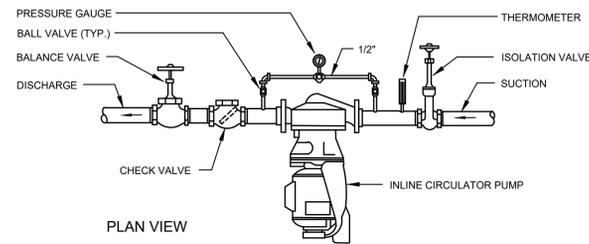
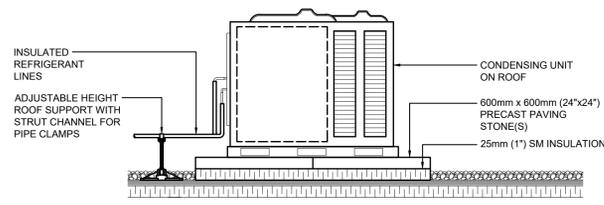


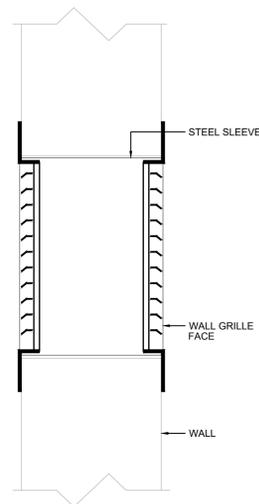
**PIPE PORTAL INSTALLATION DETAIL**  
SCALE: N.T.S.



**INLINE PUMP / CIRCULATOR DETAIL**  
SCALE: N.T.S.



**ROOF MOUNTED CONDENSING UNIT DETAIL**  
SCALE: N.T.S.



**TRANSFER DUCT - TWO SIDES OF WALL**  
SCALE: N.T.S.

**GENERAL NOTES: (APPLICABLE TO ALL DRAWINGS)**

- THESE DRAWINGS ARE AN INTEGRAL PART OF THE SPECIFICATIONS WHICH ACCOMPANY THEM.
- ALL MATERIALS AND WORKMANSHIP SHALL BE NEW UNLESS NOTED OTHERWISE, FREE OF DEFECTS, AND COMPLY WITH ALL APPLICABLE STANDARDS.
- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
- INSTALL DUCTWORK / PIPING TIGHT TO UNDERSIDE OF STRUCTURE UNLESS NOTED OTHERWISE.
- DO NOT SCALE DRAWINGS. OBTAIN ALL DIMENSIONS FROM EXISTING ARCHITECTURAL PLANS, SITE INSPECTIONS, AND MANUFACTURER'S SHOP DRAWINGS.
- REFER TO ARCHITECTURAL DRAWINGS FOR LOCATION OF FIRE RATED ASSEMBLIES.
- ALL MATERIALS WITHIN RETURN AIR PLENUMS SHALL HAVE A FLAME-SPREAD RATING NOT MORE THAN 25 AND A SMOKE DEVELOPED CLASSIFICATION NOT MORE THAN 50.
- OPENINGS IN EXTERIOR WALLS AND ROOF ARE TO BE PROPERLY FLASHED AND MADE WEATHERPROOF.
- ALL ROOF FLASHING FOR CURBS & PENETRATIONS TO COMPLY WITH ROOF WARRANTOR'S REQUIREMENTS.
- ALL NECESSARY CUTTING / PATCHING FOR MECHANICAL WORK SHALL BE PROVIDED BY APPROPRIATE TRADE(S) AT CONTRACTOR'S EXPENSE UNLESS NOTED OTHERWISE.
- MAKE GOOD ALL BUILDING COMPONENTS DAMAGED BY WORK OF THIS TRADE TO THE CONSULTANT'S SATISFACTION.
- PROVIDE ALL SLEEVES, INSERTS AND HANGERS REQUIRED FOR THE WORK. TREAT ALL SLEEVES OR HOLES PIERCING ACOUSTICAL SEPARATIONS FOR INSTALLATIONS OF THIS DIVISION TO MAINTAIN ACOUSTICAL RATING. ALL GAPS SHALL BE PACKED WITH ACOUSTICAL INSULATION AND SEALED AT BOTH ENDS WITH ACOUSTICAL CAULKING. PATCH ALL OPENINGS AROUND INSTALLATIONS OF THIS DIVISION PIERCING FIRE OR SMOKE SEPARATIONS WITH AN APPROVED WATERTIGHT SMOKE AND FIRE STOP SEALANT.
- INSTALL ALL EQUIPMENT & ASSOCIATED DUCTWORK, PIPING, APPURTENANCES TO PROVIDE MAINTENANCE ACCESS. ALLOW FOR ALL ACCESS DOORS REQUIRED FOR EQUIPMENT INSTALLATIONS & SERVICE. ENSURE PROPER ACCESS DOOR SIZE, TYPE AND FIRE RATING.
- COORDINATE ALL WORK WITH OTHER TRADES AND SUPPLIERS/MANUFACTURERS TO AVOID INTERFERENCES AND CONFLICTS BETWEEN SERVICES. PLAN WORK WELL IN ADVANCE TO ELIMINATE INSTALLATION AND COORDINATE DIFFICULTIES. COOPERATE WITH OTHER TRADES ON SITE TO RESOLVE INTERFERENCES TO SATISFACTORILY COMPLETE THE PROJECT.
- THIS TRADE IS RESPONSIBLE FOR ALL EXCAVATION / BACKFILL REQUIRED TO INSTALL SERVICES SHOWN ON THESE DRAWINGS.
- IF NO STRUCTURAL CONSULTANT ENGAGE THE SERVICES OF A STRUCTURAL ENGINEER TO DESIGN REINFORCEMENT OF EXISTING STRUCTURE AS REQUIRED.
- ALL COLD CONDENSATE DRAINAGE FROM ROOFTOP EQUIPMENT SHALL BE TRAPPED PER MANUFACTURER'S RECOMMENDATIONS & SPILL TO PRECAST 600mmx250mm (24"x10") CONCRETE SPLASH BLOCK.
- DEBRIS WILL BE KEPT TO A MINIMUM. ON COMPLETION OF CONSTRUCTION AND PRIOR TO THE FINAL INSPECTION AND ACCEPTANCE BY THE OWNER, SITE SHALL BE CLEANED AND ALL SCRAP MATERIALS RESULTING FROM THE WORK SHALL BE REMOVED.
- PRIOR TO THE FINAL INSPECTION, ALL EQUIPMENT SHALL BE CLEANED. ALL CONSTRUCTION DUST AND DIRT SHALL BE REMOVED FROM INSTALLED EQUIPMENT AT THE END OF THE JOB.
- EXISTING INSTALLATIONS SHOWN FOR GENERAL REFERENCE ONLY. ATTEND SITE TO ASSESS WORK PRIOR TO BID SUBMISSION. INCLUDE ALL COSTS TO MODIFY AND / OR EXTEND NEW WORK AS REQUIRED TO MEET DESIGN INTENT. VERIFY ALL EXISTING DUCT / PIPE SIZES & CLEARANCES ON SITE.
- ALL EXISTING MECHANICAL EQUIPMENT TO REMAIN UNLESS NOTED OTHERWISE.
- OPERATION OF EXISTING MECHANICAL EQUIPMENT TO REMAIN SHALL BE VERIFIED. DEFICIENCIES SHALL BE REPORTED TO CONSULTANT.
- SCHEDULE AND PHASE WORK TO REDUCE INTERFERENCE AND DOWNTIME OF EXISTING SYSTEMS. NOTIFY OWNER'S REPRESENTATIVE OF ALL DOWNTIME PRIOR TO PROCEEDING WITH WORK.
- REMOVE EXISTING CEILING TILES AS REQUIRED TO PERFORM WORK. SAFELY STORE TILES FOR REINSTALLATION AFTER WORK & INSPECTIONS ARE COMPLETE. EXISTING DAMAGED TILES MUST BE IDENTIFIED & REPORTED TO OWNER'S REPRESENTATIVE BEFORE REMOVAL. REPLACE ANY DAMAGED TILES TO MATCH EXISTING.
- MEASURE & DOCUMENT EXISTING AIRFLOWS AT GRILLES / REGISTERS / DIFFUSERS TO BE REBALANCED. FINAL BALANCING REPORT MUST INCLUDE AS-FOUND AND FINAL AIRFLOW MEASUREMENTS.
- WHERE REPLACEMENT EQUIPMENT EXPOSES PREVIOUSLY UNFINISHED SURFACES, FINISH TO MATCH ADJACENT ASSEMBLIES.
- ALLOW FOR SCOPING OF EXISTING CONCEALED DRAINAGE PIPING TO VERIFY LOCATION & ROUTING.
- DISPOSE OF EXISTING REFRIGERANTS IN ACCORDANCE WITH ALL APPLICABLE ENVIRONMENTAL REGULATIONS.

**GENERAL DEMOLITION NOTES: (APPLICABLE TO ALL DRAWINGS)**

- ALL EXISTING EQUIPMENT TO REMAIN UNLESS IDENTIFIED OTHERWISE ON THE DRAWINGS, GENERAL NOTES OR SPECIFICATIONS.
- EXTENTS OF DEMOLITION SHOWN ARE APPROXIMATE AND THIS TRADE IS RESPONSIBLE FOR ALL DEMOLITION REQUIRED TO MEET DESIGN INTENT.
- REMOVE ALL UNUSED, ABANDONED OR REDUNDANT PIPING, HANGERS, & ACCESSORIES BACK TO SOURCE & CAP.
- COORDINATE WITH FACILITY MAINTENANCE DEPARTMENT FOR DISPOSAL OF REMOVED DEVICES. DISPOSE OF ALL UNWANTED DEVICES AS REQUIRED AS PER FACILITY STANDARDS.

**SEPARATE PRICES**

SEPARATE PRICE #1: PROVIDE SEPARATE PRICE FOR REMOVAL OF SINK IN CORRIDOR NEAR CLASSROOM 113 AND THE NEW SINK HS IN THE CORRIDOR. REFER TO MECHANICAL DRAWINGS.

PIPING LEGEND	
ITEM	DESCRIPTION
—	NEW ITEM
---	EXISTING ITEM TO REMAIN
- - - -	EXISTING ITEM TO BE REMOVED
----	BELOW FLOOR PIPING
—	HEAT TRACED PIPING
—	POTABLE (DOMESTIC) COLD WATER (DCW)
—	POTABLE (DOMESTIC) HOT WATER (DHW)
—	POTABLE (DOMESTIC) HOT WATER RETURN (DHW-R)
—SAY—	SANITARY DRAIN
—CD—	CONDENSATE DRAIN
—	NATURAL GAS
—RL—	REFRIGERANT LIQUID
—RS—	REFRIGERANT SUCTION
—HTWS—	HOT WATER SUPPLY
—HTWR—	HOT WATER RETURN
—	GATE VALVE
—	BALL VALVE
—	BUTTERFLY VALVE
—	BALANCING VALVE
?	FLOW RATE
—	UNION
—	STRAINER
—	CHECK VALVE
—	TRIPLE DUTY VALVE
—	2 WAY CONTROL VALVE
—	3 WAY CONTROL VALVE
—	PRESSURE RELIEF VALVE
—AV—	AV - MANUAL AIR VENT; AAV - AUTOMATIC AIR VENT
—	BACKFLOW PREVENTER
—DCVA—	DOUBLE CHECK VALVE ASSEMBLY
—RP—	REDUCED PRESSURE ASSEMBLY
—	PUMP
—	FLEXIBLE CONNECTION
—	REDUCER/INCREASER
—	ELBOW TURNED UP
—	ELBOW TURNED DOWN
—	PIPE CAP
—	PIPE SINGLE LINE CUTOFF
—	PRESSURE GAUGE
—	THERMOMETER
—	SENSOR WELL (T-TEMPERATURE)
—	SENSOR WELL (P-PRESSURE)
—	FLOW SWITCH
—	LOW WATER CUT OFF
—	NEW CONNECTION TO EXISTING

THIS IS A STANDARD LEGEND. ALL SYMBOLS MAY NOT NECESSARILY BE USED ON DRAWINGS.

DUCTWORK LEGEND	
SYMBOL	DESCRIPTION
—	NEW ITEM
---	EXISTING ITEM TO REMAIN
- - - -	EXISTING ITEM TO BE REMOVED
REL	EXISTING ITEM TO BE RELOCATED
ER	EXISTING ITEM IN RELOCATED POSITION
EX	EXISTING ITEM TO REMAIN
OED	OPEN ENDED DUCT
—	DUCTWORK SHOWN DOUBLE LINE
—OC	OCCUPANCY SENSOR
—T	THERMOSTAT/TEMPERATURE SENSOR
—	NEW CONNECTION TO EXISTING
EA	EXHAUST AIR
OA	OUTSIDE AIR
RA	RETURN AIR
SA	SUPPLY AIR
—	FLEXIBLE DUCT CONNECTION
—	DUCT DOWN - POSITIVE / NEGATIVE PRESSURE
—	DUCT UP - POSITIVE / NEGATIVE PRESSURE
—	SUPPLY AIR GRILLE
—	RETURN AIR GRILLE
—	DRAWING NOTE TAG
—	EQUIPMENT TAG
—	EQUIPMENT TYPE
—	EQUIPMENT NUMBER (REFER TO SCHEDULES FOR INFO)

THIS IS A STANDARD LEGEND. ALL SYMBOLS MAY NOT NECESSARILY BE USED ON DRAWINGS.

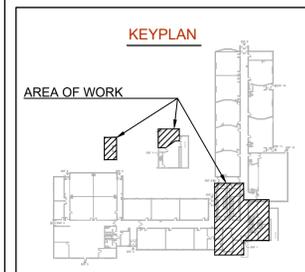
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**REVISIONS**

NO.	ISSUED FOR	DATE
00	50% CLIENT REVIEW	26.01.28
01	90% CLIENT REVIEW	26.02.11
02	TENDER	26.03.03

**NORTH**

**PROFESSIONAL ENGINEER**  
J.J. PEPPER  
100114890  
PROVINCE OF ONTARIO

DESIGN	ALC	DRAWN	ALC
CHECKED	JP	REVIEWED	ALC

**PROJECT**  
ST. PETER CES

**ADDRESS**  
92 AVENUE ROAD,  
CAMBRIDGE, ON

**PROJECT NO.**  
CE-6381

**DRAWING TITLE**  
LEGENDS, GENERAL NOTES &  
DETAILS - MECHANICAL

**DRAWING NUMBER**  
M1 OF 9

PLUMBING FIXTURE SCHEDULE					
DWG REF	DESCRIPTION	HOT [in.] (mm)	COLD [in.] (mm)	DRAIN [in.] (mm)	
WC	BOWL: AMERICAN STANDARD 4.8L FUSH 3451.001.020 'MADERA' FLOOR MOUNTED, VITREOUS CHINA WATER CLOSET WITH ELONGATED BOWL, SYPHON JET BOWL AND 38 MM (1 1/2") TOP SPUD INLET.	---	1-1/2"	3"	
	VALVE: DELTA TECK 81T201HWA EXPOSED POLISHED CHROME PLATED HARD WIRED FLUSH VALVE, INFRARED SENSOR, VACUUM BREAKER, 38MM (1-1/2") CONNECTION. ASME A112.1037 / CSA B125.37 AND ADA / ANSI A117.1 CODE COMPLIANT. ADJUST FOR 4.8L FLUSH. INCLUDE TRANSFORMER ACCESSORIES AS REQUIRED.	---	(38)	(76)	
	SEAT: CENTOCO 1500STS FOR ELONGATED BOWL, SOLID WHITE PLASTIC, OPEN FRONT WITH REMOVABLE BUMPERS, CONCEALED CHECK HINGE, AND TYPE 316 STAINLESS STEEL HINGE POSTS AND TRIM.				
UR	URINAL: AMERICAN STANDARD "WASHBROOK" NO. 6590.001.020 VITREOUS CHINA, WASHDOWN FLUSH ACTION, 19 MM (3/4") TOP SPUD, INTEGRAL FLUSH SPREADER, OPEN TRAP, STAINLESS STEEL REMOVABLE STRAINER AND 50 MM (2") OUTLET CONNECTION.	---	3/4"	2"	
	VALVE: DELTA TECK 81T231HWA EXPOSED POLISHED CHROME PLATED HARD WIRED FLUSH VALVE, INFRARED SENSOR, VACUUM BREAKER, 38MM (1-1/2") CONNECTION. ASME A112.1037 / CSA B125.37 AND ADA / ANSI A117.1 CODE COMPLIANT. ADJUST FOR 0.5L FLUSH. INCLUDE TRANSFORMER ACCESSORIES AS REQUIRED.	---	(19)	(51)	
	CARRIER: WATTS CA-311 HEAVY DUTY URINAL CARRIER WITH PIPE UPRIGHTS WELDED TO STEEL BASE PLATES.				
MS	SINK: STERN-WILLIAMS NO. MTB-2424 WITH MOULDED STONE BASIN, 250 MM (10") HIGH WALLS, INTEGRALLY MOLDED SHELF, CAST BRASS CADMIUM PLATED DRAIN BODY, CAST BRASS LOCKNUT, NEOPRENE GASKET, STAINLESS STEEL COMBINATION DOME STRAINER AND LINT BASKET AND DRAIN BODY FOR 80 MM (3") I.P.S. LEAD CALULATED JOINT. CW STAINLESS STEEL BACK PANEL.	1/2"	1/2"	3"	
	FAUCET: DELTA TECK 28T2965 WALL MOUNTED SERVICE SINK FAUCET WITH 150 MM (6") BLADE HANDLES, HOSE END SPOUT, PAIL HOOK, BOTTOM BRACE, INTEGRAL STOPS, VACUUM BREAKER AND 1200 MM (48") VINYL HOSE AND HANGER.	(13)	(13)	(76)	
	WASTE: 80 MM (3") CAST IRON TP TRAP.				
HS	SINK: FRANKE MODEL 'HWS1821-I-3' INTEGRATED HAND WASH STATION 214.0493.260. FLOOR MOUNT HAND WASH STATION WITH BACKSPASH AND INTEGRATED WASTE BIN, 18 GAUGE, TYPE 304 STAINLESS STEEL, EXPOSED SURFACES ARE SATIN FINISHED, 1 1/2" GRID WASTE FITTING IS INCLUDED, OUTSIDE DIMENSIONS 21" X 18" X 63 1/4". INSIDE BOWL 14" X 16" X 9".	1/2"	1/2"	1-1/2"	
	FAUCET: DELTA TECK 2T74844 'GOOSENECK' POLISHED CHROME-PLATED, BRASS RIGID CENTRELINE DECK-MOUNTED GOOSENECK SPOUT C/W 7.58LPM (2.0GPM) LAMINAR FLOW CONTROL, AND 100mm (4") CENTERS. PROVIDE COMPLETE WITH 6" (152mm) VANDAL RESISTANT COLOUR-CODED METAL WRIST BLADE HANDLES.	(13)	(13)	(38)	
	SUPPLIES: MCOUIRE FAUCET SUPPLIES, CHROME PLATED FINISH, FLEXIBLE COPPER RISERS, CONVERTIBLE QUARTER-TURN ANGLE STOPS, CONVERTIBLE LOOSE KEY HANDLE, SHALLOW ESCUTCHEON PLATE.				
DRAIN: MCOUIRE 38mm (1-1/2") TUBULAR TP TRAP, CLEANOUT, CHROME FINISH, CAST BRASS BODY, OPEN GRID STRAINER, SANIGUARD ANTI-MICROBIAL PROTECTION, AND WALL FLANGE.					

CONDENSING UNIT SCHEDULE										
DWG REF	ASSOCIATED UNIT	MANUF.	MODEL	COOLING CAPACITY [MBH] (kW)	STAGES	EER	ELECTRICAL			REMARKS
							V / Ph / Hz	MCA	MOCP	
CU-01	EX AHU	ENG AIR	CUE183/O	225 (65.9)	-	10.8	208 / 3 / 60	84.4	100	DISCONNECT BY DIV 26. INSTALL ON SUPPORTS. WEIGHT = 1370 LBS. MATCH EXISTING REFRIGERANT AND EXISTING AHU COIL REQUIREMENTS. CONNECT TO NEW BAS.

ALTERNATE MANUFACTURERS:  
NOTES: COOLING CAPACITY BASED ON 95°F AMBIENT

BOILER SCHEDULE												
DWG REF	MANUF.	MODEL	INPUT [MBH] (kW)	OUTPUT [MBH] (kW)	FLOW [USGPM] (L/s)	ΔT [°F] (°C)	ΔP [ft. w.c.] (kPa)	FLUID TYPE	ELECTRICAL		REMARKS	
									V/PH/Hz	FLA		
B-03	LOCHINVAR	KBX650N	650.0 (190.5)	630.5 (184.8)	62.0 (3.91)	20.0 (-6.7)	16.0 (47.8)	WATER	120 / 1 / 60	13	C/W CONDENSATE NEUTRALIZING KIT, LOW WATER CUTOFF, FLOW SWITCH, AND INLET/OUTLET TEMP SENSORS. CONNECT TO NEW BAS.	

ALTERNATE MANUFACTURERS: HYDROTHERM, LAARS, LOCHINVAR, RIELLO, SMITH, VIESSMAN, WEIL MCLAIN

PUMP SCHEDULE												
DWG REF	SERVING	MANUF.	MODEL	FLOW [GPM] (L/s)	HEAD [ft. w.c.] (kPa)	FLUID	EFF. [%]	PUMP POWER [BHP]	MOTOR [HP]	RPM	ELECTRICAL [V / Ph / Hz]	REMARKS
P-03, P-04	HEATING SYSTEM	BELL AND GOSSETT	e-80SC 3x3x7C	140.0 (8.83)	45.0 (134.50)	WATER	73.3	2.25	5.0	1800	208/3/60	- CONFIRM EXISTING FLOW AND HEAD OF EXISTING BOILER PUMPS AND REPORT TO CONSULTANT PRIOR TO PURCHASE. PUMP TO BE LIKE FOR LIKE. CONNECT TO NEW BAS. C/W LOOSE VFD PROVIDED BY MECHANICAL INSTALLED BY ELECTRICAL.

ALTERNATE MANUFACTURERS: ARMSTRONG, GRUNDFOS, TACO, WILCO  
NOTES: PG = PROPYLENE GLYCOL

DUCTLESS SPLIT AC - INDOOR UNIT SCHEDULE									
DWG REF	MANUF.	MODEL	SERVICE	COOLING CAPACITY [MBH] (kW)	HEATING CAPACITY [MBH] (kW)	ELECTRICAL			REMARKS
						VOLT / Ph / Hz	MCA	MOCP	
AC-01	MITSUBISHI	PKA-A12LA-TH	HP-01	12.0 (3.5)	9.1 (2.7)	208/1/60	1	15	-CAPABLE OF MODULATING CAPACITY - PROVIDE C/W REMOTE T-STAT & CONDENSATE PUMP - COMPLETE WITH M-NET ADAPTER FOR BAS INTEGRATION

DUCTLESS SPLIT AC - OUTDOOR UNIT SCHEDULE									
DWG REF	MANUF.	MODEL	SERVICE	TOTAL COOLING [MBH] (kW)	TOTAL HEATING [MBH] (kW)	ELECTRICAL			REMARKS
						VOLT / Ph / Hz	MCA	MOP	
HP-01	MITSUBISHI	PUZ-A12NKA7	AC-01	12.0 (3.5)	9.1 (2.7)	208/1/60	11	28	C/W EQMT SUPPORT FRAME

ALTERNATE MANUFACTURERS: DAIKIN, LG  
NOTES: COOLING CAPACITY BASED ON 35.0°C (95.0°F) AMBIENT. HEATING CAPACITY BASED ON -8.3°C (17°F) AMBIENT.

DIFFUSER SCHEDULE				
DWG REF	MANUF.	MODEL	FINISH	REMARKS
S1	PRICE	520	WHITE	DOUBLE DEFLECTION, LOUVERED SUPPLY GRILLE, STEEL CONSTRUCTION, C/W VOLUME DAMPER.

GENERAL NOTE: MOUNTING FRAME TO SUIT CEILING TYPES. SEE ARCHITECTURAL REFLECTED CEILING PLAN DRAWINGS FOR CEILING TYPES. PROVIDE INTEGRAL FIRE STOP FLAPS WHERE FIRE DAMPERS ARE INDICATED ON DRAWINGS.  
ALTERNATE MANUFACTURERS: KREUGER, METALAIRE, NAILOR, PRICE, TITUS, TUTTLE & BAILEY.

EXPANSION TANK SCHEDULE							
DWG REF	MANUF.	MODEL	TANK VOLUME [GAL] (L)	ACCEPTANCE VOLUME [GAL] (L)	MIN. PRESSURE [PSI] (kPa)	MAX PRESSURE [PSI] (kPa)	REMARKS
EXP-01	AMTROL	ST-447C	53.0 (200.6)	53.0 (200.6)	25.0 (172.4)	125.0 (861.8)	FULL ACCEPTANCE BLADDER.

ALTERNATE MANUFACTURERS: AMTROL, BELL & GOSSETT

**CONTROL NOTES:**

- GENERAL
  - ALL SETPOINTS AND SCHEDULES SHALL BE ADJUSTABLE.
  - UNOCCUPIED HEATING SETPOINT: 60.0°F (15.6°C)
  - UNOCCUPIED COOLING SETPOINT: 80.0°F (26.6°C)
  - OCCUPIED HEATING SETPOINT: 70.0°F (21.1°C)
  - OCCUPIED COOLING SETPOINT: 75.0°F (23.8°C)
  - CO2 SETPOINT: 800 PPM
  - REFER TO DRAWINGS AND SCHEMATICS FOR DEVICE AND EQUIPMENT LOCATIONS.

**DEFINITIONS**

- EQUIPMENT DUTY / STANDBY: WHERE EQUIPMENT IS DESIGNATED DUTY / STANDBY, DUTY EQUIPMENT TO OPERATE, STANDBY EQUIPMENT TO START AUTOMATICALLY IF DUTY EQUIPMENT ENTERS ALARM/FAILURE STATUS MODE. ROLES SHALL ALTERNATE EVERY 700 HOURS (MONTHLY)
- EQUIPMENT LEAD/LAG: WHERE EQUIPMENT IS DESIGNATED LEAD / LAG, LEAD EQUIPMENT TO OPERATE, LAG EQUIPMENT TO START / STOP AUTOMATICALLY PER OPERATING SEQUENCE. ROLES SHALL ALTERNATE EVERY 700 HOURS (MONTHLY)
- OA, OAT: OUTSIDE AIR, OUTSIDE AIR TEMPERATURE
- SA, SAT: SUPPLY AIR, SUPPLY AIR TEMPERATURE
- RA, RAT: RETURN AIR, RETURN AIR TEMPERATURE
- EA, EAT: EXHAUST AIR, EXHAUST AIR TEMPERATURE
- MA, MAT: MIXED AIR, MIXED AIR TEMPERATURE

**ALARM LEVELS**

- LIFE SAFETY: LATCHING - TRIGGERED AFTER TRUE FOR 1 SECOND
- CRITICAL EQUIPMENT: LATCHING - TRIGGERED AFTER TRUE FOR 10 SECONDS
- URGENT: NON-LATCHING - TRIGGERED AFTER TRUE FOR 1 MINUTE
- WARNING: NORMAL, NON-LATCHING - TRIGGERED AFTER TRUE FOR 5 MINUTES

LATCHING ALARMS SHALL REQUIRE OPERATOR ACKNOWLEDGEMENT BEFORE RETURNING TO NORMAL

**PENTHOUSE BOILER PLANT:**

- B-03  
GENERAL:
- COORDINATE WITH CONTROLS CONTRACTOR. EXISTING CONTROL SEQUENCES TO BE MAINTAINED.
  - BOILER MANUFACTURERS REPRESENTATIVE TO START-UP AND TEST BOILERS AND ASSOCIATED CONTROL SYSTEM.
  - BAS SHALL ALLOW FOR BOILER AND PUMP CONTROL.

**CONTROL DEVICES:**

- OUTDOOR AIR TEMPERATURE SENSOR C/W SUN SHADE SHIELD ON NORTH SIDE OF BUILDING.
- BOILER HIGH LIMIT SWITCH
- BOILER LOW WATER CUT-OFF
- WATER TEMPERATURE SENSOR [TS-1]

**SEQUENCE OF OPERATIONS:**

- MAINTAIN EXISTING SYSTEM OF OPERATIONS.

**ALARMS / SAFETIES:**

LEVEL 2: ON HIGH LIMIT BOILERS SHALL BE DISABLED.  
[ON LOW WATER BOILERS SHALL BE DISABLED].

**CONDENSING UNIT:**

CU-01

**GENERAL:**

- COORDINATE WITH CONTROLS CONTRACTOR. EXISTING CONTROL SEQUENCES TO BE MAINTAINED.

**BASEMENT BOILER PLANT:**

- P-01, P-02, P-03 & P-04  
GENERAL:
- COORDINATE WITH CONTROLS CONTRACTOR. EXISTING CONTROL SEQUENCES TO BE MAINTAINED. INSTALL VFDS ON NEW P-03 AND P-04.

**SEQUENCE OF OPERATIONS:**

- MAINTAIN EXISTING SYSTEM OF OPERATIONS.

**VRF DUCTLESS SPLIT SYSTEMS:**

- HP-01 & AC-01  
GENERAL:
- COORDINATE OCCUPANCY SCHEDULE WITH OWNER PRIOR TO PROGRAMMING VRF CONTROLLER
  - RETAIN SERVICES OF MANUFACTURER TO RELEASE REQUIRED POINTS FROM INTERFACE AND ASSIST IN INTEGRATION OF EQUIPMENT INTO BAS

**CONTROL DEVICES:**

- MANUFACTURER'S MASTER CONTROLLER WITH BacNet INTERFACE
- REMOTE TEMPERATURE CONTROLLER FOR EACH FAN COIL UNIT.

**SEQUENCES:**

- UN-OCCUPIED PERIODS: MODULATE FAN COIL AND CONDENSING UNITS TO MAINTAIN A UNOCCUPIED SPACE TEMPERATURE SETPOINTS
- OCCUPIED MODE: FAN SHALL RUN CONTINUOUSLY. MODULATE FANCOIL AND CONDENSING UNITS TO MAINTAIN OCCUPIED SPACE TEMPERATURE SETPOINTS. ON FURTHER CALL FOR HEATING MODULATE HEATING CONTROL VALVE TO MAINTAIN SETPOINTS.

**ALARMS / SAFETIES**

LEVEL 2: HIGH CONDENSATE PAN LEVEL, UNIT SHALL INDEX TO OFF MODE.

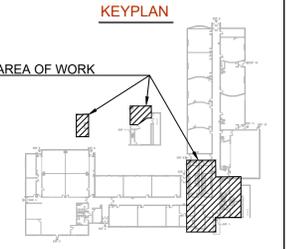
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REVISIONS		
NO.	ISSUED FOR	DATE
00	50% CLIENT REVIEW	26.01.28
01	90% CLIENT REVIEW	26.02.11
02	TENDER	26.03.03

**NORTH**

PROVINCE OF ONTARIO  
LICENSED PROFESSIONAL ENGINEER  
J.J. PEPPER  
100114890  
06-03-05  
26-03-05

DESIGN	ALC	DRAWN	ALC
CHECKED	JP	REVIEWED	ALC

**PROJECT**

ST. PETER CES

**ADDRESS**

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CAMBRIDGE, ON

**PROJECT NO.**

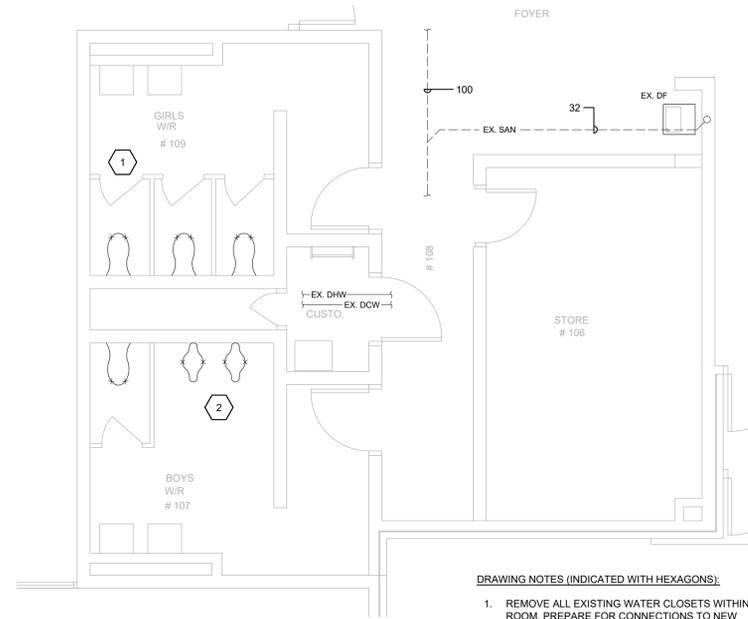
CE-6381

**DRAWING TITLE**

SCHEDULES - MECHANICAL

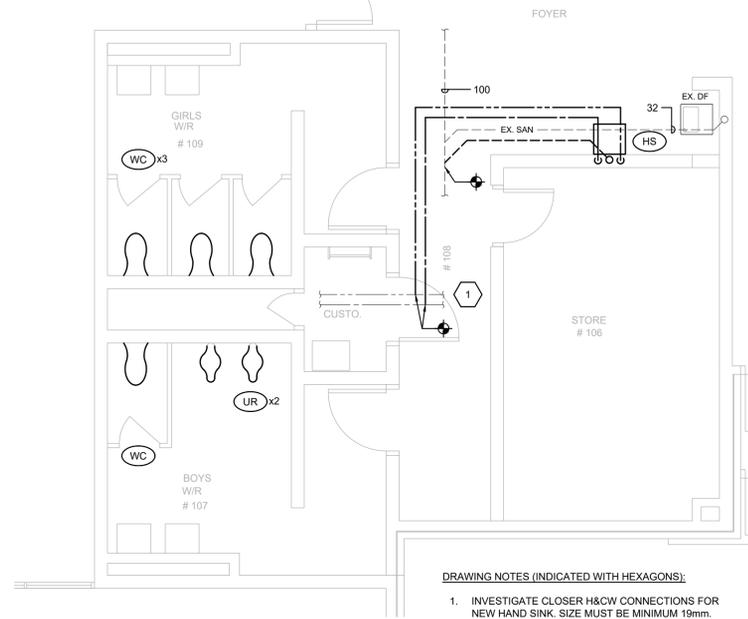
**DRAWING NUMBER**

M2 OF 9



**DRAWING NOTES (INDICATED WITH HEXAGONS):**

1. REMOVE ALL EXISTING WATER CLOSETS WITHIN ROOM. PREPARE FOR CONNECTIONS TO NEW FIXTURES.
2. REMOVE ALL EXISTING WATER CLOSETS & URINALS WITHIN ROOM. PREPARE FOR CONNECTIONS TO NEW FIXTURES.



**DRAWING NOTES (INDICATED WITH HEXAGONS):**

1. INVESTIGATE CLOSER H&CW CONNECTIONS FOR NEW HAND SINK. SIZE MUST BE MINIMUM 19mm.

**ADDITIONAL PROJECT SCOPE:**

- AT PROJECT START, SCOPE EXISTING MAIN SANITARY AND STORM LINES BETWEEN THE MAIN FOYER UP THE CORRIDOR TO KINDERGARTEN CLASSROOM #16. REPORT FINDINGS TO CONSULTANT AND SCHOOL BOARD.
- GENERAL CONTRACTOR TO REPLACE EXISTING SANITARY LINE ON THE EXTERIOR FROM THE STREET TO THE BUILDING. SIZE OF PIPE TO MATCH EXISTING.

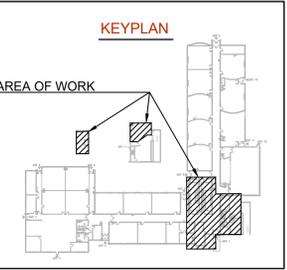
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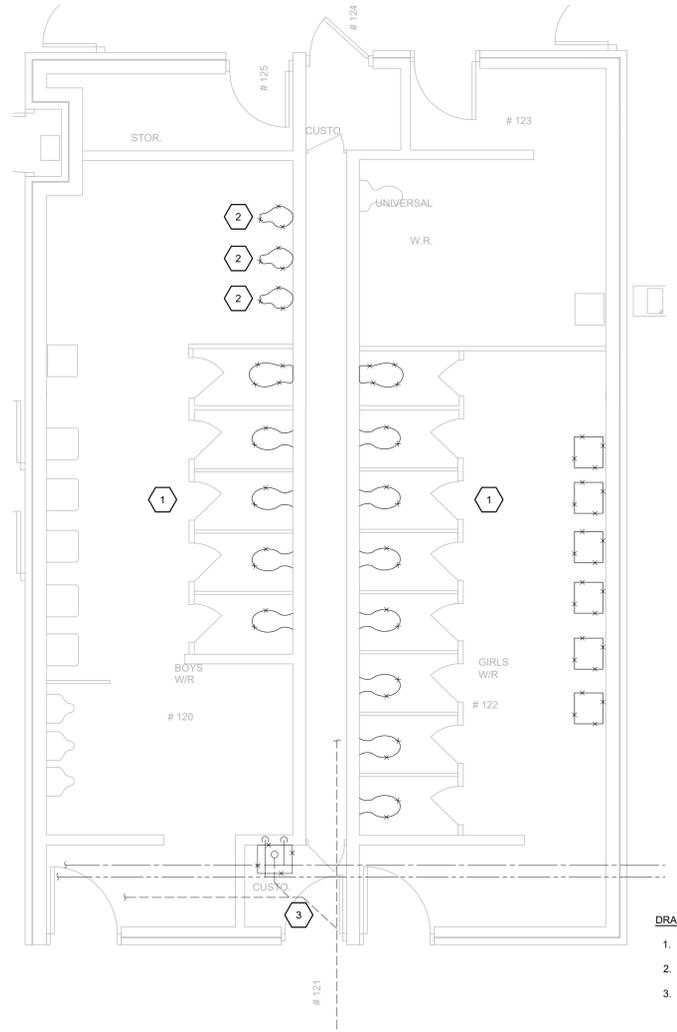


**WASHROOM PART PLAN - PLUMBING & DRAINAGE REMOVALS**

SCALE: 1:50

**WASHROOM PART PLAN - PLUMBING & DRAINAGE**

SCALE: 1:50

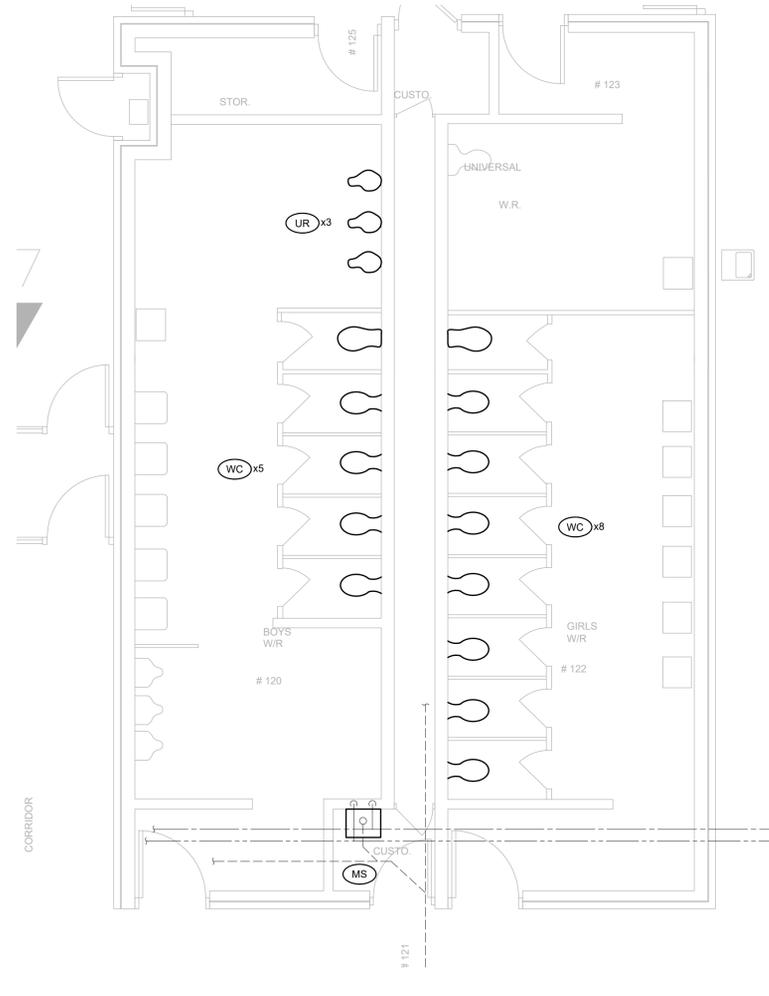


**DRAWING NOTES (INDICATED WITH HEXAGONS):**

1. REMOVE ALL EXISTING WATER CLOSETS WITHIN ROOM. PREPARE FOR CONNECTIONS TO NEW FIXTURES.
2. REMOVE EXISTING URINAL. PREPARE CONNECTION FOR NEW FIXTURE.
3. REMOVE EXISTING MOP SINK. PREPARE FOR NEW FIXTURE.

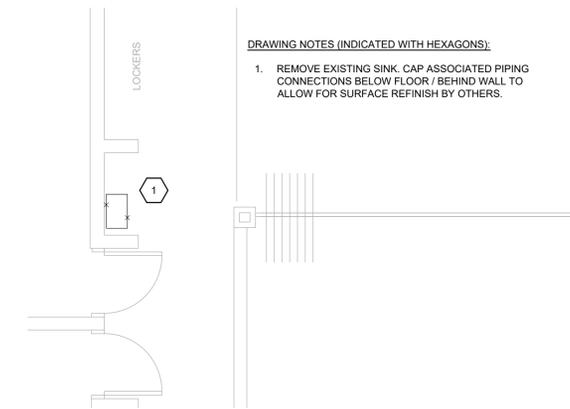
**WASHROOM PART PLAN - PLUMBING & DRAINAGE REMOVALS**

SCALE: 1:50



**WASHROOM PART PLAN - PLUMBING & DRAINAGE**

SCALE: 1:50



**DRAWING NOTES (INDICATED WITH HEXAGONS):**

1. REMOVE EXISTING SINK. CAP ASSOCIATED PIPING CONNECTIONS BELOW FLOOR / BEHIND WALL TO ALLOW FOR SURFACE REFINISH BY OTHERS.

**CORRIDOR PART PLAN - PLUMBING & DRAINAGE REMOVALS**

SCALE: 1:50

**REVISIONS**

NO.	ISSUED FOR	DATE
00	50% CLIENT REVIEW	26.01.28
01	90% CLIENT REVIEW	26.02.11
02	TENDER	26.03.03

**NORTH**

**PROFESSIONAL ENGINEER**  
J.J. PEPPER  
100114890  
PROVINCE OF ONTARIO

DESIGN	ALC	DRAWN	ALC
CHECKED	JP	REVIEWED	ALC

**PROJECT**  
ST. PETER CES

**ADDRESS**  
92 AVENUE ROAD,  
CAMBRIDGE, ON

**PROJECT NO.**  
CE-6381

**DRAWING TITLE**  
WASHROOM PART PLAN -  
PLUMBING & DRAINAGE

**DRAWING NUMBER**  
M3 OF 9



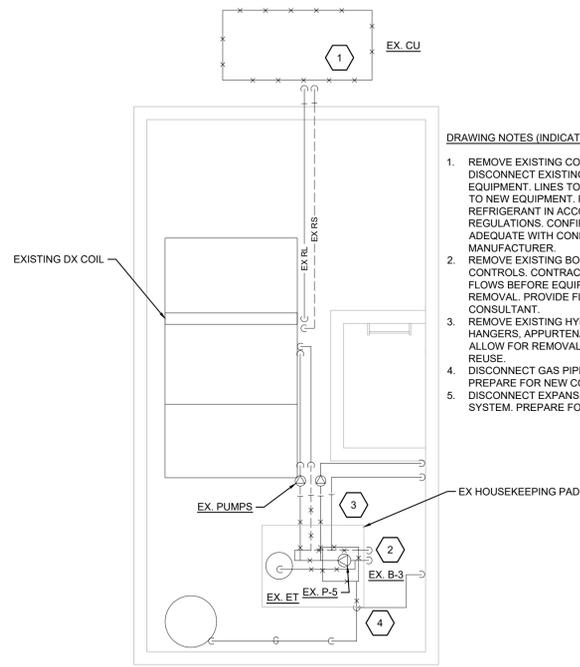
**REFERENCE IMAGE - COMBUSTION AIR INTAKE**

SCALE: NTS



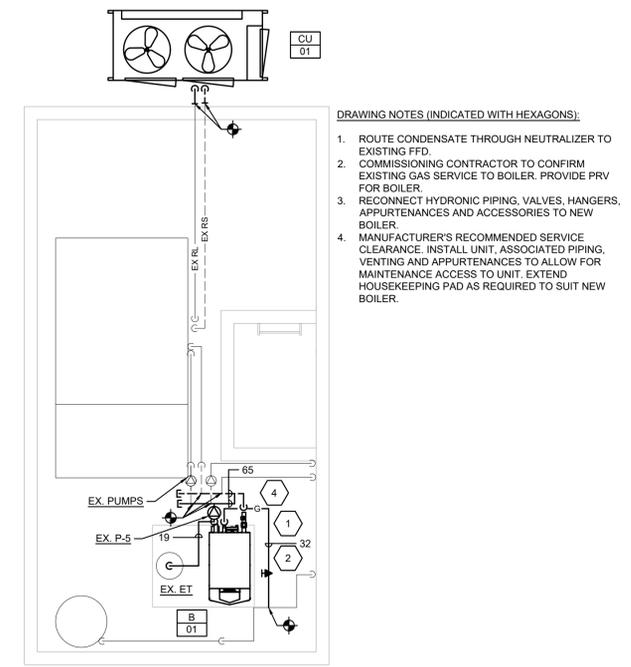
**REFERENCE IMAGE - REFRIGERANT PIPING**

SCALE: NTS



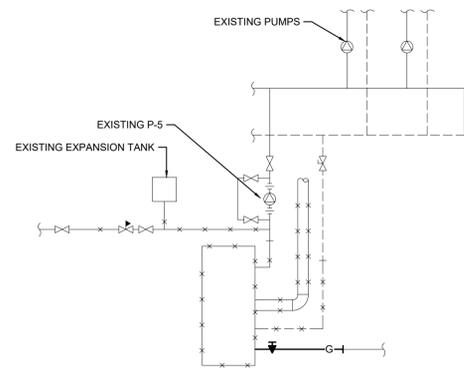
**FAN ROOM PART PLAN - PIPING REMOVALS**

SCALE: 1:50



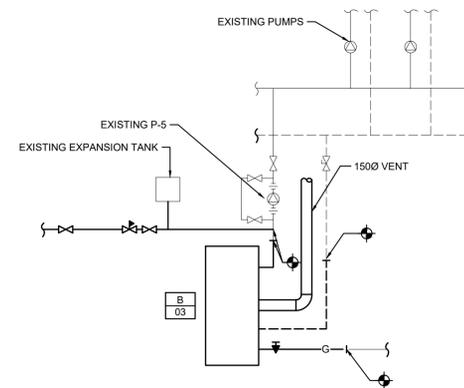
**FAN ROOM PART PLAN - PIPING**

SCALE: 1:50



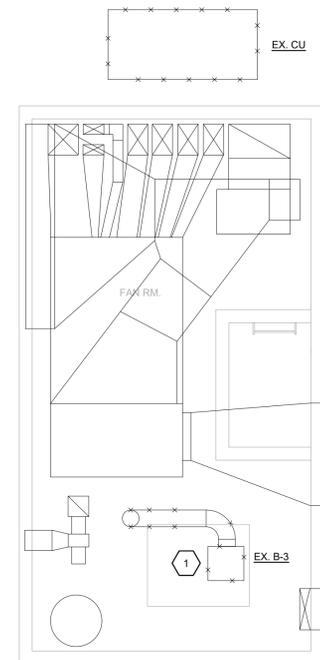
**MECHANICAL ROOM FLOW SCHEMATIC REMOVALS**

SCALE: N.T.S.



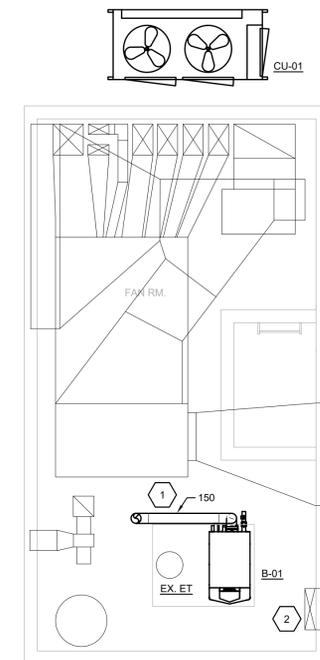
**MECHANICAL ROOM FLOW SCHEMATIC**

SCALE: N.T.S.



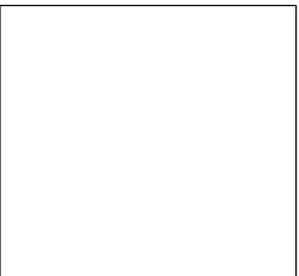
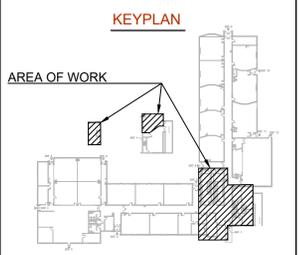
**FAN ROOM PART PLAN - HVAC REMOVALS**

SCALE: 1:50



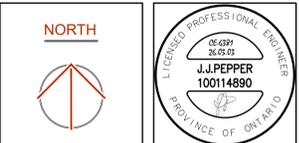
**FAN ROOM PART PLAN - HVAC**

SCALE: 1:50



**REVISIONS**

NO.	ISSUED FOR	DATE
00	50% CLIENT REVIEW	26.01.28
01	90% CLIENT REVIEW	26.02.11
02	TENDER	26.03.03



DESIGN	ALC	DRAWN	ALC
CHECKED	JP	REVIEWED	ALC

**PROJECT**  
ST. PETER CES

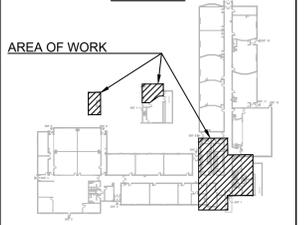
**ADDRESS**  
92 AVENUE ROAD,  
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**PROJECT NO.**  
CE-6381

**DRAWING TITLE**  
FAN ROOM PART PLANS

**DRAWING NUMBER**  
M4 OF 9

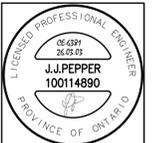
**KEYPLAN**



**REVISIONS**

NO.	ISSUED FOR	DATE
00	50% CLIENT REVIEW	26.01.28
01	90% CLIENT REVIEW	26.02.11
02	TENDER	26.03.03

**NORTH**



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CHECKED	JP	REVIEWED	ALC

**PROJECT**

ST. PETER CES

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**PROJECT NO.**

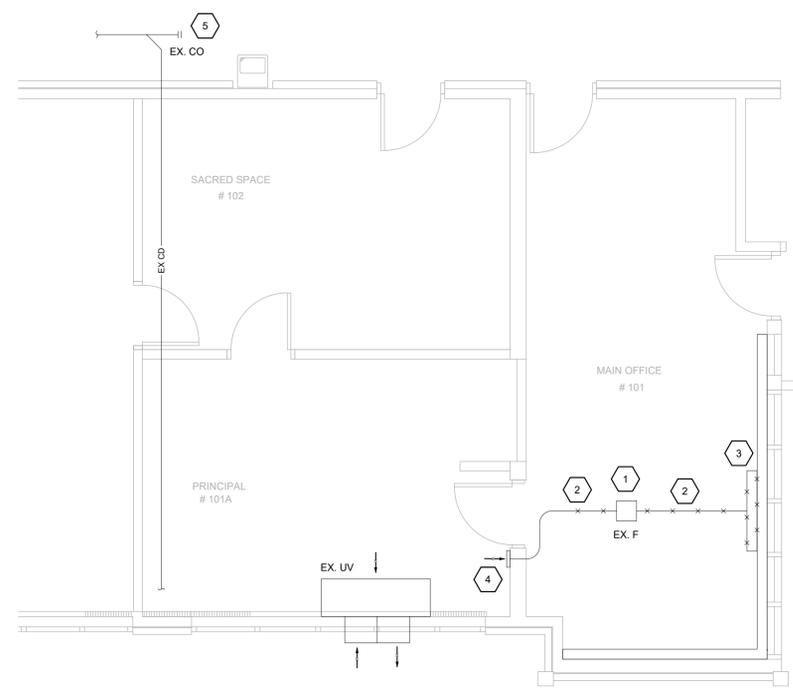
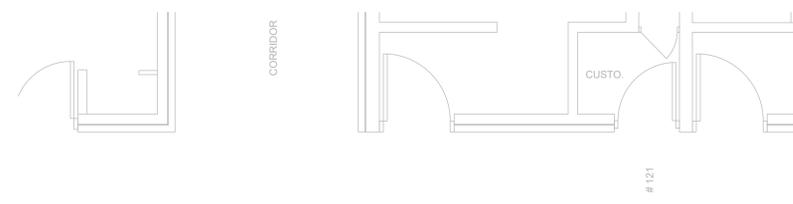
CE-6381

**DRAWING TITLE**

MAIN OFFICE PART PLAN- HVAC

**DRAWING NUMBER**

M5 OF 9

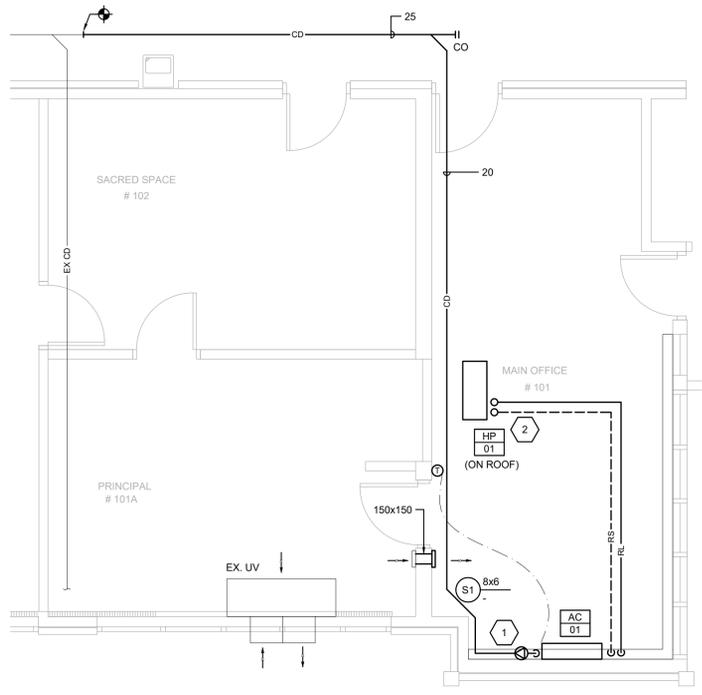
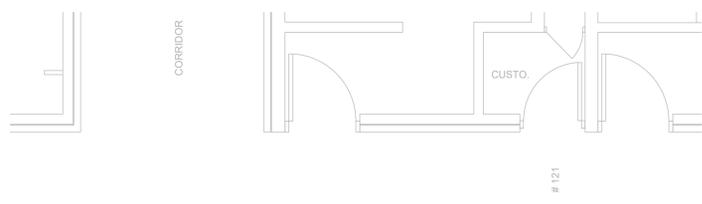


**MAIN OFFICE PART PLAN - HVAC REMOVALS**

SCALE: 1:50

**DRAWING NOTES (INDICATED WITH HEXAGONS):**

1. REMOVE FAN, HANGERS, AND ALL ASSOCIATED CONTROLS / WIRING.
2. REMOVE DUCT, HANGERS, & APPURTENANCES FROM FAN TO DIFFUSER / GRILLE.
3. REMOVE EXISTING DIFFUSER / GRILLE.
4. EXISTING WALL PENETRATION AND GRILLE TO REMAIN.
5. REMOVE EXISTING CLEAN OUT ON CONDENSATE LINE AND PREPARE FOR CONNECTION.



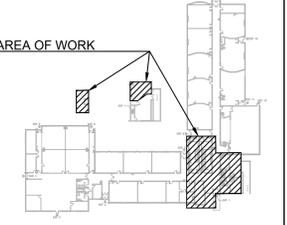
**MAIN OFFICE PART PLAN - HVAC**

SCALE: 1:50

**DRAWING NOTES (INDICATED WITH HEXAGONS):**

1. PROVIDE CONDENSATE PUMP AND PUMPED CONDENSING LINE TO EXISTING CONDENSATE LINE IN HALLWAY.
2. PROVIDE REFRIGERANT LINES TO AND FROM CONDENSER, C/W ROOF CONE AND ROOF WORK.

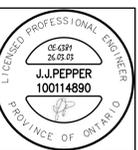
**KEYPLAN**



**REVISIONS**

NO.	ISSUED FOR	DATE
00	50% CLIENT REVIEW	26.01.28
01	90% CLIENT REVIEW	26.02.11
02	TENDER	26.03.03

**NORTH**



DESIGN	ALC	DRAWN	ALC
CHECKED	JP	REVIEWED	ALC

**PROJECT**

ST. PETER CES

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92 AVENUE ROAD,  
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**PROJECT NO.**

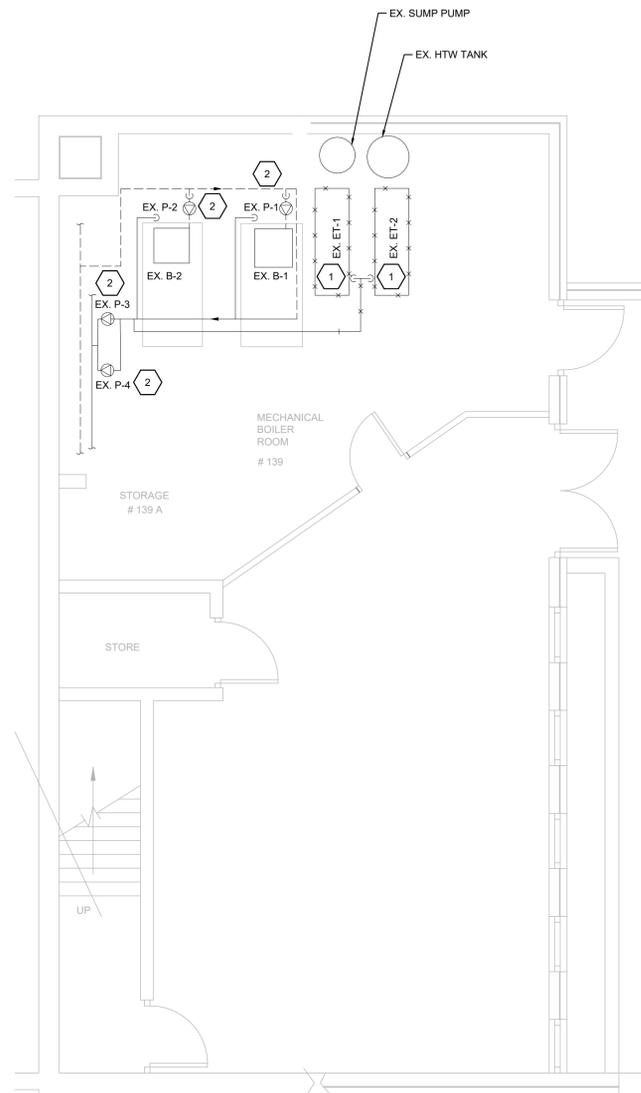
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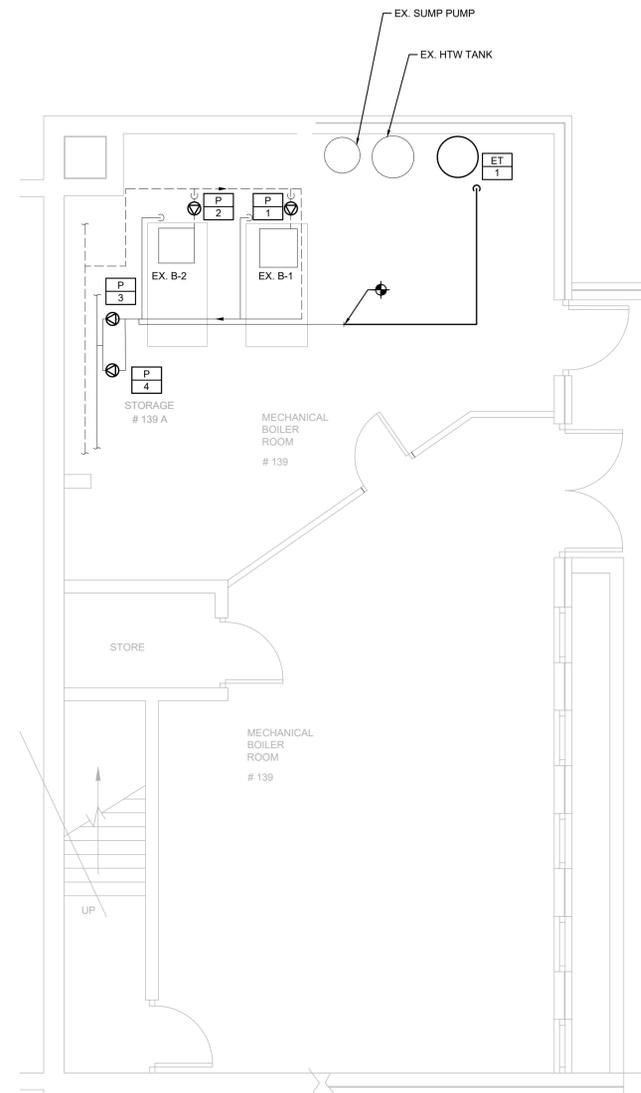
MECHANICAL BOILER ROOM  
PART PLAN- HYDRONICS

**DRAWING NUMBER**

M6 OF 9



- DRAWING NOTES (INDICATED WITH HEXAGONS):**
1. REMOVE EXISTING EXPANSION TANK & ASSOCIATED PIPING, HANGERS, VALVES, APPURTENANCES.
  2. REMOVE EXISTING PUMP & ASSOCIATED VALVES, ACCESSORIES.



**MECHANICAL BOILER ROOM PART PLAN - HYDRONICS REMOVALS**

SCALE: 1:50

**MECHANICAL BOILER ROOM PART PLAN - HYDRONICS**

SCALE: 1:50



**REFERENCE IMAGE - EXPANSION TANKS**

SCALE: NTS

**1. MECHANICAL GENERAL REQUIREMENTS:**

**1.1. GENERAL:**

- 1.1.1. MAKE SITE VISIT(S) AS NECESSARY BEFORE BID CLOSING TO ESTABLISH AND VERIFY ALL EXISTING CONDITIONS. MAKE ALLOWANCE FOR ANY NEW OR EXISTING SERVICE AND EQUIPMENT RELOCATIONS NECESSARY TO COMPLETE THE WORK AND INCLUDE IN THE BID PRICE. EXTRAS WILL NOT BE ALLOWED FOR FAILURE TO PROPERLY EVALUATE EXISTING CONDITIONS.
- 1.1.2. THE DRAWINGS SHOW THE GENERAL INTENT OF THE WORK, NOT THE DETAILS OF INSTALLATION. CO-ORDINATE THE ROUTING AND INSTALLATION OF ALL MECHANICAL SERVICES WITH ALL EXISTING CONDITIONS, STRUCTURE AND THE WORK OF ALL OTHER TRADES. PROVIDE INSTALLATION DRAWINGS AS REQUIRED.
- 1.1.3. DO NOT SCALE MECHANICAL DRAWINGS. TAKE FIELD DIMENSIONS PRIOR TO ANY INSTALLATION.
- 1.2. **DESCRIPTION:** PROVIDE WORK IN ACCORDANCE WITH FULL INTENT AND MEANING OF DRAWINGS AND SPECIFICATIONS. THE WORD "PROVIDE" WHERE USED IN THE CONTRACT DOCUMENTS, IS TO BE INTERPRETED AS "SUPPLY AND INSTALL" ALONG WITH ALL ASSOCIATED HARDWARE AND CONNECTIONS.
- 1.3. **WORKMANSHIP:** PROVIDE ALL NEW MATERIALS AND EQUIPMENT WITH THE APPROPRIATE LISTING (I.E. CSA, ULC, CETL, ETC.) ALL WORKMANSHIP BY THIS TRADE SHALL BE FIRST CLASS, CONFORMING TO INDUSTRY STANDARD PRACTICES FOR SAFETY, ACCESSIBILITY, DURABILITY AND NEATNESS FOR ACCEPTANCE BY THE OWNER'S REPRESENTATIVES.
- 1.4. **SLEEVES, HANGERS, INSERTS:** PROVIDE ALL SLEEVES, INSERTS AND HANGERS REQUIRED FOR THE MECHANICAL WORK. TREAT ALL SLEEVES OR HOLES PERFORMING ACUSTICAL SEPARATIONS FOR INSTALLATIONS OF THE DIVISION TO MAINTAIN ACUSTICAL RATING. ALL GAPS SHALL BE PACKED WITH ACUSTICAL INSULATION AND SEALED AT BOTH ENDS WITH ACUSTICAL CAULKING. PATCH ALL OPENINGS AROUND INSTALLATIONS OF THIS DIVISION PIERCING FIRE OR SMOKE SEPARATIONS WITH AN APPROVED WATERTIGHT SMOKE AND FIRE STOP SEALANT.
- 1.5. **FLASHING:**

- 1.5.1. FOR LOCATIONS WITH ROOF PENETRATIONS SERVING A PIECE OF EQUIPMENT, SUCH AS FOR ROOF MOUNTED, SPLIT SYSTEM CONDENSING UNITS, ETC. USE PORTALS PLUS, INC. ALUMI-FLASH SYSTEM CONSISTING OF 330 MM (13") HIGH, ONE PIECE SPUN ALUMINUM BASE WITH DECK FLANGE AND EPDM RUBBER CAP. USE CAPS SUITABLE FOR REQUIRED NUMBER AND DIAMETER OF SERVICE PENETRATIONS. FLASHING IS FOR MECHANICAL AND ELECTRICAL TRADES ONLY. COORDINATE WITH ELECTRICAL TRADE TO MINIMIZE THE NUMBER OF FLASHINGS REQUIRED.
- 1.5.2. FOR PLUMBING VENT ROOF PENETRATIONS, USE THALER SJ-38 "STACK JACK" INSULATED FLASHING CONSISTING OF 330 MM (13") HIGH, ONE PIECE SPUN ALUMINUM BASE WITH DECK FLANGE, URETHANE INSULATION LINE AND EPDM BASE SEAL. SIZE SEALS TO SUIT PIPE DIAMETER.

- 1.6. **INTERPRETATION:** DIVISION OF THE WORK AMONG SUPPLIERS OR VENDORS AND SUBCONTRACTORS IS SOLELY THE CONTRACTOR'S RESPONSIBILITY. NEITHER THE OWNER NOR CONSULTANT ASSUMES ANY RESPONSIBILITY TO ACT AS AN ARBITER TO ESTABLISH SUBCONTRACT TERMS BETWEEN SECTORS OR DISCIPLINES OF WORK.
- 1.7. **COORDINATION BETWEEN TRADES:** CO-ORDINATE THE WORK OF THIS TRADE WITH ALL OTHER TRADES ON THE JOB SO THAT THE WORK MAY PROGRESS WITHOUT ANY DELAY. SCHEDULE AND PHASE DEMOLITION AND NEW WORK TO REDUCE INTERFERENCE AND DOWNTIME OF EXISTING SYSTEMS. NOTIFY OWNERS REPRESENTATIVE OF ALL DOWNTIME PRIOR TO PROCEEDING WITH WORK.

- 1.8. **DISCREPANCY:** IF A DISCREPANCY IS FOUND IN THE SPECIFICATION OR ON THE DRAWINGS, REQUEST CLARIFICATION PRIOR TO THE END OF THE QUESTION PERIOD SO THAT CLARIFICATION CAN BE PROVIDED IN WRITING.
- 1.9. **REGULATORY REQUIREMENTS:** CONFORM TO GOVERNING MUNICIPAL AND PROVINCIAL CODES, RULES AND REGULATIONS AND/OR AUTHORITIES HAVING JURISDICTION.
- 1.10. **CODES AND STANDARDS:**

- 1.10.1. ALL WORK SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE ONTARIO BUILDING CODE, THE ONTARIO FIRE CODE AND ANY OTHER LOCAL REGULATIONS HAVING JURISDICTION OVER THE WORK OF THIS TRADE.
- 1.10.2. WHERE A CODE OR STANDARD IS REFERENCED, THE LATEST VERSION OF THE CODE OR STANDARD REFERENCED IN THE APPLICABLE BUILDING CODE IS TO BE APPLIED.
- 1.11. **SAFETY:** COMPLY WITH ALL PROVINCIAL/FEDERAL AND/OR LOCAL SAFETY REGULATIONS, INCLUDING THE OCCUPATIONAL HEALTH AND SAFETY ACT. IN ADDITION, COMPLY WITH ALL OF THE OWNER'S HEALTH AND SAFETY REQUIREMENTS.
- 1.12. **PERMITS AND FEES:** OBTAIN ALL PERMITS REQUIRED FOR INSTALLATION OF MECHANICAL TRADES WORK. ARRANGE FOR INSPECTIONS TESTS THEREWITH AND PAY ALL COSTS FOR PERMITS, INSPECTIONS, AND ASSOCIATED FEES. THIS INCLUDES ANY TSSA INSPECTION AND/OR CERTIFICATION. OBTAIN PERMITS IMMEDIATELY AFTER NOTIFICATION OF AWARD OF CONTRACT.
- 1.13. **TAXES:** ENSURE THAT PROVINCIAL AND/OR FEDERAL TAXES ARE INCLUDED WHERE REQUIRED.

- 1.14. **WARRANTY:** PROVIDE A WRITTEN WARRANTY FOR ALL MATERIALS, EQUIPMENT AND LABOUR FOR A ONE-YEAR PERIOD TO BEGIN AT THE TIME OF SUBSTANTIAL COMPLETION. COMPLETE ALL WARRANTY REGISTRATION ON BEHALF OF THE BUILDING OWNER. INCLUDE COPIES OF COMPLETED DOCUMENTATION IN OPERATIONS AND MAINTENANCE MANUALS.
- 1.15. **CERTIFICATION:** PROVIDE MANUFACTURER'S WRITTEN CERTIFICATION OF THE INSTALLATION AND OPERATION OF ALL SYSTEMS AND MAJOR EQUIPMENT.
- 1.16. **EXISTING SERVICE:**

- 1.16.1. DO NOT SHUT DOWN OR MAKE CONNECTIONS TO ANY EXISTING SERVICE WITHOUT WRITTEN PERMISSION OF THE OWNER.
- 1.16.2. BE RESPONSIBLE FOR DEMOLITION AND REMOVAL OF MECHANICAL EQUIPMENT AND SERVICES DESIGNATED FOR REMOVAL ON DRAWINGS.
- 1.17. **SITE PROTECTION AND CLEANLINESS:** PROTECT ALL WORK AND MATERIALS, BEFORE AND AFTER ERECTION, FROM WEATHER AND OTHER HAZARDS, AND KEEP IN A CLEAN AND ORDERLY MANNER. AVOID ACCUMULATION OF DEBRIS AS THE WORK PROGRESSES. ON COMPLETION OF THE CONSTRUCTION AND PRIOR TO THE FINAL INSPECTION AND ACCEPTANCE BY THE OWNER, CLEAN UP AND REMOVE FROM THE SITE ALL SCRAP MATERIALS RESULTING FROM THE WORK OF THIS TRADE.
- 1.18. **ADJUSTMENT AND OPERATION OF SYSTEMS:** WHEN WORK IS COMPLETE, ADJUST ALL EQUIPMENT ITEMS, OF VARIOUS SYSTEMS, FOR PROPER OPERATION WITHIN FRAMEWORK OF DESIGN INTENT, AND OPERATING CHARACTERISTICS AS PUBLISHED BY EQUIPMENT MANUFACTURER.
- 1.19. **MISCELLANEOUS STEEL:** SUPPLY AND INSTALL MISCELLANEOUS STRUCTURAL SUPPORTS, PLATFORMS, AND BRACES, AS REQUIRED TO HANG OR SUPPORT ALL EQUIPMENT, PIPING, DUCTWORK AND SIMILAR ITEMS.

- 1.20. **EQUIPMENT INSTALLATION:** INSTALL AND START UP ALL ITEMS OF EQUIPMENT, DEVICES AND SYSTEMS IN ACCORDANCE WITH MOST RECENT MANUFACTURER'S PUBLISHED GUIDELINES AND RECOMMENDATIONS. CONTRACTOR IS RESPONSIBLE FOR ASCERTAINING MANUFACTURERS INSTALLATION GUIDELINES AND RECOMMENDATIONS. TOUCH UP ALL SHOP PAINTED EQUIPMENT DAMAGED IN TRANSIT OR DURING INSTALLATION TO MATCH ORIGINAL SHOP FINISH.
- 1.21. **CUTTING AND PATCHING:** PROVIDE ALL CUTTING AND PATCHING REQUIRED FOR THE WORK OF THIS TRADE. ALL CUTTING AND PATCHING SHALL BE PERFORMED BY TRADE SPECIALIZING IN THE MATERIAL TO BE PATCHED. INCLUDE ALL COSTS FOR CUTTING AND PATCHING RELATED TO THE WORK OF THIS TRADE IN THE BID PRICE. WHERE PIPES AND DUCTS ARE SHOWN PASSING THROUGH EXISTING WALLS, FLOORS, AND ROOF, CUT AND PATCH THE NECESSARY OPENINGS. SHOULD CUTTING, REPAIRING, AND PATCHING OF PREVIOUSLY FINISHED WORK OF OTHER TRADES, BE REQUIRED TO ALLOW INSTALLATION OF MECHANICAL WORK, PAY ALL COSTS FOR TRADE SECTION CONCERNED TO PERFORM WORK.

- 1.22.1. ALL SPECIALTY TOOLS NECESSARY FOR EQUIPMENT INSTALLED IN THIS PROJECT.
- 1.23. **CHANGES IN THE WORK:** CHANGES TO THE CONTRACT REQUIRING ADDITIONS TO OR DELETIONS FROM THE WORK OF THIS DIVISION SHALL BE CARRIED OUT UPON WRITTEN REQUEST OF THE CONSULTANT. EXTRAS TO THE CONTRACT OR CREDITS SHALL BE SUBMITTED WITH A COMPLETE COST BREAKDOWN AS FOLLOWS:

- ITEMIZED MATERIAL LIST WITH QUANTITIES AND UNIT COSTS
- ITEMIZED LABOUR COST BREAKDOWN
- COPY OF QUOTATIONS FROM ALL SUPPLIERS FOR ALL EQUIPMENT
- COPY OF QUOTATIONS FROM ALL SUBCONTRACTORS INCLUDING ALL OF THE REQUIREMENTS OF THIS SECTION
- TOTAL MATERIAL COST
- TOTAL HOURS
- HOURLY RATE (REFER TO SUPPLEMENTARY CONDITIONS AND GENERAL CONTRACT)
- TOTAL OVERHEAD AND PROFIT (REFER TO SUPPLEMENTARY CONDITIONS AND GENERAL CONTRACT)

- 1.24. **COMPLETION:** PRIOR TO THE FINAL INSPECTION, CLEAN ALL MECHANICAL EQUIPMENT, CLEAN ALL CONSTRUCTION DUST AND DIRT FROM INSTALLED EQUIPMENT AT THE END OF THE JOB. REPAIR ANY DAMAGE BY THE MECHANICAL TRADE TO EXISTING BUILDINGS OR EQUIPMENT, ETC TO THE CONSULTANTS SATISFACTION.
- 1.25. **SUBMITTALS:**

**1.2.1. SHOP DRAWINGS:**

- 1.2.1.1. SUBMIT SHOP DRAWINGS FOR ALL EQUIPMENT SUPPLIED BY MECHANICAL DIVISION. SUBMIT ELECTRONIC COPIES TO CONSULTANT FOR REVIEW.
- 1.2.1.2. SUBMIT UNITS OF MEASURE IN EITHER METRIC OR IMPERIAL THAT MATCH THOSE OF THE DRAWINGS.
- 1.2.1.3. PROVIDE TITLE SHEET INCLUDING PROJECT NAME, SHOP DRAWING NAME (INCLUDING SPECIFICATION CLAUSE REFERENCE).
- 1.2.1.4. EACH SHOP DRAWING MUST BEAR STAMP AND SIGNATURE OF RESPONSIBLE OFFICIAL IN CONTRACTOR'S AND SUBCONTRACTOR'S ORGANIZATION. FOR EACH SUBMISSION, AS EVIDENCE THAT DRAWING HAS BEEN CHECKED AGAINST REQUIREMENTS AS CALLED FOR IN SPECIFICATIONS AND DRAWINGS.

**1.2.2. INTERFERENCE DRAWINGS:**

- 1.2.2.1. IN AREAS WHERE SPACE IS LIMITED AND MULTIPLE TRADES ARE INSTALLING SERVICES, COORDINATE INSTALLATION OF SERVICES. PREPARE INTERFERENCE DRAWINGS PRIOR TO CONSTRUCTION TO ENSURE INSTALLATION OF ALL SERVICES IS COORDINATED.

**1.2.3. OPERATION AND MAINTENANCE INSTRUCTION MANUALS:**

- 1.2.3.1. PROVIDE PDF COPIES OF COMPLETE OPERATION AND MAINTENANCE INSTRUCTIONS FOR EQUIPMENT FURNISHED UNDER THIS CONTRACT. MANUAL TO BE ORGANIZED WITH BOOKMARKS IN A FORMAT TO MATCH THE SPECIFICATION SECTIONS. ONCE MANUAL IS REVIEWED AND ACCEPTED, PROVIDE PDF VERSION, 2 HARD COPY VERSIONS IN THREE RING BINDERS, AND USE DRIVE COMPLETE WITH INDEX PAGES, INDEXING TABS AND COVER IDENTIFICATION AT FRONT AND SIDE.
- 1.2.3.2. MANUALS SHALL INCLUDE THE FOLLOWING INFORMATION:

- CONTACT INFORMATION OF CONSULTANTS AND CONTRACTORS
- COMPLETE SET OF FINAL PROJECT SHOP DRAWINGS
- CONTROL SHOP DRAWINGS AND OPERATING SEQUENCE, INCLUDING WIRING OF COMPONENTS
- COPY OF THE VALVE DIRECTORY
- OPERATING INSTRUCTIONS, INCLUDING START-UP AND SHUT-DOWN PROCEDURE
- MAINTENANCE INSTRUCTIONS, INCLUDING PREVENTIVE MAINTENANCE INSTRUCTIONS FOR COMPONENTS OF EQUIPMENT
- FINAL TESTING AND BALANCING REPORT
- COPIES OF THE FINAL TSSA CERTIFICATES
- MANUFACTURERS' WARRANTIES AND GUARANTEES
- AS-BUILT DRAWINGS

**1.2.4. AS-BUILT DRAWINGS:**

- 1.2.4.1. PRINT A FULL SCALE SET OF DRAWINGS FOR THE SITE THAT INCLUDE ALL ADDENDUM REVISIONS. MAINTAIN AN ACCURATE RECORD OF DEVIATIONS AND CHANGES FROM CONTRACT DRAWINGS WITH RED LINE MARKINGS ON SITE AS CONSTRUCTION PROGRESSES. TRANSFER AS-BUILT MARK-UPS TO DIGITAL DRAWING FORMAT AT THE COMPLETION OF THE PROJECT. THIS PROCESS SHOULD BE COMPLETED BEFORE TESTING, BALANCING AND/OR COMMISSIONING. SUBMIT TO THE CONSULTANT WITH THE O&M MANUALS AT COMPLETION OF PROJECT.
- 1.2.4.2. THE AS-BUILT DRAWINGS SHALL HAVE A VALUE OF \$5,000 UNLESS THE MECHANICAL CONTRACT VALUE IS LESS THAN \$100,000 WHICH SHALL HAVE A \$3,000 VALUE. ONCE AS-BUILT DRAWINGS HAVE BEEN COMPLETED, SUBMITTED AND REVIEWED, PAYMENT WILL BE RELEASED. THIS VALUE IS NOT INCLUDED IN THE AMOUNT REQUIRED BY THE CONSTRUCTION LIEN ACT.

- 1.3. **EQUIPMENT NAMEPLATES:** PROVIDE LAMINATED WHITE PHENOLIC PLASTIC NAMEPLATES WITH 10 MM HIGH BLACK LETTERS FOR EQUIPMENT INSTALLED UNDER THIS DIVISION. INCLUDE EQUIPMENT NUMBER AND EQUIPMENT NAME GENERALLY AS LISTED ON DRAWING SCHEDULES. SUBMIT LIST OF NAMEPLATES TO CONSULTANT FOR REVIEW PRIOR TO FABRICATION. IF THE OWNER HAS SPECIFIC STANDARDS, FOLLOW THESE STANDARDS.
- 1.4. **FIRESTOPPING AND SMOKE SEAL:**

- 1.4.1. PROVIDE ULC LISTED FIRESTOP SYSTEM TO SEAL AROUND ALL MECHANICAL SERVICES WHICH PENETRATE PART OF A BUILDING ASSEMBLY REQUIRED TO HAVE A FIRE RESISTANCE RATING.
- 1.4.2. SUBMIT DETAILED SHOP DRAWINGS TO THE CONSULTANT FOR REVIEW, INCLUDING:
  - MANUFACTURERS TECHNICAL PRODUCT DATA AND INSTALLATION INSTRUCTIONS FOR EACH SPECIFIC TYPE AND LOCATION OF PENETRATION
  - CERTIFICATION THAT PROPOSED FIRESTOPPING MATERIALS AND ASSEMBLIES COMPLY WITH CAN4-S11534
  - ULC LISTINGS WITH COPIES OF ULC DATA SHEETS FOR EACH SPECIFIC TYPE AND LOCATION OF PENETRATION

**1.5. MATERIALS AND EQUIPMENT:**

- 1.5.1. **EQUALS AND ALTERNATES:**
- 1.5.1.1. USE MATERIALS AND EQUIPMENT AS SPECIFIED HEREIN, OR SPECIFIED EQUIVALENT. DESIGN OF MECHANICAL SYSTEMS HAS BEEN BASED ON FIRST LISTED SUPPLIER AND MODEL NUMBER/SIZE STATED IN EQUIPMENT SCHEDULES.
- 1.5.1.2. SOME ITEMS OF EQUIPMENT, ONE OR MORE ADDITIONAL NAMES OF ACCEPTABLE EQUAL MANUFACTURERS MAY BE LISTED. THE DESIGN, LAYOUT, SPACE ALLOCATION, CONNECTION DETAILS, ETC., ARE BASED ON THE PRODUCTS NAMED FIRST IN THE DESCRIPTION AND/OR SCHEDULES. THE GENERAL APPROVAL INDICATED BY LISTING THE NAMES OF OTHER EQUAL MANUFACTURERS IS TO ESTABLISH THE QUALITY OF MANUFACTURE ONLY AND IS SUBJECT TO FINAL REVIEW OF SHOP DRAWINGS, PERFORMANCE DATA, TEST REPORTS BY CONSULTANT.
- 1.5.1.3. SUPPLIERS WISHING TO SUBMIT OTHER ITEMS OF EQUIPMENT FOR APPROVAL AS AN EQUAL TO THOSE SPECIFIED MUST APPLY TO THE CONSULTANT AT LEAST 10 CALENDAR DAYS BEFORE BID CLOSING DATE. REQUESTS MUST BE ACCOMPANIED BY COMPLETE DESCRIPTION AND TECHNICAL DATA ON THE ITEMS PROPOSED. DEVIATIONS FROM THE SPECIFICATIONS MUST BE STATED IN WRITING AT TIME OF APPLICATION FOR APPROVAL.
- 1.5.1.4. ITEMS OF EQUIPMENT BY MANUFACTURERS, NOT NAMED IN THE SPECIFICATIONS, MAY BE OFFERED AS ALTERNATIVES. PROPOSALS MUST BE ACCOMPANIED BY FULL DESCRIPTIVE AND TECHNICAL DATA, TOGETHER WITH THE STATEMENT OF AMOUNT OF ADDITION OR DEDUCTION FROM THE BASE BID.
- 1.5.1.5. AFTER EXECUTION OF THE CONTRACT, SUBSTITUTION OF EQUIPMENT WILL NOT BE CONSIDERED.
- 1.5.1.6. WHERE EQUIPMENT OTHER THAN THE EQUIPMENT USED AS A BASIS FOR DESIGN, LAYOUT AND SPACE ALLOCATION IS USED, PRODUCE AND SUBMIT REVISED LAYOUTS OF EQUIPMENT, PIPES, DUCTS, ETC., IN THE AREAS AFFECTED. SUBMIT THESE DRAWINGS WITH THE SHOP DRAWINGS. FAILURE TO PRODUCE THESE DRAWINGS IS AN INDICATION BY THE CONTRACTOR THAT THEY ARE NOT REQUIRED AND THE ORIGINAL SPACE ALLOCATIONS ARE ADEQUATE FOR THE SUBSTITUTED EQUIPMENT.

NOMINAL PIPE SIZE	INSERT LENGTH
MM (IN)	MM (IN)
40-65 (1-1/2 - 2-1/2)	250 (10)
80-150 (3-4)	300 (12)
200-250 (8-10)	400 (14)
>=300 (>=12)	550 (22)

SYSTEM / LOCATION	TYPE	THICKNESS, MM (IN)
POTABLE (DOMESTIC) WATER:		
COLD COND. / EOMT DRAIN	PGF (OR CF)	25(1)
COLD	PGF (OR CF)	25 (1)
HOT & REIRC., <=32 MM (1-1/4")	PGF	25 (1)
HOT & REIRC., >=38 MM (1-1/2")	PGF	38 (1-1/2)
HYDRONIC		
HTW / HTG., <=32mm (1-1/4")	PGF	38 (1-1/2)
HTW / HTG., >=38mm (1-1/2")	PGF	50 (2-1/2)
REFRIG., <=32 MM (1-1/4")	CF	19 (3/4)
REFRIG., >=38 MM (1-1/2")	CF	25 (1)

- 3.1. **EQUIPMENT:** INSULATE PUMP BODIES, EXPANSION TANKS, STRAINERS UNLESS FACTORY INSULATED.
- 3.1.1. HOT EQUIPMENT: 50 MM (2") OF FGF INSULATION UNLESS NOTED OTHERWISE.
- 3.1.2. COLD EQUIPMENT: 25mm (1") OF PGF OR CF INSULATION WITH VAPOUR RETARDER ON UNLESS NOTED OTHERWISE.
- 3.1.3. DO NOT INSULATE OVER TOP OF NAMEPLATES AND ASME STAMPS. WHERE EQUIPMENT REQUIRES SERVICE, PROVIDE EASILY REMOVABLE INSULATION THAT CAN BE REMOVED AND REINSTALLED TO ALLOW FOR REQUIRED SERVICE.

- 1.6. **MECHANICAL PROJECT COMPLIANCE:**
- 1.6.1. THE FOLLOWING DOCUMENTS AND/OR CONFIRMATION IS REQUIRED TO ALLOW THE CONSULTANT TO ISSUE OUR LETTER OF GENERAL REVIEWS.
  - AIR BALANCING REPORTS
  - CONFIRMATION THAT FIRESTOPPING IS COMPLETE

**2. TESTING AND BALANCING:**

- 2.1. **AIR AND WATER BALANCING:**
- 2.1.1. ASSUME RESPONSIBILITY FOR TESTING, BALANCING, AND PLACING ALL AIR HANDLING AND LIQUID SYSTEMS IN OPERATION.
- 2.1.2. RETAIN INDEPENDENT BALANCING FIRM TO BALANCE AIR AND WATER HANDLING SYSTEMS.
- 2.1.3. PROVIDE SHEAVES AND PULLEYS AND BELTS AS REQUIRED TO ACHIEVE AIR FLOWS INDICATED. CO-ORDINATE SUPPLY WITH EQUIPMENT MANUFACTURER.
- 2.1.4. ON COMPLETION OF TESTING AND BALANCING OF ALL SYSTEMS, SUBMIT TO CONSULTANT A PDF REPORT OF FINDINGS, INCLUDING COMPLETE DATA OF PUMP AND FAN PERFORMANCE, STATIC PRESSURES, AIR AND WATER FLOW RATES, FINAL READINGS AT ALL OUTLETS, AND AMPERE READINGS OF ALL MOTORS, TAKEN AT MOTOR TERMINALS WHEN EQUIPMENT IS OPERATING UNDER FULL LOAD CONDITIONS.

- 2.1.5. SUBMIT WITH EACH COPY OF REPORT, COMPLETE SETS OF DUCT LAYOUT PRINTS NEATLY MARKED IN RED INK, SHOWING ALL LOCATIONS AT WHICH TEST READINGS WERE TAKEN, AIR VOLUME, VELOCITY AND STATIC PRESSURE IN EACH SUPPLY AND RETURN DUCT, AND FINAL READING AT ALL OUTLETS. OBTAIN DUCT LAYOUT PRINTS FOR MARK-UP PURPOSES FROM CONSULTANT.
- 2.1.6. SUBMIT WITH EACH COPY OF REPORT, COMPLETE SETS OF PIPING LAYOUT PRINTS NEATLY MARKED IN RED, SHOWING ALL LOCATIONS AT WHICH TEST READINGS WERE TAKEN, AND FLOW MEASUREMENT. SHOW DIFFERENTIAL PRESSURE ACROSS PUMPS. OBTAIN PIPING LAYOUT PRINTS FROM CONSULTANT.
- 2.1.7. **INSTALLATION TOLERANCES:**
- 2.1.7.1. AIR HANDLING SYSTEMS: ±5% OF DESIGN
- 2.1.7.2. AIR OUTLETS / INLETS: ±10% OF DESIGN
- 2.1.7.3. HYDRONIC SYSTEMS: ±5% OF DESIGN

**3. MECHANICAL INSULATION:**

- 3.1. ALL PRODUCTS TO HAVE FLAME SPREAD RATING LESS THAN 25 AND SMOKE DEVELOPED CLASSIFICATION LESS THAN 50 IN COMPLIANCE WITH CANULC-S102.
- 3.2. PROVIDE A CONTINUOUS VAPOUR BARRIER ON ALL COLD SYSTEMS.
- 3.3. **DEFINITIONS:**
- INDIRECTLY CONDITIONED SPACE (IND COND SP): ENCLOSED SPACE THAT IS HEATED OR COOLED INDIRECTLY BY BEING CONNECTED TO ADJACENT SPACES INCLUDING RETURN AIR PLENUMS WITH OR WITHOUT EXPOSED ROOFS ABOVE
- UNCONDITIONED SPACE (UNCOND SP): AN ENCLOSED SPACE THAT IS NOT HEATED OR COOLED INCLUDING MECHANICAL CHASES / FURRED-IN SPACES.
- OUTSIDE: EXPOSED TO OUTDOOR AMBIENT TEMPERATURES INCLUDING SOFFITS, PARKING GARAGES, UNHEATED ATTICS / PLENUMS ABOVE INSULATED CEILINGS, AND UNHEATED CRAWL SPACES.
- CONCEALED: INSULATED MECHANICAL SERVICES AND EQUIPMENT ABOVE SUSPENDED CEILINGS, IN CHASES / BULKHEADS AND MECHANICAL / ELECTRICAL SERVICE ROOMS.

- 3.4. **INSULATION TYPES:**
- 3.4.1. **PGF - PREFORMED GLASS FIBRE:** FIBROUS GLASS SPLIT SECTIONAL PIPE INSULATION CONFORMING TO CANULC S102, WITH FACTORY APPLIED VAPOUR BARRIER JACKET TO CGSB 51-GP-52M AND SELF-SEAL LAP JOINT. THERMAL CONDUCTIVITY TO ASTM C335.
- 3.4.2. **FGF - FLEXIBLE GLASS FIBRE:** FLEXIBLE NON-COMBUSTIBLE BLANKET CONFORMING TO CANULC S102, WITH FACTORY APPLIED VAPOUR BARRIER JACKET TO CGSB 51-GP-52M. THERMAL CONDUCTIVITY TO ASTM C177.
- 3.4.3. **RGF - RIGID GLASS FIBRE:** RIGID NON-COMBUSTIBLE BLANKET CONFORMING TO CANULC S102, WITH FACTORY APPLIED VAPOUR BARRIER JACKET TO CGSB 51-GP-52M. THERMAL CONDUCTIVITY TO ASTM C177.
- 3.4.4. **CF - CELLULAR FOAM FLEXIBLE:** CELLULAR ELASTOMERIC, TUBE/SHEET/ROLL WITH ANTIMICROBIAL COATING CONFORMING TO CANULC S102. THERMAL CONDUCTIVITY CONFORMING TO ASTM C177/C518. EXPOSED INSULATION TO HAVE WHITE FINISH.

**3.3. SURFACE FINISHES / JACKETS:**

- 3.3.1. **EXPOSED INTERIOR PIPING:** FINISH EXPOSED INSULATED PIPING, VALVES AND FITTINGS WITH PVC JACKETING WITH 25/50 FIRE RATING, BASED ON CANULC-S102-M88 TESTING.
- 3.3.0. **PROTECTIVE JACKETS:** EXPOSED INSULATED PIPING IN PUBLIC AREAS & STORAGE / MECHANICAL ROOMS UP TO 250 (10FT) AFE. PROVIDE METAL JACKET OF 4 MM (3/16") THICK, PLAIN OR STUCCO EMBRESSED ALUMINUM, WITH LONGITUDINAL "SNAP-LOCK", OR LAPPED JOINTS CAULKED WITH SILICONE AND BUTT JOINTS SECURED WITH ALLOY STRAPS AND MECHANICAL FASTENERS. PROVIDE JACKETING COMPLETE WITH FACTORY ATTACHED PROTECTIVE LINER NOT APPLICABLE FOR REFRIGERANT PIPING.
- 3.3.1. **SANITARY PIPING:** FINISH INSULATED SANITARY PIPING BELOW BARRIER FREE LAVATORY TRAPS WITH PVC JACKETING. PVC MUST HAVE ATTAINED 25/50 FIRE RATING, BASED ON CANULC-S102-M88 TESTING.

- 3.4. **CLADDING - OUTSIDE PIPING & DUCTWORK:**
- 3.4.1. PROVIDE OUTSIDE EXPOSED INSULATED PIPING & DUCTWORK WITH ZERO PERMEABILITY, SELF-ADHESIVE LAMINATE EXTERIOR INSULATION CLADDING, MINIMUM 5 PLY, 11 KG (25 LB) PUNCTURE RATING, SERVICE TEMPERATURE RATING -70°C TO 148° (-94°F TO 300°F), 3M VENTURECLAD OR SIMILAR.

- 3.5. **PIPING:**
- 3.5.1. DO NOT INSULATE FLANGES OR UNIONS AT CONNECTION TO EQUIPMENT.
- 3.5.2. VALVE OPERATORS AND BALANCING VALVE TEST PORTS TO BE ACCESSIBLE WITHOUT REMOVAL OF INSULATION.
- 3.5.3. **PIPE INSULATION INSERTS AND SHIELDS:** PROVIDE RIGID INSERTS AND SHIELDS AT ALL HANGER SUPPORTS WHERE PIPING IS INSULATED. INSERT THICKNESS TO MATCH INSULATION THICKNESS. INSERT TO BE HYDROUS CALCIUM SILICATE RIGID PIPE INSULATION. INSERT AND SHIELD TO PROTECT BOTTOM HALF OF PIPE. SHIELD TO BE FABRICATED FROM GALVANIZED STEEL. SHIELD COLOUR TO MATCH COLOUR OF INSULATION FINISH. SHIELD AND INSERT LENGTH TO BE AS FOLLOWS:

DESIGN	ALC	DRAWN	ALC
CHECKED	JP	REVIEWED	ALC

- 3.6. **PIPE INSULATION APPLICATION:**
- 3.6.1. POTABLE COLD WATER, NON-METALLIC PIPING, PART 9 BUILDINGS - INSULATION NOT REQUIRED.
- 3.6.2. COMPLETELY INSULATE ALL OTHER SYSTEMS LISTED BELOW.

SYSTEM / LOCATION	TYPE	THICKNESS, MM (IN)
SANITARY WHERE NOTED / SPECFICED		
COLD COND. / EOMT DRAIN	PGF (OR CF)	25(1)
POTABLE (DOMESTIC) WATER:		
COLD	PGF (OR CF)	25 (1)
HOT & REIRC., <=32 MM (1-1/4")	PGF	25 (1)
HOT & REIRC., >=38 MM (1-1/2")	PGF	38 (1-1/2)
HYDRONIC		
HTW / HTG., <=32mm (1-1/4")	PGF	38 (1-1/2)
HTW / HTG., >=38mm (1-1/2")	PGF	50 (2-1/2)
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- 3.1. **EQUIPMENT:** INSULATE PUMP BODIES, EXPANSION TANKS, STRAINERS UNLESS FACTORY INSULATED.
- 3.1.1. HOT EQUIPMENT: 50 MM (2") OF FGF INSULATION UNLESS NOTED OTHERWISE.
- 3.1.2. COLD EQUIPMENT: 25mm (1") OF PGF OR CF INSULATION WITH VAPOUR RETARDER ON UNLESS NOTED OTHERWISE.
- 3.1.3. DO NOT INSULATE OVER TOP OF NAMEPLATES AND ASME STAMPS. WHERE EQUIPMENT REQUIRES SERVICE, PROVIDE EASILY REMOVABLE INSULATION THAT CAN BE REMOVED AND REINSTALLED TO ALLOW FOR REQUIRED SERVICE.

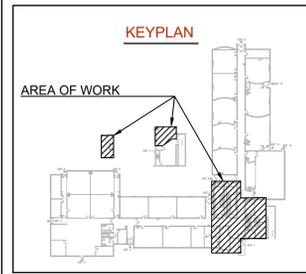
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NO.	ISSUED FOR	DATE
00	50% CLIENT REVIEW	26.01.28
01	90% CLIENT REVIEW	26.02.11
02	TENDER	26.03.03

**REVISIONS**

NO.	ISSUED FOR	DATE
00	50% CLIENT REVIEW	26.01.28
01	90% CLIENT REVIEW	26.02.11
02	TENDER	26.03.03

**NORTH**

DESIGN	ALC	DRAWN	ALC
CHECKED	JP	REVIEWED	ALC

**PROJECT**

**ST. PETER CES**

**ADDRESS**

**92 AVENUE ROAD,  
CAMBRIDGE, ON**

**PROJECT NO.**

**CE-6381**

**DRAWING TITLE**

**MECHANICAL SPECIFICATIONS**

**DRAWING NUMBER**

**M7 OF 9**

4. PIPING SYSTEMS

4.1. GENERAL

4.1.1. EXPANSION AND CONTRACTION: INSTALL ALL PIPING SO AS TO BE FREE FROM STRAIN AND DISTORTION DUE TO EXPANSION AND CONTRACTION AS GOVERNED BY REQUIREMENTS OF ANSI B31.1, EXCEPT AS HEREINAFTER MODIFIED. ALLOW FOR EXPANSION AND CONTRACTION BY OFFSETS, EXPANSION U-BENDS OR LOOPS. DO NOT USE EXPANSION JOINTS OF ANY TYPE UNLESS SPECIFICALLY INDICATED ON DRAWINGS.

4.1.2. PIPING SUBJECT TO FREEZING:

4.1.2.1. WHERE HORIZONTAL OR VERTICAL PIPING IS RUN ALONG AN OUTSIDE BUILDING WALL AND CONCEALED IN A PIPE SPACE, CIRCULATION OF INTERIOR AIR SHALL BE MAINTAINED IN THE PIPE SPACE BY MEANS OF AN AIR GRILLE(S), LOCATED AT THE TOP AND THE BOTTOM OF THE PIPE SPACE, FACING THE INTERIOR OF THE BUILDING.

4.1.3. LINES, GRADES AND SLOPES:

4.1.3.1. INSTALL LIQUID AND AIR PIPING FREE OF POCKETS AND PITCH TO DRAIN, AT LOW POINTS IN PIPING, WITH VALVES OR TRAPS INSTALLED AS REQUIRED FOR DRAINAGE OF THE PIPING.

4.1.4. UNIONS OR FLANGES - PROVIDE IN THE FOLLOWING LOCATIONS:

4.1.4.1. FOR BY-PASSES AROUND EQUIPMENT, CONTROL VALVES, DEVICES IN PIPING SYSTEMS, AND ELSEWHERE INDICATED ON DRAWINGS.

4.1.5. PIPING CONNECTIONS TO MAINS:

4.1.5.1. MAKE BRANCH CONNECTIONS OF STEAM, GAS, AND COMPRESSED AIR PIPING, TO RESPECTIVE HORIZONTAL PIPING OF LARGER DIAMETER, TO UPPER QUADRANT OF LARGER PIPE.

4.1.6. SLEEVES:

4.1.6.1. INSTALL SLEEVES WHERE PIPING PASSES THROUGH FOUNDATIONS, ABOVE GRADE FLOORS, AND WALLS. FABRICATE SLEEVES OF SCHEDULE 40 BLACK STEEL PIPE OR TYPE "K" COPPER TUBING.

4.1.7. ESCUTCHEON PLATES: PROVIDE ESCUTCHEON PLATES ON BARE PIPING PASSING THROUGH FINISHED FLOORS OR FLOORS.

4.1.8. VALVES: PROVIDE DRAIN VALVES WITH HOSE THREAD OUTLET CONNECTION, OR VALVE WITH LONG NIPPLE ON OUTLET, AT ALL LOW POINTS OF EACH WATER SYSTEM, AND ABOVE ALL RISER OR BRANCH STOP VALVES, FOR PROPER DRAINAGE OF PIPING.

4.1.9. VALVE TAGS AND INDEXES: UPON COMPLETION OF WORK, FURNISH AND INSTALL 25 MM (1") DIA. BRASS TAG AT EACH VALVE BEARING AN INDEX NUMBER DESIGNATING VALVE. PROVIDE DIGITAL AND HARDCOPY DIRECTORY MOUNTED IN GLAZED HARDWOOD FRAME FOR EACH SYSTEM, GIVING THE VALVE INDEX NUMBER, SIZE, MAKE AND CATALOGUE NO. AND "SERVICE" OF EACH VALVE AND LOCATION OF VALVE. INCLUDE SCHEMATIC SHOWING EACH VALVE ALONG WITH INDEX NUMBER FOR CROSS-REFERENCE.

4.1.10. PIPE IDENTIFICATION:

4.1.10.1. LABEL PIPING INSTALLED UNDER THIS DIVISION TO INDICATE CONTENT AND DIRECTION OF FLOW. INCLUDE OPERATING PRESSURE OR VACUUM, AS APPLICABLE.

4.2. HANGERS AND SUPPORTS:

4.2.1. GENERAL:
4.2.1.1. PIPE HANGERS & SUPPORTS TO CSA B214 & MSS SP-58.
4.2.1.2. SUPPORT OR SUSPEND ALL PIPING WITH NECESSARY HANGERS, STRUCTURAL SUPPORTS AND/OR BRACKETS AS REQUIRED, TO PREVENT SAGGING, WARPING AND VIBRATION.
4.2.1.3. DO NOT ALLOW LOADS, OF ANY NATURE, TO BE TRANSMITTED THROUGH PIPING CONNECTIONS TO EQUIPMENT.
4.2.1.4. PROVIDE SUITABLY DAMPENED SPRING HANGERS FOR FIRST THREE SUPPORTS FROM EQUIPMENT CONNECTION ON PIPING SUBJECT TO EXCESSIVE MOVEMENT.

4.2.2. HANGERS:

4.2.2.1. FOR ALL INSULATED PIPING UP TO NPS 4, CARRYING LIQUIDS AT TEMPERATURES 10.5°C (51°F) AND HIGHER, USE STANDARD WEIGHT CLEVIS HANGERS.
4.2.2.2. FOR INSULATED PIPING OF NPS 4 DIA. AND LARGER, CARRYING LIQUIDS AT TEMPERATURES 10.5°C (51°F) OR HIGHER, USE ADJUSTABLE ROLLER TYPE HANGERS WITH LOCKNUTS, SUPPORT ROLLERS AT BOTH ENDS WITH 2 ADJUSTABLE RODS WITH LOCKNUTS.
4.2.2.3. FOR INSULATED PIPING CARRYING LIQUIDS AT A TEMPERATURE OF 10°C (50°F) OR LESS, USE ELONGATED CLEVIS TYPE HANGERS.
4.2.2.4. PROVIDE INSULATION PROTECTION BEARING PLATES AT ALL HANGERS AND SUPPORTS FOR ALL INSULATED PIPING.
4.2.2.5. FOR NON-INSULATED PIPING USE CLEVIS TYPE OF WROUGHT STEEL CONSTRUCTION.
4.2.2.6. FOR COPPER TUBING PROVIDE COPPER COATED HANGERS.
4.2.2.7. ATTACH HANGER RODS, TO BUILDING STRUCTURE, BY MEANS OF MALLEABLE IRON BEAM CLAMPS OR CONCRETE INSERTS

4.2.3. HANGER SPACING:

4.2.3.1. FOR HORIZONTAL RUNS OF PLUMBING AND DRAINAGE PIPING COMPLY WITH HANGER SPACING REQUIREMENTS OF BUILDING CODE.
4.2.3.2. FOR HORIZONTAL RUNS OF BLACK OR GALVANIZED STEEL PIPE, OTHER THAN FOR PLUMBING SERVICE, COMPLY WITH MSS SP-58 TABLES 3 & 4.
4.2.3.3. FOR HORIZONTAL RUNS OF COPPER TUBING FOR SERVICES OTHER THAN PLUMBING, DO NOT EXCEED 1.8 M (6') BETWEEN HANGERS UNLESS SPECIFICALLY NOTED.

4.2.3.4. FOR HORIZONTAL RUNS OF PIPING FABRICATED OF PVC FOR SERVICES OTHER THAN PLUMBING, DO NOT EXCEED 1.22 M (4')

4.2.4. ROOF PIPING:

4.2.4.1. PROVIDE ECOLOK PIPE SUPPORT, UV SATURATED RECYCLED RUBBER, MAKE PROVISIONS FOR EXPANSION AND CONTRACTION.
4.2.4.2. PROVIDE GALVANIZED STRUT AND HORSESHOE CLAMPS OF SUFFICIENT HEIGHT TO SECURE PIPING TO SUPPORTS BLOCKS. PROVIDE EXTENSION KITS AS REQUIRED.
4.2.4.3. REFRIGERANT PIPE, DO NOT EXCEED 1.8 M (6') BETWEEN SUPPORTS.

4.3. MATERIALS OF CONSTRUCTION:

4.3.1. SANITARY AND INDIRECT DRAIN (INCLUDING VENTING):

4.3.1.1. REFERENCE STANDARDS:
4.3.1.1.1. CAST IRON, TO CSA B70. MECHANICAL FITTINGS TO CSA B602.
4.3.1.1.2. COPPER, DWV, HARD DRAWN COPPER DRAINAGE TUBE CONFORMING TO ASTM B 306 WITH WROUGHT COPPER OR CAST BRASS SOLDER JOINT DRAINAGE FITTINGS TO ASME B16.29 OR ASME B16.25.
4.3.1.1.3. ABS, DWV, TO CAN/CSA-B181.1. SOLVENT JOINTS TO ASTM D2335.
4.3.1.1.4. PVC, BUILDING SEWER AND DRAIN PIPE, TO CAN/CSA-B182.1 OR B182.2. RUBBER RING GASKETS INTEGRAL WITH BELL OR SOLVENT WELD TO ASTM D2564.
4.3.1.1.5. PVC, DWV, TO CAN/CSA B181.2. FLAME SPREAD RATING & SMOKE DEVELOPED CLASSIFICATION PER CANULC-102.2 WITH CERTIFICATION LABEL.
4.3.1.1.6. POLYETHYLENE, TO CAN/CSA B137.1. BUTT FUSION FITTINGS TO ASTM D3281.
4.3.1.1.7. GALVANIZED STEEL, TO ASTM A52/A52M.

4.3.1.2. APPLICATION:

4.3.1.2.1. NO PLASTIC PIPING IS PERMITTED TO BE INSTALLED IN VERTICAL SERVICE SPACE.
4.3.1.2.2. PIPING CAST INTO CONCRETE RAFT SLAB SHALL BE PVC, DWV WITH FLAME-SPREAD RATING NOT MORE THAN 25.
4.3.1.2.3. BURIED SECTIONS WITHIN BUILDING AREA AND TO 1.5M (5'-0") OUTSIDE BUILDING, CAST IRON OR PVC, BUILDING SEWER AND DRAIN PIPE.

4.3.1.2.4. ABOVE GRADE:

4.3.1.2.4.1. PIPING 75 MM (3") AND SMALLER: COPPER, DWV
4.3.1.2.4.2. PIPING 100 MM (4") AND LARGER: CAST IRON
4.3.1.2.4.3. PIPING 150 MM (6") AND SMALLER: PVC, DWV OR ABS, DWV

4.3.2. POTABLE (DOMESTIC) HOT AND COLD WATER:

4.3.2.1. REFERENCE STANDARDS:

4.3.2.1.1. ALL MATERIALS TO BE NSF/ANSI 61 & 372 CERTIFIED.
4.3.2.1.2. COPPER:
4.3.2.1.2.1. PIPING: SEAMLESS WATER TUBE TO ASTM B88
4.3.2.1.2.2. FITTINGS:
4.3.2.1.2.3. SOLDER JOINT FITTINGS TO ASME B16.18 (CAST) OR B16.22 (WROUGHT) OR
4.3.2.1.2.4. ALL PEX ELBOWS, ADAPTERS, COUPLINGS, PLUGS, TEES, BRASS ASTM 1960 COLD-EXPANSION BY PIPE MANUFACTURER UTILIZING IN-GOING COLD-EXPANSION PEX-A REINFORCING RINGS. PEX TO METAL TRANSITIONS BY PIPE MANUFACTURER, TO ASTM F876.0.

4.3.2.1.3. PEX-A:

4.3.2.1.3.1. CROSSLINKED POLYETHYLENE PIPING TO CAN/CSA-B137.5. PRESSURE AND TEMPERATURE RATINGS: 93°C (200°F) AT 80 PSI (551 KPA), 82°C (180°F) AT 100 PSI (689 KPA).
4.3.2.1.3.2. 50 MM (2") AND SMALLER: CANULC-S102.2 LISTED TO A MAXIMUM OF 25 FLAME SPREAD / 50 SMOKE DEVELOPED WITH NO LIMITATIONS ON SPACING.
4.3.2.1.3.3. 65 MM (2-1/2") AND LARGER: CANULC-S102.2 LISTED TO A MAXIMUM OF 25 FLAME SPREAD / 50 SMOKE DEVELOPED WITH RATED FIBERGLASS INSULATION.
4.3.2.1.3.4. SEAL PENETRATIONS AT FIRE SEPARATIONS PER CANULC-S115.
4.3.2.1.3.5. PIPING WITHIN A FIRE SEPARATION PER CANULC-S101.
4.3.2.1.3.6. ALL FITTINGS BY TUBING MANUFACTURER.
4.3.2.1.3.7. 25 YEAR CSA SYSTEM WARRANTY (INCLUDING CONSEQUENTIAL) FROM INSTALLATION DATE.

4.3.2.2. APPLICATION:

4.3.2.2.1. ABOVE GROUND PIPING 75 MM (3") AND SMALLER:
4.3.2.2.1.1. TYPE "L" HARD DRAWN COPPER TUBING. PROVIDE SOLDER TO THREADED ADAPTERS AT SCREWED VALVES OR EQUIPMENT.
4.3.2.2.1.2. PEX-A FOR 38 MM (1-1/2") AND SMALLER (ON COMPLETION OF INSTALLATION THE SYSTEM SHALL BE CHARGED WITH POTABLE WATER TO A PRESSURE WHICH MEETS LOCAL PLUMBING CODES. THE SYSTEM SHALL REMAIN AT THIS PRESSURE FOR A MINIMUM OF 24 HOURS TO ENSURE SYSTEM INTEGRITY). PROVIDE COPPER STUB-OUT ELBOWS AT EACH FIXTURE CONNECTION. STUB-OUT TO BE MANUFACTURED FROM SEAMLESS COPPER TUBING WITH A MACHINED ASTM F-1807 PEX BARB CONNECTION AND SPIN SEALED OUTLET. FOLLOW MANUFACTURERS INSTRUCTIONS FOR INSTALLATION.

4.3.3. NATURAL GAS UP TO 860 KPA (125 PSI):

4.3.3.1. REFERENCE STANDARDS:

4.3.3.1.1. STEEL PIPING, SCHED. 40 ERW OR CW BLACK CARBON STEEL PIPE TO ASTM A53/53M OR ASTM 106/106M. FITTINGS / JOINTS - WELDED: CLASS 2000 FORGED STEEL SOCKET WELD FITTINGS CONFORMING TO ASTM A 105/A105M. FITTINGS / JOINTS - THREADED: CLASS 150 BLACK MALLEABLE IRON SCREWED FITTINGS CONFORMING TO ASTM A 197/A197M AND ASME B16.3. FITTINGS / JOINTS - COLD PRESS CONNECT. TO ASTM B16.3 MATERIAL REQMTS. ANSI LC-4/CSA 6.32 PERFORMANCE REQMTS. ANSI HBNR SEALING ELEMENTS.
4.3.3.1.2. COPPER TUBING: TYPE "K" OR "L" TO ASTM B 88; TYPE G TO ASTM B87. FITTINGS / JOINTS - SOLDERED: WROUGHT CU ALLOY SOLDER TYPE 1 TO ANSI/ASME B16.22. FITTINGS / JOINTS - COLD PRESS CONNECT. TO ASTM B16.3 MATERIAL REQMTS. ANSI LC-4/CSA 6.32 PERFORMANCE REQMTS. ANSI HBNR SEALING ELEMENTS.
4.3.3.1.3. CORRUGATED STAINLESS STEEL TUBING (CSST): ASTM A240 TYPE 304 STAINLESS STEEL, 0.25MM (0.010") MIN. WALL THICKNESS, TO CSA/ANSI LC 1/CSA 6.26. UV RESISTANT POLYETHYLENE JACKET TO ASTM E84 SMOKE 50, FLAME 25 RATING. FITTINGS / JOINTS: SAE CA380 BRASS FITTINGS, DOUBLE WALL FLARE SEALING AND JACKET CAPTURING FOR STEEL TUBING PROTECTION.

4.3.3.2. APPLICATIONS:

4.3.3.2.1. ABOVE GRADE PIPING - EXPOSED, 50MM (2") OR LESS:
4.3.3.2.1.1. STEEL PIPE, THREADED OR COLD-PRESS FITTINGS / JOINTS.
4.3.3.2.1.2. COPPER TUBE WITH FLARED, BRAZED OR PRESS-CONNECT FITTINGS / JOINTS.
4.3.3.2.1.3. CORRUGATED STAINLESS STEEL TUBING (CSST) & JOINTS: FITTINGS, REVISE PIPE SIZING SHOWN ON PLANS PER MANUFACTURER'S GUIDELINES & DOCUMENT ON AS-BUILT DRAWINGS.
4.3.3.2.1.4. FITTINGS & JOINTS THAT WILL BE CONCEALED SHALL

BE INSPECTED & TESTED PRIOR TO CONCEALMENT.

4.3.4. HYDRONIC (HEATING):

4.3.4.1. REFERENCE STANDARDS:

4.3.4.1.1. PIPING:

4.3.4.1.1.1. COPPER, SEAMLESS WATER TUBE TO ASTM B88 / B88M.
4.3.4.1.1.2. STEEL, CONTINUOUS WELD OR ELECTRIC RESISTANCE WELDED BLACK CARBON STEEL CONFORMING TO ASTM A 53/AS3M GRADE B.
4.3.4.1.1.3. PVC, TO CSA B137.3. SOLVENT WELD JOINTS TO ASTM D2855.
4.3.4.1.1.4. 50 MM (2") AND SMALLER: CANULC-S102.2 LISTED TO A MAXIMUM OF 25 FLAME SPREAD / 50 SMOKE DEVELOPED.
4.3.4.1.1.5. 65 MM (2-1/2") AND LARGER: CANULC-S102.2 LISTED TO A MAXIMUM OF 25 FLAME SPREAD / 50 SMOKE DEVELOPED WITH RATED FIBERGLASS INSULATION. PRESSURE AND TEMPERATURE RATINGS: 93°C (200°F) AT 80 PSI (551 KPA), 82°C (180°F) AT 100 PSI (689 KPA).
SEAL PENETRATIONS AT FIRE SEPARATIONS PER CANULC-S101. ALL FITTINGS BY TUBING MANUFACTURER. 25 YEAR WARRANTY FROM INSTALLATION DATE.

4.3.4.1.2. END FITTINGS & JOINTS:

4.3.4.1.2.1. SOLDERED COPPER: TO ASME B16.18 CAST BRASS OR ASME B16.22 SOLDER - WROUGHT COPPER WITH LEAD FREE SOLDER TO ASTM B32.
4.3.4.1.2.2. THREADED: TO ASME B1.20.1.
4.3.4.1.2.3. SOLDER: TO ASTM B16.18.
4.3.4.1.2.4. COLD PRESS: TO ASME B16.3 WITH FACTORY INSTALLED EPDM, INSTALLED USING PROPER TOOL, ACTUATOR, JAWS, AND RINGS AS INSTRUCTED BY THE PRESS FITTING MANUFACTURER.
4.3.4.1.2.5. SOCKET WELD: TO ASTM A105/A-105M & ASME B16.1.
4.3.4.1.2.6. GROOVED: CSA B242 TO ASTM A-356 WITH GRADE 'E' EPDM GASKETS RATED FOR -34°C TO 120°C (-30°F TO 250°F)
4.3.4.1.2.7. FLANGED: TO ASTM B16.1.
4.3.4.1.2.8. COUPLINGS: HINGED, TWO PIECE FLANGES, SHOULDERED OR KEVED CAST DUCTILE IRON CONFORMING TO ASTM A-538 GRADE 65-45-12 AND LOCK BOLT, FLANGE BOLTING, -ZINC PLATED HEX HEAD MACHINE BOLTS AND HEX NUTS CONFORMING TO ASTM A 307-97 CLASS A.

4.3.4.1.2.9. FLANGED, CLASS 150 FORGED STEEL SLIP-ON OR WELDNCK RAISED FACE TYPE CONFORMING TO ASTM A 181/A181M-98B GRADE 1 AND ASME B16.5. 1.6 MM (1/16") EPDM GASKETS FOR ANSI CLASS 150. SEMI-FINISHED HEX HEAD MACHINE BOLTS AND SEMI-FINISHED HEX NUTS, BOTH OF CARBON STEEL CONFORMING TO ASTM A 307-97 CLASS A.

4.3.4.1.2.10. PEX: TO ASTM F1807-8 PEX F1960 BARB ENDS.

4.3.4.1.2.11. PEX-A FITTINGS COMPRESSION: 25 MM (1") THROUGH 100 MM (4") NOMINAL PIPE SIZE: SORS FITTING CONSISTING OF A DOUBLE O-RING INSERT WITH A COMPRESSION SLEEVE TIGHTENED AROUND THE PIPE AND INSERT.

4.3.4.1.2.12. ALL PEX ELBOWS, ADAPTERS, COUPLINGS, PLUGS, TEES, BRASS ASTM 1960 COLD-EXPANSION BY PIPE MANUFACTURER UTILIZING IN-GOING COLD-EXPANSION PEX-A REINFORCING RINGS. PEX TO METAL TRANSITIONS BY PIPE MANUFACTURER, TO ASTM F876.0.

4.3.4.2. APPLICATION:

4.3.4.2.1. ABOVE FLOOR PIPING 50 MM (2") AND SMALLER:
4.3.4.2.1.1. COPPER, TYPE "L" HARD DRAWN COPPER TUBING, TYPE "L" SOFT ANNEALED COPPER TUBING MAY BE USED WITH CONVICTOR ENCLOSURES. FITTINGS: WROUGHT COPPER SOLDER JOINT. PRESSURE TYPE, WITH IPS TO COPPER ADAPTERS AT SCREWED CONNECTIONS.
4.3.4.2.1.2. STEEL, SCHEDULE 40 WITH ASME B16.3 CLASS 150 THREADED OR COLD PRESS FITTINGS.
4.3.4.2.1.3. ABOVE FLOOR PIPING, 65 MM (2-1/2") AND LARGER:
4.3.4.2.1.3.1. STEEL, SCHEDULE 40 WITH RATED FACE FLANGE OR GROOVED FITTINGS.
4.3.4.2.2. EQUIPMENT DRAINS & OVERFLOWS:
4.3.4.2.2.1. COPPER, TYPE L & DWV HARD DRAWN WITH CAST BRASS OR SOLDER WROUGHT FITTINGS.
4.3.4.2.2.2. PVC, SCHEDULE 40 WITH SOLVENT WELD JOINTS.

4.3.4.3. CLEANING:

4.3.4.3.1. CLEAN ALL NEW HYDRONIC PIPING.
4.3.4.3.2. FLUSH SYSTEMS TO REMOVE LOOSE DIRT.
4.3.4.3.3. PROVIDE CLEANER TO ADEQUATELY CLEAN NEW SYSTEM PIPING. MIX CONCENTRATION IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND CIRCULATE FOR 24 TO 72 HOURS AT A TEMPERATURE BETWEEN 21-60°C (70-140°F).
4.3.4.3.4. DRAIN SYSTEMS, REFILL WITH FRESH WATER AND CIRCULATE FOR MINIMUM OF 4 HOURS TO FLUSH OUT REMAINING CHEMICAL SOLUTION.
4.3.4.3.5. REFILL SYSTEMS WITH CLEAN WATER AND INHIBITOR AS REQUIRED.
4.3.4.3.6. INCLUDE SUPPLIER OF WATER TREATMENT SYSTEMS SUPERVISION AND ASSISTANCE DURING INSTALLATION FOR CLEAN OUT AND STARTUP PROCEDURES. PROVIDE ELECTRONIC VERSION OF WRITTEN REPORT TO CONSULTANT.

4.3.5. REFRIGERATION:

4.3.5.1. GENERAL: SUCTION LINES SHALL BE RATED AT 2413 KPA (350 PSI) AND LIQUID AT 1451 KPA (650 PSI) OR LIQUID AND DISCHARGE LINES AT 1451 KPA (650 PSI).

4.3.5.2. OTHER SYSTEMS:

4.3.5.2.1. APPLICATION: TYPE ACR HARD DRAWN COPPER TUBING, HARD DRAWN COPPER TUBING CONFORMING TO ASTM B280.
4.3.5.2.2. FITTINGS: HEAVY WROUGHT COPPER, SOLDER JOINT TYPE WITH ADAPTER FITTINGS WHERE SCREWED CONNECTIONS ARE NECESSARY.
4.3.5.2.3. INSTALLATION: MAKE SOLDER TYPE JOINTS WITH "SIL-FOS" SILVER SOLDER OR SIMILAR HIGH MELTING POINT SOLDER HAVING A MELTING POINT OF AT LEAST 538°C (1000°F). REMOVE ALL INTERIOR PARTS OF REFRIGERANT RIGS AND VALVES BEFORE APPLYING HEAT TO THE JOINT.

4.3.6. FLUE GAS VENT (DIRECT VENTS):

4.3.6.1. MATERIAL TYPE AND/OR TEMPERATURE RATING SHALL BE INCLUDED ON THE PIPE PRINT LINE & MANDATORY ORANGE AND BLACK WARNING LABEL APPLIED TO EACH FITTING AS REQUIRED BY ULC S636 TO DISTINGUISH A CERTIFIED GAS VENTING SYSTEM FROM NON-CERTIFIED PLUMBING PIPE. DO NOT MIX PIPE, FITTINGS, SOLVENTS, OR JOINING METHODS FROM DIFFERENT BH VENT MANUFACTURERS; EXCHANGING COMPONENTS FROM VARIOUS MANUFACTURERS VIOLATES THE CONDITIONS OF CERTIFICATION IN THE ULC S636 STANDARD AND VOIDS THE PRODUCT WARRANTY. VENT PIPING PASSING THROUGH AIR PLENUMS, SHALL BE TESTED AND LISTED IN ACCORDANCE WITH CANULC S102.2 AND CLEARLY MARKED WITH THE CERTIFICATION LOGO INDICATING A FLAME-SPREAD RATING NOT MORE THAN 25 AND A SMOKE-DEVELOPED CLASSIFICATION NOT EXCEEDING 50.
4.3.6.2. PVC, SYSTEM S636 PVC VENT PIPING AND FITTINGS, ULC S636 CLASS IIA CERTIFIED, FOR USE UP TO AND INCLUDING 65°C (149°F). SYSTEM S636 PVC CEMENT AND PRIMER IS TO BE USED FOR INSTALLATION.

4.3.6.3. CPVC, SYSTEM S636 CPVC VENT PIPING AND FITTINGS, ULC S636 CLASS IIB CERTIFIED, FOR USE UP TO AND INCLUDING 90°C (194°F). SYSTEM S636 CPVC CEMENT AND PRIMER IS TO BE USED FOR INSTALLATION.

4.3.6.4. POLYPROPYLENE, SYSTEM S636 POLYPROPYLENE VENT PIPING AND FITTINGS, ULC S636 CLASS IIB CERTIFIED, FOR USE UP TO AND INCLUDING 110°C (230°F).

4.3.6.5. DOUBLE WALL STAINLESS STEEL: FOR CAT. I, II, III, OR IV CONDENSING OR NON-CONDENSING: 441 SS OUTER WALL, AL29-4C INNER WALL. MINIMUM POSITIVE PRESSURE RATING 5 inH2O, TESTED TO 35 inH2O. MAXIMUM FLUE GAS TEMPERATURE 480°F (249°C).
4.3.6.6. SUBMIT VENT & SIZING CALCULATIONS WITH ASSOCIATED EQUIPMENT.

4.4. TESTING:

4.4.1. NATURAL GAS: CONDUCT FINAL TESTS ON NATURAL GAS PIPING IN ACCORDANCE WITH ONTARIO GAS UTILIZATION CODE AND WITH REQUIREMENTS OF LOCAL GAS COMPANY OR GOVERNING AUTHORITY.
4.4.2. WATER: HYDROSTATICALLY TEST WATER PIPING AT 862 KPA (125 PSIG) PRESSURE TO DETECT EXCESSIVE WATER LOSSES.

5. PLUMBING SYSTEM:

5.1. REFERENCES STANDARDS:

5.1.1. CONFORM TO ALL APPLICABLE CODES INCLUDING, BUT NOT LIMITED TO, THE FOLLOWING:
5.1.1.1. CSA-B84.10: SELECTION AND INSTALLATION OF BACKFLOW PREVENTERS
5.1.1.2. CSA-B149.1: NATURAL GAS AND PROPANE INSTALLATION CODE
5.1.2. ALL PIPING, ACCESSORIES AND EQUIPMENT TO CONFORM TO THE REQUIREMENTS OF NSF/ANSI 61-G & NSF/ANSI 372.
5.2. VENTING: PLUMBING VENTING MAY OR MAY NOT BE SHOWN ON DRAWINGS. PROVIDE A COMPLETE PLUMBING VENTING SYSTEM FOR ALL PLUMBING FIXTURES SHOWN, IN ACCORDANCE WITH THE ONTARIO BUILDING CODE. CARRY VENT, WASTE AND SOIL STACKS THROUGH THE ROOF WHERE SHOWN ON DRAWINGS OR WHERE REQUIRED. SUPPLY ALL FLASHING MATERIALS. USE MATERIALS AS SPECIFIED IN MECHANICAL GENERAL REQUIREMENTS.

5.3. STERILIZATION OF POTABLE (DOMESTIC) WATER SYSTEMS:

5.3.1. FLUSH EACH SYSTEM, AFTER COMPLETION, BY ALLOWING FULL FLOW OF WATER THROUGH SYSTEM FOR A PERIOD OF FIFTEEN MINUTES, OR LONGER WHEN DIRECTED BY CONSULTANT.
5.3.2. AFTER FLUSHING OF THE SYSTEM IS COMPLETED, PROVIDE A 24 HOUR CONTACT STERILIZATION TREATMENT BY TREATING THE WATER WITH 50 PPM OF CHLORINE AS RECOMMENDED IN AWWA SPECIFICATION C-651. AFTER STERILIZATION PERIOD HAS ELAPSED, FLUSH SYSTEM TO REDUCE CHLORINE CONTENT TO AN ACCEPTABLE LEVEL.

5.4. PLUMBING FIXTURES:

5.4.1. PROVIDE CSA COMPLIANT PLUMBING FIXTURES.
5.4.2. PROVIDE PLUMBING FIXTURES AS INDICATED IN SCHEDULE ON DRAWINGS.
5.4.3. CAULK ALL AROUND BASES OF MOP SERVICE SINKS, BUILT-IN BATHTUBS, AND OTHER BUILT-IN FIXTURES.

5.5. VALVES:

5.5.1. SUBMIT SHOP DRAWINGS FOR ALL VALVES.
5.5.2. POTABLE (DOMESTIC) WATER:
5.5.2.1. REFERENCE STANDARDS:
5.5.2.1.1. LEAD FREE, 0.25% CONTENT PER NSF-61/372
5.5.2.1.2. BRONZE TO ASTM C893/30
5.5.2.1.3. BRASS TO ASTM C467/50
5.5.2.1.4. CAST IRON TO ASTM A126
5.5.2.1.5. STAINLESS STEEL TO ASTM A351
5.5.2.1.6. CPVC RATED TO 1,600 KPA (232 PSIG) AT 23°C (73°F)
5.5.2.1.7. ALL PRESSURE RATINGS, SIZES TO MSS SP-25
5.5.2.2. BALL VALVE (UP TO AND INCLUDING 75MM (3")); 600 CWP, BRONZE BODY, FULL PORT, STAINLESS VENTED BALL, PTFE SEATS, BLOW-OUT PROOF STEM, LOCKING LEVER HANDLE WITH INSULATION STEM EXTENSION, SOLDERED, THREADED OR PEX CONNECTIONS, MANUFACTURED TO MSS SP-110. PROVIDE 3-PIECE VALVE FOR CRITICAL SERVICE. PROVIDE 2-PIECE VALVE FOR NON-CRITICAL SERVICE.
5.5.2.3. MAKE-UP WATER VALVES:
5.5.2.3.1. PROVIDE WATER FEEDER VALVES IN POTABLE (DOMESTIC) WATER PIPING TO HEATING, COOLING SYSTEMS WHERE INDICATED ON DRAWINGS. VALVES SHALL BE LINE SIZE AND COMPLETE WITH RELIEF VALVE AND STRAINER.
5.5.2.3.2. SET REDUCING VALVE TO HOLD AN EXCESS PRESSURE OF 35 KPA (5 PSI) ABOVE HIGHEST PRESSURE IN SYSTEM.
5.5.2.3.3. PROVIDE SUITABLY SIZED RELIEF VALVE AND PIPE TO DRAIN. SET RELIEF VALVE 210 KPA (30 PSI) HIGHER THAN REDUCING VALVE.
5.5.2.4. WATER PRESSURE REDUCING VALVES:
5.5.2.4.1. PROVIDE PRESSURE REDUCING VALVES IN POTABLE (DOMESTIC) WATER PIPING WHERE SHOWN ON DRAWINGS.
5.5.2.4.2. PROVIDE INTEGRAL STRAINER, LEAD FREE BRASS BODY, STAINLESS STEEL AND THERMOPLASTIC INTERNAL PARTS, REINFORCED EPDM DIAPHRAGM, SOLDER OR THREADED WITH SINGLE UNION ENDS.
5.5.2.4.3. PROVIDE SUITABLY SIZED RELIEF VALVE AND PIPE TO DRAIN.
5.5.2.5. RELIEF VALVES: CSA AND ASME CERTIFIED AND LISTED, BRONZE BODY, AUTOMATIC DIRECT PRESSURE ACTUATED, TEMPERATURE RELIEF MAXIMUM 90°C (210°F). SIZED PER MANUFACTURER REQUIREMENTS TO SUIT SIZE OF THE ASSOCIATED EQUIPMENT.

5.6. NATURAL GAS ISOLATION:

5.5.3.1. UP TO 50 MM (2"), 1,034 KPA (150PSIG) / 600WOG RATING. BRASS OR BRONZE BODY, FULL PORT, BALL VALVE, PTFE SEATS, DOUBLE O-RING BODY OR PTFE PACKING, CHROME PLATED SOLID BRONZE BALL. LEVER HANDLE. CSA/CSG 125 / 3.16 APPROVED.
5.5.3.2. 65MM (2-1/2") AND LARGER: CLASS 150, CARBON STEEL, 241HWCB BODY, STAINLESS STEEL BALL/STEM, PTFE PACKING, CHROME PLATED SOLID BRONZE BALL. LOCKING LEVER OR GEAR FLANGED HANDLE. CSA/CSG 125G / 3.16 APPROVED.
5.6. GAS PRESSURE REDUCING STATIONS:
5.6.1. PRESSURE REDUCING STATION: PROVIDE IN ARRANGEMENT AND OF CAPACITY INDICATED ON DRAWINGS TO REDUCE NATURAL GAS PRESSURE. COMPLETE WITH GAS PRESSURE REGULATING VALVE, RELIEF VALVE, VENTS TO ATMOSPHERE WITH OPENINGS TURNED DOWN AND PROTECTED BY SCREEN, ISOLATING VALVES AND PRESSURE GAUGES ON BOTH SIDES OF PRESSURE REDUCING STATION.
5.6.2. SAFETY RELIEF VALVES: PROVIDE WHERE REQUIRED, SIZED SO THAT COMBINED CAPACITY OF RELIEF PORT OF GAS REGULATOR AND OF RELIEF VALVE WILL PROVIDE RELIEF CAPACITY EQUAL TO TOTAL CAPACITY OF PRESSURE REDUCING STATION.

5.7. PLUMBING SPECIALTIES:

5.7.1. CLEANOUTS (CO):
5.7.1.1. PROVIDE CLEANOUTS IN DRAINAGE PIPING AT LOCATIONS INDICATED ON DRAWINGS, AT BASE OF EACH VERTICAL STACK OR RAINWATER LEADER AND AS CLOSE AS POSSIBLE TO WHERE THE DRAINAGE PIPING LEAVES THE BUILDING, AS REQUIRED TO COMPLY WITH BUILDING CODE.
5.7.1.2. WHERE CLEANOUTS ARE CONCEALED IN WALLS, PROVIDE AN ACCESS COVER ON WALL. TYPE OF COVER TO SUIT WALL SURFACE AND CONSTRUCTION.
5.7.2. WATER HAMMER ARRESTORS: PROVIDE IN ACCORDANCE WITH THE PLUMBING AND DRAINAGE INSTITUTE STANDARD PD-WH-201. ARRESTORS SHALL BE COPPER CONSTRUCTION WITH BELLOWS SIZED TO PD-WH-201 AND PRE-CHARGED FOR OPERATION IN TEMPERATURE RANGE -0.5C TO 82C (33F TO 180F) AND A MAXIMUM 10.6 BAR (150 PSI) WORKING PRESSURE.

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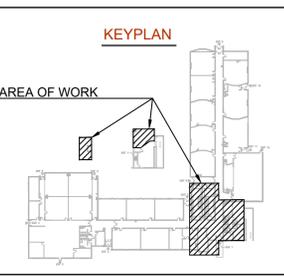


Table with 3 columns: NO., ISSUED FOR, DATE. Contains revision entries for 00, 01, and 02.

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NORTH arrow and professional engineer seal for J.J. PEPPER, 100114890, LICENSED PROFESSIONAL ENGINEER, PROVINCE OF ONTARIO.

Table with 4 columns: DESIGN, ALC, DRAWN, ALC. Checked/Reviewed status.

PROJECT: ST. PETER CES

ADDRESS: 92 AVENUE ROAD, CAMBRIDGE, ON

PROJECT NO.: CE-6381

DRAWING TITLE: MECHANICAL SPECIFICATIONS

DRAWING NUMBER: M8 OF 9

6. HYDRONICS (HEATING) SYSTEM:

- 6.1. THE SYSTEMS SHALL CONFORM TO ALL APPLICABLE CODES INCLUDING, BUT NOT LIMITED TO, CSA-B514.
  - 6.2. VALVES:
    - 6.2.1. REFERENCE STANDARDS:
      - 6.2.1.1. BRONZE: TO ASTM B62.
      - 6.2.1.2. BRASS: TO ASTM B283.
      - 6.2.1.3. CAST IRON: TO ASTM A126
      - 6.2.1.4. STAINLESS STEEL: TO ASTM A351.
    - 6.2.2. GENERAL: PROVIDE SAME MANUFACTURER THROUGHOUT WITH PRESSURE RATING MARKED PER MSS-SP-25. ALL VALVES TO HAVE VALID CRN REGISTRATION NO. ISSUED BY RESPECTIVE PROVINCE. SUBMIT SHOP DRAWINGS FOR ALL VALVES.
    - 6.2.3. VALVES, 50 MM (2") AND SMALLER:
      - 6.2.3.1. ISOLATION: 2 PIECE BRASS OR BRONZE BODY, 1.034 KPA (150 PSI) 60 WOG RATING, FULL PORT, STAINLESS STEEL BALL, LOCKING LEVER HANDLE WITH INSULATION STEM EXTENSION, SOLDERED, THREADED OR PEX CONNECTIONS, MANUFACTURED TO MSS SP-110 STANDARD.
      - 6.2.3.2. CHECK, Y PATTERN SWING TYPE, BRONZE BODY / TRIM, 860 KPA(125 PSI) 200 WOG RATING
    - 6.2.4. VALVES, 63MM (2-1/2") AND LARGER:
      - 6.2.4.1. ISOLATION: LUG STYLE CAST OR DUCTILE IRON BODY, 1,380 KPA (150 PSI) 200 WOG RATING, ALUMINUM BRONZE DISC, EPDM, STAINLESS STEEL STEM, LOCKING LEVER HANDLE WITH INSULATION STEM EXTENSION UP TO 150 MM (6"), MANUAL GEAR OPERATOR WITH INSULATION STEM EXTENSION 200MM (8") AND LARGER, DEAD END SERVICE - BUBBLE TIGHT SHUT-OFF TO 200 PSI.
      - 6.2.4.2. CHECK, WAFER, CAST IRON BODY, STAINLESS STEEL TRIM & SEAT, VITON A SEAT RING, CLASS 125, 200 WOG RATING.
      - 6.2.4.3. CHECK AT PUMP DISCHARGE, SILENT, CAST IRON BODY, STAINLESS STEEL TRIM & SEAT, SPRING LOAD CENTRE GUIDED DISC, CLASS 125, 200 WOG RATING.
  - 6.2.5. BALANCING VALVES:
    - 6.2.5.1. FOR SIZES 50 MM (2") AND UNDER, USE VALVE WITH ADJUSTABLE HIDDEN MEMORY FOR TAMPER PROOF BALANCING, CAST COPPER ALLOY BODY COMPLETE EPOXY RESIN COATING, SELF SEALING TEST POINTS FOR PRESSURE, TEMPERATURE SENSING PROBES, PROTECTIVE CAP AND END CONNECTIONS TO SUIT PIPING SYSTEM.
    - 6.2.5.2. FOR SIZES 65 MM (2 1/2") AND OVER, VALVE WITH ADJUSTABLE HIDDEN MEMORY FOR TAMPER PROOF BALANCING, CAST COPPER ALLOY BODY COMPLETE EPOXY RESIN COATING, SELF SEALING TEST POINTS FOR PRESSURE, TEMPERATURE SENSING PROBES, PROTECTIVE CAP AND END CONNECTIONS TO SUIT PIPING SYSTEM.
- 6.2.6. DRAIN VALVE: PROVIDE 13 MM (1/2") BRASS SEDIMENT FAUCETS WITH HOSE THREAD OUTLETS AT LOW POINTS OF WATER AIR PIPING SYSTEMS.
- 6.3. HYDRONIC SPECIALTIES:
  - 6.3.1. POT FEEDER: FOR EACH SYSTEM, FURNISH A BYPASS FEEDER WITH HEAVY CAST IRON BODY WITH A WORKING PRESSURE OF 1,390 KPA (200 PSIG) AND CAPACITY AS SCHEDULED, FOR ADDING CHEMICALS TO THE SYSTEM. FEEDER SHALL INCLUDE INLET / OUTLET ISOLATING VALVES AND 20 MM (3/4") DRAIN VALVE.
  - 6.3.2. STRAINERS: "Y" TYPE, CLASS 125 CAST IRON BODY STRAINER WITH REMOVABLE MONET SCREEN CW CLEANOUT. MAXIMUM PRESSURE DROP KPA (0.9 PSIG).
  - 6.3.3. THERMOMETERS:
    - 6.3.3.1. STEM TYPE THERMOMETERS: 230 MM (9") SCALE, ADJUSTABLE ANGLE TYPE, WITH RED APPEARING MERCURY LENS FRONT TUBE, AND CAST ALUMINUM CASE, COMBINED CELSIUS AND FARENHEIT SCALE.
    - 6.3.3.2. DIAL TYPE THERMOMETERS: 114 MM (4-1/2") DIAL SIZE, UNIVERSAL ANGLE TYPE, WITH LINEAR SCALE, BLACK CAST ALUMINUM CASE, CHROME PLATED RING, BRONZE BUSHED BRASS MOVEMENT WITH ADJUSTABLE POINTER, COMBINED CELSIUS AND FARENHEIT SCALE.
    - 6.3.3.3. PROVIDE SENSING BULBS SUITABLE FOR LIQUID MEDIUM BEING MEASURED, FURNISH BULBS IN PIPING OR EQUIPMENT WITH STAINLESS STEEL SEPARABLE WELLS.
  - 6.3.4. PRESSURE GAUGES: CAST ALUMINUM CASE, AND BLACK FINISH, PHOSPHOR BRONZE BUSHED ROTARY TYPE MOVEMENT, BRONZE BOURDON TUBE, 114 MM (4-1/2") DIAL WITH COMBINED PSI AND KILOPASCAL SCALE.
  - 6.3.5. AIR VENTS: PROVIDE AUTOMATIC AIR VENTS, COMPLETE WITH DRIP TRAYS, AT HIGH POINTS OF WATER PIPING SYSTEMS AND ALSO IN ANY OTHER LOCATION NOTED ON DRAWINGS.
  - 6.3.6. AIR SEPARATORS: FURNISH AIR SEPARATORS IN WATER AND GLYCOL/WATER PIPING SYSTEMS OF SIZE AND CAPACITY INDICATED ON DRAWINGS.
  - 6.3.7. SIDE STREAM FILTER: PROVIDE COMPLETE WITH FILTER, SIGHT FLOW INDICATOR, BALL VALVE AND NIPPLES: 19 MM (1/2") NPT CONNECTIONS.
  - 6.3.8. EXPANSION TANK: PRE-CHARGED VERTICAL STEEL EXPANSION TANK WITH INTEGRAL HEAVY DUTY BUTYL RUBBER DIAPHRAGM.
  - 6.3.9. FLEXIBLE PIPING CONNECTIONS: FURNISH FLEXIBLE METAL HOSES ON PIPING CONNECTIONS TO HEATING AND COOLING COILS, ON SUCTION AND DISCHARGE CONNECTIONS TO PUMPS, AND IN PIPING SYSTEMS WHERE INDICATED ON DRAWINGS.
- 6.4. PUMPS:
  - 6.4.1. SEE SCHEDULE ON DRAWINGS FOR SERIES, CAPACITIES, AND DETAILS.
  - 6.4.2. STARTERS AND ELECTRICAL WIRING BY ELECTRICAL TRADE.
  - 6.4.3. IN-LINE:
    - 6.4.3.1. CLOSE-COUPLED, SINGLE STAGE, CENTRIFUGAL PUMPS DESIGNED FOR INSTALLATION IN A VERTICAL OR HORIZONTAL POSITION, OPERATING TO 1207 KPA (175 PSIG) MAXIMUM WORKING PRESSURE AND 225°F (107°C) MAXIMUM OPERATING TEMPERATURE.
    - 6.4.3.2. PUMP VOLUTE SHALL BE CAST IRON AND IMPELLER SHALL BE BRONZE/BRASS.
    - 6.4.3.3. PROVIDE FACTORY SUPPLIED THERMAL INSULATION SHELL WITH PUMP.

7. REFRIGERATION SYSTEM:

- 7.1. THE SYSTEMS AND INSTALLATION SHALL CONFORM TO ALL APPLICABLE CODES INCLUDING, BUT NOT LIMITED TO, CSA-B52 AND ASME B31.5.
- 7.2. REFRIGERATION SYSTEMS LARGER THAN 4536 KG (5 TONS) SHALL BE TSSA REGISTERED. RECORD DOCUMENTS TO BE SUBMITTED WITH MANUFACTURER'S COMMISSIONING REPORT FOR CONSULTANT REVIEW.
- 7.3. INSTALLERS MUST BE TSSA CERTIFIED AND TRAINED/CERTIFIED BY EQUIPMENT SUPPLIER.
- 7.4. ALL SYSTEMS SHALL DISPLAY APPROPRIATE OZONE DEPLETION PREVENTION (ODP) TAGS PRIOR TO COMMISSIONING. MANUFACTURER SHALL NOT COMMISSION ANY SYSTEM NOT DISPLAYING PROPER ODP TAG.
- 7.5. PRESSURE RELIEF VALVES SHALL BE INSTALLED IN PAIRS & INDIVIDUALLY ISOLATED TO ALLOW FOR MAINTENANCE AND REPLACEMENT EVERY FIVE YEARS AS MANDATED BY THE CSA REFRIGERATION CODE.
- 7.6. PROVIDE LIQUID LINE FILTER DRYER ON EACH REFRIGERANT CIRCUIT LOCATED SUCH THAT ALL LIQUID REFRIGERANT PASSES THROUGH. INSTALL MOISTURE INDICATING LINE SIZE SIGHT GLASS IN ALL REFRIGERANT CIRCUITS DOWNSTREAM OF ALL FILTER DRYERS & AS INDICATED.
- 7.7. NITROGEN PURGING / SWEEPING SHALL BE USED WHEN BRAZING AND WELDING TO MINIMIZE OXIDIZATION.
- 7.8. CONTRACTOR TO USE CLAMPS, EXPANSION JOINTS AND INSTALLATION PRACTICES WHICH ALLOW THE PIPES TO EXPAND AND CONTRACT FREELY.
- 7.9. CONTRACTOR SHALL, AT ALL TIMES DURING THE INSTALLATION AND TESTING OF THE REFRIGERATION SYSTEM, TAKE STEPS TO PREVENT THE RELEASE OF REFRIGERANTS INTO THE ATMOSPHERE.
- 7.10. INSTALL ISOLATION VALVES WHERE REQUIRED BY MANUFACTURER'S SCHEMATICS.
- 7.11. PIPING SHALL BE PITCHED 13 MM (1/2") FOR EVERY 3,000 MM (10 FT) OF LENGTH IN THE DIRECTION OF FLOW TO ENSURE ADEQUATE OIL DRAINAGE. OPEN ENDS OF REFRIGERANT LINES OR EQUIPMENT SHALL BE PROPERLY CAPPED OR PLUGGED DURING INSTALLATION TO KEEP MOISTURE, DIRT, OR OTHER FOREIGN MATERIAL OUT OF THE SYSTEM. PIPING SHALL REMAIN CAPPED UNTIL INSTALLATION.
- 7.12. TESTING, EVACUATION AND CHARGING SYSTEM:
  - 7.12.1. COMPLY WITH CSA-B52.

- 7.12.2. CONTRACTOR SHALL PROVIDE EQUIPMENT MANUFACTURER WITH ACTUAL INSTALLED PIPE LENGTHS FOR REFRIGERANT CHARGE CALCULATION. SYSTEM TO BE CHARGED WITH REQUIRED QUANTITY BEFORE EQUIPMENT MANUFACTURER'S COMMISSIONING.
- 7.12.3. PROVIDE ALL REFRIGERANT REQUIRED FOR TESTING AND CHARGING THE SYSTEM.
- 7.12.4. AFTER TESTING, EVACUATION AND CHARGING IS COMPLETED, ALLOW SYSTEM TO OPERATE UNDER NORMAL CONDITIONS FOR A MINIMUM PERIOD OF 24 HOURS, AT WHICH TIME, MOISTURE INDICATOR SHOULD INDICATE A DRY SYSTEM. IF IT DOES NOT SO INDICATE, CHANGE DRYER AND OPERATE UNIT FOR ANOTHER 24 HOURS. REPEAT THIS PROCEDURE UNTIL MOISTURE INDICATOR INDICATES A THOROUGHLY DRY SYSTEM.

8. MECHANICAL EQUIPMENT:

- 8.1. BOILER (CONDENSING):
  - 8.1.1. CSA LISTED MODULATING NATURAL GAS BOILERS AS SCHEDULED.
  - 8.1.2. HEAT EXCHANGER: CORROSION RESISTANT FOR FULL CONDENSING OPERATION, ASME RATED UP TO 1103 KPA (160 PSIG).
  - 8.1.3. VENTING: CATEGORY IV.
  - 8.1.4. CONTROLS: TOUCH SCREEN CONTROLLER WITH: PASSWORD SUPPORT, OUTDOOR RESET, PUMP DELAY WITH FREEZE PROTECTION, DHW PRIORITIZATION, LEAD/LAG SCHEDULING, DATA LOGGING, NIGHT SETBACK, AND ABILITY TO CONTROL SYSTEM PUMP(S), MULTIPLE BOILER PUMPS, 1 DHW PUMP.
  - 8.1.5. ACCESSORIES: HIGH LIMIT WITH MANUAL RESET, LOW WATER CUT OFF WITH MANUAL RESET, INLET/OUTLET TEMP SENSORS, T&P GAUGE, RELIEF VALVE AND CONDENSATE NEUTRALIZE.
- 8.2. CONDENSING UNIT: AHRI CERTIFIED DX AIR COOLED CONDENSING UNIT WITH CAPACITIES, EFFICIENCIES AND ACCESSORIES AS INDICATED IN THE SCHEDULES ON DRAWINGS. UNIT SHALL BE CONSTRUCTED OF HEAVY GAUGE, GALVANIZED STEEL AND PAINTED WITH WEATHER RESISTANT POWDER COAT PAINT. COMPRESSORS SHALL BE HERMETIC TYPE WITH INTERNAL TEMPERATURE AND PRESSURE PROTECTION. CONDENSER COILS SHALL BE PROTECTED ON ALL SIDES BY LOUVERED PANELS. UNIT SHALL BE CAPABLE OF OPERATING IN AMBIENT CONDITIONS AS HIGH AS 115°F (46°) AND AS LOW AS 55°F (12°F).
- 8.3. DUCTLESS SPLIT SYSTEM:
  - 8.3.1. SYSTEM SHALL CONSIST OF AN INDOOR EVAPORATOR AND OUTDOOR AIR COOLED CONDENSING UNIT WITH VARIABLE COMPRESSOR SPEED INVERTER TECHNOLOGY.
  - 8.3.2. SYSTEM SHALL HAVE STANDARD COOLING OPERATION DOWN TO A MINIMUM AMBIENT TEMPERATURE OF 0°F (-18°C).
  - 8.3.3. INDOOR UNIT: FACTORY WIRED AND TESTED AND CONTAIN A DRAIN PLOT, ADJUSTABLE LOUVRE, WASHABLE FILTER, AND 4 SPEED FAN.
  - 8.3.4. OUTDOOR UNIT: COMPATIBLE WITH INDOOR HEAD SPECIFIED. CONSTRUCTED OF GALVANIZED STEEL PLATE AND CONTAIN DC DIRECT DRIVE FAN MOTORS, SCROLL COMPRESSOR WITH VARIABLE SPEED INVERTER TECHNOLOGY, AND HIGH PRESSURE AND OVER CURRENT PROTECTION DEVICES.
  - 8.3.5. PROVIDE MICRO PROCESSOR CONTROL COMPATIBLE WITH EQUIPMENT TO PERFORM INPUT FUNCTIONS TO PROPERLY OPERATE THE SYSTEM AND PROVIDE THE CONTROL SEQUENCES INDICATED ON THE DRAWINGS.

9. AIR DISTRIBUTION SYSTEM:

- 9.1. DUCTWORK:
  - 9.1.1. GENERAL:
    - 9.1.1.1. PROVIDE DUCTWORK CONSTRUCTED TO STRACNA 250 PA (1" W.G.) PRESSURE CLASSIFICATION & SEAL CLASS A. FOLLOW ALL OF THE LATEST SMACNA REQUIREMENTS.
    - 9.1.1.2. SEAL ALL DUCT JOINTS AND CONNECTIONS TO DIFFUSERS AND EQUIPMENT WITH HIGH VELOCITY WATER BASED DUCT SEALER.
    - 9.1.1.3. PROVIDE DUCTS OF SIZES INDICATED ON DRAWINGS. WHERE DUCTS ARE TO BE FURNISHED WITH ACOUSTIC DUCT INSULATION, ADJUST DUCT SIZE TO ACCOMMODATE THICKNESS, WITH CLEAR INSIDE DIMENSIONS AS INDICATED ON DRAWINGS.
    - 9.1.1.4. CONTINUOUSLY SOLDER OR SEAL JOINTS IN EXTERIOR AIR INTAKE DUCTS AND PLENUMS TO PREVENT DRIPPING OF MOISTURE.
    - 9.1.1.5. PROVIDE DUCTWORK OF GALVANIZED STEEL SHEET UNLESS INDICATED OTHERWISE.
    - 9.1.1.6. DUCTWORK ASPECT RATIOS CAN BE ADJUSTED TO A MAXIMUM OF 4:1 WHILE KEEPING AT LEAST THE SAME CROSS SECTIONAL AREA, TO AVOID INTERFERENCES, AS REQUIRED.
  - 9.1.2. RECTANGULAR DUCTWORK:
    - 9.1.2.1. FOR LONGITUDINAL JOINTS ON RECTANGULAR DUCTWORK, FURNISH PITTSBURGH LOCK JOINTS TIGHTLY CLOSED ALONG FULL LENGTH OF SEAM.
    - 9.1.2.2. CROSS-BREAK FLAT SURFACES BETWEEN JOINTS, OR BETWEEN JOINTS AND INTERMEDIATE REINFORCEMENTS, TO PREVENT VIBRATION OR BUCKLING.
    - 9.1.2.3. WHERE ELBOWS ARE INDICATED AS SQUARE TYPE, PROVIDE AIR TURNING VANES OF DOUBLE BLADE CONSTRUCTION.
  - 9.1.3. ROUND DUCTWORK:
    - 9.1.3.1. FURNISH NINETY DEGREE ELBOWS WITH SMOOTH CENTRE LINE RADIUS OF 1.5 TIMES DUCT DIAMETER. ALTERNATIVELY FURNISH ELBOWS OF 5 PIECE CONSTRUCTION, SUBJECT TO APPROVAL BY CONSULTANT.
    - 9.1.3.2. DUCTWORK SHALL USE SPIRAL LOCK SEAM TYPE DUCT, SLIP JOINTS IN DIRECTION OF FLOW, IN ACCORDANCE WITH SMACNA STANDARDS.
- 9.2. DIFFUSERS, REGISTERS AND GRILLES:
  - 9.2.1. REFER TO SCHEDULE AND TAGS ON DRAWINGS FOR ACCESSORIES, NECK SIZE, DIMENSIONS AND CAPACITY.
  - 9.2.2. PROVIDE FRAME ACCESSORIES AS REQUIRED TO SUIT CEILING AND WALL CONSTRUCTION. COORDINATE WITH ARCHITECTURAL DRAWINGS.
- 9.3. SHEET METAL SPECIALTIES:
  - 9.3.1. ACCESS DOORS: PROVIDE ACCESS DOORS IN DUCTWORK AND PLENUMS TO ALLOW SERVICING, MAINTENANCE AND INSPECTION OF CONTROL DAMPERS, FIRE DETECTORS, BOTH SIDES OF FIRE AND FIRE/SMOKE DAMPERS, CONTROL ELEMENTS, BEARINGS AND AS INDICATED ON DRAWINGS. FURNISH ACCESS DOORS AT LEAST 300 MM X 150 MM (12" X 6") UNLESS DUCT DIMENSIONS PREVENT.
  - 9.3.2. FLEXIBLE DUCT CONNECTIONS: 75 MM (3") WIDE LISTED FIRE RETARDENT NEOPRENE COATED WOVEN GLASS FIBRE FABRIC TO NFPA 701, CRIMPED INTO 75 MM (3") 24 GA. (0.6MM) GALVANIZED STEEL EDGING STRIPS, MANUFACTURED TO SMACNA STANDARDS.
- 9.4. VENTING:
  - 9.4.1. PROVIDE VENTING FOR GAS FIRED EQUIPMENT. COMPLY WITH THE REQUIREMENTS OF CSA B149.1, MANUFACTURERS REQUIREMENTS AND AUTHORITY HAVING JURISDICTION.



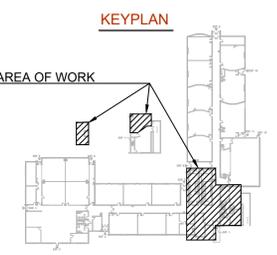
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REVISIONS

NO.	ISSUED FOR	DATE
00	50% CLIENT REVIEW	26.01.28
01	90% CLIENT REVIEW	26.02.11
02	TENDER	26.03.03

**NORTH**




DESIGN	ALC	DRAWN	ALC
CHECKED	JP	REVIEWED	ALC

PROJECT

**ST. PETER CES**

ADDRESS

**92 AVENUE ROAD,  
CAMBRIDGE, ON**

PROJECT NO.

**CE-6381**

DRAWING TITLE

**MECHANICAL SPECIFICATIONS**

DRAWING NUMBER

**M9 OF 9**