



Travaux publics et
Services gouvernementaux
Canada

Public Works and
Government Services
Canada

Direction générale des
biens immobiliers

Real Property branch

Région du Québec

Quebec region

Canada

IMMIGRATION HOLDING CENTER, LAVAL

STANTEC CONSULTING LTD.

PWGSC Project No. R.082963.001

ADDENDUM No. M-03 Mechanical

NOT TO BE USED FOR
CONSTRUCTION

March 11, 2019





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Prepared by:



Alexandre Jean, Eng.
Mechanical 2019-03-08

**Public Works and
Government Services Canada**

Immigration Holding Centre (IHC) Laval
PWGSC Project R.082963.001

Addendum No. M-03
Mechanical

This addendum completes, modifies or eliminates certain elements of the tender documents, which the addendum refers to. It is an integral part of the tender documents.

1. SPECIFICATIONS

The following sections are modified (see pages issued):

- Section 22 42 13: pages 6 to 8 issued.
- Section 22 47 00: pages 3 to 5 issued.
- Section 23 84 13: page 3 issued.
- Section 25 90 01: pages 1 to 9 issued.

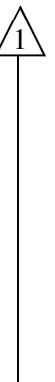
2. DRAWINGS

2.1 MECHANICAL

The following drawings are modified and issued with the current addendum **(19 drawings)**:

- | | |
|--------|--------|
| • M001 | • M204 |
| • M101 | • M206 |
| • M102 | • M401 |
| • M103 | • M402 |
| • M104 | • M403 |
| • M106 | • M406 |
| • M109 | • M407 |
| • M201 | • M501 |
| • M202 | • M502 |
| • M203 | |

- .2 LM-1: Wall-mounted sink, for disabilities access.
 - .1 Bowl: Vitrified porcelain, with integrated backsplash shelf, concave front, low depth in the front, overflow opening in the front, supply opening place at 102 mm from center axis to center axis, dissimulated supports, dimensions of 686 mm x 509 mm.
 - .1 Acceptable products: American Standard 9141.911.020; Zurn; Toto.
 - .2 Faucet: Mixing valve with unique lever, mixing spout without washer and brass chrome aerator, 131 mm projection and thermostatic mixing valve.
 - .1 Device can limit the flow at 5.7 liter per minute at 413 kPa.
 - .2 Acceptable products: Chicago Faucets 420-ABCP; Zurn; American Standard.
- .3 LM-2: Wall-mounted sink.
 - .1 Bowl: Vitrified porcelain, with integrated backsplash shelf, concave front, low depth in the front, overflow opening in the front, supply opening place at 102 mm from center axis to center axis, dissimulated supports, dimensions of 521 mm x 464 mm, 165 mm deep.
 - .1 Acceptable products: American Standard Lucerne 0355.012.020; Zurn; Toto.
 - .2 Faucet: Mixing valve with unique lever, mixing spout without washer and brass chrome aerator, 131 mm projection and thermostatic mixing valve.
 - .1 Device can limit the flow at 5.7 liter per minute at 413 kPa.
 - .2 Acceptable products: Chicago Faucets 420-ABCP; Zurn; American Standard.
- .4 BP-1: Foot bath.
 - .1 Bassin: Specified in architecture;
 - .2 Faucet: Wall mounted faucet, with two levers, polished chrome-plated brass, orientable spout with a 150 mm projection, vandal proof:
 - .1 Device can limit the flow at 3.8 liter per minute at 413 kPa;
 - .2 Color-coded metal handles;
 - .3 Supplied with a thermostatic mixing valve installed on piping;
 - .4 Acceptable products: Chicago Faucets 420-ABCP; Zurn; American Standard.
- .14 Piping serving each equipment.
 - .1 Cold and hot water supply.
 - .1 Chrome piping, rigid, with a shut-off valve, valve close by a screwdriver, reducer and rosette.
 - .2 Drainage.
 - .1 Bronze "P" siphon with discharging plug on all equipment that does not have an integrated siphon.



- .2 Chrome element wherever it can be seen.
- .15 Supports.
 - .1 Pre-fabricated in-wall support mount on floor for all wall equipment.

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 washroom fixtures installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied Departmental Representative.

3.2 INSTALLATION

- .1 Mounting Heights:
 - .1 Standard: To manufacturer's recommendations.
 - .2 Wall-hung fixtures: As indicated.
 - .3 Barrier-free: To most stringent CSA B651.

3.3 ADJUSTING

- .1 Complying with water conservation requirements specified this section.
- .2 Adjustments:
 - .1 Adjust water flow rate to design flow rates.
 - .2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.
 - .3 Adjust flush valves to suit actual site conditions.
 - .4 Adjust urinal flush timing mechanisms.
 - .5 Set controls of automatic flush valves for WCs and urinals to prevent unnecessary flush cycles within inoccupancy time of the building.
- .3 Checks:
 - .1 Water closets, urinals: Flushing action.
 - .2 Aerators: Operation, cleanliness.
 - .3 Vacuum breakers, backflow preventers: Operation under all conditions.
- .4 Thermostatic Controls:
 - .1 Verify temperature settings, operation of control, limit, and safety controls.

3.4 CLEANING

- .1 Progress Cleaning: Clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
- .3 Waste Management: In accordance with Section 01 74 19 - Waste Management and Disposal.

END OF SECTION


1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store, and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: In accordance with Section 01 74 19 - Waste Management and Disposal.


Part 2 Products

2.1 MANUFACTURED UNITS

- .1 Fixtures: Manufacture in accordance with CAN/CSA-B45 Series.
- .2 Trim, fittings: Manufacture in accordance with CAN/CSA-B125.3.
- .3 Exposed plumbing brass to be chrome plated.
- .4 Number, Locations: Architectural drawings to govern.
- .5 Refrigerated Drinking Fountains:
 - .1 F-1: Interior refrigerated drinking fountain recessed.



 - .1 Universal access wall-mounted refrigerated drinking fountain, rear panel and ventilation grille made of 304 grade, 18-gauge, stainless steel.
 - .2 Refrigeration system: Packaged hermetic R134a unit with pre-cooler, insulated double wall chiller, storage tank, air-cooled condenser, thermostatically controlled.
 - .3 Capacity: 30 L/h from 27°C to 10°C, with 32°C ambient air. In accordance with ARI 1010.
 - .4 Cabinet: Type 302 stainless steel, satin finish, integral back, strainer, access panel and grille, elevated bubbler base.
 - .5 Bubbler: Pushbutton operated, self-regulating, angle stream, squirt-proof, with nozzle and guard.
 - .6 Electrical: Grounded electrical cord with plug: 120 V, 60 Hz. CSA certified.
 - .7 Acceptable products: Haws H1109.8, Elkay, Stern-Williams.
 - .2 FE-1: Exterior drinking fountain.


↑

 - .1 Universal drinking fountain for exterior wall mounted installation, freeze resistant, and vandal-proof, without integrated trap.
 - .2 Cabinet: Type 302 stainless steel, satin finish, integral back, strainer, access panel, and grille, elevated bubbler base.
 - .3 Bubbler: Pushbutton operated, self-regulating, angle stream, squirt-proof, with nozzle, and guard.
 - .4 Acceptable products: Haws 1109FR, Elkay, Stern-Williams.

- .6 Fixture Piping:
 - .1 Hot and cold-water supplies to each fixture:
 - .1 Chrome plated rigid supply pipes each with screwdriver stop, reducers, escutcheon.
 - .2 Waste:
 - .1 Brass "P" trap with cleanout on each fixture not having integral trap.
 - .2 Chrome plated in all exposed places.
- .7 Chair Carriers:
 - .1 Factory manufactured floor-mounted carrier systems for all wall-mounted fixtures.

Part 3 Execution

3.1 APPLICATION

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

3.2 INSTALLATION

- .1 Mounting Heights:
 - .1 Standard: To comply with manufacturer's recommendations unless otherwise indicated or specified.
 - .2 Wall-hung fixtures: As indicated, measured from finished floor.
 - .3 Physically handicapped: To comply with most stringent of either NBC or CAN/CSA B651.
- .2 Drinking Fountains and Water Coolers:
 - .1 In accordance with ARI 1010.

3.3 ADJUSTING

- .1 Complying with water conservation requirements specified this Section.
- .2 Adjustments:
 - .1 Adjust water flow rate to design flow rates.
 - .2 Adjust water cooler, drinking fountain flow stream to ensure no spillage.
- .3 Checks:
 - .1 Refrigerated water coolers: Operation, temperature settings.
- .4 Thermostatic Controls:
 - .1 Verify temperature settings, operation of control, limit, and safety controls.

3.4 CLEANING

- .1 Clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools, and equipment.
- .2 Waste Management: In accordance with Section 01 74 19 - Waste Management and Disposal.

END OF SECTION

- .2 304 stainless-steel evaporation chamber.
- .3 Lid with secure screw type closures or snap closure.
- .4 Fast-absorbing vapor dispenser (less than 200 mm (8 in.)).
- .5 Heating element(s) type "Incoloy Clad" or Inconel 800/825.
- .6 Solenoid type water supply valve.
- .7 Integrated automated drain water chiller.
- .8 Integral fill cup with minimum 1-in. (25 mm) air gap to prevent back siphoning.
- .9 Filter with removable sieve installed on the water inlet valve.
- .10 Water level control device.
- .11 Prefiltered thermal protection with manual reset and installed on unit.
- .12 Electrical panel separated from evaporation chamber and equipped with hinged access door and key lock. The panel must include a subpanel consisting of magnetic contactor(s), automatic top and low water fill controller, transformer, control and load fuses, and terminal block connection. High voltage wiring must be protected to prevent the risk of electric shock.
- .13 Control module with indicator light indicating operation of the humidifier.
- .14 CSA and UL approvals.
- .15 Wall support.
- .16 Electronic control system for adjustment of intervals and times of automatic drainage with a timer.
- .17 Automatic end-of-season drainage system.
- .18 Controller modulating S.C.R. or proportional S.S.R. with pass detection and zero switching, with 0-10 VDC or 4-20 mA signal.
- .19 Accessories:
 - .1 Particle filter: For 30-micron particles.
 - .2 For installation on humidifier water supply.
 - .3 Acceptable products: Culligan, Filter-Guard 4435-55.
- .20 Features: As per the Humidifier schedule on drawings.
- .21 Acceptable Products: Nortec, model RS; Pure, EC model; Neptronic, model SK 300M; Vapac, LR Series; Dri-Steem.

2.2 DRAIN COOLER

- .1 Equipment that mixes cold water with hot rejected water, with a thermostatic mixing valve, a stainless steel mixing tank, and a vacuum breaker to maintain water discharge below 60°C.
- .2 Acceptable products: Dristeem Drane Kooler.



Part 1 General

1.1 RELATED REQUIREMENTS

- | | | |
|-----|------------------|----------------------------------------------------------------|
| .1 | Section 23 01 05 | Operation and Maintenance of HVAC Systems during construction. |
| .2 | Section 23 05 13 | Common Motor Requirements for HVAC. |
| .3 | Section 23 05 53 | Identification for HVAC Piping and Equipment. |
| .4 | Section 25 01 11 | EMCS: Start-up, Verification and Commissioning. |
| .5 | Section 25 01 12 | EMCS: Training. |
| .6 | Section 25 05 01 | EMCS: General Requirements. |
| .7 | Section 25 05 02 | EMCS: Submittal and Review Process. |
| .8 | Section 25 05 03 | EMCS: Project Record Documents. |
| .9 | Section 25 05 54 | EMCS: Identification. |
| .10 | Section 25 05 60 | EMCS: Field Installation. |
| .11 | Section 25 08 20 | EMCS: Warranty and Maintenance. |
| .12 | Section 25 10 01 | EMCS: Local Area Network (LAN). |
| .13 | Section 25 10 02 | EMCS: Operator Work Station (OWS). |
| .14 | Section 25 30 01 | EMCS: Building Controllers. |
| .15 | Section 25 30 02 | EMCS: Field Control Devices. |

1.2 GENERAL

- | | |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| .1 | Following sequences apply for all the mechanical systems, when necessary. |
| .2 | Critical protections or those required by Codes (detection of gas, fire, etc.) will not have to be by-passed in any way, neither manually, nor by computer. If an input is required to the centralized system, supply a relay to execute the double function of control and alarm. |
| .3 | When there is an input of information for proof of operation, a total of hours of operation of mechanical equipment (water cooler, ventilators, pumps, air conditioning devices, etc.) will automatically be made, complete with operator control resetting. |
| .4 | Program alarms for all the following situations: |
| .1 | Discrepancy between command and status signals; |
| .2 | Room temperature at more than 2°C from the setpoint; |
| .3 | System temperature at more than 2°C from the setpoint for longer than 30 minutes; |
| .4 | Hydronic network temperature at more than 1°C from the setpoint for longer than 30 minutes; |
| .5 | Other values: Greater than 5% discrepancy with the setpoint. |

- .5 When the program switches control modes (example: Cooling with heating), a dead band of 1°C minimum must be included on setpoints. Also, several control stages in sequence contain a minimum time IN and OUT. These measures eliminate the danger of equipment cyclic functioning.
- .6 When restarting after breakdown, systems will be restarted with 15-minute intervals (adjustable delay).
- .7 All butterfly control valves will be corrected by software programming or by characterized connecting rod and actuators to maintain a proportional valve flow with the control signal.
- .8 The following sequences must be read together with drawings and list of points. Supply all the control points necessary for the control sequences performing, listed or implicit.
- .9 Program trend log points for all the input and output analog points and variables that change in time.

Part 2 Sequences of Operation

2.1 HEATING/COOLING/GEOTHERMAL NETWORK

- .1 System Description:
 - .1 Recovery chillers (heat pumps) provide heating and cooling of the building.
 - .2 There are four two stage chillers (RF-01A to REF-01D), two natural gas condensing boilers (CH 01 and CH-02) and one DX chiller (REF-02). with an air-cooled condenser. The setpoints are transmitted via BACnet. The following information is integrated via the BACnet interface: Electrical power (kW), heating / cooling power, compressor states, water and refrigerant pressure (per circuit), water temperatures, and alarms.
 - .3 RM-0X motorized control valves all have positioners to return valve position to central system.
 - .4 The CO-EN-REF and CO-EN-CH energy meters measure return flow rates and temperatures to calculate the building's energy consumption in real time. They return the energy consumed and the flow to the central system.
- .2 Sequence of Operation:
 - .1 Heat pump chillers, boilers, auxiliary chiller, and heating and cooling pumps are shut down when there is no demand for heating or cooling.
 - .2 Glycol pressurization units or cold-water pressure reduction station maintain pressure in water and glycol systems. Network pressures PR REF, PR-CH, PR-CHP, and PR-GEO are returned to the central system.
 - .3 The TA-REF chilled water setpoint is 6.7°C (44°F).
 - .4 The TA-CHA heating setpoint is 43°C (110°F).
 - .5 The heat pumps chillers are controlled in sequence (by the integrated control unit) to maintain the chilled water (TA-REF) or heating (TA-CHA) setpoint, whichever is greater the greater demand. Main heating pump PCH-1A or PCH-1B and main chilled water pump PREF-1A or PREF 1B are always in

- operation. When starting a heat pump, the two pumps, hot side (PCH-3A or PCH-3B) and cold side (PREF 2A or PREF-2B), start.
- .6 When the system is in demand for cooling, and there is a surplus of heat in the primary heating network and the water temperature at the inlet of the chillers TR-CHA-P1 is approaching 39.8°C, PGEO 1A or PGEO-1B pump is started alternately, the geothermal well access valves (RM 02 and RM 03) open to evacuate the heat and at the same time the RM-01 valve closes proportionally. The operation of the valves is done gradually to avoid a sudden change in the temperature of the network. The modulation of the RM-01, RM-02, and RM-03 valves keeps the setpoint at the chiller inlet at 37.8°C. When the water temperature at the chiller inlet (TR CHA-P1) is maintained at 37.8°C or below for 5 minutes, the RM-02 and RM-03 valves return to the closed position and the RM-02 valve 01 returns to the open position, and the PGEO-1A or 1B pump is turned off.
- .7 If the heat pump chillers (REF-01A to REF-01D) are no longer sufficient for the cooling demand and the secondary network temperature (TA REF) is moving away from the setpoint, the REF 02 chiller is started to maintain the network setpoint. The REF-02 chiller is stopped when the supply temperature (TA-REF) is below the setpoint. Heat pumps are in priority mode on REF-02 cooler and boilers.
- .8 When the system is in heating mode and the inlet temperature (TR REF-P) at REF-01A to REF 01D falls below 0°C, the pump PGEO-1A or PGEO -1B is started alternately, the geothermal well access valves (RM-04 and RM 05) open to absorb heat from the ground and at the same time the RM-01 valve closes proportionally. The operation of the valves is done gradually to avoid a sudden change in the temperature of the network. The modulation of the RM 01, RM 04, and RM-05 valves keeps the setpoint at the chiller inlet between -1°C and 2°C. When the chiller inlet water temperature (TR-REF-P) is maintained at 2°C and higher for 5 minutes, the RM-04 and RM-05 valves return to the closed position, and the valve RM 01 returns to the open position, the PGEO-1A or 1B pump is off. When the geothermal field return temperature is below -4°C, the chillers are gradually unloaded.
- .9 At the same time, when the primary system supply temperature (TA-REF-P) is lower than 6.7°C, the RM-06 is modulated to maintain the supply temperature of the secondary network (TA-REF) at 6.7°C.
- .10 If the heat pump chillers (REF-01A to REF-01D) are no longer sufficient for the heating demand of the secondary network (TA-CHA), the injection heating pumps PCH 2A or PCH-2B start alternately and the motorized valve associated with the boiler is opened and the boiler is modulated to maintain the setpoint, if the supply temperature of the main heating network (TA CHA) is not reached with a single boiler, the second boiler is started. The boiler supply setpoints are transmitted via BACnet. The following information is integrated via the BACnet interface: Heating power (kW), modulation percentage, burner states, water and gas temperatures, and alarms.



2.2 50% GLYCOL NETWORK (KITCHEN)

- .1 System Description:
 - .1 50% glycol supply for the heating coil in ventilation units UV-C, provided by glycol heat exchanger ECH-GLY and PECH-4A/PECH-4B circulation pumps.
- .2 Sequence of Operation:
 - .1 When UV-C ventilation unit requires hot water for the heating coil. either PECH-4A or PECH-4B pump is started alternately.
 - .2 The motorized valve (RM-09) installed on the hot water network is modulated to maintain the supply temperature of the 50% glycol network (TA-ECH-GLY) at the setpoint of 35°C (95°F).
 - .3 The 50% glycol pressures (PR-ECH-GLY) is returned to the EMCS.



2.3 PUMPS WITH INTEGRATED VFD'S

- .1 System Description:
 - .1 These pumps have their own controls and their (Variable Frequency Drive) VFD's. The rotation speed is controlled according to an algorithm that is adjusted at the initial start-up TAB of the system. The stop / start is controlled by the EMCS. The power in kW, the rotation in TPM, the percentage (%) of rotation, the operating state, and the alarms are returned via BACnet.

2.4 VENTILATION SYSTEMS UV-XXX (TYP.)

- .1 System Description:
 - .1 These are the main air distribution systems. These are variable flow systems. They include a supply fan and a cooling coil, a humidifier, and a filter section. Each system is equipped with its outdoor air supply system with recovery (UAF-XX), which includes a supply fan, an exhaust fan, and a heat recovery wheel.
- .2 Sequence of Operation:
 - .1 System shutdown:
 - .1 The fan is off. The humidifier is off and the chilled water valve is closed.
 - .2 The system is stopped on smoke detection by the fire alarm system.
 - .3 UAF-XX: The fans and the heat wheel are stopped, and the dampers are closed.
 - .2 System operating:
 - .1 The system operates 24 hours a day. The schedule can be changed on the screen.
 - .2 On a start-up request, the supply fan is started. The motorized fresh air and evacuation dampers are opened, and a proof of opening is used to start UAF-XX unit. The fans of the UAF-XX are started and the rotational speed of the heat wheel is controlled by the integrated control unit of the UAF-XX.

- .3 The air temperatures before and after the heat wheel are returned to the EMCS for real time display via the BACnet MS/TP network.
- .4 The EMCS returns a signal representing the static pressure of the supply duct to modulate the VFD of the fan.
- .5 When the fresh air temperature does not allow free cooling, the chilled water valve is modulated to maintain the setpoint.
- .6 The supply temperature is maintained between 13°C and 21°C depending on the highest demand of the rooms.
- .7 When the relative humidity of the return air is less than 28%, the humidifier can operate and the EMCS modulates the capacity of the humidifier to maintain 30%. A high relative humidity limit causes the humidifier to shut down and returns an alarm. The relative humidity of the duct is returned to the system by the duct probe.
- .8 A low temperature limit stops the units on if supply temperature is lower than 4°C.
- .9 The pressure loss of dirty filters is 350 Pa (1.4 in. Water) for UV-XX units and 350 Pa (1.4 in. Water) for UAF-XX units. EMCS displays pressure and alarm when final pressure is reached.
- .3 Alarms:
 - .1 Unwanted shutdown of fan(s).
 - .2 Control point in manual mode.
 - .3 Supply temperature too low or too high.
 - .4 Freeze limit stop.
 - .5 UAF-XX controller alarm.
 - .6 Dirty filters.
- .4 History to program:
 - .1 Supply, return, and exhaust temperatures.

2.5 VENTILATION SYSTEM UV-C/ VE-1 / VE-2

- .1 System Description:
 - .1 This is the kitchen air supply system. It includes a supply fan, a 50% glycol hot water heating coil, and a filter section. This system is used to ventilate and heat the kitchen, and to compensate for the air exhausted by the dishwasher and the cooking hoods.
- .2 Sequence of Operation:
 - .1 System shutdown:
 - .1 The fans are off, the outside air damper is closed, and the return damper is 100% open and the heating valve is closed. The dishwasher exhaust fan VE-2 and kitchen exhaust hood fan VE-1 are off.
 - .2 The system is stopped on a smoke detection by the fire alarm system or by the cooking hoods control system.
 - .3 When the system is off, it can restart to heat the kitchen in winter.

- .2 System operating:
 - .1 The system operates 12 hours a day. The schedule can be changed on the EMCS screen.
 - .2 On an unoccupied start request for kitchen heating, the unit's supply fans are started. The motorized fresh air damper is closed and the return damper is 100% open. The heating coil valve is modulated to maintain the room temperature.
 - .3 On a start request, the unit's fans are started. The motorized fresh air damper opens in the minimum position (in order to maintain XXX l/s according to the air flow sensor) and the return damper closes proportionally to the opening of the outside air damper. The heating coil valve is modulated to maintain a minimum supply temperature of 13°C or higher, if the room temperature setpoint is not met.
 - .4 The EMCS returns a signal that represents the static pressure of the supply duct to modulate the frequency drives of the fans, to maintain a constant air flow
 - .5 When the dishwasher is turned on, the VE-2 exhaust fan is started. The fresh and return air dampers are modulated to maintain the outdoor air flow at XXX l/s, (as indicated by the outdoor air flow sensor).
 - .6 When the kitchen hood control panel starts the VE-1 exhaust, the fresh air and return air dampers are modulated to maintain the outside air flow rate, the air flow rate is returned to the EMCS by the kitchen hood control panel. The total outside air flow must include the outside air flow of the dishwasher if it is running.
 - .7 A low temperature limit stops the unit on detection of a supply temperature lower than 4°C.
 - .8 Pressure loss of dirty filters is 350 Pa (1.4 in. Water). The EMCS displays pressure and an alarm when the final pressure is reached.
- .3 Alarms:
 - .1 Unwanted shutdown of fan(s).
 - .2 Control point in manual mode.
 - .3 Supply temperature too low or too high.
 - .4 Freeze limit stop.
- .4 History to program:
 - .1 Supply temperature.
 - .2 Room temperature.
 - .3 Hours of operation VE-1.
 - .4 Hours of operation VE-2.



2.6 AIR TERMINAL UNITS

.1 Sequence of Operation:

- .1 The application controller (TCU) sequentially modulates the air terminal unit's damper, the heating coil and the additional heating (where applicable) to maintain the room temperature at its setpoint. The evacuation terminal unit (where applicable) modulates to maintain the evacuation airflow equal to the alimention airflow.
- .2 The terminal box damper is controlled to maintain the air flow between minimum flow and maximum flow rates. In heating demand, the minimum increases proportionally with the heating demand up to a maximum according to the terminal unit.
- .3 In the zones with radiant floor heating: When the exterior temperature is below 10°C, the radiant floor zone heating control valve modulates to maintain the slab temperature at 22°C.
- .4 Rooms 1618 and 1618A: At the start of a decontamination cycle, when the pushbutton in room 1618A is manually activated, the terminal box T-VAV-73, the associated heating coil control valve and the evacuation terminal box are closed. At the end of a decontamination cycle, upon reactivation of the pushbutton in room 1618A, the terminal box, the associated heating coil control valve, and the evacuation terminal box return to their normal operating sequence.



2.7 FINED TUBE RADIATORS, UNIT VENTILATORS, AND UNIT HEATERS

.1 Sequence of Operation:

- .1 Typical zone with fined tube radiators:
 - .1 The heating is valve is modulated to maintain room setpoint when there is a heating demand.
- .2 Typical zone with unit ventilator:
 - .1 The fan is powered on by a contactor and the heating is valve is modulated to maintain room setpoint when there is a heating demand.
- .3 Typical zone with unit heater:
 - .1 The fan is powered on by a contactor and the heating is valve is modulated to maintain room setpoint when there is a heating demand.

2.8 FAN COIL UNITS

.1 System Description:

- .1 Certain rooms are heated and/or cooled by fan coil units.

.2 Sequence of Operation:

- .1 In occupied mode, the fan runs continuously. The coil (heating and/or cooling) valves are modulated to maintain the room setpoint. The state of the fan is returned to the EMCS.
- .2 In unoccupied mode, fans are shutdown, but start on demand for heating and/or cooling to maintain the same setpoint as in occupied time.

2.9 MECHANICAL ROOM VENTILATION (VA-01)

- .1 Sequence of Operation:
 - .1 System off:
 - .1 The supply fan is off.
 - .2 The outdoor air damper and exhaust damper are closed, the return air damper is opened.
 - .2 System on:
 - .1 The supply fan is turned on as per schedule (adjustable) or an elevation of room temperature above 23°C.
 - .2 The dampers are modulated to maintain supply air temperature as per setpoint. Setpoint varies from 13°C to 18°C depending on room temperature.
 - .3 When room temperature is below 18°C, the unit heaters are started.

2.10 GARAGE EXHAUST -SYSTEM VE-03

- .1 System Description:
 - .1 The system is comprised of a wall exhaust fan (VE-03), gas detection sensors, and an associated outdoor air intake.
- .2 Sequence of Operation:
 - .1 On a detection of either CO or NO_x by the gas sensors, the outdoor air intake is opened and the exhaust fan is started. Exhaust fan running indication and alarm are returned to the EMCS. Gas concentrations are returned to EMCS via BACnet MS/TP.

2.11 MAIN ELECTRICAL ENTRANCE

- .1 Sequence of Operation:
 - .1 Electrical energy measuring module is integrated to EMCS via BACnet.
 - .2 The module transmits instant power (kW), maximum power demand (kW), electrical consumption (kWh), voltage per phase, and current per phase in amp, etc.
 - .3 This data is shown on screen in real time: Power (kW), maximum demand in the last hour (kW), maximum demand (kW) for the last 24 hours, month, and year. Electrical consumption (kWh) for the last hour, week, month, and year.

2.12 LIGHTING CONTROL

- .1 Sequence of Operation:
 - .1 Lighting control is by relay panels. Lighting is controlled by an hourly schedule. Programming of lighting control panels is integrated to EMCS via BACnet.



2.13 GREASE INTERCEPTOR

- .1 Sequence of Operation:
 - .1 On an alarm from the grease interceptor control panel, an alarm is generated at the EMCS.

2.14 EMERGENCY POWER GENERATOR – FUEL MANAGMENT

- .1 Sequence of Operation:
 - .1 The fuel management system transmits the fuel tank level via BACnet. The fuel management system also relays alarms for leaks of tank and containment and high- and low-level alarms via a digital input.

2.15 DOMESTIC COLD WATER

- .1 Sequence of Operation:
 - .1 Cold water consumption will be transmitted in real time. The following information will be recorded and displayed: consumption by hour, day, week, month and year. Display previous day, week, month, and year.
 - .2 An alarm will be issued if consumption is over the average per history.

2.16 DOMESTIC HOT WATER

- .1 Sequence of Operation:
 - .1 Hot water consumption will be transmitted in real time. The following information will be recorded and displayed: Consumption by hour, day, week, month, and year. Display previous day, week, month, and year.
 - .2 An alarm will be issued if consumption is over the average per history.

Part 3 Products

3.1 NOT USED

- .1 Not Used.

Part 4 Execution

4.1 NOT USED

- .1 Not Used.

END OF SECTION