schneider SQL server
- C. C&E finds the ION meter and adds to EMIS (Creates Entelliweb BACnet points for kW & kWh)

#### FACILITIES MANAGEMENT

Central Services Building | 1236 Henry Street | PO Box 15000 | Halifax NS, B3H 4R2 Canada

**DAL.CA**



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- D. JCI (Metasys) finds the points in the C580-B600-ebMGR01 location and adds to Metasys
  - a. All current electrical meters (in Metasys) are found at: NAE-10>Bacnet IP1>C580-B600-ebMGR01.

### 3. Water:

- A. Via Halifax Regional Water Commission Revenue Meter's Signal Duplicator to be supplied by the Building Management System Contractor.
  - a. 4 – 20 mA signal
  - b. Arrange for signal duplicator via Halifax Regional Water Commission. Last Contact Info: Corey Whalen, Supervisor of Metering, coreyw@halifaxwater.ca, 902 490-5472, 902 441-1145 (Cell)
- B. Meters are configured as per the University's Utility Meter Standard within the University's Metasys Building Management System
- C. Each meter's object information is provided to Controls & Equipment who define each in enteliWEB and then in the University's EMIS.

### 4. Thermal Energy:

- A. Meters are supplied, installed and configured as per the University's Utility Meter Standard within the University's Metasys Building Management System
- B. Each meter's object information is provided to Controls & Equipment who define each in enteliWEB and then in the University's EMIS.

## 22 07 19 Piping Insulation

### 2. General Requirements:

- A. Wherever damage to the insulation jacketing is possible (e.g. within 4'-0" of the floor within mechanical rooms, etc.), the insulation shall be installed complete with a canvas jacket, otherwise insulation shall be complete with a PVC jacket.
- B. All exterior insulation shall be complete with an aluminum jacket, self-adhering peel and stick flexible weatherproof claddings shall not be acceptable.

## 22 10 10 Plumbing Pumps

### 1. Domestic Booster Pumps:

- A. Systems shall be a manufactured, pre-packaged complete with close-coupled horizontal design pumps, all bronze construction and of a duplex, or triplex, configuration with individual pumps sized for 50% of duty.
- B. Where a future expansion to the system is possible, it shall be sized to have 20% excess flow, head pressure & motor capacity when operating at peak design capacity.
- C. Systems shall be serviced by essential power, if available within the building.

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- D. Systems shall be integrated to the campus building management system with the following control points:

<b>OBJECT NAME</b>	<b>READ/WRITE</b>	<b>Units</b>
BMS Remote Start/Stop	Read/Write	Stop (0)/Start (1)
System Status	Read	Off (0)/On (1)
System Power	Read	kW
General Alarm	Read	Ok (0)/Alarm (1)
Discharge Pressure	Read	psi,ft,kPa,m,bar
Discharge Pressure Setpoint	Read/Write	psi,ft,kPa,m,bar
Suction Pressure	Read	psi,ft,kPa,m,bar
Boost Pressure	Read	psi,ft,kPa,m,bar
Lead Pump Number	Read	1, 2, X
Pump 1 Speed	Read	%
Pump 2 Speed	Read	%
Pump X Speed	Read	%
Pump 1 Power	Read	kW
Pump 2 Power	Read	kW
Pump X Power	Read	kW
Pump 1 Mode	Read/Write	Hand/Off/Auto
Pump 2 Mode	Read/Write	Hand/Off/Auto
Pump X Mode	Read/Write	Hand/Off/Auto
Pump 1 Operating Hours	Read	Hours
Pump 2 Operating Hours	Read	Hours
Pump X Operating Hours	Read	Hours
Alarm Reset	Read/Write	Off (0)/Reset (1)
Pump 1 VFD Fault	Read	Ok (0)/Alarm (1)
Pump 2 VFD Fault	Read	Ok (0)/Alarm (1)
Pump X VFD Fault	Read	Ok (0)/Alarm (1)
Pump 1 Alarm	Read	Ok (0)/Alarm (1)
Pump 2 Alarm	Read	Ok (0)/Alarm (1)
Pump X Alarm	Read	Ok (0)/Alarm (1)
Low Suction Pressure Alarm	Read	Ok (0)/Alarm (1)
High Suction Pressure Alarm	Read	Ok (0)/Alarm (1)
Low Discharge Pressure Alarm	Read	Ok (0)/Alarm (1)
High Discharge Pressure Alarm	Read	Ok (0)/Alarm (1)
Suction Pressure Sensor Alarm	Read	Ok (0)/Alarm (1)

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OBJECT NAME	READ/WRITE	Units
Discharge Pressure Sensor Alarm	Read	Ok (0)/Alarm (1)

### 2. Sump Pumps and Pits:

- A. Systems shall be a manufactured, pre-packaged complete with float & rod type control system (individual mercury float-based systems shall not be acceptable) and of a duplex configuration with individual pumps sized for 100% of duty (i.e. peak design flow).
- B. Where a future expansion to the system is possible, it shall be sized to have 20% excess flow, head pressure & motor capacity when operating at peak design capacity.
- C. The pump control circuitry shall be designed to alternate pumps for each pumping cycle automatically.
  - d. Low turns on duty pump.
  - e. High turns on standby pump.
  - f. High High alarms visually, audibly and via relay output to the Building Management System (BMS).
- D. Devices in pits or tanks shall be retrievable for service and or repair via a cabling or other system or means accessible from the access point. Each means will be labelled as to the device it is connected to. Including, but not necessarily limited to, pumps, foot valves & float valves.
- E. The consultant is responsible for designing the removal means which may consist of a simply cable to a hoisting system depending on the device and it weight/application.
- F. The electrical feed to the duplex pump control shall be fed from an emergency source, when the facility is equipped with emergency power.

## 22 11 16 Domestic Water Piping

### 1. Piping Requirements:

- A. Plastic pipe is expressly not permitted in any instance for pressurized lines, except for in slab radiant heating.
- B. Pressurized domestic cold, hot and recirculation water piping:

Service	Pipe Material	Fittings Material	Joints
2" or less, above ground	Copper Type K or L	Wrought Copper	Soldered or Press Fit rated for up to 248 F & suitable for potable water

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Service	Pipe Material	Fittings Material	Joints
Greater than 2", above ground	Copper Type L	Wrought Copper	Silfos, Press Fit or Mechanical Grooved either rated for up to 248 F & suitable for potable water
Less than 2", below ground	Copper Type K	Soft Copper	Muller Mechanical Fitting
2" and greater, below ground	Ductile Iron	Ductile Iron	Mechanical Flange

### C. Non-Pressurized domestic cold-water piping:

Service	Pipe Material	Fittings	Joints
Trap Seal Primer Line	Copper 'L' Soft Tubing, coated or plastic is encased in concrete.	-	Job Specific

## 2. Press Fit or Mechanical Grooved Applications:

- A. For press fit or mechanical grooved applications, installation specifications shall state the following as a minimum.
- B. Press fit applications:
  - a. Installation:
    - i. Copper and copper alloy press connections shall be made in accordance with the manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting.
    - ii. The joints shall be pressed using the tool(s) and jaws/rings approved by the manufacturer.
    - iii. Prior to installation, training shall be performed on the jobsite by the manufacturer or their certified agent. Training must include proper installation and safety procedures and each individual must make a proper press connection with fittings and tools provided by the manufacturer for the demonstration only. With their approved fitting connection, each installer will be given a wallet card stating they were present for training on the current jobsite. The wallet card must be carried by the certified installer at all times, if

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this documentation cannot be provided when requested, the portion installed by that individual shall be removed and reinstalled by a certified installer.

b. Testing:

- i. Water Testing: The copper tubing system shall first be water tested for joint tightness, and to locate any unpressed connections. When first testing with water, the proper pressure range is 15 psi to 85 psi, at this pressure unpressed connections will leak water through the engineered leak path embedded within the fitting. Once all connections are confirmed pressed, the system shall then be pressurized to the maximum pressure and length of time required by the code or standard. The system shall have no leaks at the rated pressure. Following a successful initial pressure test, the system shall be pressure tested up to 600 psi with water.

C. Mechanical grooved applications:

- a. Mechanical Grooved joints shall be installed in accordance with the manufacturer's latest published instructions. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service during the shop drawing review process. Gaskets shall be molded and produced by the grooved coupling manufacturer. As a minimum, couplings with high temperature gaskets (250F) are to be used. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. The Mechanical Grooved coupling manufacturer's factory trained field representative shall provide on-site training for each of installing contractor's field personnel used on the project in the proper use of grooving tools, application of groove, and installation of grooved piping products. Grooving tools shall be of the same manufacturer as the fittings and couplings. Training must take place prior to any installation of grooved product. A list of attendees who have satisfied training requirements for the project will be provided to the Owner, Engineer and Contractor. Mechanical Grooved product installed by an individual found not to have satisfied training will be removed and reinstalled by trained persons at the cost of the contractor. A factory trained representative shall periodically visit the jobsite to ensure best practices in mechanical grooved product installation are being followed. Contractor shall remove and replace any improperly installed products.
- b. Systems shall be designed in accordance with the coupling manufacturer's design guidelines associated with thermal expansion and contraction. The final layout shall be reviewed by a professional engineer employed, or retained, by the coupling manufacturer. This resource shall submit a written confirmation of this review to the Project Engineer for their review & approval, prior to installation.

### 3. Acceptable Performance:

- A. Hot water circulation must be that 120 deg.F (49 deg.C.) reaches the faucets within 10 seconds of initial activation.

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### 22 11 19 Domestic Water Piping Specialties

#### 1. Piping Specialties:

- A. Frost Free Hydrants shall be provided on exterior building walls. Spacing & quantities as per direction of the University's Project Manager.
- B. A minimum of one Hose bib shall be provided in each mechanical room protected as per current applicable codes.
- C. For washrooms with a minimum two water closets, and two sinks, behind a lockable access panel, a cold-water hose connection shall be provided.

#### 2. Isolation and Valve Requirements:

- A. All domestic cold, hot and recirculation water piping shall have isolation valves provided at:
  - a. each floor level;
  - b. each washroom, kitchenette and/or laboratory; and
  - c. each fixture with pressurized water supply.
- B. Consideration shall be provided for building area or, "wing" level isolation at the discretion of the University Project Manager.
- C. Except for specialty valves, all valves to be of one manufacturer.
- D. Use full port ball valves up to 2" and gate for larger pipe sizes.
  - a. Butterfly valves are not permitted.
- E. Use globe valves for any control valve or PRV bypass lines.
  - a. Butterfly valves are not permitted.
- F. The manufacturers listed below are preferred, but not to be sole sourced. Equal equivalents are to be recommended by the designer and approved by the Project Manager.

Fixture	Preferred Manufacturer
Gate Valve	Crane, Jenkins, Watts
Ball Valve	Crane, Jenkins, Watts
Globe Valve	Crane, Jenkins, Watts
Check Valve	Crane, Jenkins, Watts

### 22 13 16 Sanitary Waste and Vent Piping

#### 1. Piping Requirements:

- A. All piping and pipe fittings shall be in accordance with the following tables.
- B. Sanitary drainage and vent piping:

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Service	Pipe Materials	Fittings	Joints
Less than 3", above ground	DWV Copper	DWV Copper	Soldered
3" and greater, above ground	Cast Iron*	Cast Iron	Mechanical Joint
Less than 3", below ground	ABS	ABS	Glued
3" and greater, below ground	PVC/ABS	PVC	Mechanical Joint (hub and ring gasket)
Laboratory and/or chemical	Glass/Blueline		

- C. PVC or PVC XFR will be considered on a case by case basis, with justification, however, the consultant shall ensure that noise concerns are considered.
- D. Storm water drainage piping:

Service	Pipe Materials	Fittings	Joints
Any size, above ground	Cast Iron	Cast Iron	Mechanical Joint
Less than 3", below ground	ABS	ABS	Glued
3" and greater, below ground	PVC	PVC	Mechanical Joint (hub and ring gasket)

### 22 13 19 Sanitary Waste Piping Specialties

#### 1. Piping Specialties:

- Floor drains shall be provided, as a minimum, in all washrooms, custodial closets and mechanical service rooms.
- All cleanouts shall be floor-mounted cleanouts complete with stainless steel cover flush to the finished floor surface. (i.e. plug cleanouts shall not be accepted), unless permission provided otherwise by the University Project Manager.
- All running traps shall have cleanouts at the crown of both sides of the trap.
- All sanitary vent piping shall connect into the building sanitary vent system, air admittance valves may be accepted with permission provided by the University Project Manager.

### 22 15 00 General Service Compressed - Air Systems

#### 1. Piping Requirements:

- The University has central compressed air systems with clean, dry, oil-free air for all Halifax Campuses. These systems shall be used for compressed air.

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- a. No new air compressor equipment shall be installed without approval from the University Project Manager.
- B. For the Agricultural Campus, new compressors shall be rotary screw type only
- C. All new compressed air systems shall supply clean, dry, oil-free control air to the pneumatic control system

### **22 31 00 Domestic Water Softeners**

- 1. No requirements currently, place held for future requirements.

### **22 32 00 Domestic Water Filtration Equipment**

- 1. No requirements currently, place held for future requirements.

### **22 33 00 Electrical Domestic Water Heaters**

- 1. No requirements currently, place held for future requirements.

### **22 35 00 Domestic Water Heat Exchangers**

- 1. Thermal Source**
  - A. In anticipation for the campus' conversion to hot water from steam, DHW systems shall be hot water to hot water, or electric. There shall be no steam to hot water based DHW systems.
- 2. Performance Requirements:**
  - A. Where indirect domestic hot water heaters are used, the consultant shall ensure they are not the driving factor for system temperature or operational requirements in a hydronic heating system that will operate with a water temperature reset program or be otherwise shutdown throughout the year.
  - B. Consideration should be given to dual heating methods.

### **22 42 00 Commercial Plumbing Fixtures**

- 1. Preferred Manufacturers:**
  - A. The manufacturers listed below are preferred. Alternates may be recommended by the designer and approved by the Project Manager.

Fixture	Preferred Manufacturer
Domestic Water Backflow Preventers	Watts



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<b>Fixture</b>	<b>Preferred Manufacturer</b>
Fixture Carriers (Toilets)	Zurn
Floor and Roof Drains	Zurn
Vanity Lavatory Basin	Frankie (Aristilane) OV1721R
Stainless Steel Sinks	Frankie, AMI
Electronically activated flush valves for urinals (Not concealed type)	Zurn or Sloan
Dual-flush manual flush valve for toilets	Zurn or Sloan
Toilets	American Standard
Urinals	Kohler, American Standard
Automatic motion sensor faucet	Delta, Sloan, Moen, or Chicago
Manual single lever faucet for vanity basin	Delta, Sloan, Moen
Pumps, cold water booster	Armstrong, Bell & Gossett (B&G)
Pumps, fire	Armstrong, Bell & Gossett (B&G)
Water fountains	ELKAY

### 2. Water Closets:

The maximum horizontal distance from any fixture to a sanitary waste stack shall be 25 feet. The consultant MUST obtain approval of their design by the Project Manager for any variance to this.

#### a. Wall Hung Toilet- Vitreous China- Tank Type

- 1 American Standard Glenwall Pressure-Assisted Elongated #2093.700 .020 Low Consumption Toilet, white vitreous china, wall hung, siphon jet flush action, 6 L (1.6 US Gal) per flush, raised sanitary bar, 305 mm x 254 mm (12" x 10") water surface, two (2) piece, 'Speed Connect' tank assembly, bolted tank cover, elongated bowl, 51 mm (2") fully glazed internal trapway , bolt caps.
- 2 American Standard Commercial #5901.100SS Toilet Seat, Heavy Duty, for elongated bowl, open front, solid polypropylene plastic, less cover, reinforced stainless steel self-sustaining check hinges, post nuts and washers.
- 3 Note: Acceptable alternate manufacturers: Crane & Eljer no other alternates will be accepted.

#### b. Wall Hung Toilet -Vitreous China- For Dual Flush Flushometer- Exposed-Manual

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- 1 American Standard Aftwall Millennium Flowise Elongated #3351.101.020 HET Toilet, white vitreous china with EverClean antimicrobial surface which inhibits the growth of stain and odor causing bacteria mold and mildew, wall hung, siphon jet flush action, operates in the range of 4.2 L to 6 L (1.1 US Gal to 1.6 US Gal) per flush, condensate channel, 305 mm x 254 mm (12" x 10") water surface, elongated bowl, 54 mm (2-1/8") fully glazed internal trapway, 38 mm (1-1/2") dia. Top spud.
- 2 American Standard Commercial #5901.100SS Toilet Seat, Heavy Duty, for elongated bowl, open front, solid polypropylene plastic, less cover, reinforced stainless steel self-sustaining check hinges, post nuts and washers.
- 3 Sloan UpperCut #WES 111-CP, Exposed Manual Dual Flush Flushometer for Top Spud Toilet, chrome plated, 6 L (1.6 US Gal) full flush I 4.2 L (1.1 US Gal) partial flush, quiet action 'PERMEX' diaphragm type with dual filter by-pass, non-hold open feature, green color A.D.A triple seal oscillating handle with antimicrobial protection, two (2) adhesive backed Metal Wall Plates etched with Instructions, V.P. Smooth design stop cap on bak-chek angle stop (screwdriver operated), flush tube for 292 mm (11-1/2") rough-in, high pressure vacuum breaker.
- 4 Note: Acceptable alternate manufacturers: Crane & Eljer no other alternates will be accepted

### c. Floor Mounted Toilet- Vitreous China- Tank Type

- 1 American Standard Champion Pro #211AA.004 Low Consumption Toilet, 419 mm high, vitreous china with EverClean antimicrobial surface which inhibits the growth of stain and odor causing bacteria mold and mildew, Floor Mounted, siphon jet flush action, 6 L (1.6 US Gal) per flush, large sweeping sanitary bar, 229 mm x 203 mm (9" x 8") water surface, two (2) piece, 'Speed Connect' tank assembly, unlined tank, large flapper-free 102 mm (4") dia. Piston action accelerator flush valve, 'Pilot Valve' water control (without float) for quiet refill, 305 mm (12") rough-in, elongated bowl, 60 mm (2-3/8") fully glazed internal trapway, floor outlet, bolt caps.
- 2 Provide bolted tank cover if required- to meet local codes. Provide trip lever on open side of Toilet (wide side) if required - to meet local codes.
- 3 American Standard Commercial #5901.100SS Toilet Seat, Heavy Duty, for elongated bowl, open front, solid polypropylene plastic, less cover, reinforced stainless steel self-sustaining check hinges, post nuts and washers.
- 4 Note: Acceptable alternate manufacturers: Crane & Eljer no other alternates will be accepted.

### 3. Urinals:

- A. Shall be white vitreous china.
- B. Urinals shall be mounted with an exposed, low flow automatic flush-o-meter electrically supplied with low voltage from a transformer mounted in a concealed space.

### 4. Washroom Sinks:

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- A. Shall be white vitreous china, or stainless steel.
- B. Faucets shall be complete with hot and cold-water isolation valves
- C. Public lavatory faucets shall be complete with an automatic motion sensor, the sink shall not be fitted with plugs or chains. Faucets should be of commercial grade. The drain shall have a grid.
- D. Private lavatory faucets (located in residences) shall be complete with a manual, single lever with plug and/or chain. Faucets should be of commercial grade.
- E. Fixtures should have accessible offset waste pipes, with accessible taps.
- F. The provision of lavatory basins mounted in vanity units is preferred for 2 or more basins in all public washrooms.

### **5. Custodial Sinks:**

- A. Shall be provided such that there is a minimum of one (1) sink per building level, located in custodial closets.
- B. Shall be floor-mounted with dimensions of 24" wide by 24" long by 12" high and complete with a stainless-steel splash guard on the wall to a height of 48".

## **22 45 00 Emergency Plumbing Fixtures**

- 1. No requirements currently, place held for future requirements.

## **22 47 00 Drinking Fountains and Water Coolers**

### **1. Drinking Fountains:**

- A. Coordinate locations of water fountains during design process.
- B. Shall be wall mounted, stainless steel, barrier-free, filtered, cooled, and able to fill water bottles.
- C. Standard of acceptance shall be Elkay Model EZ H2O Model LZWSR\_1B.

## **22 67 00 Reverse Osmosis Piping and Equipment**

### **1. Piping Requirements:**

- A. All piping and valves shall be type 316, schedule 5 stainless steel with all-welded joints and specifically manufactured fittings as required. All piping shall be mechanically polished and factory cleaned with capped ends. Alternates may be accepted with permission provided by the University Project Manager.
- B. The piping distribution system shall be installed such that it's a continuous loop with all dead-legs limited to a maximum of six (6) pipe diameters.
- C. Consideration should be given to the fluid velocity within the piping system to minimize the risk of contamination.