BREECHING AND CHIMNEYS

1. GENERAL

1.1 Scope

.1 Site fabricated breeching.

.2 Manufactured chimneys for oil fired equipment.

1.2 Quality Assurance

.1 Vents and Chimneys: Labelled by Underwriters' Laboratory of Canada.

1.3 Definitions

.1 Vent: Enclosed passageway for conveying flue gases from the appliances to outdoors.

.2 Breeching: Portion of vent from the appliance to the chimney.

.3 Chimney: Primary vertical portion of vent.

.4 Draft: Flow of air or combustion products or both, through an appliance and its venting system.

.5 Mechanical Draft: Draft produced by a mechanical device such as a fan, blower, or aspirator which may supplement natural draft.

.6 Forced Draft: A mechanical draft produced by a device upstream of the combustion zone of an appliance.

.7 Induced Draft: A mechanical draft produced by a device downstream from the combustion zone of an appliance.

.8 Natural Draft: A draft other than mechanical draft.

1.4 Submittals

.1 Comply with requirements of Section 15010, supply shop drawings for all fabricated and pre-manufactured breeching and fuel elements.

2. PRODUCTS

2.1 Vents

.1 Type A: To CAN 4-S604.

.1 Application: Gas and liquid fuel fired appliances.

.2 Service Temperature: Maximum flue gas temperature of *540* ℃.

.2 Type A-2 Vent: To CAN 4-S629.

.1 Application: Gas, liquid and solid fuel fired appliances.

.2 Service Temperature: Maximum flue gas temperature of *650 ℃*.

2.2 Breeching

.1 For forced, induced, or natural draft with dilution, gas or liquid fuel fired appliances, use one of the following:

.1 Mild steel, all welded construction with thicknesses as follows:

Vent Diameter	Min. Thickness
300 mm and smaller	1.3 mm

.2 Breeching constructed of same vent components as chimney.

2.3 Accessories

.1 Cleanouts: Bolted, gasketted type, full size of breeching area.

.2 Barometric Damper: single acting sized to 70% of full size of breeching area.

.3 Appurtenances: Raincap, thimbles, support brackets and guys, flashing and counter flashings, fly ash screen, and other materials required to complete the assembly.

3. EXECUTION

3.1 Vent Installation

.1 Install vents, complete with accessories and appurtenances, in accordance with latest editions of CAN 1-B139 National Building Code, manufacturer's instructions and as follows:

.1 Type A: To CAN 4-S604.

.2 Type A-2: To CAN 4-S629.

.2 Do not penetrate flue gas chamber of vent with screws or mechanical fasteners.

.3 Install breeching with positive slope upward from appliance, min. 2%.

.4 Suspend breeching using trapeze hangers at *1500 mm* centres.

.5 Install cleanout at base of chimney.

.6 Provide properly sized barometric damper as required.

.7 Support chimney at bottom, roof and intermediate levels.

.8 Install thimbles where penetrating roof.

.9 Install raincap on chimney outlet.

.10 Install counterflashing where chimneys pass through roof.

.11 Provide for expansion and contraction of chimney and breeching.

END OF SECTION

AIR FILTERS

1. GENERAL

1.1 Scope

.1 Pleated filters.

1.2 Quality Assurance

.1 Filters shall be product of and supplied by one manufacturer.

.2 Filter media shall be UL listed, Class I or Class II.

.3 Filter components assembled to form filter banks shall be products of same manufacturer.

.4 All filters shall be in accordance with ASHRAE Standard 52.

.5 Filters containing asbestos, urea formaldehyde or fibreglass shall not be acceptable.

1.3 Alternatives

.1 Size, media face area, material, test efficiency, initial and final air resistance of alternative manufacturers shall be as specified.

1.4 Submittals

.1 Provide shop drawings of all filters, and filter racks/housings.

2. PRODUCTS

2.1 Frames

.1 Fabricate filter frames and supporting structures of galvanised steel or extruded aluminum with necessary gasketting between frames and walls. Provide holding frames 1.6 mm "T" section construction.

.2 Provide standard size frames to provide interchangeability of filter media of other manufacturers.

2.2 Pleated Filters

.1 Media: The filter shall be constructed of non-woven reinforced cotton rayon. A diamond grid with 98% open area shall provide support for the media. The media shall be bonded to media support to ensure pleat stability. A rigid, moisture resistance heavy duty kraft board shall enclose the media. The filter pack shall be bonded to the inside periphery of the frame to eliminate air bypass.

.2 The efficiency shall be 30-35% based on ASHRAE 52 up to 2.54 m/s for 25 mm and 50 mm thick.

.3 Filters containing asbestos, urea formaldehyde or fibreglass will not be accepted.

2.3 Spare Parts

.1 5 sets of spare filters

3. EXECUTION

3.1 Installation

.1 Construct and install filters to prevent passage of unfiltered air. Provide felt, rubber or neoprene gaskets.

.2 Do not operate fan system connected to filter banks until filters (temporary or permanent) are in place. Provide new filters at take-over by the Owner. Replace filters used during construction.

.3 Provide filter banks in arrangement shown with removal and access indicated.

3.2 Performance

.1 Not applicable.

END OF SECTION

CONTROLS

1. GENERAL

.1 The control sequences contain a general description of the intent of the operation of the systems to be controlled. The Contractor shall review individual systems to ensure equipment and life safety interlocks are not overridden.

.2 The relationships between the points, systems and building are described in the control sequences.

.3 Review with the Engineer during the shop drawing stage to finalise the control sequences for each system.

.4 Provide control systems consisting of thermostats, dampers, operators, indicating devices, interface equipment and other apparatus required to operate mechanical system and to perform functions specified.

.5 Provide electric control system.

.6 Provide control devices, components, wiring and materials.

.7 Provide instructions for Owners.

.8 Coordinate the work of this section with work of Division 16 and Division 17.

2. PRODUCTS

2.1 Control Valves

.1 Two-way and three-way valves for liquids: Two-way valves shall have equal percentage characteristics and three-way valves shall have linear characteristics. Size two-way valve operators to close against maximum pump shut-off head. Ball valves as control valves are not acceptable.

.2 Size control valves as per following criteria:

- Select two-way control valves for coils, heat exchangers, terminal units, etc., with a minimum pressure drop of 35 k and a maximum pressure drop of 70 kPa.

- Select three-way control valves for coils for pressure drop equal to three times the equipment pressure drop up to maximum 70 kPa.

.3 Provide valves complete with electric operators.

.4 Two Way Valves for Radiation and Unit Heaters:

.1 Globe valve, threaded ends, bronze body, stainless steel trim, *689 kPa* rated, double O-ring packing.

.5 Three Way Valves for AHU coils:

.1 Globe valve, threaded ends, bronze body, stainless steel trim, 1722 kPa rated.

2.2 Damper Actuators

.1 Ventilation System Modulating Actuator: Electric motor, spring return, 90° - 160° adjustable stroke, electronic drive circuit, electro-mechanical brake, internal transformer, rated ambient temperature range -37°C to 54°C, operating torque 5.7 N-m, breakaway torque 22.6 N-m. Provide damper linkage for all actuators, minimum position potentiometer on outside air actuator. Standard of Acceptance: Honeywell M955C Super Mod with Q605 damper linkage, one Q209 minimum positive potentiometer, BYK resistor kit for unison damper control.

2.3 Dampers

.1 Sizes

.1 Blades maximum 150 mm wide and 1200 mm long.

.2 Materials

.1 Frame: 2.5 mm thick extruded aluminum, insulated with polystyrene foam R-5.

.2 Blades: extruded aluminum with internal hollows insulated with 22 mm thick polyurethane foam and thermal breaks.

.3 Bearings: double sealed, celcan inner bearing, polycarbonate outer bearings.

.4 Linkage and Shafts: aluminum hexagon rod

.5 Seals: replaceable synthetic rubber seals side, top and bottom of frame and along all blade edges.

.3 Performance Characteristics:

.1 Temperature range minus 40°C to 90°C.

.4 Standard of Acceptance: TAMCO series 9000 low leakage/thermal break insulated damper.

3. EXECUTION

.1 Provide data base for all hardware points listed for system operation to meet specification operating sequences.

.2 All controllers are to be installed to ensure accessibility from the floor.

.3 Identify all control components with Lamacoid plates.

.4 Identify all control wiring with numbers at each device and panel.

.5 In general, transmitters, switches and some indicators are locally mounted. Mount all other components in control cabinets.

.6 Components in pipes: mount using separate wells so that removal of component does not cause loss of fluid from pipe.

.7 Components on sheet metal ductwork: mount using metal mounting brackets attached to ductwork with sheet metal screws or bolts. Support all flexible type elements.

.8 Remotely mount device if vibration of pipe, duct equipment can harm device or cause erroneous readings.

.9 Position thermometers and temperature gauges so that they are easily seen by a person standing on the floor.

.10 Install all components so that they can be removed using normal hand tools (screwdrivers, wrenches, etc.). Do not use pop rivets or welding.

.11 All electrical work consistent with Electrical Specification.

.12 Select transmitters, thermostats, pressure gauges, indicators, etc., so that normal operating point is approximately mid-point of instrument range.

.13 Check and verify location of thermostats and other exposed control sensors with plans and room details before installation. Locate thermostats 1500 mm above floor unless specified otherwise.

.14 Install damper motors on outside of ducts. Do not locate in outside airstream.

.15 **All temperature indicators and selectors to be in Celsius degrees.**

4. CONTROL SEQUENCES

4.1 Unit Heaters

.1 The surface mounted electric heat/cool thermostat shall cycle the fan motor on a drop in space temperature.

4.2 Fuel Oil System

.1 Fuel from the outdoor tank is transferred to the day tank via two (2) positive displacement fuel transfer pumps. One pump is standby. The operating pump selection shall be via a manual switch located on a panel adjacent to the pumps.

.2 Pump cut-in switch is mounted at 1/3 level and cut-out switch at 3/4 level in the day tank.

.3 Level switches are to be provided in the day tank, wired to the PLC by Division 17.

4.3 Emergency Generator Room Ventilation

.1 When the emergency generator starts, the outdoor air damper shall open to minimum position, return air damper shall open to maximum position and the AHU-1 supply fan shall start.

.2 As the space temperature changes, the room thermostat shall modulate the outdoor air, exhaust air and recirculation air damper to maintain set point.

.3 Upon generator shutdown, the outdoor air, minimum outdoor air, and exhaust air dampers are closed and recirculation air damper is opened.

.4 Hard wired electric controls are to be used. All controls shall be on stand-by power.

4.4 Heating System

.1 Boilers B-1 and B-2

.1 Boiler controls are provided by the boiler manufacturer.

.2 Provide all safety or operational interlocks to boiler control panels as required.

.3 Boilers generate heating propylene glycol at 88°C.

.4 Boiler duty / standby selection is automatic by the boiler control panel.

.2 Building Heating Loop

.1 Building heating loop consists of pump P-1 and P-2 piped in a single primary loop to the building heating loop and air handling unit (AHU-1) coil.

.2 P-1 and P-2 are 100% capacity each (duty/standby), and are normally activated via the boiler control panel. When outdoor temperature drops below *18°C*, the duty pump shall start. Program shall have *5°C* deadband to prevent excessive pump cycling.

.3 Supply temperature to building heating loop is reset as follows:

O/A Temp.	HWS
-5°C or less	*88°C*
10°C	*60°C*

Temperature control is achieved by cycling the duty boiler.

4.5 Air Handling Unit

.1 AHU-1

.1 The air handling unit AHU-1 is a two speed unit serving the Service Room.

.2 The unit is mounted indoors and consists of a supply fan, heating coil, filters and mixing box.

.3 Air is relieved via a wall mounted damper and hood.

.2 System Start/Stop

.1 The air handling unit will be energised during occupied times (via the light switch) at low speed and outdoor air damper is open 10%.

.2 The system will be switched to high volume for any one of the following events:

1 Cooling is called for by the heat/cool thermostat.

2 Cooling is called for when the generator is operating.

.3 Temperature Control

.1 The discharge air temperature is reset based on space temperature requirements.

.2 Space thermostat to be contain Heat/Cool/Off selector switch.

.3 In heating mode, maximum outdoor air damper position to be 10%.

.4 In cooling mode, outdoor air, return air and relief air dampers modulate to satisfy space temperature set point.

.4 Freeze Stats

.1 Provide averaging type freeze stat in the air handling unit at location indicated. Upon sensing a low temperature, the supply fan shall stop, and all outdoor and exhaust air dampers shall close. The freeze stat must be reset manually.

4.6 Domestic Hot Water System

.1 Integral controls for domestic water heater maintain the water supply temperature setpoint.

END OF SECTION

1. LIST OF SCHEDULES

.1 Air Handling Unit Schedule

.2 Exhaust Air Fan Schedule

.3 Unit Heater Schedule

.4 Boiler Schedule

.5 Radiation Schedule

.6 Tank Schedule

.7 Pump Schedule

.8 Hydronic Heat Exchanger Schedule

.9 Air Outlet Schedule

.10 Domestic Water Heater Schedule

LIST OF SCHEDULES

Air Handling Unit Schedule

Tag	AHU-1
Location	Service Room
Area Served	Service Room
Type	Fan Coil
Manufacturer	Commercial Aire
Model	HOHD60
Supply Fan	
Volume (L/s)	470 / 945
ESP (Pa)	125
Fan Type	FC DWDI
Fan Speed (rpm)	860
Motor Power (kW)	0.56 (3/4 HP)
Power Supply	575/3/60
Minimum Outdoor Air (L/s)	10%
Heating Coil Section	
Coil Capacity (kW)	3.7
EAT (°C)	14.5
LAT (°C)	21.0
Max Face Velocity (m/s)	2.5
Media	50% Prop. Gly./Water
Rows	1

LIST OF SCHEDULES

Exhaust Air Fan Schedule

Tag	EF-1
Function	Washroom Exhaust
Location	Washroom
Volume *(L/s)*	72
E.S.P. Press *(Pa)*	62.2
RPM	1050
Motor Power *(kW)*	0.129
Power Supply (V/Ph/Hz)	115/1/60
Drive	Direct
Type	Ceiling
Manufacturer	Greenheck
Model	SP-9
Control	Light switch
Accessories & Remarks	

LIST OF SCHEDULES

Unit Heater Schedule

Tag	UH-1	UH-2
Location	Service Room	Service Room
Heating Medium	50 / 50 Prop. Gly.	50 / 50 Prop. Gly.
Capacity *(kW)*	14.6	17.75
Liquid Entering Temp *(°C)*	88	88
Liquid Leaving. Temp *(°C)*	71	71
Design Liquid Flow *(L/s)*	0.15	0.15
Liquid P.D. *(kPa)*	0.9	0.9
Air Flow *(L/s)*	345	345
RPM	1350	1350
Motor Power *(W)*	75	75
Power Supply (V/Ph/Hz)	120/1/60	120/1/60
Arrangement	Horizontal	Horizontal
Manufacturer	Sigma	Sigma
Model	40-H	40-H
Accessories & Remarks		

NOTE: Capacities shown are actual capacities using 50% propylene glycol.

LIST OF SCHEDULES

Boiler Schedule

Tag	B-1	B-2	B-3
Manufacturer	Weil McLain	Weil McLain	Future Boiler
Model	580	580	-
Fuel Oil flow (L/hr)	16.8	16.8	-
Rated Heating Output (kW)	151	151	-
EGT (°C)	71	71	-
LGT (°C)	88	88	-
Flow Rate (L/s)	2.55	2.55	-
Heating Media	50 / 50 Propylene Glycol / Water	50 / 50 Propylene Glycol / Water	-
Electrical (V/ph/Hz)	120/1/60	120/1/60	-
Motor (kW)	0.25	0.25	-
Remarks	c/w flame retention burner Power Flame WCR-1	c/w flame retention burner Power Flame WCR-1	-

LIST OF SCHEDULES

Radiation Schedule

Tag	R-1
Location	Crawlspace
Fluid Entering Temp *(°C)*	88
Fluid Temperature Drop *(°C)*	17
No. of Rows/Passes	1
Capacity *(W/m)*	690
Type	Bare fin radiation
Manufacturer	Sigma
Model	C075-3x3
Accessories & Remarks	

NOTE: Capacities shown are actual capacities using 50% propylene glycol.

LIST OF SCHEDULES

Tank Schedule

Tag	TK-1	TK-2	TK-3
Service	Fuel Storage Tank	Fuel Oil Day Tank	Glycol Expansion Tank
Location	Outside Building	Mechanical Room	Mechanical Room
Type	Double Wall	Double Wall	Expansion Tank
Capacity *(litre)*	30,000	1,135	800
Diameter *(mm)*	2490	610 (oval)	750
Height/Length *(mm)*	7112	1345/2025	2110
Manufacturer	Durex	ZCL	Amtrol
Model	Horizontal	250G d/w	Extrol 800-L
Accessories & Remarks	Refer to drawings and specifications	Refer to drawings and specifications	
Tag	**TK-4**		
Service	Glycol Fill Tank		
Location	Mechanical Room		
Type	Custom Atmospheric		
Capacity *(litre)*	180		
Diameter *(mm)*	610		
Height/Length *(mm)*	1245		
Manufacturer	Axiom		
Model	SF100		
Accessories & Remarks	c/w pump P-4		

LIST OF SCHEDULES

Pump Schedule

Tag	P-1	P-2	P-3	P-4
Function	Primary Glycol Heating	Primary Glycol Heating	Future Glycol Heating	Glycol fill
Location	Mechanical Room	Mechanical Room	Mechanical Room	Mechanical Room
Type	Vertical In-line	Vertical In-line	-	Vertical In-line
Impeller	Cast Brass	Cast Brass	-	Non-ferrous
Casing	Cast Iron	Cast Iron	-	Cast Iron
Medium Pumped	50% Propylene Glycol	50% Propylene Glycol	-	Glycol
Design Pressure *(kPa)*	1207	1207	-	345
Max. Operating Temp. *(°C)*	120	120	-	150
RPM	1800	1800	-	-
Design Flow Rate *(L/S)*	2.55	2.55	-	0.06
Discharge Head *(kPa)*	104.5	104.5	-	345
Suction/Discharge Sizes *(mm)*	40	40	-	-
Motor Power *(kW)*	0.75	0.75	-	0.7 Amps
Power Supply (V/ph/Hz)	600/3/60	600/3/60	-	115/1/60
Manufacturer	Bell & Gossett	Bell & Gossett	-	Axiom
Model	90 1-1/2A	90 1-1/2A	-	SF100
Remarks	100% duty / standby	100% duty / standby	-	Part of TK-4 tank package

LIST OF SCHEDULES

Tag	P-5	P-6
Function	Fuel Oil Pump	Fuel Oil Pump
Location	Mechanical Room	Mechanical Room
Type	Positive Displacement	Positive Displacement
Impeller	Cast Iron	Cast Iron
Casing	Cast Iron	Cast Iron
Medium Pumped	Fuel Oil	Fuel Oil
Design Pressure *(kPa)*	1035	1035
Max. Operating Temp. *(°C)*	107	107
RPM	1200	1200
Design Flow Rate *(L/S)*	3.8 LPM	3.8 LPM
Discharge Head *(kPa)*	345	345
Suction/Discharge Sizes *(mm)*	15	15
Motor Power *(kW)*	0.19	0.19
Power Supply (V/ph/Hz)	120/1/60	120/1/60
Manufacturer	Viking	Viking
Model	C432	C432
Remarks	Duty / Standby	Duty / Standby

LIST OF SCHEDULES

Hydronic Heat Exchanger Schedule

Tag	HE-1	HE-2
Function	Raw Water Tempering	Future Raw Water Tempering
Location	Mechanical Room	Mechanical Room
Type	Shell/tube	Shell/tube
Heating Side Data		
Medium	50% Prop. Gly. / Water	50% Prop. Gly. / Water
Design Flow *(L/s)*	1.94	-
Entering Temp *(°C)*	88	-
Leaving Temp *(°C)*	71	-
Pressure Drop *(kPa)*	6.9	-
Heated Side Data		
Medium	Domestic Water	Domestic Water
Design Flow *(L/S)*	1.28	-
Entering Temp *(°C)*	0	-
Leaving Temp *(°C)*	22	-
Pressure Drop *(kPa)*	17.9	-
Dimensions Dia. x L *(mm)*	115 x 1945	-
Max. Design Press. *(kPa)*		-
Manufacturer	Armstrong	-
Model	WX-0406-204-1-CBBSSNNS-12	-
Accessories & Remarks	Copper double wall tubes, brass tubesheet, bronze head	-

LIST OF SCHEDULES

Air Outlet Schedule

Type	Description	Manufacturer	Model
S-1	Louvred face double deflection supply air grille, 20 mm blade spacing, front blades parallel to short dimension, steel construction, sidewall mounted, off-white baked enamel finish	E.H. PRICE	SIZE/510/S/B13
E-1	Egg Crate return/transfer air grille, extruded aluminum border and frame, sidewall/ ceiling mounted, off-white baked enamel finish.	E.H. PRICE	SIZE/80A/F/A/B13

LIST OF SCHEDULES

Domestic Water Heater Schedule

Tag	DWH-1
Service	Domestic Hot Water
Location	Under counter in Service Room
Manufacturer	State
Model	PCE 6 10MSA
Dimensions	
Capacity (L)	23
Height (mm)	385
Diameter (mm)	350
Input (kW)	1.5
Recovery Rate (L/hr @ 56°C)	60
Electrical (V/ph/Hz)	120/1/60
Remarks	

END OF SECTION