PLUMBING LEGEND

ABBV.	SYMBOL	DESCRIPTION
TS		TRAP SEAL
SP		SUMP PUMP
G	G	NATURAL GAS
W		SANITARY WASTE BELOW FLOOR
W		SANITARY WASTE ABOVE FLOOR
V		SANITARY VENT
RDL	RDL	ROOF DRAIN ABOVE FLOOR OR GRADE
SD		STORM DRAIN BELOW FLOOR OR GRADE
GCO		GRADE CLEANOUT
WCO	OR	WALL CLEANOUT
		PLUG VALVE
		GAS COCK
VTR		VENT THRU ROOF
FD		FLOOR DRAIN
RD/OD		ROOF DRAIN/OVERFLOW DRAIN
DSN		DOWNSPOUT NOZZLE
		SPLASH BLOCK
		SPLASH BLOCK WITH DOWNSPOUT NOZZLE

GENERAL LEGEND

ABBV.	SYMBOL	DESCRIPTION
G.C.		GENERAL CONTRACTOR
M.C.		MECHANICAL CONTRACTOR
P.C.		PLUMBING CONTRACTOR
E.C.		ELECTRICAL CONTRACTOR
T.C.C.		TEMPERATURE CONTROL CONTRACTOR
A.F.F.		ABOVE FINISHED FLOOR
A.F.G.		ABOVE FINISHED GRADE
B.F.F.		BELOW FINISHED FLOOR
B.F.G.		BELOW FINISHED GRADE
N.C.		NORMALLY CLOSED
N.O.		NORMALLY OPEN
(N)		NEW
SF		SQUARE FOOTAGE
		CONTROL WIRING
		DIRECTION OF FLOW IN PIPE
		PITCH PIPE DOWN IN DIRECTION OF ARROW
	E	PIPE CAP
		GAUGE
		PRESSURE GAUGE WITH COCK
		FLOW METER FITTING
		PIPE UNION
		FLEXIBLE PIPE CONNECTION
		STRAINER WITH BLOWDOWN VALVE
		STRAINER
CV		CHECK VALVE
BV		BALANCING VALVE
		BALL VALVE
		BUTTERFLY VALVE
		MANUAL AIR VENT
		AUTOMATIC AIR VENT
		PRESSURE RELIEF VALVE
P/T		PRESSURE/TEMPERATURE TEST PLUG
		PIPE ELBOW DOWN
		PIPE ELBOW UP
		TEE OFF BOTTOM OF PIPE
		TEE OFF TOP OF PIPE
		THERMOMETER

SPECIFICATION (PLUMBING)

PIPING:

A. WASTE, VENT, AND STORM PIPING SHALL BE SCHEDULE 40 PVC "SOLID CORE" WITH SOLVENT WELDED FITTINGS.

INSULATION:
A. STORM PIPING INSULATION SHALL BE 1".

B. WATER PIPING INSULATION BE 1" THICK & EQUAL TO .21 TO .28 BTU· IN/h· FT2/ ·°F CONDUCTIVITY.

EQUIPMENT:

A. GRADE CLEANOUT (GCO): CAST IRON BODY & FRAME, CLEANOUT PLUG, ADJUSTABLE, ROUND, CAST IRON TOP. H2O RATED ZURN OR EQUAL.

B. WALL CLEANOUT (WCO): CAST IRON BODY ADAPTABLE TO PIPE W/ CAST BRONZE OR CAST BRASS CLEANOUT PLUG. STAINLESS STEEL COVER INCLUDING SCREWS. ZURN OR EQUAL.

VALVES:

A. GAS PLUG VALVE:
   a. 2" AND SMALLER: 150 PSI, CAST-IRON BODY, STRAIGHTAWAY PATTERN, SQUARE BRONZE HEAD, THREADED ENDS.
      1. DEZURIK #PEC.
      2. HOMESTEAD: 611.

B. GAS COCKS:
   a. GAS COCKS 3" AND SMALLER: 250 PSI NON-SHOCK CWP, BRONZE BALL VALVE WITH CHROME PLATED BALL, THREADED ENDS, UL LISTED.
      1. 1) NIBCO, INC: T-580-70-UL-842.
      2. 2) APOLLO 80-100.

C. GAS PRESSURE REGULATORS:
   a. PRESSURE REGULATORS (SERVICE OR LINE): "NATURAL GAS" COMPLY WITH ANSI Z21.80. SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE AS INDICATED ON THE DRAWINGS.
      1. END CONNECTIONS: THREADED FOR REGULATORS 2" AND SMALLER; FLANGED FOR REGULATORS 2-1/2" AND LARGER.
      2. BODY AND DIAPHRAGM CASE: CAST IRON OR DIE-CAST ALUMINUM.
      3. SPRINGS: ZINC-PLATED STEEL; INTERCHANGEABLE.
      4. DIAPHRAGM PLATE: ZINC-PLATED STEEL.
      5. SEAT DISC: NITRILE RUBBER RESISTANT TO GAS IMPURITIES, ABRASION, AND DEFORMATION AT THE VALVE PORT.
      6. ORIFICE: ALUMINUM; INTERCHANGEABLE.
      7. SEAL PLUG: ULTRAVIOLET-STABILIZED, MINERAL-FILLED NYLON.
      8. SINGLE-PORT, SELF-CONTAINED REGULATOR WITH ORIFICE NO LARGER THAN REQUIRED AT MAXIMUM PRESSURE INLET, AND NO PRESSURE SENSING PIPING EXTERNAL TO THE REGULATOR.
      9. PRESSURE REGULATOR SHALL MAINTAIN DISCHARGE PRESSURE SETTING DOWNSTREAM, AND NOT EXCEED 150 PERCENT OF DESIGN DISCHARGE PRESSURE AT SHUTOFF.
      10. ATMOSPHERIC VENT: FACTORY- OR FIELD-INSTALLED, STAINLESS STEEL SCREEN IN OPENING IF NOT CONNECTED TO VENT PIPING. REGULATOR MAY INCLUDE VENT LIMITING DEVICE INSTEAD OF VENT CONNECTION IF APPROVED BY AUTHORITIES HAVING JURISDICTION.
      11. MAXIMUM INLET PRESSURE: SEE DRAWINGS.
      12. OUTLET PRESSURE: SEE DRAWINGS AND EQUIPMENT SCHEDULES.
      13. APPROVED MANUFACTURERS:
          a. i. AMERICAN METER COMPANY.
          b. ii. FISHER CONTROL VALVES AND REGULATORS; DIVISION OF EMERSON PROCESS MANAGEMENT.
          c. iii. TRON, INC.

HVAC LEGEND

ABBV.	SYMBOL	DESCRIPTION
SMS	SMS	SNOW MELT SUPPLY
SMR	SMR	SNOW MELT RETURN
SMS-HT	SMS-HT	SNOW MELT SUPPLY HIGH TEMPERATURE
SMS-LT	SMS-LT	SNOW MELT SUPPLY LOW TEMPERATURE
MCD	M / S	MOTORIZED CONTROL DAMPER
		BACKDRAFT DAMPER
	T	THERMOSTAT
	VFD	VARIABLE FREQUENCY DRIVE
	#	ANALOG OUTPUT
	#	ANALOG INPUT
	#	DIGITAL OUTPUT
	#	DIGITAL INPUT
		ROUND SUPPLY DUCT UP & DOWN
		STANDARD RADIUS ELBOW
	10x8	NEW RECTANGULAR DUCTWORK - WIDTH x DEPTH
UH		UNIT HEATER
P		PUMP
B		BOILER
AS		AIR SEPARATOR
ET		EXPANSION TANK
LVR		LOUVER

PLUMBING GENERAL NOTES

1. FIELD VERIFY EXACT LOCATION OF ALL CONNECTIONS PRIOR TO CONSTRUCTION.
2. ROUGH-IN AND FINAL CONNECT ALL FIXTURES, EQUIPMENT, ETC.
3. CONTRACTOR SHALL INSPECT SITE TO THOROUGHLY FAMILIARIZE HIMSELF WITH THE AREA OF WORK. ANY DISCREPANCES BETWEEN THESE DOCUMENTS AND ACTUAL CONDITIONS SHALL BE REPORTED TO THE ARCHITECT/ENGINEER FOR RESOLUTION PRIOR TO BID PRICING. NO EXTRAS WILL BE ALLOWED DUE TO LACK OF KNOWLEDGE OF EXISTING CONDITIONS.
4. ALL WORK SHALL BE PER LOCAL BUILDING AND HEALTH DEPARTMENT REQUIREMENTS.
5. REFERENCE HVAC DRAWINGS FOR EXACT LOCATION OF ALL HVAC EQUIPMENT REQUIRING PLUMBING CONNECTIONS. COORDINATE WITH HVAC CONTRACTOR EXACT PLUMBING CONNECTION REQUIREMENTS PRIOR TO COMMENCING WORK.
6. ALL STORM DRAINAGE PIPING WITHIN THE BOUNDARIES OF THE BUILDING SHALL BE SLOPED AT 1/8" PER FOOT UNLESS OTHERWISE NOTED.
7. ALL VENTS THROUGH THE ROOF (VTR) SHALL BE POSITIONED A MINIMUM OF 15'-0" FROM ANY OUTSIDE AIR INTAKE.
8. REFERENCE ARCHITECTURAL DRAWINGS FOR LOCATIONS OF ALL FIRE RATED WALLS. ALL PIPE PENETRATIONS THROUGH FIRE RATED WALLS SHALL BE SEALED IN ACCORDANCE WITH THE BUILDING CODE.
9. OFFSET ALL PIPING AS REQUIRED TO AVOID STRUCTURAL MEMBERS, CANTS, FLASHING, MECHANICAL, OR ELECTRICAL EQUIPMENT.
10. PROVIDE CHROME PLATED SET SCREW TYPE ESCUTCHEONS AT ALL EXPOSED PIPE PENETRATIONS THROUGH WALLS AND CASEWORK.
11. PORTIONS OF THIS BUILDING WILL BE OCCUPIED DURING THIS CONSTRUCTION PROJECT. THE MECHANICAL CONTRACTOR SHALL COORDINATE THE SCHEDULING OF THEIR WORK WITH THE GENERAL CONTRACTOR. CLEAN UP AT THE END OF EACH DAY.
12. PROVIDE EQUIPMENT LABELS FOR ALL MAJOR EQUIPMENT, INCLUDING WATER HEATERS, PUMPS, CONTROL PANELS, ETC. LABELS SHALL BE AFFIXED OR ADHERED DIRECTLY TO EQUIPMENT. EQUIPMENT TO BE LABELED WITH ENGRAVED PLASTIC LAMINATE SIGNS.
13. SUBMIT TO THE ARCHITECT/ENGINEER ELECTRONIC PDF FILES OF MECHANICAL SUBMITTALS FOR REVIEW OF ALL MAJOR EQUIPMENT AS LISTED ON DRAWING EQUIPMENT SCHEDULES, AS WELL AS PRODUCTS SHOWN IN SPECIFICATIONS. ENGINEER ASSUMED NO RESPONSIBILITY FOR EQUIPMENT OR INSTALLATION COORDINATION THAT HAS NOT BEEN SUBMITTED FOR REVIEW.
14. CONTRACTOR SHALL WARRANTY WORK, EQUIPMENT, FIXTURES, MATERIALS, AND PROPER OPERATION FOR A PERIOD OF ONE YEAR FROM THE DATE OF ACCEPTANCE OF BUILDING BY OWNER. THIS GUARANTEE SHALL NOT INCLUDE NORMAL MAINTENANCE REQUIRED BY THE OWNER AS DESCRIBED IN THE OPERATION AND MAINTENANCE MANUALS.
15. PROVIDE TWO SETS OF OPERATION AND MAINTENANCE (O&M) MANUALS FOR OWNER AT COMPLETION OF PROJECT TO THE ARCHITECT/ENGINEER FOR REVIEW. MANUALS TO INCLUDE INSTALLATION INSTRUCTIONS, REPLACEMENT PART LISTS, AND MAINTENANCE INFORMATION ON ALL MECHANICAL EQUIPMENT, FIXTURES, ETC. SUBMITTED.
16. CONTRACTOR SHALL MAINTAIN A COMPLETE AND ACCURATE SET OF RECORD DRAWINGS SHOWING ACTUAL INSTALLED LOCATIONS OF WORK. SUBMIT THESE DRAWINGS AS PART OF THE OPERATION AND MAINTENANCE MANUALS AT COMPLETION OF PROJECT.

RADIANT HEAT GENERAL NOTES

1. FURNISH ALL LABOR, MATERIALS TRANSPORTATION, EQUIPMENT, AND SERVICES TO INSTALL A HYDRONIC RADIANT HEAT SYSTEM WHERE INDICATED ON THE DRAWINGS.
2. SHOP DRAWINGS, OR DESCRIPTIONS OF MATERIALS, AND DETAILS OF INSTALLATION SHALL BE SUBMITTED FOR APPROVAL. NO FABRICATION SHALL BE PERFORMED UNTIL APPROVAL IS OBTAINED.
3. TUBE SHALL CARRY A 25-YEAR NON-PRORATED WARRANTY AGAINST FAILURE DUE TO DEFECT IN MATERIAL AND/OR WORKMANSHIP.
4. TUBE SHALL BE CROSS-LINKED POLYETHYLENE WITH AN OXYGEN DIFFUSION BARRIER, RATED AT 180°F MAXIMUM WORKING TEMPERATURE, AND 100 PSI WORKING PRESSURE. THE TUBE SHALL BE MANUFACTURED IN ACCORDANCE WITH ASTM STANDARD SPECIFICATION F 876.
5. TUBING LAYOUT SHALL BE BY THE TUBING MANUFACTURER'S APPROVED REPRESENTATIVE. TUBING MANUFACTURER'S REPRESENTATIVE SHALL PROVIDE A WRITTEN STATEMENT THAT THE TUBING LAYOUT WILL OPERATE CORRECTLY WITH THE SPECIFIED PUMP AND CONTROL SYSTEM. WHEN THE TUBING LAYOUT DOES NOT WORK WITH THE SPECIFIED PUMP, THE MANUFACTURER'S REPRESENTATIVE SHALL SELECT AND SUBMIT ON THE CORRECT PUMP. SUBMIT TUBE FLOW AND PRESSURE DROP DATA FOR EACH ZONE FOR REVIEW.
6. THE TUBE DIMENSIONS SHALL BE: 3/4" NOMINAL DIAMETER UNLESS SCHEDULED OTHERWISE.
7. THE MINIMUM BEND RADIUS FOR COLD BENDING OF THE TUBE SHALL NOT BE LESS THAN SIX TIMES THE OUTSIDE DIAMETER. BENDS WITH A RADIUS LESS THAN STATED SHALL REQUIRE THE USE OF A BEND SUPPORT AS SUPPLIED BY THE TUBE MANUFACTURER.
8. MANIFOLDS: MANIFOLDS SHALL BE OF CAST BRASS OR COPPER CONSTRUCTION, MANIFOLDS SHALL HAVE INTEGRAL CIRCUIT BALANCING VALVES. MANIFOLDS SHALL BE ABLE TO VENT AIR AND DRAIN WATER FROM THE SYSTEM. MANIFOLDS SHALL BE PROVIDED WITH SUPPORT BRACKETS AND TUBE BEND SUPPORT. MANIFOLDS SHALL BE ISOLATED FROM SUPPLY AND RETURN TUBING WITH VALVES THAT ARE SUITABLE FOR ISOLATION AND BALANCING.
9. FITTINGS SHALL BE MANUFACTURED OF DEZINCIFICATION RESISTANT BRASS. THESE FITTINGS MUST BE SUPPLIED BY THE TUBE MANUFACTURER. THE FITTINGS SHALL CONSIST OF A BARBED INSERT, A COMPRESSION RING, AND A COMPRESSION NUT.
10. INSTALL MANIFOLDS IN UPONOR WALL CABINETS OR YARD BOXES. WHERE POSSIBLE COMBINE MANIFOLDS INTO ONE CABINET, AT THE LOCATIONS AS SHOWN. COORDINATE WALL CABINET LOCATIONS, SIZES AND FRAMING REQUIREMENTS WITH THE GENERAL CONTRACTOR.
11. ACCEPTABLE MANUFACTURERS: REHAU AND UPONOR.

HVAC PIPING NOTES AND SPECIFICATIONS

1. PROVIDE SCHEDULE 40 PVC PIPING SLEEVES AT ALL WALL PENETRATIONS.
2. SNOWMELT PIPE SIZE 2 1/2" AND LARGER: BLACK STEEL PIPE; ASTM A-53; SCHEDULE 40; 150 WROUGHT-STEEL BUTTWELDING FITTINGS WITH WELDED JOINTS.
3. SNOWMELT PIPE SIZE 2" AND SMALLER: COPPER PIPE; ASTM B-88, TYPE L, HARD-DRAWN TEMPER; WROUGHT-COPPER FITTINGS WITH SOLDERED JOINTS.
4. DIRECT BURIED PIPING (ALL SIZES): PEX-A SERVICE TUBING PRE-INSULATED WITH HDPE SEAMLESS CORRUGATED OUTER JACKET. UPONOR ECOFLEX OR EQUIVALENT.
5. PROVIDE ALL PIPE HANGERS WITH THERMAL HANGER SHIELDS AND HIGH DENSITY INSERTS MSS TYPE 40; CONSTRUCTED OF AN INSERT OF HIGH DENSITY, 100 PSI, WATER-PROOFED CALCIUM SILICATE MEETING, ASTM C-533 TYPE 1. ENCASE INSERT IN A GALVANIZED SHEET METAL SHIELD. HIGH DENSITY INSERT AND SHIELD SHALL SURROUND THE BOTTOM 180° OF THE SUPPORTED PIPE AT A MINIMUM WITH TOP 180° VOID SPACE FILED WITH SEGMENTS OF INSULATION.
6. CLEANING, FLUSHING AND INSPECTING GENERAL: CLEAN EXTERIOR SURFACES OF SUPERFLUOUS MATERIALS, AND PREPARE FOR APPLICATION OF SPECIFIED COATINGS (IF ANY). FLUSH OUT SYSTEMS WITH CLEAN WATER BEFORE PROCEEDING WITH REQUIRED TESTS. INSPECT EACH RUN OF EACH SYSTEM FOR COMPLETION OF JOINTS, SUPPORTS AND ACCESSORY ITEMS. INSPECT PRESSURE PIPING IN ACCORDANCE WITH PROCEDURES OF ASME B31. PROVIDE A PRE-START UP LIQUID ALKALINE DISPERSANT CLEANER FOR ALL THE FLUSHING AND CLEANING OF ALL HVAC WATER SYSTEMS.
7. PIPING TESTS
   TEST PRESSURE PIPING IN ACCORDANCE WITH ASME B31. GENERAL: PROVIDE TEMPORARY EQUIPMENT FOR TESTING, INCLUDING PUMP AND GAUGES. TEST PIPING SYSTEM BEFORE INSULATION IS INSTALLED WHEREVER FEASIBLE, AND REMOVE CONTROL DEVICES BEFORE TESTING. TEST EACH NATURAL SECTION OF EACH PIPING SYSTEM INDEPENDENTLY BUT DO NOT USE PIPING SYSTEM VALVES TO ISOLATE SECTIONS WHERE TEST PRESSURE EXCEEDS VALVE PRESSURE RATING. FILL EACH SECTION WITH WATER AND PRESSURIZE FOR INDICATED PRESSURE AND TIME. AIR MAY BE USED IF ALLOWED BY CODE. AIR CANNOT BE USED FOR PLASTIC PIPING.
   A. REQUIRED TEST PERIOD IS 8 HOURS.
   B. TEST EACH PIPING SYSTEM AT 150% OF OPERATING PRESSURE INDICATED, BUT NOT LESS THAN 100 PSI TEST PRESSURE.
   C. TEST FORCE DRAINAGE (PUMPED) PIPING AT 50 PSI.
   D. OBSERVE EACH TEST SECTION FOR LEAKAGE AT END OF TEST PERIOD. TEST FAILS IF LEAKAGE IS OBSERVED OR IF PRESSURE DROP EXCEEDS 5% OF TEST PRESSURE.

   REPAIR PIPING SYSTEMS SECTIONS WHICH FAIL REQUIRED PIPING TEST, BY DISASSEMBLY AND RE-INSTALLATION, USING NEW MATERIALS TO EXTENT REQUIRED TO OVERCOME LEAKAGE. DO NOT USE CHEMICALS, STOP-LEAK COMPOUNDS, MASTICS, OR OTHER TEMPORARY REPAIR METHODS. DRAIN TEST WATER FROM PIPING SYSTEMS AFTER TESTING AND REPAIR WORK HAS BEEN COMPLETED.

SHEET INDEX

MECHANICAL GENERAL NOTES AND SPECIFICATIONS

1. THESE DOCUMENTS ARE DIAGRAMMATIC IN NATURE AND ARE NOT INTENDED TO BE UTILIZED AS SHOP DRAWINGS NOR NECESSARILY SCALED FOR EXACT MEASUREMENTS. ANY DISCREPANCIES BETWEEN THESE DOCUMENTS AND THE ACTUAL CONDITIONS SHALL BE REPORTED TO THE ARCHITECT/ENGINEER FOR RESOLUTION PRIOR TO INSTALLATION.
2. MECHANICAL WORK SHALL COMPLY WITH ALL APPLICABLE CODES. VERIFY ALL REQUIREMENTS PRIOR TO SUBMITTING BID OR COMMENCING WORK.
3. MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ANY ADDITIONAL COORDINATION OR MODIFICATIONS THAT MAY BE REQUIRED DUE TO THE USE OR INSTALLATION OF EQUIPMENT OTHER THAN THAT OF THE BASIS OF DESIGN MANUFACTURERS LISTED ON THE DRAWINGS.
4. THE MECHANICAL CONTRACTOR SHALL COORDINATE WORK WITH OTHER TRADES PRIOR TO AND DURING CONSTRUCTION. THE MECHANICAL SYSTEMS SHOWN SHALL BE RUN AS HIGH AS POSSIBLE UNLESS NOTED OTHERWISE.
5. REFER TO THE ARCHITECTURAL DRAWINGS FOR ROOFING DETAILS SPECIFIC TO THIS PROJECT.
6. THE MECHANICAL CONTRACTOR SHALL COORDINATE THERMOSTAT, SENSOR, AND SWITCH LOCATIONS WITH ARCHITECT/ENGINEER PRIOR TO INSTALLATION. ALL THERMOSTATS, SENSORS, AND SWITCHES SHALL BE LOCATED 48" AFF UNLESS INDICATED OTHERWISE. WHERE EXISTING CONDITIONS REQUIRE EXPOSED CONTROL WIRING, SUCH WIRING SHALL BE CONCEALED WITH WIRE MOLD. WIRE MOLD COLOR SHALL BE SELECTED BY THE ARCHITECT.
7. PROVIDE EQUIPMENT LABELS FOR ALL MAJOR EQUIPMENT, INCLUDING BUT NOT LIMITED TO AIR HANDLING SYSTEMS, FANS, CONTROLS, AND DAMPERS. LABELS SHALL BE AFFIXED OR ADHERED DIRECTLY TO EQUIPMENT. EQUIPMENT TO BE LABELED WITH ENGRAVED PLASTIC LAMINATE SIGNS.
8. PROVIDE PIPE MARKER IDENTIFICATION INCLUDING ARROWS TO INDICATE DIRECTION OF FLOW. LOCATE PIPE MARKER AND ARROWS WHEREVER PIPING IS EXPOSED TO VIEW IN OCCUPIED SPACES, MECHANICAL ROOMS, AND ACCESSIBLE MAINTENANCE AREAS (SHAFTS, TUNNELS, PLENUMS). MARKERS SHALL BE SNAP-ON TYPE OR PRESSURE-SENSITIVE TYPE AT INSTALLER'S OPTION. COLORS TO COMPLY WITH ANSI A13.1.
9. PROVIDE VALVE TAGS ON EVERY VALVE. AND CONTROL DEVICE IN EACH PIPING SYSTEM. LIST EACH TAGGED VALVE IN VALVE SCHEDULE FOR EACH PIPING SYSTEM. MOUNTED FRAMED VALVE SCHEDULE IN MAIN MECHANICAL ROOM. VALVE TAGS 1-1/2" DIAMETER OF PLASTIC LAMINATE OR BRASS WITH PIPING SYSTEM ABBREVIATION IN 1/4" HIGH LETTERS AND SEQUENCED VALVE NUMBERS IN 1/2" HIGH LETTERS.
10. BALANCE HYRONIC SYSTEMS TO THE QUANTITIES SHOWN AND SUBMIT BALANCE REPORT TO THE ARCHITECT/ENGINEER FOR REVIEW. FAN AND PUMP SYSTEMS TO BE BALANCED WITHIN PLUS 10 PERCENT OR MINUS 5 PERCENT OF LISTED VALUES. AIR INLETS AND OUTLETS TO BE BALANCED WITH PLUS 10 PERCENT TO MINUS 5 PERCENT OF LISTED VALUES.
11. SUBMIT TO THE ARCHITECT/ENGINEER ELECTRONIC PDF FILES OF MECHANICAL SUBMITTALS FOR REVIEW OF ALL MAJOR EQUIPMENT AS LISTED ON DRAWING EQUIPMENT SCHEDULES, AS WELL AS DUCTWORK ACCESSORIES AND CONTROLS. ENGINEER ASSUMES NO RESPONSIBILITY FOR EQUIPMENT OR INSTALLATION COORDINATION THAT HAS NOT BEEN SUBMITTED FOR REVIEW.
12. CONTRACTOR SHALL WARRANTY WORK, EQUIPMENT, MATERIALS, AND PROPER OPERATION FOR A PERIOD OF ONE YEAR FROM THE DATE OF ACCEPTANCE OF BUILDING BY OWNER. THIS GUARANTEE SHALL NOT INCLUDE NORMAL MAINTENANCE REQUIRED BY THE OWNER AS DESCRIBED IN O&M MANUALS.
13. PROVIDE TWO SETS OF OPERATION AND MAINTENANCE (O&M) MANUALS FOR OWNER AT COMPLETION OF PROJECT TO THE ARCHITECT/ENGINEER FOR REVIEW. DOCUMENTATION SHALL CONSIST OF MANUFACTURER'S INFORMATION, SPECIFICATIONS AND RECOMMENDATIONS, PROGRAMMING PROCEDURES AND DATA POINTS, NARRATIVES, AND OTHER MEANS OF ILLUSTRATING TO THE OWNER HOW THE BUILDING, EQUIPMENT, AND SYSTEMS ARE INTENDED TO BE INSTALLED, MAINTAINED, AND OPERATED. REQUIRED REGULAR MAINTENANCE ACTIONS FOR EQUIPMENT AND SYSTEMS SHALL BE CLEARLY STATED ON A READILY VISIBLE LABEL. THE LABEL SHALL INCLUDE THE TITLE OR PUBLICATION NUMBER FOR THE OPERATION AND MAINTENANCE MANUAL FOR THAT PERTICULAR MODEL AND TYPE OF PRODUCT.
14. CONTRACTOR SHALL MAINTAIN A COMPLETE AND ACCURATE SET OF RECORD DRAWINGS SHOWING ACTUAL INSTALLED LOCATIONS OF WORK. SUBMIT THESE DRAWINGS AS PART OF THE OPERATION AND MAINTENANCE MANUALS AT COMPLETION OF PROJECT.

MECHANICAL HVAC INSULATION NOTES AND SPECIFICATIONS

1. COMBUSTION AIR DUCTWORK SHALL BE WRAPPED WITH 2" DUCT WRAP WITH VAPOR BARRIER JACKET, MINIMUM R-8. NO DUCT LINER ALLOWED.
2. ALL EXHAUST DUCTWORK SHALL NOT BE REQUIRED TO BE INSULATED, UNLESS NOTED OTHERWISE.
3. INSULATE SNOWMELT WATER PIPING 1-1/2" AND SMALLER WITH 1-1/2" FIBERGLASS PIPE INSULATION WITH ALL SERVICE JACKET. INSULATE SNOWMELT WATER PIPING 2" AND LARGER WITH 2" PIPE INSULATION WITH ALL SERVICE JACKET.

MECHANICAL HVAC NOTES AND SPECIFICATIONS

1. PROVIDE DUCT TRANSITIONS FROM EQUIPMENT CONNECTIONS TO DUCT SIZES INDICATED AS REQUIRED.
2. PROVIDE A FLEXIBLE CONNECTION TO THE INTAKE AND DISCHARGE OF ALL MECHANICAL EQUIPMENT HAVING ROTATING PARTS. FLEXIBLE CONNECTION SHALL COMPLY WITH ALL APPLICABLE CODES.
3. MAINTAIN A MINIMUM OF 15'-0" FROM OUTSIDE AIR INTAKES TO PLUMBING VENTS.
4. ALL ELBOWS, BOTH HORIZONTAL AND VERTICAL, SHALL BE LONG RADIUS ELBOWS WHEREVER POSSIBLE, OR SHALL HAVE TURNING VANES WHERE SHOWN.
5. ALL JOB SITE DUCTWORK PRIOR TO INSTALLATION SHALL BE COVERED AND PROTECTED FROM DIRT, DUST, AND DAMAGE PER SMACNA STANDARDS. OPENINGS IN INSTALLED DUCTWORK DURING CONSTRUCTION SHALL BE SEALED CLOSED WITH PLASTIC TO PREVENT DUST AND DEBRIS INTRUSION INTO DUCTWORK SYSTEMS.
6. COORDINATE LOUVER, WALL CAP, AND AIR DEVICE PLACEMENT WITH BRICK OR BLOCK COURSING WHERE APPLICABLE.
7. FLUES FOR BOILERS, SHALL BE ENGINEERED BY THE FLUE MANUFACTURER, BASED ON ACTUAL EQUIPMENT, AND SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
8. SNOWMELT CONTROLLERS AND DEVICES TO BE DISTECH INSTALLED BY LONG BUILDING ENVIRONMENTS. BASE BID: PROVIDED CONTROLLERS MUST BE CAPABLE OF OPERATING IN STAND-ALONE WITHOUT EXTERNAL BAS INTERFACE. ADJUSTABLE SET POINTS SHALL BE PROVIDED VIA LOCAL/TEMPORARY HARDWIRED CONNECTION. ADD-ALTERNATE: ETHERNET NETWORK CONNECTION PROVIDED BY OTHERS, TCC TO PROVIDE A BAS COMPUTER GATEWAY AND INTEGRATE GRAPHICS AND CONTROL POINTS FROM SNOWMELT SYSTEM TO NIAGRA FRAMEWORK.

PERMIT SUBMITTAL 03/05/2021

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COLORADO LICENSED VERIFIED 38020 PROFESSIONAL ENGINEER
03-05-2021

NOTICE: DUTY OF COOPERATION

Release of these plans contemplates further cooperation among the owner, his contractor and the architect. Design and construction are complex. Although the architect and his consultants have performed their services with due care and diligence, they cannot guarantee perfection. Communication is imperfect and every contingency cannot be anticipated. Any ambiguity or discrepancy discovered by the use of these plans shall be reported immediately to the architect. Failure to notify the architect compounds misunderstanding and increases construction costs. A failure to cooperate by a simple notice to the architect shall relieve the architect from responsibility for the consequences. Changes made from the plans without consent of the architect are unauthorized and shall relieve the architect of responsibility for all consequences arriving out of such changes.

REVISIONS

No.	Description	Date

STEAMBOAT GONDOLA RELOCATION

STEAMBOAT SPRINGS, CO

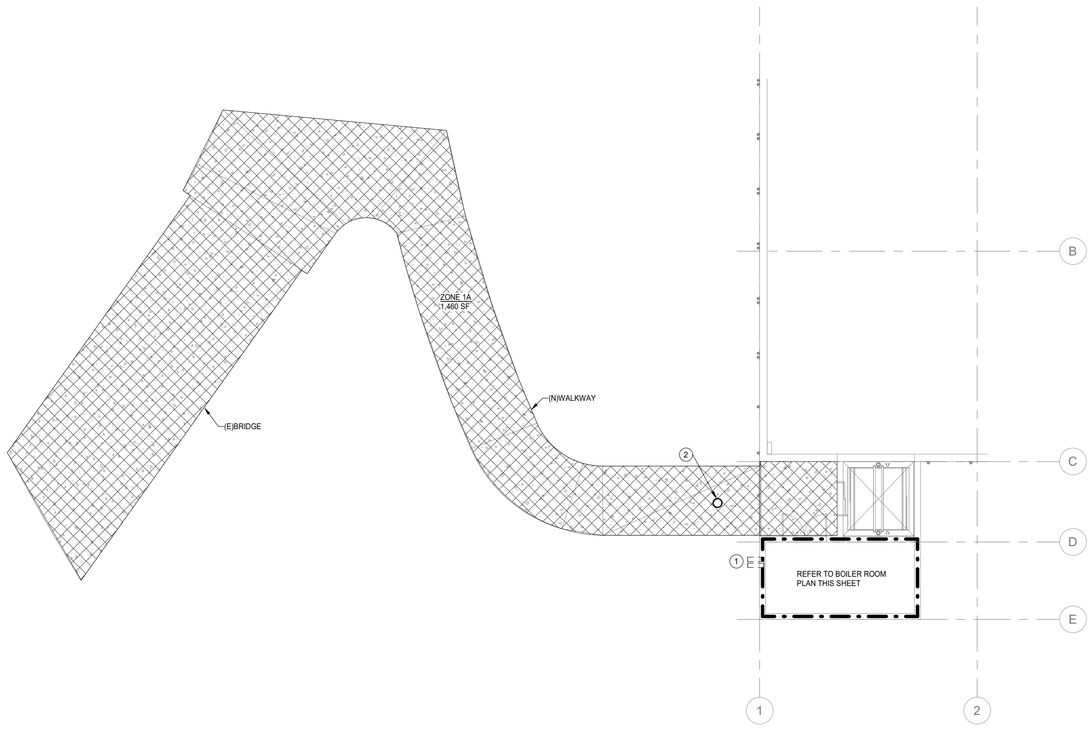
ERIC SMITH ASSOCIATES, P.C.
1919 SEVENTH STREET
BOULDER, COLORADO, 80302
(303) 442-5456, (303) 442-4745 FAX

Job Number:	20034
Date:	03/05/21
Drawn By:	EAB
Checked By:	TVS

Project Phase
PERMIT SUBMITTAL

Sheet Title
MECHANICAL COVER SHEET

Sheet Number
MP000

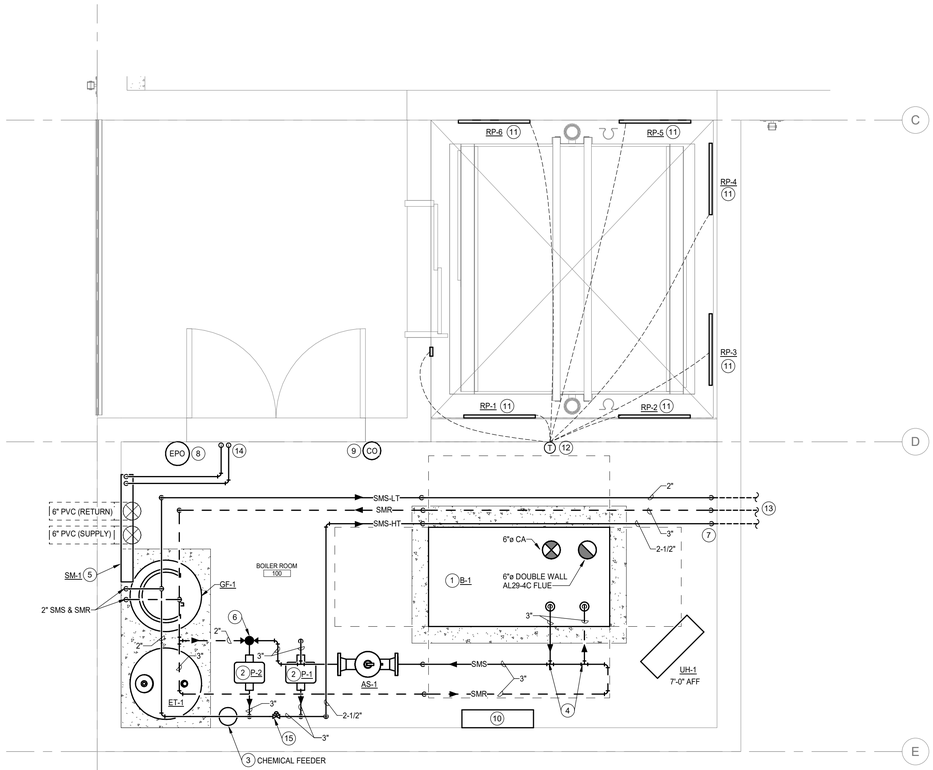


PARTIAL HVAC SITE PLAN

SCALE: 1/8" = 1'-0"

HVAC KEYNOTES:

1. SMS & SMR LOOPS FROM PVC CONDUITS TO ZONE 1. REFER TO SNOWMELT TUBING SUBMITTAL DRAWINGS FOR LOOP ROUTING.
2. SNOWMELT SLAB TEMPERATURE AND MOISTURE SENSOR MOUNTED IN SLAB AND WIRED BY TO CONTROLLER IN BOILER ROOM. COORDINATE LOCATION WITH OWNER PRIOR TO INSTALLATION TO AVOID VEHICLE TRAFFIC.



LOWER LEVEL HVAC PLAN

SCALE: 1/2" = 1'-0"

HVAC KEYNOTES:

1. MOUNT BOILER ON 4" CONCRETE PAD THAT IS 6" LARGER THAN BOILER FOOTPRINT IN ALL DIRECTIONS.
2. MOUNT PUMPS ON SLAB WITH 6" TALL UNISTRUT MOUNTING STAND AND WAFFLE PAD.
3. CHEMICAL FEEDER MOUNTED ON WALL WITH MANUFACTURERS WALL BRACKET. PROVIDE AXIOM CBF-2 OR EQUIVALENT BY NEPTUNE.
4. TEE'S FOR PRIMARY SUPPLY AND RETURN CONNECTIONS TO BOILER TO BE SPACED BETWEEN 9" AND 15" APART.
5. SNOWMELT SUPPLY AND RETURN MANIFOLDS MOUNTED ON WALL APPROXIMATELY 4'-0" AFF. ROUTE SUPPLY AND RETURN LOOPS DOWN FROM MANIFOLD AND THROUGH SLAB IN 6" PVC CONDUITS (SUPPLY AND RETURN LOOPS IN SEPARATE CONDUIT). PROVIDE SPRAY FOAM TYPE SEALANT AROUND PIPING THROUGH PVC OPENING. CONDUITS TO EXTEND 36" BELOW GRADE AND ELBOW FOUNDATION WALL. REFER TO PARTIAL HVAC SITE PLAN THIS SHEET FOR CONTINUATION.
6. 1-1/2" THREE-WAY, MODULATING, 24V BALL TYPE CONTROL VALVE. COMMON PIPING DOWN, NORMALLY CLOSED TO SMR, NORMALLY OPEN TO SMS. SIZE FOR 108 GPM, MAX PRESSURE DROP 10 PSI. VALVE WILL NORMALLY OPERATE AT 38 GPM. PROVIDED BY TCC, MANUFACTURER TO BE BELIMO, HONEYWELL, OR GRISWOLD.
7. SMS-HT, SMS-LT, & SMR DOWN ON WALL TO APPROXIMATELY 1'-0" AFF. TRANSITION TO HDPE DIRECT BURIED PIPING AND ROUTE THROUGH WALL WITH LINK-SEAL AT EACH WALL PENETRATION.
8. 24V EPO PROVIDED AND WIRED TO BOILER SHUTDOWN CIRCUIT BY TCC. PILLA BSD120 OR EQUAL.
9. 24V CARBON MONOXIDE DETECTOR WITH AUDIBLE ALARM BY TCC.
10. SNOWMELT CONTROLLER IN NEMA 1 PANEL ENCLOSURE, PROVIDE 120V POWER TO CONTROLLER. REFER TO CONTROL DRAWINGS.
11. MOUNT RADIANT PANEL IN ELEVATOR SHAFT WITH BOTTOM OF PANEL AT 18" ABOVE BOTTOM OF PIT. CONFIRM ALL MOUNTING LOCATIONS WITH ELEVATOR INSTALLER.
12. 24V THERMOSTAT WITH REMOTE SENSOR BY TCC WIRED TO POWER RELAY TERMINAL AT RADIANT HEATERS. MOUNT SENSOR IN SHAFT AT 54" AFF.
13. DIRECT BURIED SMS-HT, SMS-LT, & SMR (UPONOR ECOFLEX SINGLE OR EQUIVALENT). REFER TO FIRST LEVEL HVAC PLAN FOR CONTINUATION.
14. 3/4 SMS-LT & SMR LOOP FROM SNOWMELT MANIFOLD 1 UP INTO FIRST LEVEL SLAB AND NORTH TO ZONE 1B ABOVE.
15. TWO-POSITION, LINE SIZE, NORMALLY CLOSED, BUTTERFLY TYPE CONTROL VALVE WITH 24V ACTUATOR. PROVIDED BY TCC, MANUFACTURER TO BE BELIMO, HONEYWELL, OR GRISWOLD.

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COLORADO LICENSED PROFESSIONAL ENGINEER
38020
03-05-2021
ERIC SMITH

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REVISIONS

No.	Description	Date

STEAMBOAT GONDOLA RELOCATION

STEAMBOAT SPRINGS, CO

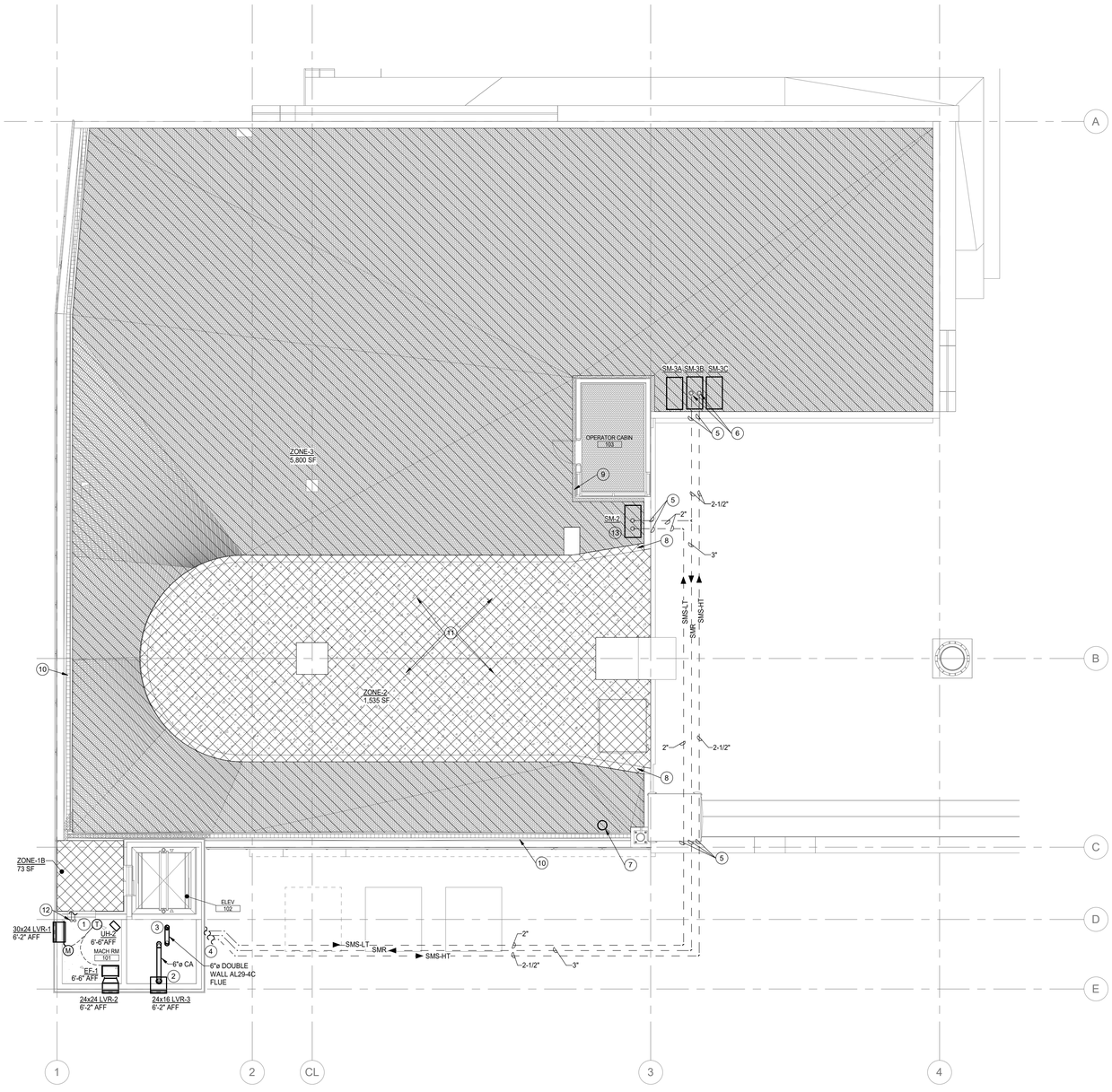
ERIC SMITH ASSOCIATES, P.C.
1919 SEVENTH STREET
BOULDER, COLORADO, 80302
(303) 442-5456, (303) 442-4745 FAX

Job Number:	20034
Date:	03/05/21
Drawn By:	EAB
Checked By:	TVS

Project Phase
PERMIT SUBMITTAL

Sheet Title
LOWER LEVEL HVAC PLAN

Sheet Number
M101



FIRST LEVEL HVAC PLAN

SCALE: 1/8" = 1'-0"

HVAC KEYNOTES:

1. 120V REVERSE ACTING THERMOSTAT TO POWER 120V MOTORIZED DAMPER ACTUATOR (N.C.) AND EXHAUST FAN. COORDINATE REQUIREMENTS WITH EC.
2. PROVIDE LOUVER WITH 18" DEEP INSULATED SHEETMETAL PLENUM BOX, PROVIDE CONICAL TAKE OFF FROM TOP OF BOX AND INSULATED SHEETMETAL COMBUSTION AIR DOWN TO BOILER CONNECTION.
3. DOUBLE WALL AL29-4C FLUE UP FROM BOILER BELOW AND OFFSET NEAR ELEVATOR HOISTWAY WALL. FLUE TO CONTINUE ABOVE ROOF. SUPPORTED WITH WALL CLAMPS FROM ELEVATOR HOISTWAY WALL AND TERMINATE 3'-0" ABOVE TOP OF ELEVATOR ROOF WITH BOILER MANUFACTURER RECOMMENDED FLUE CAP.
4. DIRECT BURIED SM-LT, SMS-HT, & SMR PIPING FROM BOILER ROOM ROUTE IN SAME TRENCH TO MANIFOLDS A MINIMUM OF 24" BELOW GRADE, COORDINATE WITH OTHER UTILITIES AND GONDOLA EQUIPMENT REQUIREMENTS.
5. PROVIDE PVC SLEEVES FOR PIPING THROUGH FOUNDATION WALL, COORDINATE EXACT LOCATIONS WITH GC IN FIELD.
6. 2-1/2" SMS-HT & SMR UP FROM BELOW GRADE, PROVIDE PIPING TEE'S BELOW GRADE AND ROUTE 2" SMS-HT & SMR TO EACH SM-3A, SM-3B, AND SM-3C. SUPPPLY AND RETURN MANIFOLDS TO BE MOUNTED IN INDIVIDUAL YARD BOXES MOUNTED IN SNOWMELT ZONE FLUSH WITH PAVERS. COORDINATE YARD BOX SIZE WITH SIZE OF MANIFOLDS PROVIDED. ROUTE SNOWMELT TUBING FROM MANIFOLDS TO ZONE 3. YARD BOXES TO BE OLD CASTLE PRECAST POLYMER CONCRETE BOXES WITH LOCKABLE POLYMER COVER.
7. SNOWMELT SLAB TEMPERATURE AND MOISTURE SENSOR MOUNTED IN SLAB AND WIRED BY TO CONTROLLER.
8. PROVIDE SUPPLY AND RETURN SNOWMELT TUBING WITHIN 10" WIDE ELEVATED CURB AROUND ZONE 2. TUBING TO BE LOCATED APPROXIMATELY 3" BELOW TOP OF CONCRETE CURB COORDINATE EXACT LOCATION WITH GONDOLA EQUIPMENT INSTALLER
9. PROVIDE 6" CLEAR SPACE WITHOUT TUBING AROUND FUTURE OPERATOR CABIN.
10. 6" WIDE TRENCH DRAIN LOCATED AT PAVER PERIMETER.
11. COORDINATE SNOWMELT TUBING ROUTING IN FIELD WITH GONDOLA EMBED CORE DRILLS SO TUBING IS NOT DAMAGED. TYPICAL ALL SNOWMELT TUBING LOCATIONS AND ANY CORE DRILL LOCATIONS, SLEEVE THESE LOCATIONS WHERE POSSIBLE. COORDINATE CLOSELY WITH GONDOLA RAIL SYSTEM WITHIN THIS AREA IT WILL BE INSTALLED AFTER CONCRETE IS SET.
12. SNOWMELT LOOP UP IN FIRST FLOOR SLAB AND TO ZONE 1B.
13. 2" SMS-LT & SMR UP FROM BELOW GRADE TO SM-2. MANIFOLDS TO BE MOUNTED IN YARD BOX MOUNTED IN SNOWMELT ZONE FLUSH WITH PAVERS. COORDINATE YARD BOX SIZE WITH SIZE OF MANIFOLD PROVIDED. ROUTE SNOWMELT TUBING FROM MANIFOLD TO BELOW GRADE AND INTO ZONE 2. YARD BOXES TO BE OLD CASTLE PRECAST POLYMER CONCRETE BOXES WITH LOCKABLE POLYMER COVER.

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PROFESSIONAL ENGINEER

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Job Number:	20054
Date:	03/05/21
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Checked By:	TVS

Project Phase
PERMIT SUBMITTAL

Sheet Title
FIRST LEVEL HVAC PLAN

Sheet Number
M111

PERMIT SUBMITTAL 03/05/2021

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HEATING WATER BOILER SCHEDULE

PLAN CODE	MANUFACT. & MODEL NO.	MBH INPUT S.L.	MBH OUTPUT (7,000')	NO. OF MODULES	MBH PER MODULE	FLOWRATE PER MODULE	BOILER FLOWRATE (GPM)	DESIGN EWT (°F)	DESIGN LWT (°F)	TURN-DOWN	ELECTRICAL V/ø/HZ	ELECTRICAL FLA	DIMENSIONS L	DIMENSIONS W	DIMENSIONS H	OPER WT. (LBS)	REMARKS
B-1	RIELLO AR 2000	2,000	1,509	4.0	500.0	25.0	100.0	120.0	170.0	40:1	230/3/60	30.2	73"	35"	83"	3,500	NOTES: 1,2,3,4

NOTES:
1. INLET GAS PRESSURE TO BE BETWEEN 3.5" W.C. AND 14" W.C.
2. EACH BOILER MODULE PROVIDED WITH INTEGRAL CIRCULATION PUMP AND AUTOMATIC FLUE ISOLATION DAMPER.
3. MANUFACTURER PROVIDED 3" INLET STRAINER.
4. PROVIDE MANUFACTURER'S CONDENSATE NEUTRALIZATION KIT.

*APPROVED ALTERNATE MANUFACTURER'S: PRIOR APPROVED

PUMP SCHEDULE

PLAN CODE	MANUFACTURER & MODEL NO.	TYPE	SERVICE	GPM	TDH (FT)	% EFF.	ELECTRICAL HP (BHP)	ELECTRICAL V/ø/Hz	ELECTRICAL RPM	SIZE (IN) L	SIZE (IN) W	SIZE (IN) H	WT. (LBS)	REMARKS
P-1	GRUNDFOS CRE 45-1	VERTICAL INLINE	SNOWMELT	110.0	90.0	82.0	7.5	460/3/60	3,600	15"	14"	38"	250	NOTE: 1,2,3,4
P-2	GRUNDFOS CRE 45-1	VERTICAL INLINE	SNOWMELT	110.0	90.0	82.0	7.5	460/3/60	3,600	15"	14"	38"	250	NOTE: 1,2,3,4

NOTES:
1. SNOWMELT SYSTEM UTILIZES 50% PROPYLENE GLYCOL.
2. PROVIDE MANUFACTUER'S INTEGRAL VFD.
3. PROVIDE MANUFACTUER'S SUCTION DIFFUSER SIZED FOR SYSTEM FLOW INDICATED.
4. SELECT PUMP FOR CONDITIONS INDICATED. REFER TO M400 FOR BALANCED FLOW RATES.

*APPROVED ALTERNATE MANUFACTURER'S: ARMSTRONG

AIR/DIRT SEPARATOR SCHEDULE

PLAN CODE	MANUFACTURER & MODEL NO.	SYSTEM	GPM	WPD (FT)	PIPE CONN. SIZE	MAX. PRESS. (PSI)	DIMENSIONS (NOTE: 1) HEIGHT	DIMENSIONS (NOTE: 1) DIA.	DIMENSIONS (NOTE: 1) LENGTH	OPER. WEIGHT	REMARKS
AS-1	SPIROTHERM VDN300	SNOWMELT	110	1.0	3"	150.0	32"	14"	22"	250	NOTE: 1,2

NOTES:
1. LENGTH DIMENSION IS FLANGE TO FLANGE CONNECTION DISTANCE.
2. SYSTEM UTILIZES 50% PROPYLENE GLYCOL.

*APPROVED ALTERNATE MANUFACTURER'S: NONE

EXPANSION TANK SCHEDULE

PLAN CODE	MANUFACTURER & MODEL NO.	SERVICE	TANK VOLUME	ACCEPT. VOLUME	SYSTEM VOLUME	FILL TEMPERATURE	MAX. AVERAGE TEMPERATURE	MIN. OPER. PRESSURE	MAX. OPER. PRESSURE	TANK SIZE DIA.	TANK SIZE HT.	OPER. WEIGHT	REMARKS
ET-1	B&G B-300	SNOWMELT	80.0	80.0	1,000.0	40.0	170.0	20.0	45.0	24"	52"	1,000	NOTE: 1,2

NOTES:
1. SNOWMELT WATER SYSTEMS CONTAINS 50% PROPELYNE GLYCOL.
2. ASME PRESSURE RATING EQUALS 125 PSI.

*APPROVED ALTERNATE MANUFACTURER'S: ARMSTRONG

GLYCOL FEEDER SCHEDULE

PLAN CODE	MANUFACTURER & MODEL NO.	SERVICE	SYSTEM PUMP FLOW (GPM)	SYSTEM PUMP HEAD (PSI)	SYSTEM PUMP MOTOR HP	TANK SIZE (GAL)	UNIT "ON" PRESSURE (PSI)	UNIT "OFF" PRESSURE (PSI)	SYSTEM ELECTRICAL REQUIREMENTS	TANK P.G. (%)	UNIT SIZE DIA.	UNIT SIZE HT.	OPER. WT. (LBS)	REMARKS
GF-1	AXIOM SF-100	SNOWMELT	1.3	25.0	50 W	55.0	12.0	15.0	NOTE: 1	50.0	24"	50"	160	NOTE: 1,2,3

NOTES:
1. PROVIDE A DEDICATED 120/1/60 20 AMP CIRCUIT WITH A GFI RECEPTACLE LOCATED WITHIN 3 FEET OF AND BEHIND UNIT.
2. PROVIDE FLOAT SWITCH FOR LOW LEVEL PUMP SHUTOFF AND ALARM TO THE DDC SYSTEM.
3. PROVIDE NEMA 4X UNIT CONTROL PANEL.

*APPROVED ALTERNATE MANUFACTURER'S: NEPTUNE

FAN SCHEDULE

PLAN CODE	MANUFACTURER & MODEL NO.	TYPE	SERVICE	SONES	CFM	T.S.P. @ 5,300'	RPM @ 5,300'	MOTOR W	MOTOR V/ø/Hz	WT (LBS)	VIB. ISOL.	CONTROL	DAMPER TYPE	REMARKS
EF-1	GREENHECK SP-A1550	INLINE	ELEVATOR MACHINE	10.0	1,500	0.15	1,610	818	120/1/60	70	NOTE: 4	NOTE: 3	NOTE: 2	NOTE: 1

NOTES:
1. PROVIDE MANUFACTURER'S ELECTRICAL DISCONNECT.
2. MANUFACTURER PROVIDED BACKDRAFT DAMPER AT FAN OUTLET.
3. FAN CONTROLLED THROUGH REVERSE ACTING, LINE VOLTAGE THERMOSTAT.
4. PROVIDE SPRING ISOLATION HANGERS FOR FAN MOUNTING.

*APPROVED ALTERNATE MANUFACTURER'S: PENN BARRY

LOUVER SCHEDULE

PLAN CODE	MANUFACTURER & MODEL NO.	SERVICE	FREE AREA (SQ. FT.)	CFM	VEL. (FPM)	A.P.D. (IN. W.C.)	MATERIALS	SIZE (INCHES) W	SIZE (INCHES) H	SIZE (INCHES) D	REMARKS
LVR-1	GREENHECK SED-501	ELEVATOR MACHINE INTAKE	2.2	1,500	670	0.09	ALUMINUM	24"	24"	5"	NOTE: 1,2,3,4
LVR-2	GREENHECK SED-501	ELEVATOR MACHINE EXHAUST	2.2	1,500	670	0.09	ALUMINUM	24"	24"	5"	NOTE: 1,2,3,4
LVR-3	GREENHECK SED-501	BOILER INTAKE	1.5	-	-	-	ALUMINUM	24"	16"	5"	NOTE: 1,2,3,4

NOTES:
1. PROVIDE SIGHTPROOF LOUVER WITH 5/8" BIRD SCREEN.
2. PROVIDE WITH A 70% PVDF (OR EQUIVALENT) FINISH.
3. COLOR SELECTION BY ARCHITECT.
4. PROVIDE LOUVER WITH FLANGED FRAME.

*APPROVED ALTERNATE MANUFACTURER'S: RUSKIN

UNIT HEATER SCHEDULE (ELECTRIC)

PLAN CODE	MANUFACTURER & MODEL NO.	SERVICE	CAP. (MBH)	ELEMENT KW	ELEMENT VOLTS	ELEMENT ø	CFM	EAT	FLA	CONTROL	REMARKS
UH-1	BERKO MUH 07	BOILER ROOM	25.6	7.5	460	3	400	55.0	9.0	NOTE: 1	NOTE: 2,3,4
UH-2	BERKO MUH05	ELEVATOR MACHINE	17.1	5.0	460	3	400	55.0	6.0	NOTE: 1	NOTE: 2,3,4
RP-1,2,3,4,5,6	BERKO CP751F	ELEVATOR HOISTWAY	2.6	0.75	120	1	-	-	6.3	NOTE: 5	NOTE: 6

NOTES:
1. UNIT MOUNTED THERMOSTAT PROVIDED BY UNIT HEATER MANUFACTURER.
2. FLA (FULL LOAD AMPS) INCLUDES HEATING ELEMENT AND MOTOR CURRENT REQUIREMENTS.
3. UNIT TO BE MOUNTED FROM CEILING.
4. PROVIDE WITH HORIZONTAL DISCHARGE.
5. 24V THERMOSTAT BY TC, OUTPUT WIRED TO POWER RELAY AT HEATER.
6. 48"x24" PANEL WITH SURFACE MOUNTING KIT.

*APPROVED ALTERNATE MANUFACTURER'S: QMARK

SNOWMELT ZONE MANIFOLD SCHEDULE

PLAN CODE	MANUFACTURER & MODEL NO.	EFFECTIVE AREA (SF)	BTUH PER SF	TOTAL BTUH	EWT (°F)	LWT (°F)	GPM	TUBE SIZE	TUBE CENTERS	NUMBER OF LOOPS	P.D. (MAX)(FT)	REMARKS
SM-1	UPONOR - ZONES 1A,B	1,535	160	245,600	145	115	19.0	3/4"	9"	7	35.0	NOTE: 1,2,3,4
SM-2	UPONOR - ZONE 2	1,535	160	245,600	145	115	19.0	3/4"	9"	7	35.0	NOTE: 1,2,3,4
SM-3A	UPONOR - ZONE 3	1,933	160	309,280	170	140	24.0	3/4"	6"	9	35.0	NOTE: 1,2,3,4
SM-3B	UPONOR - ZONE 3	1,933	160	309,280	170	140	24.0	3/4"	6"	9	35.0	NOTE: 1,2,3,4
SM-3C	UPONOR - ZONE 3	1,933	160	309,280	170	140	24.0	3/4"	6"	9	35.0	NOTE: 1,2,3,4
TOTALS		8,869		1,419,040			110.0					

NOTES:
1. SNOWMELT SYSTEM CONTAINS 50% PROPYLENE GLYCOL.
2. MANIFOLD SELECTION TO PROVIDE REQUIRED NUMBER OF LOOPS AND BE INCLUDED IN PRESSURE LOSS CALCULATION BELOW MAX INDICATED.
3. MANIFOLD PROVIDED WITH BALL TYPE BALANCING/ISOLATION VALVE, MANUAL AIR VENT, PRESSURE GAUGES, AND FLOWRATE INDICATORS.
4. NUMBER OF LOOPS MAY VARY DEPENDING ON SPECIFIC MANUFACTURER TUBING LAYOUT.

*APPROVED ALTERNATE MANUFACTURER'S: REHAU

COLORADO LICENSED VERIFIED 38020 ERIC SMITH 03-05-2021 PROFESSIONAL ENGINEER

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Drawn By:	EAB
Checked By:	TVS

Project Phase
PERMIT SUBMITTAL

Sheet Title
HVAC SCHEDULES

Sheet Number
M300

PERMIT SUBMITTAL 03/05/2021

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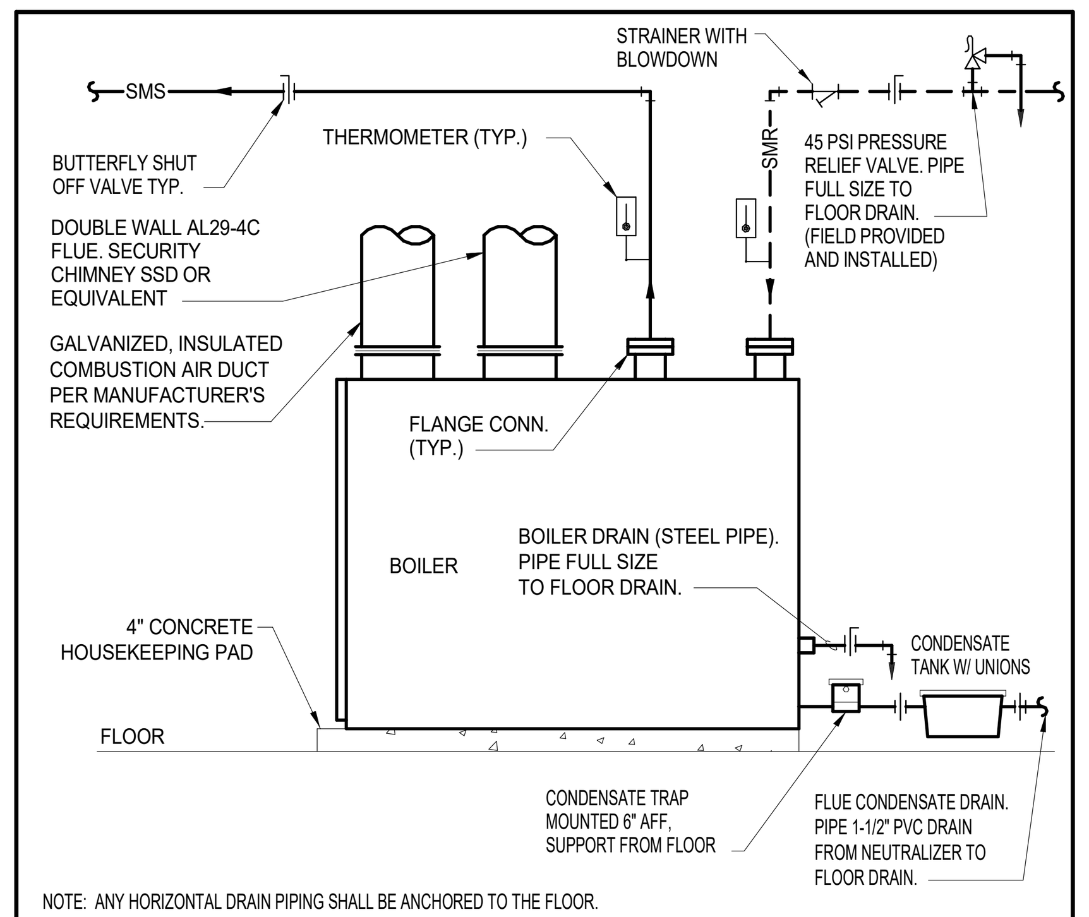
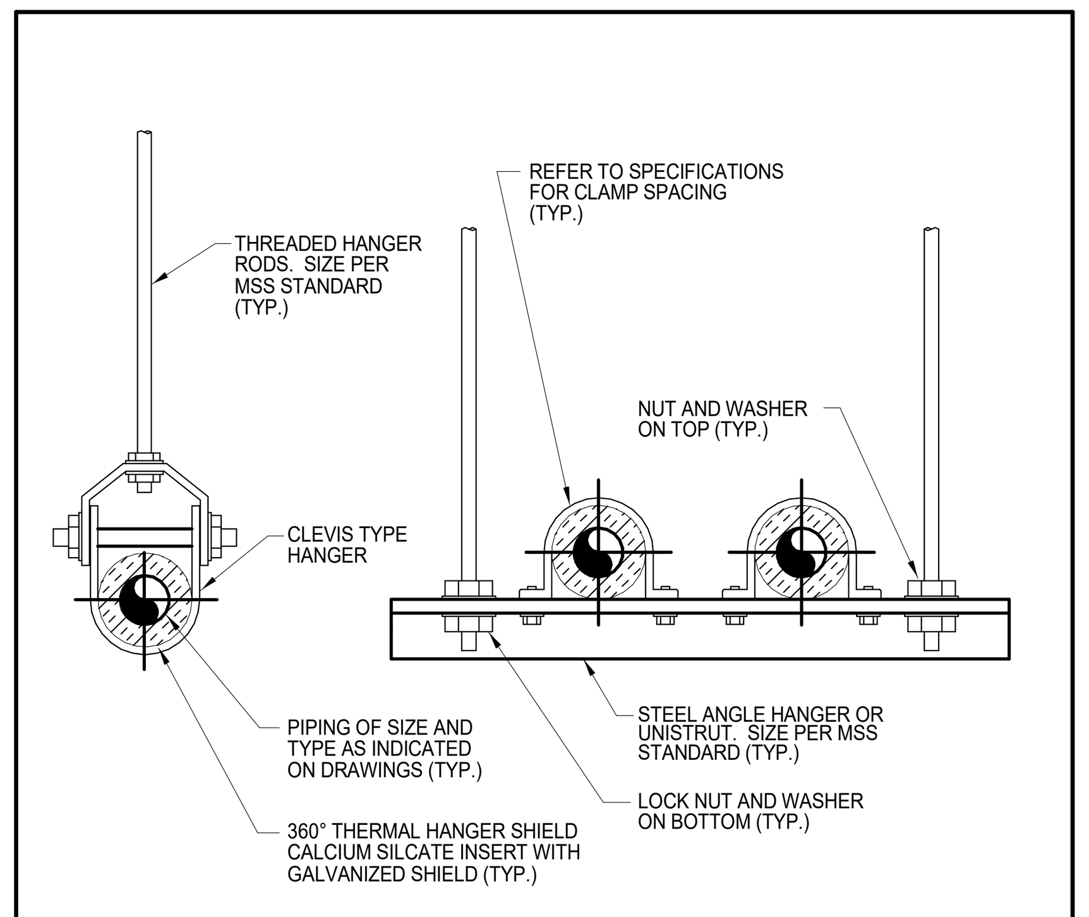
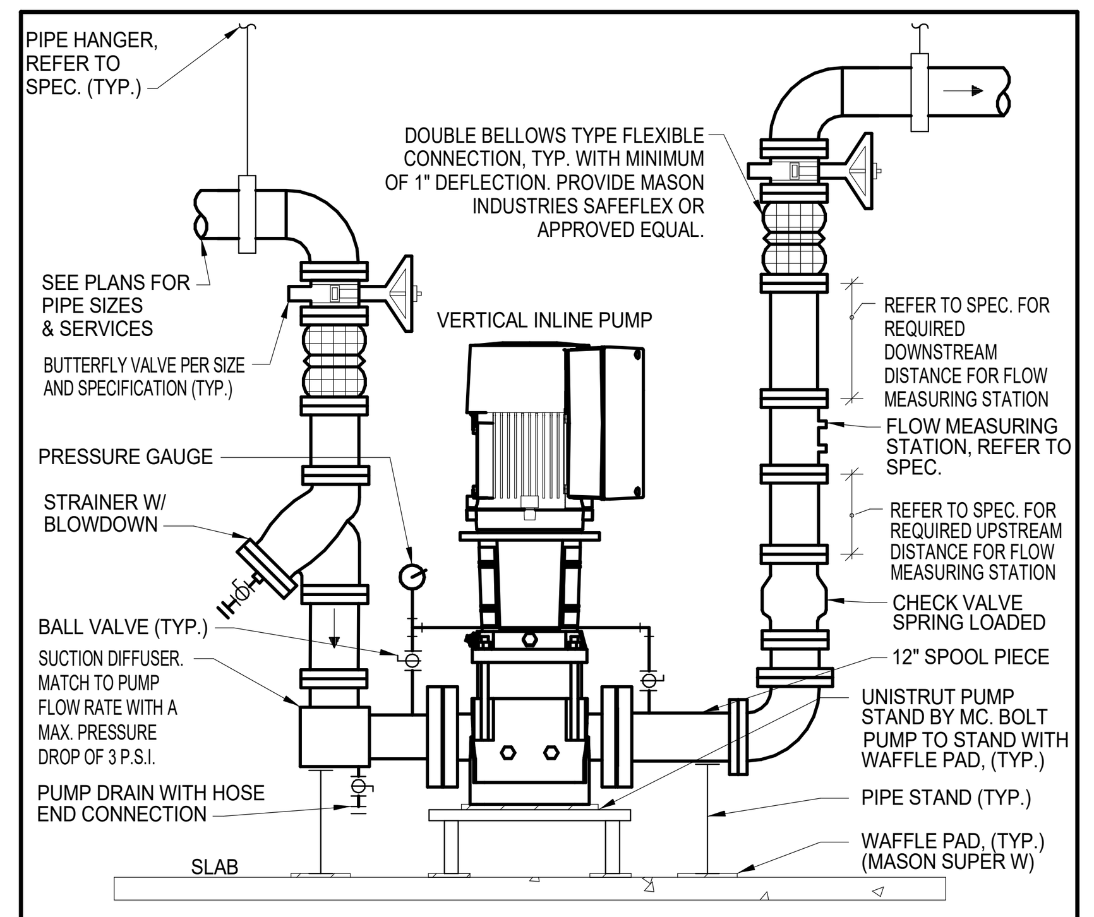


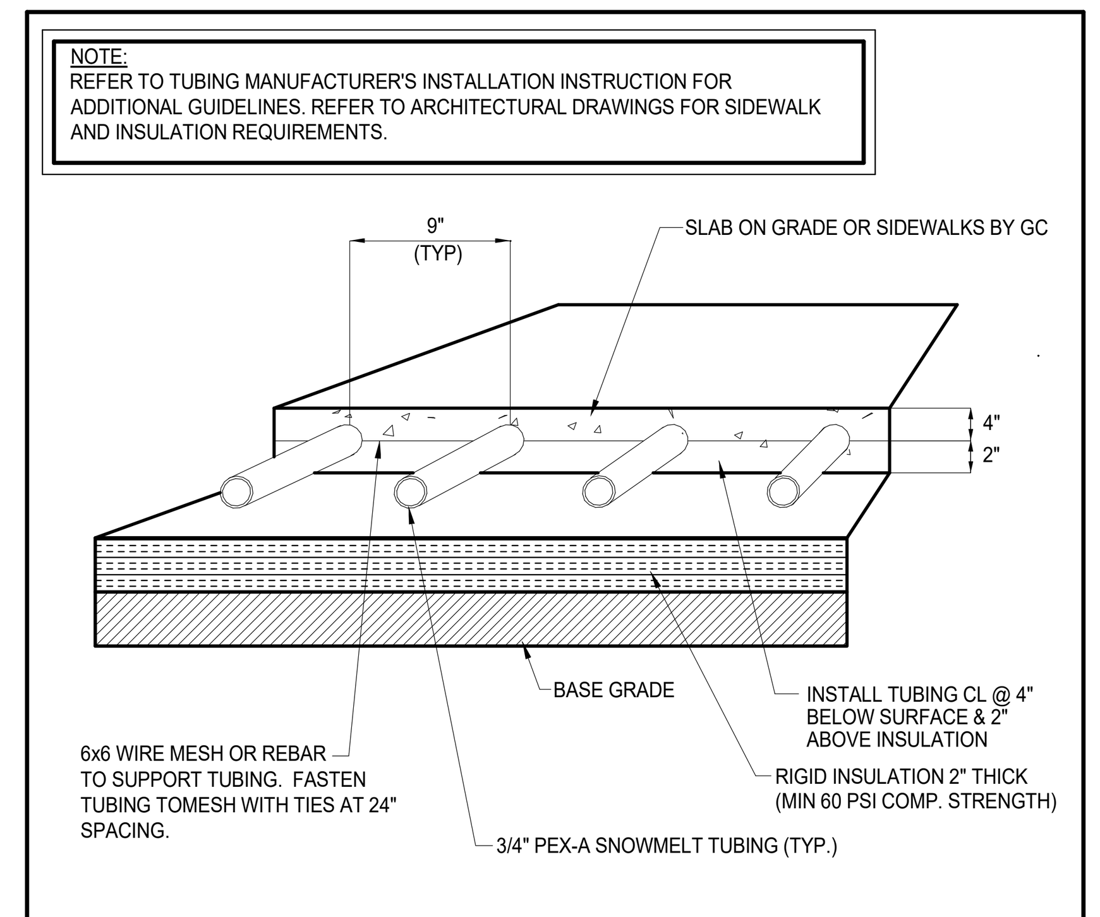
1 M400 **PIPING DETAIL - CONDENSING BOILER**
SCALE: NONE B-1



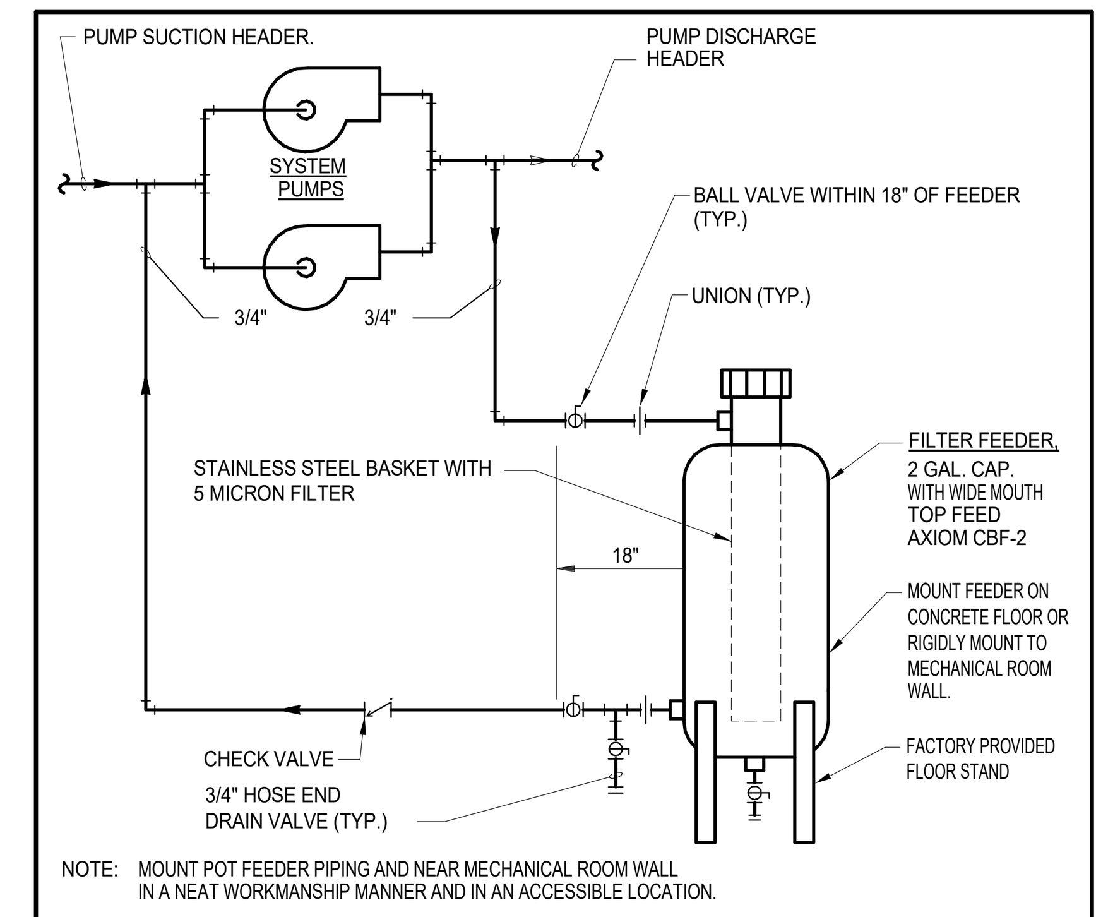
2 M400 **TYPICAL PIPE HANGER DETAIL**
SCALE: NONE
NOTE: TOTAL COMBINED OPERATING WEIGHT OF PIPING ON TRAPEZE HANGERS TO BE < 10LB/LF



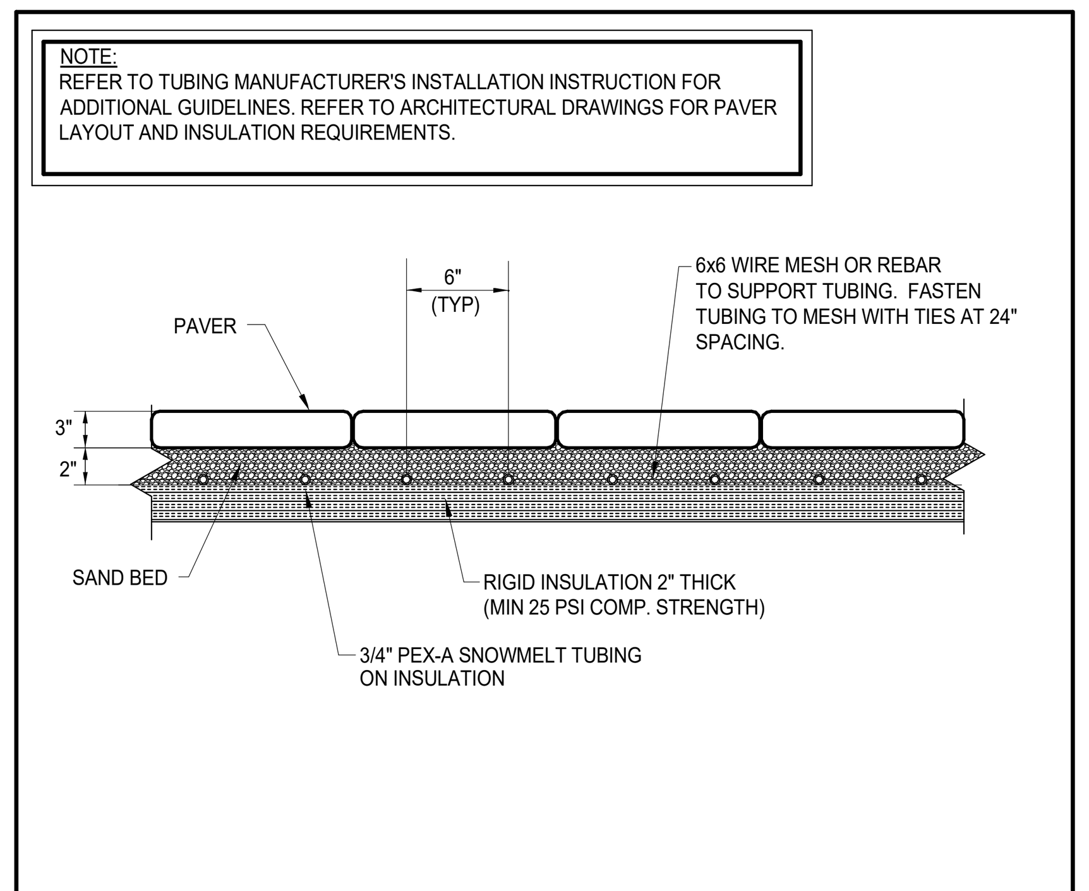
3 M400 **VERTICAL INLINE PUMP DETAIL**
SCALE: NONE



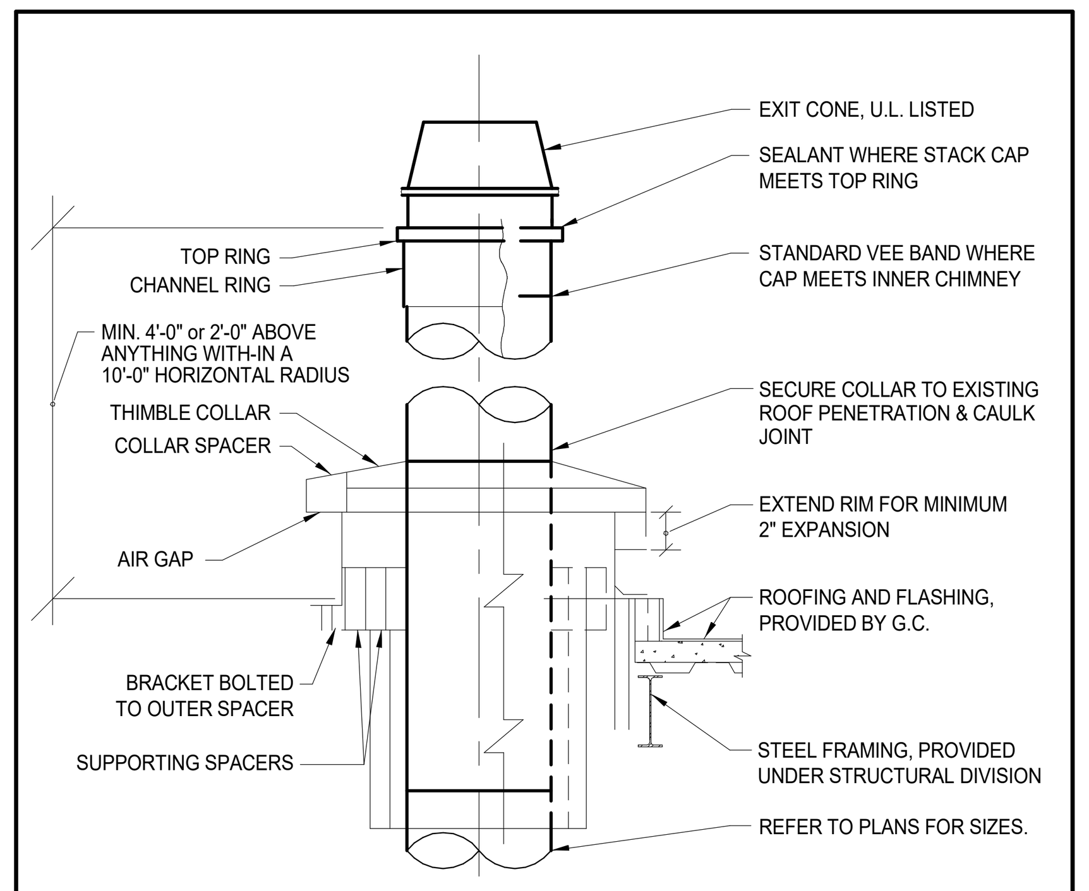
4 M400 **SNOWMELT TUBING INSTALLATION DETAIL**
SCALE: NONE (ZONES 1A,2)



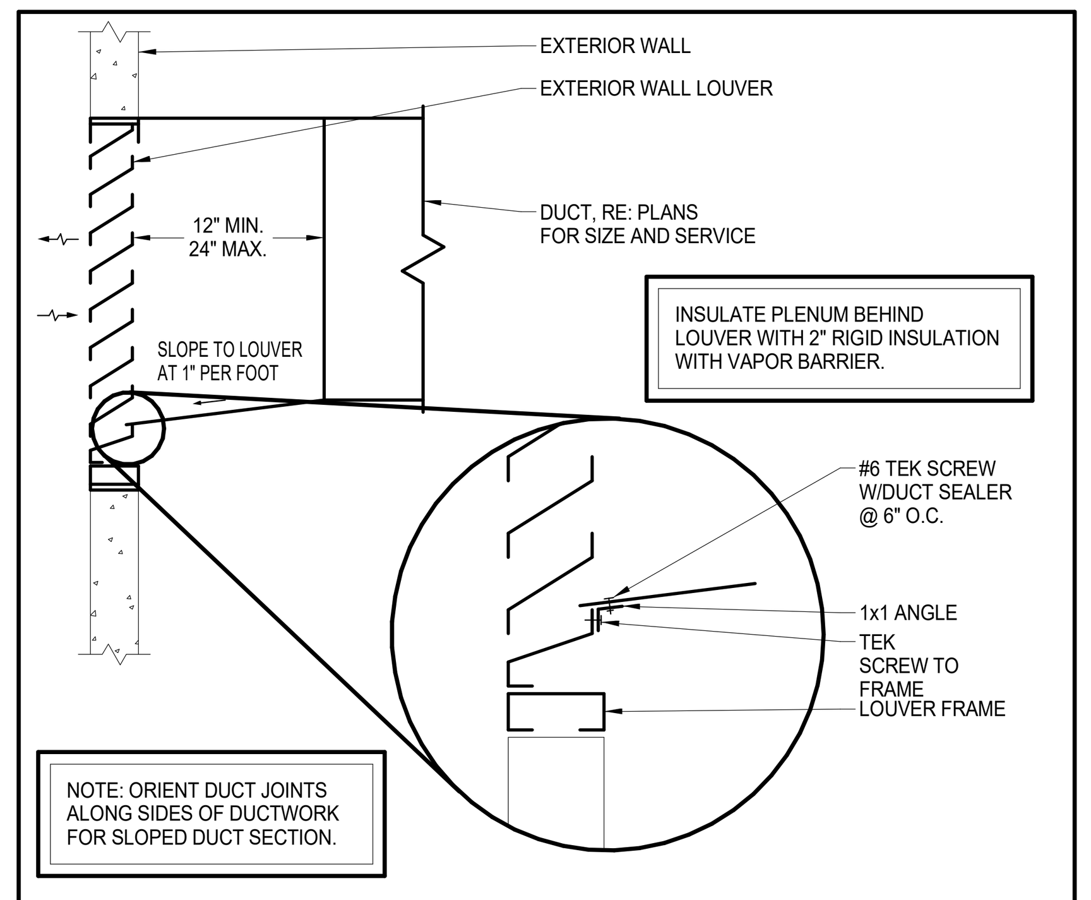
5 M400 **CHEMICAL FILTER FEEDER DETAIL**
SCALE: NONE



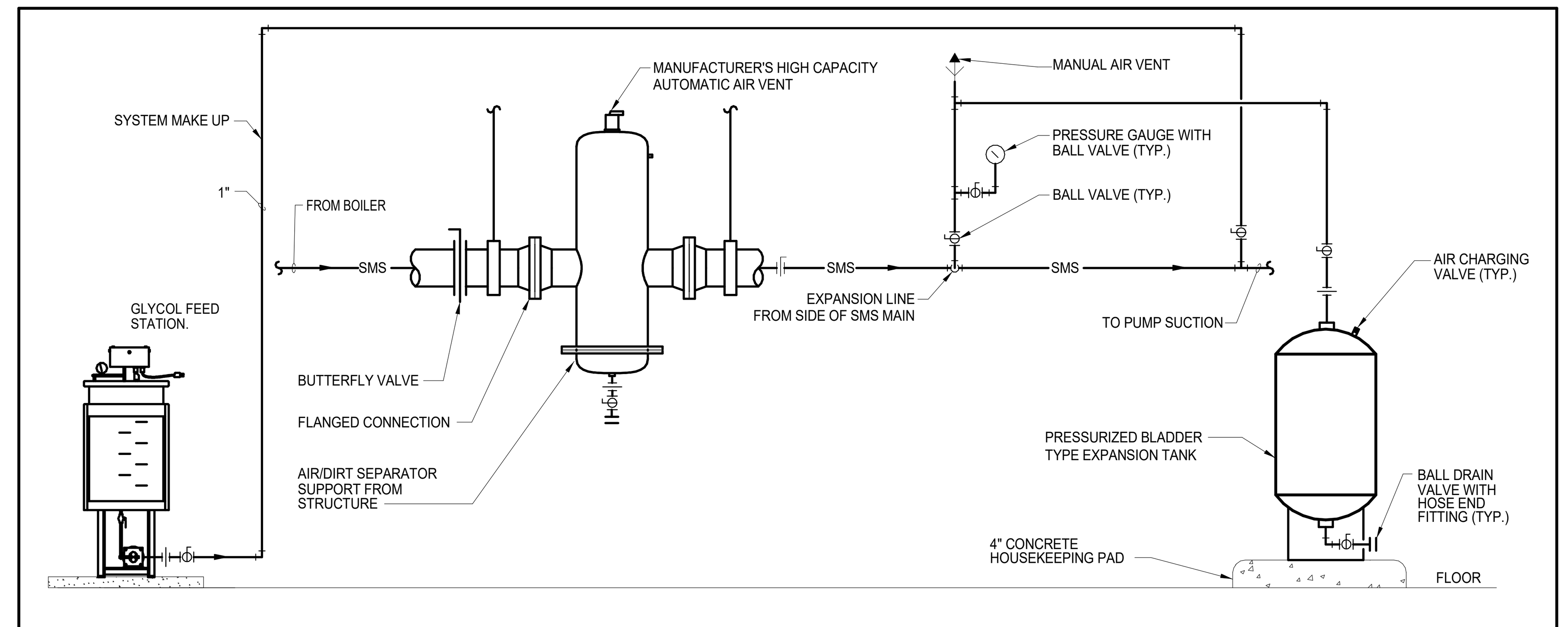
6 M400 **SNOWMELT INSTALLATION DETAIL**
SCALE: NONE (ZONE 3)



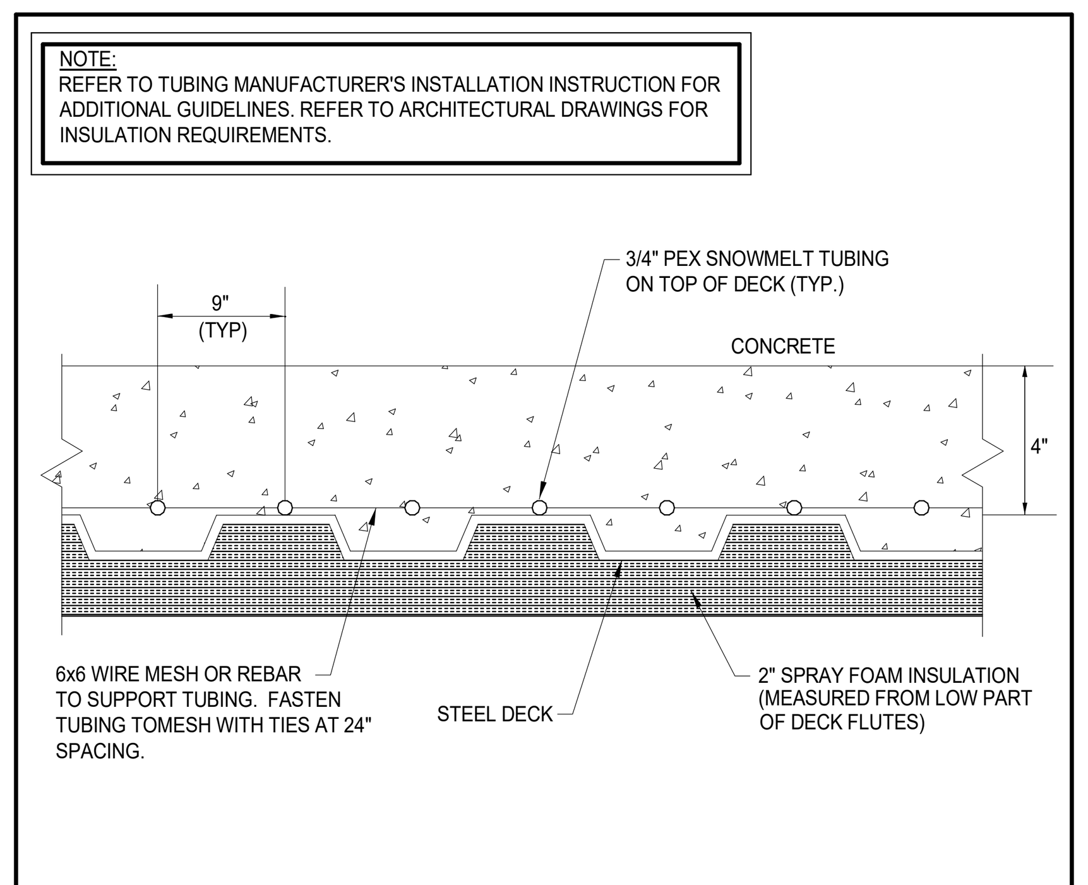
7 M400 **FLUE THRU ROOF DETAIL**
SCALE: NONE



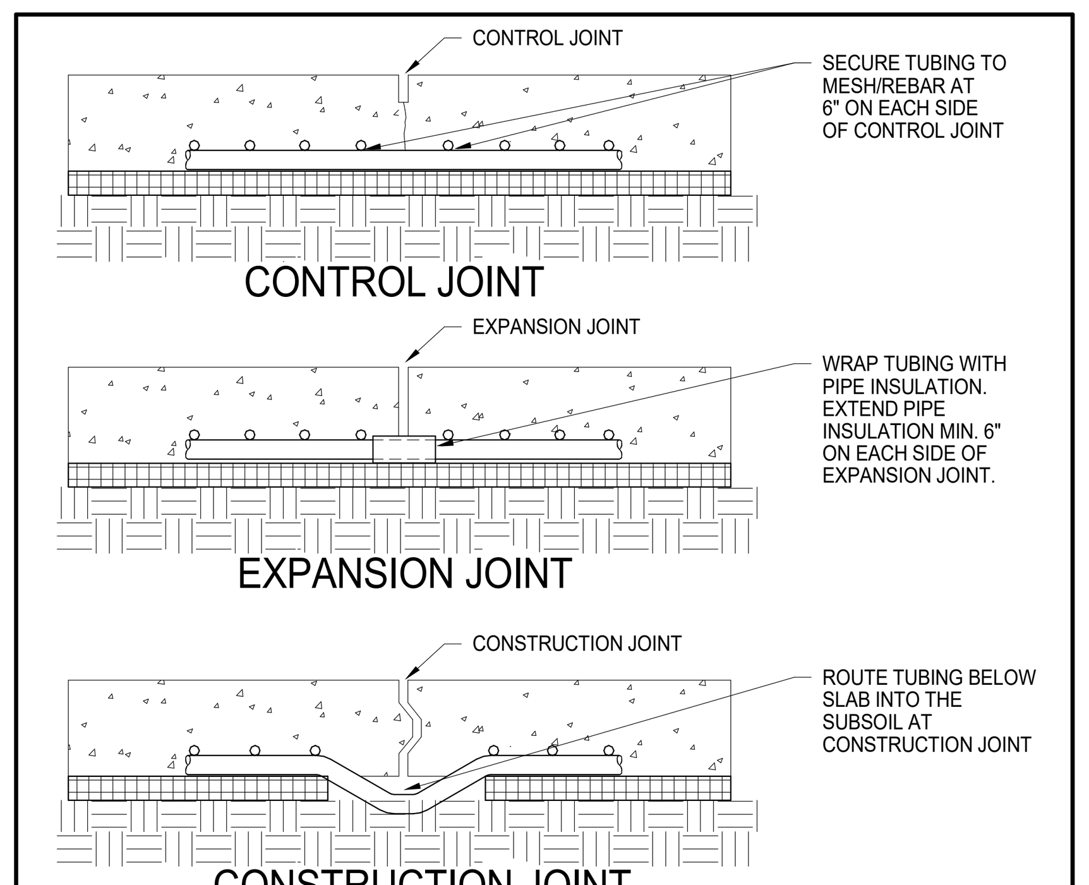
8 M400 **EXTERIOR WALL LOUVER DETAIL**
SCALE: NONE



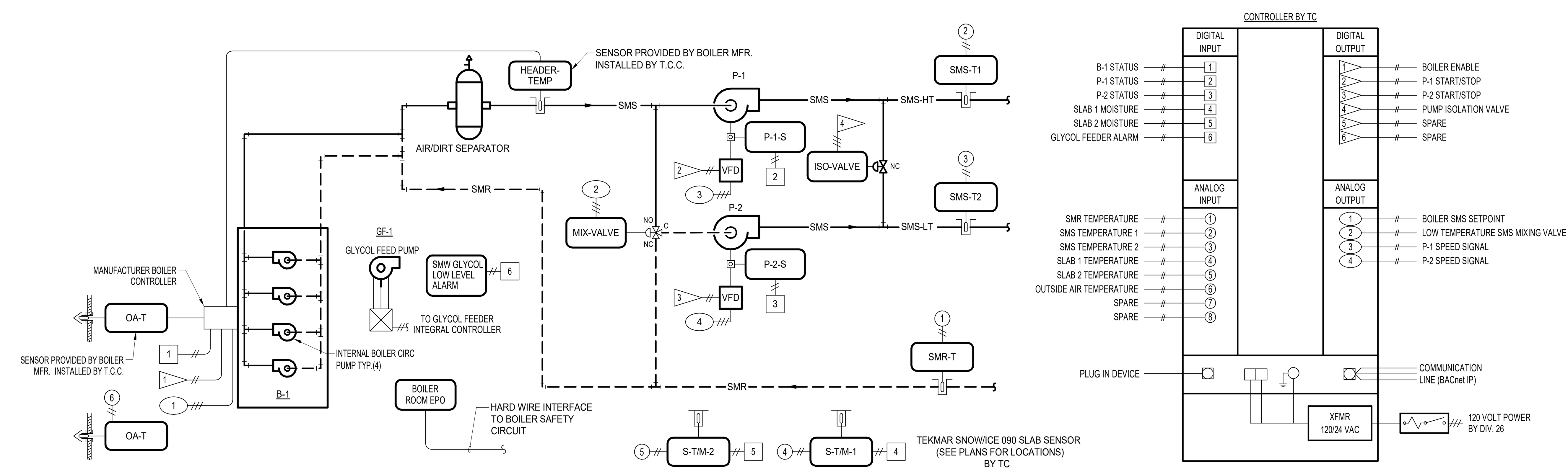
9 M400 **EXPANSION TANK, AIR/DIRT SEPARATOR & GLYCOL FEEDER PIPING DETAIL**
SCALE: NONE (SNOWMELT SYSTEM)



10 M400 **SNOWMELT INSTALLATION DETAIL**
SCALE: NONE ZONE 1B



11 M400 **SNOWMELT TUBING AT JOINTS**
NO SCALE



SNOWMELT SYSTEM CONTROL DIAGRAM
SCALE: NONE

SNOWMELT SYSTEM CONTROL
A. DESIGN INTENT:
1. CONTROLS SHALL BE FIELD PROVIDED AND INSTALLED, DO NOT PROVIDE FACTORY PACKAGED CONTROLS.
2. PROVIDE A MINIMUM OF (3) OPERATION MODES: MELT, IDLE, AND OFF.
3. ALL SETPOINTS SHALL BE ADJUSTABLE. FIELD TUNE ALL SETPOINTS TO PROVIDE OPTIMAL MELTING AND MINIMAL ENERGY USAGE. COORDINATE ALL SETPOINTS WITH SNOWMELT SYSTEM SUBMITTAL.
4. PUMP TEST AND BALANCE: BALANCE BOTH P-1 AND P-2 AT (2) DIFFERENT FLOW RATES AND REPORT CORRESPONDING SPEED SIGNAL TO TCC.
   4.1. P-1 SHALL BE BALANCED AND TESTED AT 72 GPM (ONLY SERVING SM-3A,3B) AND TESTED AT 110 GPM (SERVING ALL ZONES WITH P-2 DISABLED, PUMP ISOLATION VALVE OPEN, AND MIXING VALVE AT NORMAL POSTIION).
   4.2. P-2 SHALL BE TESTED AT 38 GPM (ONLY SERVING SM-1,2) AND TESTED AT 110 GPM (SERVING ALL ZONES WITH P-1 DISABLED AND PUMP ISOLATION VALVE OPEN).

B. GENERAL:
1. THE DDC SHALL BE ENABLE THE BOILER WHEN THE SNOWMELT SYSTEM SHALL BE ENABLED WHEN THE SLAB TEMPERATURE FALLS BELOW 30°F OR THERE IS MOISTURE DETECTED ON EITHER SLAB. BOILER SHALL BE DISABLED WHEN THE SLAB TEMPERATURE IS ABOVE 40°F WITH NO MOISTURE ON SLAB.
2. THE SNOWMELT PUMPS P-1,2 SHALL BOTH ENERGIZE WHEN THE SNOWMELT SYSTEM IS ENERGIZED.
3. PROVIDE ALL ADJUSTABLE SETPOINTS AND OPERATION MODES ON FRONT END GRAPHICS.
4. THE BOILER SHALL MODULATE TO MAINTAIN THE SNOWMELT SUPPLY TEMPERATURE ACCORDING TO THE FOLLOWING RESET SCHEDULE:

BOILER SMS TEMPERATURE:
BOILER SMS TEMPERATURE: 170ºF FOR OUTSIDE AIR TEMPERATURE FROM 0ºF - 35ºF.
BOILER SMS TEMPERATURE: 145ºF FOR OUTSIDE AIR TEMPERATURE FROM 35ºF AND ABOVE OR DURING IDLE MODE.

MELT MODE:
1. P-1 SERVES THE PAVER SNOWMELT AREAS REQUIRING 170ºF SMS TEMPERATURE. P-2 SERVES THE CONCRETE IMBED SNOWMELT AREAS REQUIRING 145ºF SMS TEMPERATURE.
2. ONCE THE SLAB SENSOR TEMPERATURE FALLS BELOW 30°F OR DETECTS MOISTURE, THE BOILER SHALL ENERGIZE AND MAINTAIN THE SNOWMELT SUPPLY TEMPERATURE SETPOINT AS INDICATED ABOVE.
3. THE THREE-WAY MIXING VALVE SERVING CONCRETE IMBED ZONES (SM-1,2) SHALL MODULATE TO MAINTAIN A 145ºF SMS TEMPERATURE.
4. ONCE BOTH SLAB SENSORS NO LONGER DETECT MOISTURE AND SLAB TEMPERATURES ARE ABOVE 40ºF, THE SNOWMELT SYSTEM SHALL BE DISABLED AFTER A TIME DELAY OF 30 MINUTES (ADJ.). THIS TIME DELAY SHALL BE ADJUSTED BASED ON MELTING CHARACTERISTICS OF THE SLAB, TO MINIMIZE RUN TIME.
5. SENSITIVITY OF THE MOISTURE SENSOR SHALL BE ADJUSTABLE THROUGH THE BAS.

C. IDLE MODE:
1. ENERGIZE IDLE MODE IF OUTSIDE AIR TEMPERATURE FALLS BELOW 35ºF AND NO MOISTURE IS DETECTED ON THE SLAB.
2. DURING IDLE MODE, THE SNOWMELT SYSTEM SHALL BE ENERGIZED TO PREHEAT THE SLAB. ONCE THE SLAB IS MAINTAINED ABOVE 35ºF FOR 4 HOURS WITH NO MOISTURE DISABLE IDLE MODE. ALLOW IDLE ENABLE AGAIN AFTER A DISABLE PERIOD OF 2 HOURS UNLESS MELT IS ENABLED.
2. ONCE THE SLAB SENSOR DETECTS MOISTURE OR SLAB TEMPERATURE IS BELOW 30°F, THE SYSTEM SHALL ENTER THE MELT MODE.

D. WARM WEATHER SHUT DOWN:
1. THE SNOWMELT SYSTEM SHALL BE DISABLED ONCE BOTH SLAB TEMPERATURES ARE ABOVE 40ºF AND NO MOISTURE IS DETECTED ON THE SLAB.

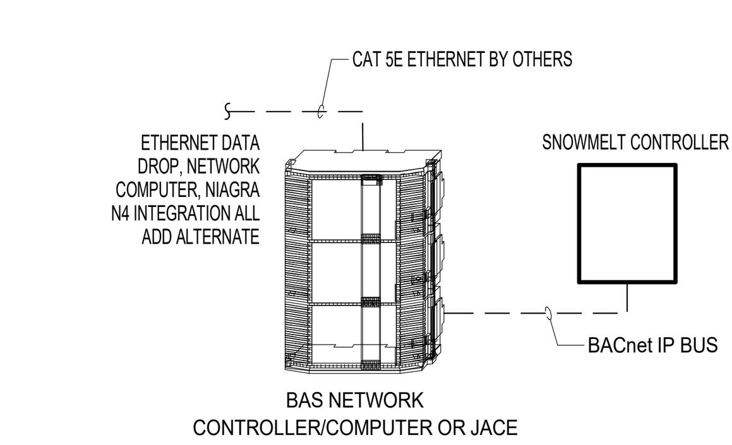
E. COLD WEATHER SHUT DOWN:
1. THE SNOWMELT SYSTEM SHALL BE DISABLED IF THE OUTDOOR AIR TEMPERATURE FALLS BELOW -3°F (ADJ.) TO PREVENT MELTING AND ICING OF THE SNOWMELT AREA. ONCE OUTDOOR AIR TEMPERATURE RISES ABOVE THE COLD WEATHER SHUTDOWN TEMPERATURE, THE MELT AND IDLE MODES ARE AVAILABLE FOR OPERATION.

G. SAFETIES:
1. PUMP FAILURE:
   a. UPON SENSING THE FAILURE OF AN ON LINE PUMP THROUGH A MISS MATCH OF THE PUMP COMMANDED OUTPUT “ON” AND CURRENT SWITCH STATUS “OFF” FOR 15 CONTINUOUS SECONDS, THE FAILED PUMP SHALL BE DISABLED AND ALARMED.
   b. IF EITHER PUMP FAILS, OPEN THE TWO-POSITION PUMP ISOLATION VALVE, RETURN THE MIXING VALVE TO NORMAL POSITION AND INCREASE THE SPEED OF THE ONLINE PUMP TO THE HIGHER REQUIRED SPEED SETTING (SEE PUMP BALANCING ABOVE). OVERRIDE BOILER SMS TEMPERATURE TO 145ºF.
2. FAILURE OF SMS TEMPERATURE TRANSMITTER:
   a. UPON SENSING A FAILURE (END OF SCALE READING) WHICH IS REQUIRED FOR BOILER STAGING CONTROL, THE FAILED TRANSMITTER SHALL BE ALARMED AT THE BAS WORKSTATION.
3. SNOWMELT WATER SYSTEM TEMPERATURE ALARM:
   a. UPON SENSING A SNOWMELT WATER SUPPLY TEMPERATURE OF 10°F ABOVE OR BELOW SETPOINT FOR 15 MINUTES, PROVIDE ALARM TO THE BAS. ALARM SHALL BE INHIBITED IF PLANT IS DISABLED.
4. GLYCOL MAKE-UP FEEDER:
   a. PROVIDE MISCELLANEOUS INTERLOCKS TO THE GLYCOL FEEDER GENERAL ALARM CIRCUIT. THE DDC SYSTEM SHALL BE ALARMED UPON LOW LEVEL.
5. FAILURE OF TEMPERATURE/MOISTURE SENSOR:
   a. UPON SENSING A FAILURE OF THE TEMPERATURE/MOISTURE SENSOR, GENERAL AN ALARM AT THE BAS WORKSTATION.
6. SLAB TEMPERATURE PROTECTION:
   a. THE TEMPERATURE DIFFERENTIAL BETWEEN THE SLAB AND SNOWMELT SUPPLY TEMPERATURE SHALL BE LIMITED TO PREVENT CRACKING OF THE CONCRETE ONLY (NOT APPLICABLE TO PAVERS). INITIAL SETPOINT SHALL BE 115°F (ADJ.).

H. TRENDS:
1. PROVIDE THE FOLLOWING TRENDS. CONFIRM TRENDING INTERVAL WITH OWNER DURING SUBMITTALS.
   a. PUMP STATUS
   b. SNOWMELT WATER SUPPLY TEMPERATURE (1 & 2)
   c. SNOWMELT WATER SUPPLY TEMPERATURE SETPOINT (1 & 2)
   d. OUTSIDE AIR TEMPERATURE
   e. SLAB SENSOR TEMPERATURE (1 & 2)
   f. SLAB SENSOR MOISTURE (1 & 2)
   g. BOILER PERCENT OUTPUT
   h. BOILER LEAVING WATER TEMPERATURE
   i. BOILER RETURN WATER TEMPERATURE

I. STATUS REPORT:
1. THE BAS SHALL PROVIDE AN OPERATING STATUS SUMMARY OF THE FOLLOWING INFORMATION TO PROVIDE THE OPERATOR WITH CRITICAL UNIT OPERATING DATA.
   a. OPERATING MODE
   b. ACTIVE SMS TEMPERATURE SETPOINT
   c. SMS-T1
   d. SMS-T2
   e. SMR-T
   f. OUTSIDE AIR TEMPERATURE
   g. PUMP STATUS (1&2)
   h. SLAB SENSOR TEMPERATURE (1 & 2)
   i. SLAB SENSOR MOISTURE (1 & 2)
   g. BOILER PERCENT OUTPUT
   h. BOILER LEAVING WATER TEMPERATURE
   i. BOILER RETURN WATER TEMPERATURE

J. DIAGNOSTICS:
1. THE BAS SYSTEM SHALL BE ABLE TO ALARM FROM ALL SENSED POINTS FROM THE BOILER PLANT AND DIAGNOSTIC ALARMS SENSED BY THE LOCAL CONTROLLER. ALARM LIMITS SHALL BE DESIGNATED FOR ALL SENSED POINTS.



BAS CONTROL DIAGRAM
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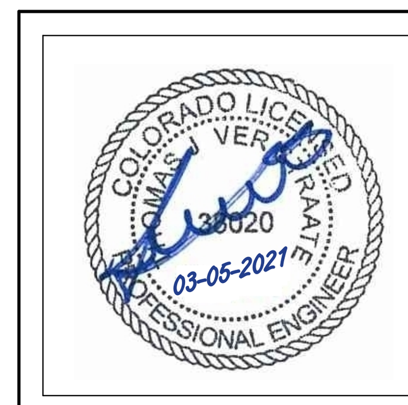
FILE: SBG PLATFORM v19.rvt
3/5/2021 7:22:09 AM

PERMIT SUBMITTAL 03/05/2021



NOTICE: DUTY OF COOPERATION
Release of these plans contemplates further cooperation among the owner, his contractor and the architect. Design and construction are complex. Although the architect and his consultants have performed their services with due care and diligence, they cannot guarantee perfection. Communication is imperfect and every contingency cannot be anticipated. Any ambiguity or discrepancy discovered by the use of these plans shall be reported immediately to the architect. Failure to notify the architect compounds misunderstanding and increases construction costs. A failure to cooperate by a simple notice to the architect shall relieve the architect from responsibility for the consequences. Changes made from the plans without consent of the architect are unauthorized and shall relieve the architect of responsibility for all consequences arriving out of such changes.

REVISIONS

No.	Description	Date

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Date: 03/05/21
Drawn By: EAB
Checked By: TVS

Project Phase
PERMIT SUBMITTAL

Sheet Title
HVAC DETAILS AND CONTROL DRAWINGS

Sheet Number
M400