IFGC PIPE SIZING CALCULATOR FOR NATURAL GAS PRESSURES LESS THAN 1.5 PSI

METER DISCHARGE PRESSURE =	14	("W.C.)
ALLOWABLE PRESSURE DROP =	7	("W.C.)
TOTAL EQUIVALENT LENGTH OF PIPE =	75	FEET
ALTITUDE CORRECTION FACTOR =	831	BTU/CFH @ ALT.

NOMINAL SCHD. 40 STEEL PIPE SIZE	CAPACITY (CFH)	CAPACITY (MBH)
1/2"	241	201
3/4"	504	420
1"	950	790
1-1/4"	1951	1622
1-1/2"	2923	2430
2"	5630	4679
2-1/2"	8973	7457
3"	15862	13182
4"	32353	26886
5"	58532	48640
6"	94776	78759

*PIPE CAPACITY IS CALCULATED USING FORMULA FOR LOW PRESSURE GAS (1.5 PSI AND LESS) LOCATED IN IFGC APPENDIX A

Q = 2313*D^2.623*((H)/(Cr*L))^.541

Q = CAPACITY (CFH)

D = INSIDE PIPE DIAMETER

H = ALLOWABLE PRESSURE DROP ("W.C.)

Cr = FACTOR FOR VISCOSITY, DENSITY AND TEMPERATURE = .6064

L = LENGTH OF PIPE (FEET)

SNOWMELT BOILER SCHEDULE

SYMBOL	SERVICE	MANUFACTURER	MODEL	HEATING CAPACITY: INPUT @ S.L. MBH	OUTPUT @ S.L. MBH	OUTPUT @ 6700' MBH	EWT (°F)	LWT (°F)	GPM	ELECTRICAL: VOLTAGE	PHASE	FLA	MCA	MOCP	FLUE SIZE IN	COMB. AIR SIZE IN	UNIT WEIGHT (LBS.)	REMARKS
EXISTING TO REMAIN, NOTED FOR REFERENCE ONLY																		
(E)B-1	SNOWMELT	AERCO	BMK 1500	1500	1410	1190	120	140	119	120	1	9.2	11.5	20	14	8	X	4
NEW BOILER																		
B-2	SNOWMELT	AERCO	BMK 1500	1500	1410	1190	120	140	119	120	1	9.2	11.5	20	14	8	X	1, 2, 3, 5

REMARKS:
1. ACCEPTABLE MANUFACTURERS: LAARS, LOCHINVAR.
2. BURNER SHALL BE DESIGNED TO FIRE ON NATURAL GAS, 720 BTU/CF, 7" WC.
3. PROVIDE INDIVIDUAL FACTORY MOUNTED BOILER CONTROL PANEL WITH (BUILDING STANDARD) CONTROLS TO COMMUNICATE WITH BUILDING AUTOMATION SYSTEM. COORDINATE WITH CONTROLS CONTRACTOR.
4. EXISTING BOILER TO REMAIN, SHOWN FOR REFERENCE ONLY. FIELD VERIFY.
5. 50% GLYCOL.

IN-LINE PUMP SCHEDULE

SYMBOL	MANUFACTURER	SERVICE	PUMP TYPE	MODEL	GPM	HEAD FT WC	EFF %	MIN HP	RPM	ELECTRICAL: VOLTS	PHASE	SUCTION SIZE IN	DISCH SIZE IN	APPROX OPERATING WEIGHT	REMARKS
EXISTING TO REMAIN, NOTED FOR REFERENCE ONLY															
(E)P-1	ARMSTRONG	SNOW-MELT	INLINE	4300	101	115	74	10	3600	208	3	3	3	100	3
NEW PUMP															
P-2	ARMSTRONG	SNOW-MELT	INLINE	4300	101	115	74	10	3600	208	3	3	3	100	1, 2

REMARKS:
1. ACCEPTABLE MANUFACTURERS: BELL AND GOSSETT, TACO.
2. PUMP SELECTION BASED ON 50% ETHYLENE GLYCOL.
3. EXISTING PUMP TO REMAIN, SHOWN FOR REFERENCE ONLY.

SNOWMELT SYSTEM SUMMARY

LOCATION	PROJECT NAME	ZONE	PROJECT ELEVATION (FT.)	SNOWMELT DESIGN TEMPERATURE (°F)	SNOWMELT DESIGN WIND SPEED (MPH)	TOTAL AREA PH 1 (SQ. FT.)	BTUH PER AREA SQ. FT.	TOTAL LOAD (BTUH)	TOTAL GPM @ 25 DEG DELTA T	SNOWMELT GLYCOL LEVEL (%)	SNOWMELT FLUID TEMP. DROP (°F)	TOTAL FLUID VOLUME (GAL)	GLYCOL VOLUME (GAL)	REMARKS
STEAMBOAT COLORADO	TORIAN PLUM APARTMENTS	EXISTING #1	6,700	0	10	10,776	140	1,508,000	101	50	25	108	44	1
		NEW #2	6,700	0	10	7,230	140	1,012,000	81	50	25	100	40	2

NEW BOILER SELECTION CALCULATIONS:
TOTAL SNOW-MELT LOAD: 1,012,000 BTUH / (0.94 * 0.72) = 1,500,000 BTUH INPUT @ S.L REQUIRED
0.94 BOILER EFFICIENCY
0.72 ALTITUDE ADJUSTMENT
SELECTED BOILER AT 1,500,000 INPUT BTUH TOTAL.

REMARKS:
1. EXISTING SNOW MELT ZONE.
2. EXISTING SNOW MELT ZONE INSTALLED, ACTIVATED UNDER THIS PROJECT.

TOTAL CONNECTED GAS LOAD SCHEDULE

EQUIPMENT	QTY	INPUT EACH (BTUH @ SL)	INPUT TOTAL (BTUH @ SL)	INLET PRESSURE	NOTES
EXISTING EQUIPMENT					
EXISTING BOILER B-1	1	1,500,000	1,500,000	7" WC	EXISTING TO REMAIN
TOTAL GAS LOAD REMAINING			1,500,000		
NEW EQUIPMENT					
NEW BOILER B-2	1	1,500,000	1,500,000	7" WC	1, 2, 3
TOTAL NEW LOAD=			1,500,000		
TOTAL EXISTING LOAD TO REMAIN=			1,500,000		
BUILDING TOTAL CONNECTED LOAD=			3,000,000		NEW AND EXISTING

NOTES:
1. MODIFICATIONS TO GAS METER AND/OR SERVICE PIPING SHALL BE PERFORMED BY THE GAS COMPANY. SUBMIT REQUIRED GAS SERVICE APPLICATION TO GAS COMPANY IN A TIMELY MANNER TO MEET THE CONSTRUCTION SCHEDULE.
2. FARTHEST CONNECTED DEVICE DISTANCE BASED ON 75'.
3. PIPE SIZING BASED ON PRESSURE AT METER OUTLET OF 14 INCHES WC. CONTRACTOR TO FIELD VERIFY OUTLET PRESSURE PRIOR TO STARTING WORK.

GENERAL NOTES:

CONTRACTOR SHALL DESIGN THE SNOW MELT SYSTEM ZONES BASED ON UPONOR, OR EQUAL. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS OF THE SNOW MELT ZONES FROM MANUFACTURER. SEE CIVIL PLANS FOR SNOW MELT ZONE LOCATIONS AND ADDITIONAL INFORMATION.

MECHANICAL LEGEND

NOT ALL ITEMS LISTED BELOW ARE USED ON THIS SET OF MECHANICAL DRAWINGS

GENERAL

SYMBOL	DESCRIPTION
DTL / SHT / EQUIP#	REFERENCE BUBBLE
	MECHANICAL/ELECTRICAL EQUIPMENT DESIGNATION
	REMOVE EXISTING
U	UNDERCUT DOOR
	AIR FLOW
	CONNECT NEW TO EXISTING

DOUBLE LINE DUCTWORK

SYMBOL	DESCRIPTION
	RECTANGULAR SUPPLY AIR DUCT UP
	RECTANGULAR SUPPLY AIR DUCT DOWN
	RECTANGULAR RETURN AIR / EXHAUST DUCT UP
	RECTANGULAR RETURN AIR / EXHAUST DUCT DOWN
	ROUND DUCT UP
	ROUND DUCT DOWN
	BRANCH DUCT 45° TAKE-OFF
	RECTANGULAR DUCT ELBOW WITH TURNING VANES
	RADIUS ELBOW RECTANGULAR/ROUND DUCT
	DUCT TRANSITION
	FLEX CONNECTION

SINGLE LINE DUCTWORK

SYMBOL	DESCRIPTION
	RECTANGULAR DUCT ELBOW WITH TURNING VANES
	RADIUS ELBOW RECTANGULAR/ROUND DUCT
	DUCT TRANSITION
	CONICAL SPIN-IN FITTING
	CONICAL SPIN-IN FITTING W/DAMPER
	FLEXIBLE DUCT

CONTROL DEVICES AND DAMPERS

SYMBOL	DESCRIPTION
H	HUMIDISTAT
P	PRESSURE SENSOR
T	SENSOR
T	WALL MOUNTED THERMOSTAT
T	UNIT MOUNTED THERMOSTAT
S	SWITCH
	FIRE DAMPER
R	RADIATION DAMPER
S	SMOKE DAMPER
	COMBINATION FIRE AND SMOKE DAMPER
	MANUAL VOLUME DAMPER W/LOCKING QUADRANT
M	MOTORIZED DAMPER

PIPING

SYMBOL	ABBV.	DESCRIPTION
HS	HS	HOT WATER SUPPLY
HR	HR	HOT WATER RETURN
CWS	CWS	CHILLED WATER SUPPLY
CWR	CWR	CHILLED WATER RETURN
CS	CS	CONDENSER SUPPLY
CR	CR	CONDENSER RETURN
HPS	HPS	HIGH PRESSURE STEAM
HPC	HPC	HIGH PRESSURE CONDENSATE
PC	PC	PUMPED CONDENSATE
D	D	EQUIPMENT DRAIN
RL	RL	REFRIGERANT LIQUID
RS	RS	REFRIGERANT SUCTION

PIPING SYMBOLS

SYMBOL	DESCRIPTION
	ARROW IN LINE INDICATES DIRECTION OF FLOW
XX	INDICATES PIPE SLOPE DOWN
	BOTTOM PIPE CONNECTION
	PIPING UP
	PIPING DOWN
	FIXTURE TRAP OR DRAIN TRAP
	PIPING CAP OR PLUG
	PUMP
BAL	BALANCING VALVE/ FLOW MEASURING DEVICE
	CALIBRATED BALANCING VALVE
	BALL VALVE
	PLUG VALVE
	GATE VALVE
	CHECK VALVE
	BUTTERFLY VALVE
	FLOW SWITCH
	SOLENOID VALVE
	PRESSURE REDUCING VALVE
	3-WAY TEMPERATURE CONTROL VALVE
	2-WAY TEMPERATURE CONTROL VALVE
	RELIEF VALVE
	STRAINER
	STRAINER WITH BLOW-OFF VALVE
	UNION
	PRESSURE GUAGE
	THERMOMETER
P/T	PRESSURE AND TEMPERATURE TAP
	CONCENTRIC REDUCER
	ECCENTRIC REDUCER
	FLEXIBLE CONNECTOR
	HOSE END DRAIN VALVE
	MANUAL AIR VENT

ABBREVIATIONS

AFF	ABOVE FINISHED FLOOR	MC	MECHANICAL CONTRACTOR	RA	RETURN AIR
AP	ACCESS PANEL	(N)	NEW	RE	REFER TO
C	COMMON	NC	NORMALLY CLOSED	SA	SUPPLY AIR
(E)	EXISTING	NIC	NOT IN CONTRACT	SRV	SAFETY RELIEF VALVE
EC	ELECTRICAL CONTRACTOR	NO	NORMALLY OPEN	TCC	TEMPERATURE CONTROL CONTRACTOR
ELEV	ELEVATION	NTS	NOT TO SCALE	TYP	TYPICAL
EQ	EQUIPMENT	OA	OUTSIDE AIR		
GC	GENERAL CONTRACTOR	PRV	PRESSURE REDUCING VALVE		

NOTE:

APPLICABLE CODE STANDARDS

2018 INTERNATIONAL BUILDING CODE
2018 INTERNATIONAL FIRE CODE
2018 INTERNATIONAL MECHANICAL CODE
2018 INTERNATIONAL PLUMBING CODE
2018 INTERNATIONAL ENERGY CONSERVATION CODE
2018 INTERNATIONAL FUEL GAS CODE

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Reviewed for Code Compliance
11/17/2023

TORIAN PLUM SNOW MELT UPGRADES

STEAMBOAT SPRINGS, COLORADO

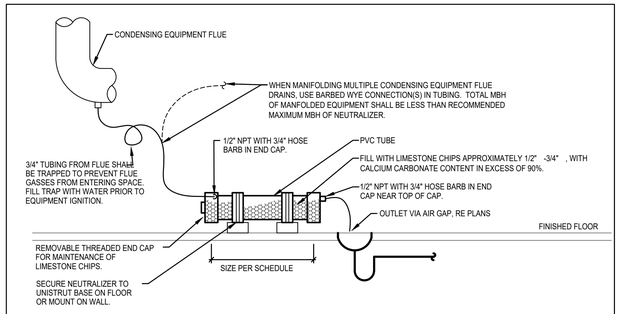
ISSUE	DATE
CONSTRUCTION DOCUMENTS	11/10/23

MEP JOB: 22336
DESIGNED: MAB
CHECKED: KVB

MECHANICAL EQUIPMENT SCHEDULES

REGISTERED 35133 11.09.23 PROFESSIONAL ENGINEER

M1.0



INLINE CONDENSATE NEUTRALIZER DIAGRAM

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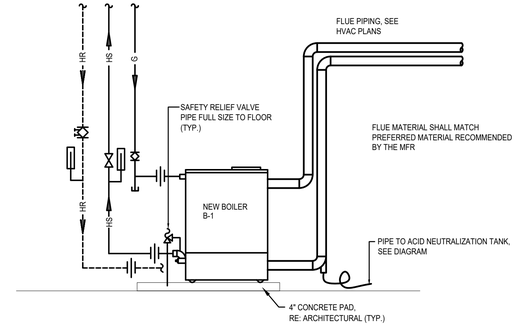

BOILER MOUNTING/PIPING DIAGRAM

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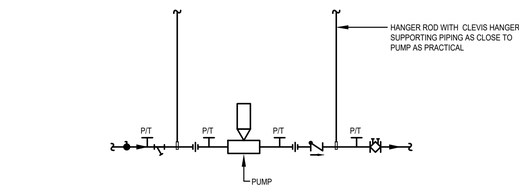

VERTICAL IN-LINE PUMP PIPING DIAGRAM

NOT TO SCALE 232100.02

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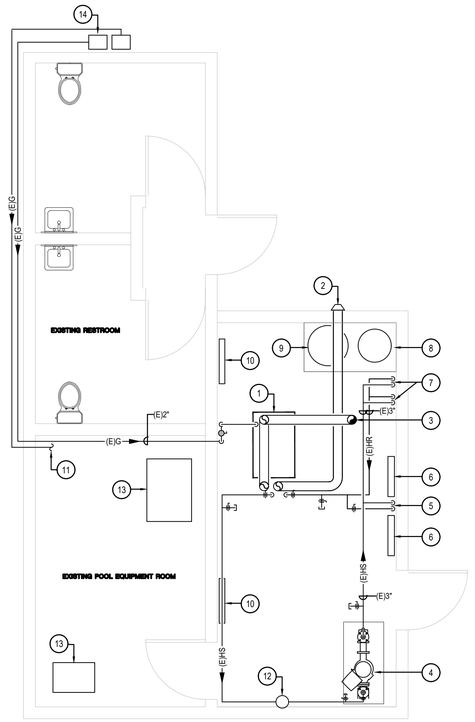
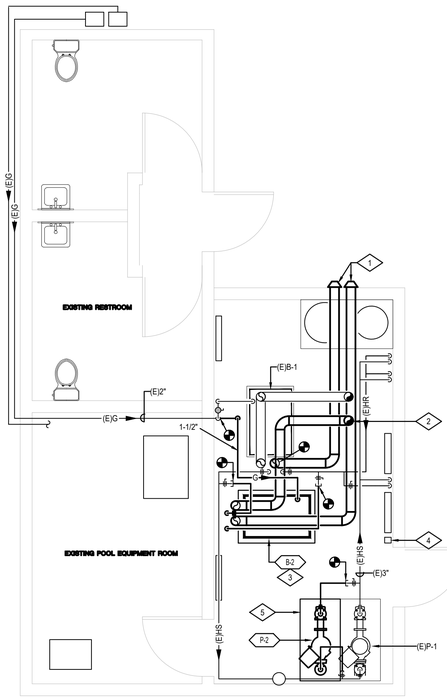
MECHANICAL DIAGRAMS

M1.1





BOILER ROOM MECHANICAL DEMOLITION PLAN

SCALE: 1/4" = 1'-0"

BOILER ROOM MECHANICAL PLAN

SCALE: 1/4" = 1'-0"

DEMOLITION DRAWING NOTES

1. EXISTING SNOW MELT GAS FIRED BOILER TO REMAIN. NO CHANGE.
2. REMOVE EXISTING DAMAGED 8" SNOW MELT BOILER INTAKE FROM EXTERIOR WALL PENETRATION BACK TO BOILER CONNECTION, FIELD VERIFY.
3. EXISTING BOILER FLUE DUCT UP THRU ROOF AND BACK TO BOILER TO REMAIN.
4. EXISTING PUMP P-1 TO REMAIN. NO CHANGE.
5. EXISTING HOT WATER SUPPLY AND RETURN PIPING TO SNOW MELT MANIFOLDS, FIELD VERIFY.
6. EXISTING SNOW MELT SYSTEM MANIFOLD.
7. EXISTING HOT WATER SUPPLY AND RETURN PIPING TO EXTERIOR SNOW MELT SYSTEM MANIFOLDS. FIELD VERIFY.
8. EXISTING GLYCOL FEEDER ASSEMBLY TO REMAIN. NO CHANGE.
9. EXISTING EXPANSION TANK TO REMAIN. NO CHANGE.
10. EXISTING ELECTRIC BASEBOARD HEATER TO REMAIN.
11. EXISTING GAS PIPING SERVING POOL/SPA EQUIPMENT TO REMAIN. FIELD VERIFY.
12. EXISTING AIR SEPARATOR TO REMAIN.
13. EXISTING POOL/SPA GAS FIRED HEATING EQUIPMENT TO REMAIN. FIELD VERIFY.
14. EXISTING GAS METER. FIELD VERIFY.

DRAWING NOTES

1. TERMINATE 8" COMBUSTION INTAKE PIPE THROUGH WALL WITH HOODED INTAKE CAP. CAP SHALL BE PROVIDED WITH BIRD SCREEN. TERMINATION SHALL BE 8 FT. ABOVE GRADE.
2. TERMINATE 8" FLUE DUCTS WITH UL LISTED AND APPROVED VERTICAL VENT TERMINATION. VENT PIPE SHALL BE AL29-4C POLYPRO MATERIAL. INSTALL PER MANUFACTURERS INSTALLATION INSTRUCTIONS. TERMINATION SHALL BE LOCATED AT LEAST 8 FT. FROM ADJACENT VERTICAL WALL.
3. CONDENSATE DRAINS FROM BOILER SHALL BE ROUTED TO AN ACID NEUTRALIZING TANK BEFORE ENTERING THE PUBLIC SANITARY SEWER SYSTEM. ALL MATERIALS FROM BOILER TO NEUTRALIZATION TANK SHALL BE ACID RESISTANT. INSTALLING CONTRACTOR SHALL COORDINATE THE FINAL LOCATION OF ACID NEUTRALIZATION TANK WITH EQUIPMENT LAYOUT.
4. PROVIDE EPO SWITCH FOR BOILER SHUT OFF COORDINATED WITH ELECTRICAL.
5. EXTEND EXISTING CONCRETE PAD FOR NEW PUMP. MATCH EXISTING CONCRETE PAD.

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MECHANICAL ROOM PLANS

REGISTERED PROFESSIONAL ENGINEER
35133
11.09.23

M2.0

DIVISION 230000 - HYDRONIC SPECIFICATIONS

PIPE AND PIPE FITTINGS

WORK INCLUDED
1. HOT WATER, CHILLED WATER, CONDENSER WATER PIPING.

QUALITY ASSURANCE
1. WELDING MATERIALS AND LABOR SHALL CONFORM TO ASME CODE FOR PRESSURE PIPING AND APPLICABLE STATE LABOR REGULATIONS.
2. USE WELDERS FULLY QUALIFIED AND LICENSED BY STATE AUTHORITIES. FURNISH CERTIFICATION FROM APPROVED TESTING AGENCY OR NATIONAL CERTIFIED PIPE WELDING BUREAU THAT WELDERS PERFORMING WORK ARE CERTIFIED.
3. ALL PIPING MATERIALS SHALL COMPLY WITH LOCAL CODES.

REFERENCE STANDARDS
1. (CURRENT) ANSI/ASTM - GRAY IRON CASTINGS FOR VALVES, FLANGES, AND PIPE FITTINGS.
2. (CURRENT) ANSI/AWS - STRUCTURAL WELDING CODE.
3. (CURRENT) ANSI/AWWA - POLYETHYLENE ENCASEMENT FOR GRAY AND DUCTILE CAST IRON PIPING FOR WATER AND OTHER LIQUIDS.
4. (CURRENT) ASTM - PRACTICE FOR MAKING SOLVENT_CEMENTED JOINTS WITH PVC PIPE AND FITTINGS.

PIPE AND TUBE
1. STEEL PIPE: ANSI/ASTM A53, BLACK.
2. DUCTILE IRON WATER PIPE: ANSI/AWWA C151.
3. COPPER WATER TUBE: ASTM B88-99EL, SEAMLESS.
4. CROSSLINKED POLYETHYLENE (PEX) PIPING FOR SNOWMELT ZONE SYSTEMS ONLY, ASTM 876-01.

PIPE AND TUBE JOINTS AND FITTINGS
1. THREADED PIPE FITTINGS: MALLEABLE IRON, ANSI/ASME B16.3 - 1999.
2. COPPER AND BRASS PIPE FITTINGS: ANSI/ASME B16.22 - 1995, PRESSURE FITTINGS.
3. CROSSLINKED POLYETHYLENE (PEX) FITTINGS - ASTM F1974-OOe. SNOWMELT ZONE SYSTEM ONLY.

UNIONS AND COUPLINGS
1. 2" AND SMALLER: 125 PSI BRONZE FOR COPPER OR BRASS PIPE, SOLDERED JOINTS.
2. 2 1/2" AND LARGER: 150 PSI FORGED STEEL FLANGES, RAISED FACE WITH WELDING NECK, FOR FERROUS PIPING; BRONZE FLANGES FOR COPPER OR BRASS PIPING. GASKETS FOR WATER ABOVE 140 DEG F.
3. GROOVED AND SHOULDERED PIPE ENDS: MALLEABLE IRON HOUSING CLAMPS TO ENGAGE AND LOCK, DESIGNED TO PERMIT SOME ANGULAR DEFLECTION, CONTRACTION, EXPANSION; C_SHAPE COMPOSITION SEALING GASKET, STEEL BOLTS, NUTS, WASHERS; GALVANIZED COUPLINGS FOR GALVANIZED PIPE.
4. DIELECTRIC UNIONS AND FLANGES: (CHILLED WATER ONLY) PROPER GASKET MATERIAL FOR CONNECTION OF DISSIMILAR METALS. UNIONS, 2" AND SMALLER; DIELECTRICALLY GASKETED FLANGES, 2_1/2" AND LARGER. USE DIELECTRIC CONNECTIONS WHEREVER JOINING DISSIMILAR METALS IN OPEN CONDENSER WATER SYSTEMS.

STRAINERS
1. 2" AND SMALLER: THREADED BRASS OR IRON BODY, Y PATTERN WITH 1/32" STAINLESS STEEL PERFORATED SCREEN.
2. 2-1/2" AND LARGER: FLANGED IRON BODY, Y PATTERN WITH 3/64" STAINLESS STEEL PERFORATED SCREEN.
3. SCREEN FREE AREA: MINIMUM THREE TIMES AREA OF INLET PIPE.

GENERAL EXECUTION
1. VERIFY LOCATION(S) OF ALL AIR PLENUMS. ALL PIPING AND SUPPORT MATERIALS INSTALLED IN AIR PLENUMS SHALL BE PLENUM-RATED. DO NOT INSTALL SPECIFIED NON-PLENUM-RATED MATERIALS IN AIR PLENUMS; USE PLENUM-RATED OPTIONS.
2. ROUTE PIPING IN ORDERLY MANNER AND MAINTAIN PROPER SLOPE. INSTALL TO CONSERVE HEADROOM AND INTERFERE AS LITTLE AS POSSIBLE WITH USE OF SPACE. RUN EXPOSED PIPING PARALLEL TO WALLS. GROUP PIPING WHENEVER PRACTICAL AT COMMON ELEVATIONS. INSTALL CONCEALED PIPES CLOSE TO BUILDING STRUCTURE TO KEEP FURRING TO A MINIMUM.
3. CONCEAL PIPING IN WALLS OR ABOVE CEILING UNLESS OTHERWISE NOTED.
4. MAINTAIN FOLLOWING PIPE SLOPES UNLESS OTHERWISE NOTED ON DRAWINGS:
   A. HYDRONIC PIPING: 1" UP PER 40'_0" IN DIRECTION OF FLOW.
   B. COOLING COIL CONDENSATE DRAIN PIPING: 1/8" DOWN PER LINEAR FOOT IN THE DIRECTION OF FLOW.
5. MAKE REDUCTIONS IN HORIZONTAL HYDRONIC WATER PIPE WITH FLAT TOP ECCENTRIC REDUCING FITTINGS.
6. INSTALL PIPING TO ALLOW FOR EXPANSION AND CONTRACTION WITHOUT STRESSING PIPE OR CONNECTED EQUIPMENT.
7. PROVIDE CLEARANCE FOR INSTALLATION OF INSULATION AND FOR ACCESS TO VALVES, AIR VENTS, DRAINS, UNIONS.
8. INSTALL SAME TYPE PIPING MATERIAL SPECIFIED FOR INSIDE BUILDING TO 5'-0" OUTSIDE BUILDING.
9. PROVIDE HOSE END DRAIN VALVE ON ALL STRAINERS 1 1/2" AND LARGER.
10. MAKE CONNECTIONS TO EQUIPMENT WITH UNIONS OR FLANGES.
11. COOLING COIL CONDENSATE DRAIN PIPING SHALL BE EQUAL TO OR LARGER THAN THE EXIT DIAMETER OF THE DRAIN PAN DRAIN CONNECTION.
12. PIPE REDUCERS: USE REDUCERS, NOT BUSHINGS, FOR CHANGES IN PIPE SIZES.
13. ON CLOSED SYSTEMS, EQUIP LOW POINTS WITH 3/4" DRAIN VALVES, HIGH POINTS WITH AIR VENTS.

PREPARATION
1. REAM PIPE AND TUBE ENDS. REMOVE BURRS. BEVEL PLAIN END PIPE. REMOVE SCALE AND DIRT, INSIDE AND OUTSIDE, BEFORE ASSEMBLY. REMOVE WELDING SLAG OR FOREIGN MATERIAL FROM PIPE AND FITTING MATERIALS.
2. CLOSE ENDS OF PIPE IMMEDIATELY AFTER INSTALLATION. LEAVE CLOSURE IN PLACE UNTIL REMOVAL IS NECESSARY FOR COMPLETION OF INSTALLATION.
3. FLUSH EACH PIPING SYSTEM AND PROVE CLEAN.

STEEL PIPE CONNECTIONS
1. 2-1/2" AND LARGER - WELDED.
2. DO NOT USE MITERED AND WELDED ELBOWS IN LIEU OF FITTINGS.
3. USE BUTT WELD FITTINGS FOR WELDED STEEL PIPES. USE OXYACETYLENE OR ELECTRIC ARC PROCESS.
4. FLANGED PIPING _ USE AMERICAN NATIONAL STANDARD REGULAR GALVANIZED HEX HEAD BOLTS AND GALVANIZED HEAVY COLD PRESSED HEX NUTS. COAT GASKETS WITH LUBRICANT BEFORE INSTALLING.
5. GROOVED PIPING _ DUCTILE IRON CONFORMING TO ASTM-395. VICTAULIC STYLE 07, WITH EPDM SYNTHETIC ELASTOMER GASKET, OVAL NECK TRACK BOLTS AND NUTS FOR GROOVED END PIPE. USE PIPE GROOVING TOOL SPECIFICALLY DESIGNED FOR SYSTEM. USE GROOVED MECHANICAL COUPLINGS AND FASTENERS ONLY FOR CHILLED WATER AND CONDENSER WATER PIPING AND ONLY IN ACCESSIBLE LOCATIONS.
6. USE LONG RADIUS ELBOWS FOR WATER PIPING.

COPPER PIPE CONNECTIONS
1. 2-1/2" AND SMALLER: USE 15% SILVER BRAZING ALLOY AND SILVER BRAZING FLUX ON CONCEALED JOINTS. USE 95% TIN, 5% ANTIMONY LEAD_FREE SOLDER AND ASTM B813-91 NON-CORROSIVE STM 1.0 FLUX ON OTHER JOINTS. APPLY FLUX ON CLEANED END OF PIPE AND INSIDE FITTINGS WITH SMOOTH EVEN COATS.
2. 3" AND LARGER: USE 15% SILVER BRAZING ALLOY AND SILVER BRAZING FLUX. APPLY FLUX ON CLEANED END OF PIPE AND INSIDE FITTINGS WITH SMOOTH EVEN COATS.
3. CONTINUOUSLY PURGE PIPING WITH DRY NITROGEN DURING SILVER BRAZING PROCESS.

APPLICATION OF PIPING SYSTEMS
SERVICE & MATERIAL
1. HEATING HOT WATER (TO 250 F), CONDENSER WATER, CHILLED WATER
   STEEL, SCHEDULE 40; COPPER, TYPE L, HARD DRAWN.
2. EQUIPMENT DRAINS AND OVERFLOWS.
   COPPER, TYPE M OR DWV, HARD DRAWN.

PIPE TESTING
1. TEST ALL PIPING SYSTEMS. CORRECT LEAKS BY REMAKING JOINTS. REMOVE EQUIPMENT NOT ABLE TO WITHSTAND TEST PRESSURE FROM SYSTEM DURING TEST. CONSULT GOVERNING CODES FOR SPECIAL SYSTEM REQUIREMENTS.
2. GIVE AMPLE NOTICE OF DATES WHEN ACCEPTANCE TEST WILL BE CONDUCTED. CONDUCT PRESSURE, PERFORMANCE, OPERATING TESTS IN PRESENCE OF REPRESENTATIVE OF AGENCIES HAVING JURISDICTION. SUBMIT THREE COPIES OF SUCCESSFUL TEST REPORTS TO OWNER.
3. TEST PIPING BEFORE BEING PERMANENTLY ENCLOSED.
4. OBTAIN CERTIFICATES OF APPROVAL, ACCEPTANCE, COMPLIANCE WITH REGULATIONS OF AGENCIES HAVING JURISDICTION. SUBMIT TO OWNER.

PIPE AND PIPE FITTINGS (CONT.)

SYSTEM TESTS
1. HYDROSTATIC TEST - WATER PIPING (NEW PIPING ONLY): HAND PUMP SYSTEM TO GREATER OF 100 PSIG OR 150% OF OPERATING PRESSURE. MAINTAIN PRESSURE UNTIL SYSTEM HAS BEEN INSPECTED FOR LEAKS BUT NOT LESS THAN FOUR HOURS.
2. AFTER TESTING THE HYDRONIC SYSTEM (NEW PIPING ONLY) FOR PROPER OPERATION OF AUTOMATIC DEVICES AND CONTROLS, OPERATE SYSTEM FOR ONE WEEK, THEN DRAIN AND WASH OUT WITH PRE-START UP CLEANING CHEMICALS. CLEAN STRAINER BASKETS, REFILL SYSTEM, LEAVE IN PROPER WORKING ORDER. AFTER SYSTEM HAS BEEN IN OPERATION FOR ONE MONTH, THOROUGHLY CHECK SYSTEM AND DEVICES FOR WATER LEAKAGE.

UNDERGROUND PIPE INSTALLATION
1. PROTECT STEEL PIPE INSTALLED BELOW GRADE AND TO MINIMUM 6" ABOVE GRADE WITH FACTORY APPLIED COVERING, PRO-CO FELT AND PIPE LINE ENAMEL NO. 4 DOUBLE WRAP OR X-TRU-COAT PLASTIC COATING.
2. CLEAN FITTINGS, NIPPLES, OTHER FIELD JOINTS THOROUGHLY.
3. APPLY TAPECOAT COMPANY PRIME COAT AND ONE LAYER OF TAPECOAT #20 HEAT APPLIED, 62 MIL TAPE PER MANUFACTURER'S RECOMMENDATIONS.

VALVES

SUBMITTALS
1. FURNISH MANUFACTURER'S SUBMITTAL DATA FOR VALVES.
2. VALVES SHALL BE OF SAME MANUFACTURER WHERE POSSIBLE.

VALVE SEATS, MATERIALS
1. SUITABLE FOR SERVICE INTENDED.

ACCEPTABLE MANUFACTURES
1. BALL VALVE: APOLLO, NIBCO.
2. BUTTERFLY VALVE: KEYSTONE, NIBCO.
3. PLUG VALVE: DEZURIK, ROCKWELL.

RATINGS
1. UNLESS OTHERWISE INDICATED, VALVES SHALL BE SUITABLE FOR 200 PSIG WOG AND 250 F.

SHUTOFF VALVE
1. BALL VALVE, 2" AND SMALLER: TWO-PIECE BRONZE OR FORGED BRASS BODY WITH PTFE SEATS, PRESSURE RATED TO 150 SWP/600 WOG, FULL PORT, BLOWOUT-PROOF STEM AND POSITIVE SHUT-OFF. PACKING GLAND WITH PTFE PACKING. STEM EXTENSION WHERE INSULATED, LOCKABLE HANDLE WHERE REQUIRED.
2. BUTTERFLY VALVE, 2-1/2" AND LARGER: FULL LUG TYPE, DUCTILE IRON BODY, 250 F SERVICE; ALUMINUM BRONZE DISK, STAINLESS STEEL STEM; CORROSION RESISTANT BEARINGS, EPDM SEAT, EXTENDED NECK FOR 2" INSULATION, CAPABLE OF BI-DIRECTIONAL DEAD END SERVICE TO FULL RATED WORKING PRESSURE OF THE VALVE UPON REMOVAL OF DOWNSTREAM FLANGE.

BALANCING VALVE
1. 2" AND SMALLER: FULL PORTED BALL VALVE WITH BALANCING STOPS.
2. 2-1/2" AND LARGER: ECCENTRIC PLUG, SEMI-STEEL BODY, RESILIENT PLUG SEALS, CORROSION RESISTANT BEARINGS, ADJUSTABLE MEMORY STOP.

CHECK VALVE
1. 2" AND SMALLER: BRONZE, SWING DISC, SOLDER OR THREADED ENDS.
2. 2-1/2" AND LARGER: IRON BODY, BRONZE TRIM, SWING DISC, RENEWABLE DISC AND SEAT, FLANGED ENDS.
3. SPRING LOADED, SILENT TYPE, CAST IRON BODY WITH BUNA-N SEATS SUITABLE FOR 250 F. WAFER AND DISCS OF ALUMINUM, BRONZE, OR DUCTILE IRON. SHAFT AND SPRINGS TYPE 316 STAINLESS STEEL.

DRAIN VALVE
1. BALL VALVE WITH NIPPLE, CAP, HOSE THREAD.

VALVE OPERATORS
1. BUTTERFLY VALVES: 2-1/2" THROUGH 6" -LEVER LOCK HANDLE WITH TOOTHED PLATE FOR SHUT-OFF SERVICE; INFINITELY ADJUSTABLE HANDLE WITH LOCK NUT AND MEMORY STOP FOR THROTTLING SERVICE. VALVES 8" AND LARGER SHALL BE GEAR OPERATED.
2. PROVIDE VALVES LOCATED MORE THAN 7'-0" FROM FLOOR IN EQUIPMENT ROOM AREAS WITH CHAIN OPERATED SHEAVES. EXTEND CHAINS TO ABOUT 5'-0" ABOVE FLOOR AND HOOK TO CLIPS ARRANGED TO CLEAR WALKING AISLES.
3. AUTOMATIC TEMPERATURE CONTROL VALVE SHALL HAVE ELECTRONIC ACTUATORS FOR MODULATING OR OPEN/CLOSE SERVICE.

INSTALLATION
1. PROVIDE VALVES SUITABLE TO CONNECT TO ADJOINING PIPING AS SPECIFIED FOR PIPE JOINTS. USE PIPE SIZE VALVES.
   A. 2" AND SMALLER: THREADED OR SOLDERED.
   B. 2-1/2" AND LARGER: FLANGED.
2. SOLDER OR SCREW TO SOLDER ADAPTERS FOR COPPER TUBING.
3. USE GROOVED BODY VALVES WITH GROOVED JOINT PIPING.
4. USE BUTTERFLY VALVE WITH TAPPED LUG BODY WHEN USED FOR ISOLATING SERVICE.
5. WHEN POSSIBLE INSTALL BUTTERFLY VALVES 8" AND LARGER WITH STEMS IN THE HORIZONTAL POSITION AND THE BOTTOM OF THE DISC OPENING DOWNSTREAM.
6. INSTALL PLUG VALVES USED FOR COMBINATION ISOLATION AND BALANCING DUTY CONSISTENT WITH FLOW DIRECTION ANTICIPATED DURING ISOLATION, NOT NORMAL DUTY.
7. PROVIDE DRAIN VALVES AT MAIN SHUT-OFF VALVES, LOW POINTS OF PIPING AND APPARATUS.
8. REMOVE STEMS AND BONNETS FROM SOLDER END VALVES DURING INSTALLATION.
9. USE SPRING LOADED CHECK VALVES AT PUMPS AND WHERE INSTALLED IN VERTICAL POSITION.

EXPANSION COMPENSATION

DESIGN CRITERIA
1. BASE EXPANSION CALCULATIONS ON 40 F INSTALLATION TEMPERATURE TO 200 F FOR HOT WATER HEATING. INCLUDE 30% SAFETY FACTOR.

SUBMITTALS
1. FURNISH MANUFACTURER'S SUBMITTAL DATA FOR:
   A. FLEXIBLE PUMP AND PIPE CONNECTORS.
   B. EXPANSION JOINTS.

ACCEPTABLE MANUFACTURES
1. FLEXONICS
2. GARLOCK
3. HYSPAN

FLEXIBLE PUMP AND PIPE CONNECTORS
1. HOSE AND BRAID, THREADED MALE NIPPLES 2" AND SMALLER, FLANGED CONNECTIONS 2-1/2" AND LARGER. STAINLESS STEEL HOSE FOR STEEL PIPING. BRONZE INNER HOSE FOR COPPER PIPING.
2. NEOPRENE SINGLE-SPHERE UNIT WITH 150 PSIG ASA STEEL FLOATING FLANGES, 150 PSIG MAXIMUM OPERATING PRESSURE, 220 F MAXIMUM OPERATING TEMPERATURE. MAXIMUM ALLOWABLE MOVEMENT LIMITS: 3/8" AXIAL COMPRESSION, 1/4" AXIAL ELONGATION, 3/8" LATERAL MOVEMENT, 15 DEGREE ANGULAR MOVEMENT.

EXPANSION LOOPS
1. FLEXIBLE LOOPS SHALL BE DESIGNED TO IMPART NO THRUST LOADS ON THE ANCHORS. THE LOOPS SHALL CONSIST OF TWO FLEXIBLE SECTIONS OF STAINLESS STEEL HOSE AND BRAID, TWO 90 DEGREE ELBOWS AND A 180 DEGREE BEND FITTING. LOOPS SHALL BE INSTALLED IN A NEUTRAL, PRE-COMPRESSED OR PRE-EXTENDED CONDITION AS REQUIRED FOR APPLICATION. INSTALL AND GUIDE PER MANUFACTURER'S RECOMMENDATIONS.

CONNECTIONS
1. PROVIDE DEVICES SUITABLE TO CONNECT TO ADJOINING PIPING AS SPECIFIED FOR PIPE JOINTS. USE PIPE SIZED UNITS.

INSTALLATION
1. INSTALL FLEXIBLE PIPE CONNECTORS ON PIPES CONNECTED TO EQUIPMENT SUPPORTED BY VIBRATION ISOLATORS.
2. INSTALL FLEXIBLE CONNECTORS AT RIGHT ANGLES TO DISPLACEMENT. INSTALL ONE END IMMEDIATELY ADJACENT TO ISOLATED EQUIPMENT AND ANCHOR OTHER END.
3. INSTALL PIPING, ANCHORS, GUIDES TO CONTROL EXPANSION AND CONTRACTION OF PIPING INCLUDING LOOPS, PIPE OFFSETS, SWING JOINTS.
4. RIGIDLY ANCHOR PIPE TO BUILDING STRUCTURE WHERE NECESSARY. PROVIDE PIPE GUIDES SO MOVEMENT TAKES PLACE ALONG AXIS OF PIPE ONLY.

SUPPORTS, ANCHORS, SEALS

WORK INCLUDED
1. PIPE HANGERS AND SUPPORTS.

REFERENCE STANDARDS
1. PIPE SUPPORTS: CURRENT ANSI STANDARD.
2. FIRE BARRIER PRODUCTS: CURRENT ASTM AND UL STANDARDS.

SUBMITTALS
1. FURNISH MANUFACTURER'S SUBMITTAL DATA FOR PREFABRICATED EQUIPMENT SUPPORTS.

PIPE HANGERS AND SUPPORTS
1. HANGERS, PIPE SIZES TO 1-1/2": ADJUSTABLE STEEL RING (INSULATED PIPE) OR BAND (UNINSULATED PIPE).
2. HANGERS, HOT PIPE SIZES 2" TO 4" AND ALL COLD PIPE SIZES: ADJUSTABLE STEEL CLEVIS.
3. HANGERS, HOT PIPE SIZES 5" AND OVER: ADJUSTABLE STEEL YOKE AND CAST IRON ROLL.
4. MULTIPLE OR TRAPEZE HANGERS:
   A. TRAPEZE HANGERS SHALL BE CONSTRUCTED FROM 12 GAUGE ROLL FORMED ASTM A570 GR. 33 STRUCTURAL STEEL CHANNEL 1-5/8" X 1-5/8" MINIMUM.
   B. MOUNT PIPES TO TRAPEZE WITH TWO PIECE PIPE STRAPS SIZED FOR OUTSIDE DIAMETER OF PIPE OR INSULATION (IF PIPES ARE REQUIRED TO BE INSULATED). FOR PIPE REQUIRED TO BE INSULATED, PROVIDE A 360 DEGREE 12" LONG GALVANIZED METAL SHIELD SURROUNDING A 360 DEGREE INSERT OF HIGH DENSITY CALCIUM SILICATE INSULATION OF THE SAME THICKNESS AS THE ADJOINING PIPE INSULATION.
   C. FOR PIPES SUBJECTED TO AXIAL MOVEMENT:
      - STRUT MOUNTED ROLLER SUPPORT FOR PIPES 5" AND OVER. USE PIPE PROTECTION SHIELD OR SADDLES ON INSULATED LINES.
      - STRUT MOUNTED PIPE GUIDE.
5. WALL SUPPORT, PIPE SIZES TO 3": CARBON STEEL HOOK.
6. WALL SUPPORT, PIPE SIZES 4" AND OVER: WELDED STEEL BRACKET AND PIPE STRAP. ADJUSTABLE STEEL YOKE PIPE ROLL OR ROLLER CHAIR FOR HOT PIPE SIZES 5" AND OVER.
7. VERTICAL SUPPORT: STEEL RISER CLAMP.
8. FLOOR SUPPORT, HOT PIPE SIZES TO 4" AND ALL COLD PIPE SIZES: CARBON STEEL, ADJUSTABLE PIPE SADDLE, LOCKNUT NIPPLE, FLOOR FLANGE, CONCRETE PIER OR STEEL SUPPORT SIZED FOR PIPE ELEVATION.
9. FLOOR SUPPORT, HOT PIPE SIZES 5" AND OVER: ADJUSTABLE ROLLER STAND AND BASE PLATE, STEEL SCREWS, CONCRETE PIER OR STEEL SUPPORT SIZED FOR PIPE ELEVATION.
10. FOR PIPE SIZES 1-1/2" AND SMALLER, PROTECT INSULATED HORIZONTAL PIPE AT POINT OF SUPPORT BY 180 DEGREE, 12" LONG SHEET METAL SHIELD. NO HANGER SHALL PENETRATE OR CRUSH INSULATING MATERIAL.
11. FOR PIPE SIZES 2" AND LARGER, PROTECT INSULATED HORIZONTAL PIPE AT POINT OF SUPPORT BY 180 DEGREE, 12" LONG GALVANIZED SHEET METAL SHIELD SURROUNDING 180 DEGREE INSERT OF HIGH DENSITY CALCIUM SILICATE INSULATION OF SAME THICKNESS AS ADJOINING PIPE INSULATION. ON COLD PIPING, EXTEND INSULATION INSERT 1" BEYOND SHEET METAL SHIELD AT EACH END. OVERSIZE HANGERS TO ACCOMMODATE SHIELDED INSERTS. NO HANGER SHALL PENETRATE OR CRUSH INSULATING MATERIAL. AT CONTRACTOR'S OPTION, PRE-MANUFACTURED THERMAL HANGER SHIELDS WITH INTEGRAL VAPOR BARRIER, EQUIVALENT TO VALUE ENGINEERED PRODUCTS PRO-SHIELD OR PRO-SHIELD N/T, MAY BE UTILIZED. FOR EXTERIOR INSTALLATIONS USE WEATHER SHIELD WITH ALUMINUM JACKET.
12. PROVIDE COPPER PLATED HANGERS AND SUPPORTS FOR COPPER PIPING WHERE PIPING AND HANGER ARE IN DIRECT CONTACT WITH ONE ANOTHER.

PIPE HANGER RODS
1. THREADED STEEL.

UPPER ATTACHMENTS
1. STEEL STRUCTURE: BEAM CLAMP OR C-CLAMP WITH RETAINING STRAP.
2. CONCRETE STRUCTURE: DROP-IN ANCHOR, ZINC PLATED CARBON STEEL BODY WITH FLANGED TOP, FOUR WAY EXPANSION SLOTS.
3. WOOD STRUCTURE: ANGLE CLIP - MINIMUM 1-1/2" BY 1-1/2" BY 3/16" THICK WITH TWO LAG OR WOOD SCREWS INTO WOOD MEMBER, PENETRATED A MINIMUM OF 2" INTO WOOD. FOR NOMINAL 2" LUMBER (1-1/2" THICK) THROUGH-BOLT WITH MINIMUM 1/4" DIAMETER MACHINE SCREW AND MINIMUM 1" OD FLAT WASHER EACH SIDE. DOUBLE-NUT THREADED ROD THROUGH ANGLE CLIP.

ANCHORS
1. USE ANCHORS FOR SUSPENDING HANGERS FROM REINFORCED CONCRETE SLABS, AND SIDES OF REINFORCED CONCRETE BEAMS.
2. REVIEW ANCHOR LOCATIONS, DEPTHS WITH ARCHITECT AND STRUCTURAL ENGINEER BEFORE INSTALLATION.
3. INSTALL PER MANUFACTURER'S DESIGN CRITERIA, INSTALLATION INSTRUCTIONS.

PIPE HANGERS AND SUPPORTS
1. SUPPORT HORIZONTAL PIPING AS FOLLOWS:

PIPE HANGER AND SUPPORT CHART			
NOMINAL PIPE SIZE	MAXIMUM HANGER SPACING		HANGER ROD DIAMETER
	STEEL	COPPER	
1-1/4" AND SMALLER	6'-0"	6'-0"	3/8"
1-1/2" TO 4"	12'-0"	12'-0"	3/8"
5" TO 8"	12'-0"	12'-0"	1/2"
10" TO 12"	12'-0"	12'-0"	5/8"

2. PLACE HANGER WITHIN 1'-6" OF EACH ELBOW OR TEE.
3. USE HANGERS WHICH ARE VERTICALLY ADJUSTABLE 1-1/2" MINIMUM AFTER PIPING IS ERECTED.
4. SUPPORT VERTICAL PIPING AT EVERY FLOOR.
5. SUPPORT EACH BRANCH PIPE TO EQUIPMENT AT TAKE-OFF AND WITHIN 12" OF TERMINATION.
6. PROVIDE GALVANIZED STEEL INSULATION PROTECTION SADDLES AT ALL SUPPORT POINTS FOR INSULATED PIPES ON TRAPEZE HANGERS.
7. ANCHOR ALL SUPPORTING LUGS OR GUIDES TO BUILDING STRUCTURE.
8. PROVIDE MULTIPLE OR TRAPEZE HANGERS WHERE SEVERAL PIPES CAN BE INSTALLED IN PARALLEL AND AT SAME ELEVATION. SPACE TRAPEZE HANGERS BASED UPON SMALLEST PIPE SIZE.
9. SUPPORT RISER PIPING INDEPENDENTLY OF CONNECTED HORIZONTAL PIPING.
10. REPAIR ANY FIRE RATED COATING TO STRUCTURE DAMAGED DURING INSTALLATION OF ATTACHMENTS.

FLASHING AND SAFING
1. WHERE EXPOSED PIPING PASSES THROUGH WALLS, FLOORS OR ROOFS, PROVIDE CHROME PLATED OR STAINLESS STEEL ESCUTCHEON FOR PIPING.
2. PROVIDE SOUND RATED FLASHING AROUND PIPES PASSING FROM EQUIPMENT ROOMS, INSTALLED PER MANUFACTURER'S DATA FOR SOUND CONTROL TO MEET THE ATTENUATION SPECIFIED ON ARCHITECTURAL DRAWINGS FOR THE DESIGNATED WALL.
3. FLASH AND COUNTERFLASH WHERE MECHANICAL EQUIPMENT PASSES THROUGH WEATHER- OR WATER-PROOFED WALLS, FLOORS AND ROOFS.

SUPPORTS, ANCHORS, SEALS (CONT.)

SLEEVES
1. PROVIDE PIPE SLEEVES TO APPLICABLE TRADES WITH PRECISE ROUGH-IN LOCATIONS FOR PIPES PASSING THROUGH CONCRETE OR MASONRY CONSTRUCTION. UNLESS OTHERWISE INDICATED, SLEEVES SHALL BE OF SIZE TO PROVIDE FROM 1/4" TO 1" CLEARANCE BETWEEN BARE PIPE AND SLEEVE OR BETWEEN INSULATION JACKET AND SLEEVE. WHERE PIPE PASSES THROUGH CONCRETE FLOOR, EXTEND SLEEVE MINIMUM 1" ABOVE FINISHED FLOOR.
2. SLEEVES IN BEARING WALLS, WATERPROOF MEMBRANE FLOORS AND WET AREAS SHALL BE STEEL PIPE OR CAST IRON PIPE FOR SMALL PIPES. SLEEVES IN NON-BEARING WALLS, FLOORS AND CEILINGS SHALL BE STEEL PIPE OR CAST IRON PIPE.
3. WHERE UNINSULATED PIPES PENETRATE BEARING WALLS (EXCLUDING FOUNDATIONS), FIRE RATED WALLS, PARTITIONS OR FLOORS, PACK AND SEAL ENTIRE SPACE BETWEEN PIPE AND SLEEVE WITH DOW CORNING 3-6548 SILICONE RTV FOAM, OR 1" MINIMUM THICKNESS OF 3M FIRE BARRIER, CP-25 CAULK, OR 303 PUTTY ON EACH SIDE OF OPENING.
4. ENCASE ALL INSULATED PIPES PENETRATING FIRE WALLS AND FLOORS IN 360 DEGREE METAL-SHIELDED INSULATION INSERTS AS MANUFACTURED BY VALUE ENGINEERED PRODUCTS. PACK AND SEAL SPACE BETWEEN SHIELD AND SLEEVE PER PRECEDING PARAGRAPH. EXTEND INSULATION INSERT ON ALL REFRIGERANT AND CHILLED WATER LINES 1" BEYOND SHEET METAL SHIELD.
5. WHERE PIPE PENETRATIONS OCCUR IN NON_FIRE RATED FLOORS OR WALLS, PACK SPACE BETWEEN PIPE AND SLEEVE OR INSULATION INSERT AND SLEEVE ON EACH END WITH MINERAL WOOL OR OTHER NON-COMBUSTIBLE MATERIAL.
6. PIPE TO SLEEVE CLOSURE FOR PIPES PENETRATING FOUNDATIONS, WATERPROOFING MEMBRANE FLOORS OR WET AREAS SHALL BE "LINK-SEAL."
7. AFTER PAINTING IS COMPLETED, INSTALL CHROME PLATED ESCUTCHEONS ON ALL PIPES PASSING THROUGH FINISHED WALLS AND FLOORS.

METERS AND GAUGES

WORK INCLUDED:
1. PORTABLE INSERTION TYPE THERMOMETERS.
2. CONSTANT READ THERMOMETERS.
3. PORTABLE INSERTION TYPE PRESSURE GAUGES.
4. CONSTANT READ PRESSURE GAUGES.
5. FLOW MEASURING DEVICES.
6. TEST PLUGS.

FURNISH MANUFACTURER'S SUBMITTAL DATA FOR:
1. THERMOMETERS
2. PRESSURE GAUGES
3. FLOW MEASURING DEVICES
4. TEST PLUGS

ACCEPTABLE MANUFACTURERS
1. THERMOMETERS: ASHCROFT, DURO, MARSHALLTOWN, TEL_TRU, WEISS, WEKSLER
2. PRESSURE GAUGES: ASHCROFT, DURO, MARSH, MARSHALLTOWN, U.S. GAUGE, WEISS, WEKSLER
3. FLOW MEASURING DEVICES:
   A. 2" AND SMALLER: FLOW DESIGN (FLOWSET), GERAND, GRISWOLD, PRESO
   B. 2-1/2" AND LARGER: BARCO/HYSPAN, FLOW DESIGN (FLOWSET), GERAND, PRESO
5. TEST PLUGS: FAIRFAX COMPANY, PETERSON EQUIPMENT, SISCO, UNIVERSAL LANCASTER

PORTABLE INSERTION TYPE THERMOMETERS
1. 5" STEMS, ACCURATE WITHIN 1% OVER DIAL RANGE, HERMETICALLY SEALED.

CONSTANT READ THERMOMETERS
1. 4-1/2" OR 5" DIAL, SEPARABLE SOCKET CONNECTION, EXTENSION NECK TO CLEAR INSULATION, SWIVEL ANGLE STEM, FULLY ADJUSTABLE, ACCURATE WITHIN 1% OVER DIAL RANGE.
2. 9" ALUMINUM CASE, MERCURY-FILLED TUBE, SEPARABLE SOCKET CONNECTION, EXTENSION NECK TO CLEAR INSULATION, SWIVEL ANGLE STEM, FULLY ADJUSTABLE, ACCURATE WITHIN 1% OVER DIAL RANGE.

PORTABLE INSERTION TYPE PRESSURE GAUGES
1. 4-1/2" DIAL, PHOSPHOR-BRONZE BOURDON TUBE, STAINLESS STEEL MOVEMENT, ACCURATE WITHIN 1/2% OVER SCALE RANGE.

CONSTANT READ PRESSURE GAUGES
1. 4-1/2" OR 5" DIAL, STANDARD BLACK CASE, BRASS PRESSURE SNUBBER AND NEEDLE VALVE. ACCURATE WITHIN 1% OVER MIDDLE HALF OF SCALE RANGE, 2% OVER REMAINDER.

FLOW MEASURING DEVICE
1. 2" AND SMALLER:
   A. ORIFICE OR VENTURI TYPE, FACTORY ASSEMBLED WITH 300 PSIG RATED BALL VALVE OR 125 PSIG RATED MULTI-TURN GLOBE VALVE WITH ADJUSTABLE MEMORY STOP.
   B. SCHRADER TYPE PRESSURE TEST PORTS AND CAPS WITH PORT EXTENSIONS.
   C. CHAINED METAL TAG INDICATING LOCATION, GPM, AND METER READING.
2. 2-1/2" AND LARGER:
   D. FOR EXISTING SYSTEMS: AVERAGING PITOT-TYPE FLOW ELEMENTS, SIMILAR TO ANNUBAR MODEL ANR-C25 FOR HOT WATER AND AWR-C25 FOR CHILLED WATER AND CONDENSER WATER,316 STAINLESS STEEL DIAMOND SHAPED SENSING ELEMENTS. PERMANENT PRESSURE LOSS TO SYSTEM SHALL NOT EXCEED 5" WATER COLUMN.
   E. FOR NEW SYSTEMS: MACHINED AND CALIBRATED VENTURI, PRESSURE DROP RANGE 20" TO 80" WATER COLUMN. COMPLETE WITH 1/4" SAE FLARE SAFETY SHUT-OFF INSTRUMENT VALVES AND SCHRADER TYPE PRESSURE PORTS AND CAPS, CHAINED METAL TAG INDICATING LOCATION, GPM AND METER READING.
   F. FOR NEW SYSTEMS: COMPLETE WITH 1/4" SAE FLARE SAFETY SHUT-OFF INSTRUMENT VALVES AND SCHRADER TYPE PRESSURE TEST PORTS AND CAPS, CHAINED METAL TAG INDICATING LOCATION, GPM, AND METER READING.

TEST PLUGS
1. NORDEL VALVE CORE AND 1/2" NPT BRASS BODY COMPLETE WITH GASKETED CAP, PRESSURE GAUGE ADAPTER.

INSTALLATION
1. MOUNT THERMOMETERS TO BE EASILY READ FROM FLOOR.
2. INSTALL THERMOMETERS IN PIPING WITH WELLS.
3. PROVIDE ONE PORTABLE INSERTION TYPE PRESSURE GAUGE AND THERMOMETER FOR EACH TEN TEST PLUGS INSTALLED.
4. INSTALL FLOW MEASURING DEVICES PER MANUFACTURER'S RECOMMENDATIONS.

MECHANICAL IDENTIFICATION

WORK INCLUDED:
1. PIPING.
2. VALVES.
3. EQUIPMENT.

EXECUTION:

3.01 PIPE IDENTIFICATION
   A. IDENTIFY EACH PIPING SYSTEM AND INDICATE DIRECTION OF FLOW WITH BAND-SECURED OR SNAP-ON PRINTED LABELS IN MECHANICAL ROOM AND OTHER EXPOSED AREAS AND PRESSURE SENSITIVE, SELF-ADHESIVE LABELS IN CONSEALED AREAS. APPLY MARKINGS AFTER PAINTING AND CLEANING OF PIPING AND INSULATION IS COMPLETED.
   B. APPLY LEGEND AND FLOW ARROWS AT VALVE LOCATIONS, AT POINTS WHERE PIPING ENTERS OR LEAVES VALVE OR METER BOX, AT NOT LESS THAN EVERY 30'-0" OF RUN OR AT LEAST ONCE IN EVERY EXPOSED LOCATION. LOCATE MARKINGS FOR MAXIMUM VISIBILITY.
   C. WHEREVER TWO OR MORE PIPES RUN PARALLEL, APPLY MARKINGS IN SAME RELATIVE LOCATION ON EACH.
   D. WORDING/COLOR COMBINATIONS SHALL MEET ANSI SPECIFICATIONS UNLESS COLORS ARE SPECIFIED OTHERWISE.
   E. SIZES OF LETTERING AND FLOW ARROWS SHALL BE AS FOLLOWS:

OUTSIDE DIAMETER OF PIPE OR COVERING (INCLUSIVE)	SIZE OF LETTER	MINIMUM LENGTH OF FLOW ARROW
5/8" TO 2"	1/2"	2-1/2"
2-1/2" AND LARGER	1"	4"

3.02 EQUIPMENT IDENTIFICATION
   A. IDENTIFY EQUIPMENT WITH LAMINATED BLACK PLASTIC TAG WITH ENGRAVED WHITE CORE LETTERING. TAG SHALL INDICATE EQUIPMENT DUTY SUCH AS "HEATING PUMP", "BOILER" AND EQUIPMENT DESIGNATION AS SHOWN ON DRAWINGS. TAGS SHALL HAVE MINIMUM THICKNESS OF 1/16", MINIMUM SIZE OF 1-1/2"x4", WITH MOUNTING HOLES. SECURE TAGS TO EQUIPMENT BY MEANS OF SCREWS, BOLTS OR CHAIN.
   B. IDENTIFY EACH THERMOSTAT AND HUMIDISTAT BY MEANS OF GUN TAG INDICATING CORRESPONDING UNIT WHICH IT CONTROLS. LOCATE TAG INSIDE THE INSTRUMENT COVER.

3.03 VALVE IDENTIFICATION
   A. IDENTIFY EACH AUTOMATIC TEMPERATURE CONTROL VALVE AND EACH MANUALLY OPERATED VALVE BY MEANS OF A BRASS OR ALUMINUM TAG, 1-1/2" ROUND, WITH STAMPED LETTERS 1/2" HIGH, FILLED WITH BLACK PAINT. NUMBER TAGS CONSECUTIVELY. FASTEN WITH CHAINS AND BRASS "S" HOOKS.

3.04 CHARTS AND DIAGRAMS
   A. PROVIDE 8-1/2"x11" CHARTS IN EACH EQUIPMENT ROOM DESIGNATING NUMBER, AREA SERVED, SERVICE OR FUNCTION AND LOCATION OF EACH TAGGED ITEM. FRAME CHARTS AND DIAGRAMS IN METAL FRAMES WITH CLEAR GLASS AND HANG IN LOCATIONS AS DIRECTED.

3.05 WARNING SIGNS
   A. PLACE WARNING SIGNS ON ALL MACHINES DRIVEN BY ELECTRIC MOTORS WHICH ARE CONTROLLED BY FULLY AUTOMATIC STARTERS, PER ARTICLE 3281, GENERAL INDUSTRY SAFETY ORDERS.

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Reviewed for Code Compliance
11/17/2023

TORIAN PLUM SNOW MELT UPGRADES
STEAMBOAT SPRINGS, COLORADO

ISSUE	DATE
CONSTRUCTION DOCUMENTS	11/10/23

MEP JOB: 22336
DESIGNED: MAB
CHECKED: KVB

MECHANICAL SPECIFICATIONS

COLORADO REGISTERED PROFESSIONAL ENGINEER
KATHERINE V. BROWN BALLAS
35133
11.09.23

M3.0

DIVISION 230000 - HYDRONIC SPECIFICATIONS (CONT.)

WATER TREATMENT

PART 1: GENERAL

1.01 WORK INCLUDED

A. TREATMENT FOR CLOSED SYSTEMS:

1. HEATING WATER SYSTEM.
2. CHILLED WATER SYSTEM.

B. TREATMENT FOR OPEN SYSTEMS:

1. CONDENSER WATER SYSTEM.

1.02 WORK FURNISHED BUT INSTALLED BY OTHERS

A. FURNISH THE FOLLOWING ITEMS TO PIPING CONTRACTOR FOR INSTALLATION:

1. CONDENSER WATER CONTROL SYSTEM.
2. CHEMICAL FEED PUMPS.
3. WATER METER FOR CONDENSER WATER MAKE-UP.
4. CORROSION COUPON RACKS.
5. SOLENOID VALVES.
6. CHEMICAL BYPASS FEEDERS.

B. COORDINATE LOCATION OF RECEPTACLES FOR CONTROLLERS, MONITORS AND PUMPS WITH ELECTRICAL CONTRACTOR.

1.03 QUALITY ASSURANCE

A. THE WATER TREATMENT COMPANY SHALL BE A RECOGNIZED SPECIALIST, ACTIVE IN THE FIELD OF INDUSTRIAL WATER TREATMENT WHOSE MAJOR BUSINESS IS IN THE FIELD OF WATER TREATMENT, AND SHALL HAVE REGIONAL WATER ANALYSIS LABORATORIES, DEVELOPMENT FACILITIES, AND SERVICE DEPARTMENT, PLUS FULL-TIME SERVICE REPRESENTATIVE WITH A MINIMUM OF TEN YEARS EXPERIENCE WITHIN THE LOCAL AREA.
B. ALL PRODUCTS SHALL BE PROVIDED BY A SINGLE CONTRACTOR TO ENSURE A SINGLE SOURCE OF RESPONSIBILITY.
C. WHILE IT IS RECOGNIZED THAT THERE ARE, FOR MOST ITEMS, SEVERAL EQUAL BRANDS AND MANUFACTURERS, THE BIDDERS SHALL FOR THE PURPOSE OF THE BID, OFFER ONLY SPECIFIED EQUIPMENT AND CHEMICALS.

1.04 SUBMITTALS

A. TECHNICAL DATA: SUBMIT SHOP DRAWINGS AND PRODUCT DATA FOR THE FOLLOWING ITEMS IN ACCORDANCE WITH THE GENERAL CONDITIONS OF THE CONTRACT:

1. WATER TREATMENT MATERIALS AND EQUIPMENT.
2. CONTROL DIAGRAMS.
3. CHEMICALS AND QUANTITY PROVIDED.

B. OPERATING INSTRUCTIONS AND MAINTENANCE DATA: SUBMIT PRINTED OPERATING INSTRUCTIONS AND MAINTENANCE DATA FOR THE FOLLOWING ITEMS:

1. ALL WATER TREATMENT EQUIPMENT AND PROCEDURES.
2. WATER TREATMENT PROGRAM CONTROL CHART.

1.05 MAINTENANCE SERVICE (OPEN SYSTEMS)

A. PROVIDE THE SERVICES OF A FULLY QUALIFIED FIELD ENGINEER AND LABORATORY AND TECHNICAL ASSISTANCE FROM A FULLY QUALIFIED LABORATORY STAFF FOR A ONE YEAR WARRANTY PERIOD. SERVICES AND ASSISTANCE SHALL INCLUDE THE FOLLOWING:

1. A TWO HOUR MINIMUM TRAINING COURSE FOR THE OPERATING PERSONNEL, INSTRUCTING THEM CLEARLY AND FULLY ON THE INSTALLATION, CARE, MAINTENANCE, TESTING AND OPERATION OF THE WATER TREATMENT SYSTEMS. THE TRAINING COURSE SHALL BE ARRANGED AT THE START-UP OF THE SYSTEM.
2. QUARTERLY TECHNICAL SERVICE VISITS TO THE JOB SITE OF THE INSTALLATION TO PERFORM FIELD INSPECTIONS AND TO MAKE WATER ANALYSES ON SITE, BOTH OF SUCH COMPLEXITY AS TO EVALUATE THE WATER SYSTEMS OPERATIONS. THE FIELD ENGINEER SHALL DETAIL FINDINGS WITH THE OWNER IN WRITING ON PROPER PRACTICES, CHEMICAL TREATING REQUIREMENTS AND ANY CORRECTIVE ACTIONS NEEDED TO PROTECT THE WATER SYSTEMS FROM SCALE, CORROSION AND FOULING.
3. BE ON CALL AT NO ADDITIONAL COST TO MAKE ON-SITE INSPECTIONS OF EQUIPMENT DURING EMERGENCY OUTAGES. MAKE RECOMMENDATIONS IN WRITING BASED ON THESE INSPECTIONS.

1.06 CHEMICAL STOCK

A. PROVIDE SUFFICIENT CHEMICALS FOR TREATMENT AND TESTING DURING THE ONE YEAR WARRANTY PERIOD. CHEMICALS SHALL NOT BE HARMFUL TO THE SYSTEM IN WHICH THEY ARE USED.

1.07 WARRANTY

A. PROVIDE ONE YEAR WARRANTY ON ALL CHEMICAL FEED EQUIPMENT.

PART 2: PRODUCTS

2.01 ACCEPTABLE WATER TREATMENT SUPPLIERS

A. CALCIUM CONTROL, INC.
B. ROCKY MOUNTAIN AQUATECH.
C. MILE HI WATER TEC, INC.

2.02 PRE-STARTUP CLEANING AND FLUSHING

A. PROVIDE A PRE-STARTUP CLEANER FOR THE FLUSHING AND CLEANING OF ALL NEW WATER SYSTEMS TO REMOVE OIL AND FOREIGN MATTER FROM THE PIPING AND EQUIPMENT PRIOR TO THE FINAL FILLING OF THE SYSTEMS. THIS CHEMICAL SHALL NOT BE INJURIOUS TO PERSON, PIPING, PIPE JOINT COMPOUNDS, PACKAGING, COILS, VALVES, PUMPS, AND THEIR MECHANICAL SEALS, TUBES, OR OTHER PART OF THE SYSTEM. THIS CHEMICAL SHALL NOT DAMAGE OR ERODE GALVANIZED COMPONENTS OR EQUIPMENT (I.E. COOLING TOWER).
B. THE WATER TREATMENT COMPANY SHALL FURNISH COMPLETE INSTRUCTIONS DICTATING THE QUANTITIES OF CLEANER TO USE, METHODS, AND DURATION OF THE OPERATIONS. THE WATER TREATMENT FIRM MUST SUBMIT TO THE MECHANICAL CONTRACTOR A COMPLETE ANALYSIS AND REPORT REGARDING CLEANING, FLUSHING, AND LEVEL OF INHIBITOR FOR EACH CLOSED LOOP SYSTEM.

2.03 CHEMICAL FEED EQUIPMENT FOR CLOSED SYSTEMS

A. PROVIDE CHEMICAL BYPASS POT FEEDERS, RATED AT 175 PSIG, FOR THE FOLLOWING CLOSED SYSTEMS:

1. HEATING WATER.
2. CHILLED WATER.
3. CONDENSOR WATER.

2.04 CLOSED SYSTEM WATER TTREATMENT CHEMICALS

A. PROVIDE A NON-CHROMATE, LIQUID NITRATE BASED CORROSION INHIBITOR FOR THE PREVENTION OF CORROSION IN CLOSED SYSTEMS, TO ACHIEVE 700 PPM TOTAL NITRATE LEVEL.

2.05 COOLING TOWER CHEMICAL TREATMENT

A. PROVIDE CHEMICAL TREATMENT, INCLUDING PASSIVATION, TO PREVENT "WHITE RUST" OF GALVANIZED METAL COMPONENTS.
B. PASSIVATION SHOULD INCLUDE EIGHT WEEKS OF COOLING TOWER OPERATION WITH WATER OF NEUTRAL PH, CALCIUM HARNESS OF 100 TO 300 PPM ($CaCO_3$) AND ALKALINITY OF 100 TO 300 PPM ($CaCO_3$). APPLY A CORROSION INHIBITOR TREATMENT OF THE PHOSPHATE/POLYMER/PHOSPHONATE TYPE.

2.06 OPEN CONDENSER WATER SYSTEM TREATMENT CHEMICALS

A. PROVIDE AN ORGANIC PHOSPHORATE BASED SCALE INHIBITOR CONTAINING CORROSION INHIBITORS AND A POLYMER BASED DISPERSANT. THE TREATMENT SHALL BE IN LIQUID FORM AND BE SUITABLE FOR FEEDING INTO THE SYSTEM DIRECTLY FROM THE SHIPPING CONTAINER. THIS CHEMICAL TREATMENT SHALL NOT CONTAIN CHROMATE OR PHOSPHATE. ACID FOR PH CONTROL WILL NOT BE CONSIDERED.
B. PROVIDE LIQUID BIOCIDES OF TWO CHEMICALLY DIFFERENT TYPES OF FORMULATION TO BE USED ON AN ALTERNATING BASIS AND TO BE EFFECTIVE AGAINST ALL NORMALLY ENCOUNTERED ALGAE AND SLIME GROWTHS.

WATER TREATMENT (CONT.)

2.07 OPEN CONDENSER WATER TREATMENT SYSTEM

A. PROVIDE AN AUTOMATIC CONDENSER WATER CONTROL SYSTEM FOR INHIBITOR FEED, BLOWDOWN, AND BIOCIDE FEEDS. INHIBITOR APPLICATION SHALL BE METER ACTIVATED, BLOWDOWN SHALL BE CONDUCTIVITY ACTIVATED, AND BIOCIDE SHALL BE AUTOMATICALLY FED ON AN ALTERNATING BASIS WITH BLOWDOWN LOCKED OUT TO ENSURE PROPER BIOCIDE RETENTION TIME IN THE RECIRCULATING WATER.
B. CONTROL SYSTEM SHALL INCORPORDATE SOLID STATE INTEGRATED CIRCUITS AND DIGITAL LED DISPLAYS IN A PAINTED ENCLOSURE. INCLUDE PREWIRED, PRE-PIPED WATER SAMPLE ASSEMBLY
C. TOTAL DISSOLVED SOLIDS CONTROL FOR CONDUCTIVITY SHALL INCLUDE:
1. LED DIGITAL CONDUCTIVITY READOUT DISPLAY (MICROHMCM).
2. TEMPERATURE COMPENSATED SENSOR PROBE, COMPATIBLE WITH SAMPLE STREAM MANIFOLD.
3. CONDUCTIVITY RANGE: 0-2000 MMHOS 0-5000 MMHOS.
4. TEST SWITCH FOR SOLENOID BLEED VALVE
5. ILLUMINATED LIGHT TO INDICATE WHEN BLEED VALVE IS OPERATED.
6. ADJUSTABLE HYSTERESIS OR DEAD BAND (INTERNAL).
7. FLOW SWITCH TO DEACTIVATE FEED AND BLEED WHEN THERE IS NO FLOW.

D. INHIBITOR FEED CONTROL BASED ON MAKE-UP VOLUME SHALL INCLUDE:

1. PROGRAMMABLE PRECISION RESET TIMER.
2. TEST SWITCH FOR INHIBITOR PUMP.
3. ILLUMINATED LIGHT TO INDICATE WHEN INHIBITOR PUMP IS ACTIVATED.

E. BIOCIDE PROGRAMMER SHALL INCLUDE:

1. 24 HOUR TIMER WITH 14 OR 28 DAY SKIP FEATURE TO PERMIT BIOCIDE ACTIVATION ANY TIME OF THE DAY.
2. PRECISION SOLID STATE BLEED LOCK-OUT TIME AND BIOCIDE PUMP TIMER, CLOCK CONTROLLED.
3. SOLID STATE ALTERNATOR TO ENABLE THE USE OF TWO DIFFERENT FORMULATIONS.
4. INDICATORS TO SHOW THE STATUS OF THE BIOCIDE OPERATIONS. INDICATORS SHALL BE ILLUMINATED WHENEVER A BIOCIDE FUNCTION IS ACTIVE.

F. PROVIDE A WATER METER OF SUFFICIENT SIZE ON SYSTEM MAKE-UP, WIRED TO CONTROL SYSTEM.
G. PROVIDE THREE CHEMICAL FEED PUMPS TO INJECT CHEMICALS DIRECT FROM THE SHIPPING DRUMS INTO THE CONDENSER WATER.
H. PROVIDE A BLOWDOWN CONTROL ASSEMBLY OF SUFFICIENT SIZE INCLUDING A CAST IRON PIPE STRAINER WITH 20 MESH SCREEN, AND SOLENOID VALVE.
I. PROVIDE A PVC PIPING MANIFOLD SYSTEM INCLUDING A FLOW SWITCH, CONDUCTIVITY PROBE, AND SAMPLE PETCOCK. THE MANIFOLD SYSTEM SHALL BE ATTACHED TO THE SIDE OF THE CONTROLLER, PREWIRED, AND PREPIPED.

2.08 OPEN CONDENSER WATER SIDESTREAM FILTER SYSTEM

A. GENERAL: FILTER SYSTEM SHALL CONSIST OF PRESSURE VESSEL WITH PERMANENT MEDIA (SAND), PREFILTER WITH REMOVABLE BASKET, PUMP, CONTROL VALVES, OPERATING CONTROLS.

B. COMPONENTS

1. PRESSURE VESSEL: 30" DIAMETER CYLINDER, 16 GAUGE 304 STAINLESS STEEL, REMOVABLE TOP JOINED WITH STAINLESS STEEL COMPRESSION BAND. INCLUDE AUTOMATIC AIR VENT, MANUAL AIR VENT, PRESSURE GAUGE ON TOP OF FILTER.
2. MEDIA: SHARP SILICA SAND WITH MINIMUM 90% PASSING THROUGH 20 MESH SCREEN.
3. OVERDRAIN AND UNDERDRAIN ASSEMBLIES: PVC.
4. PRESTRAINER: 6" DIAMETER, BRONZE, WITH CLAMP_ON CLEAR LEXAN LID, CORROSION RESISTANT NORYL BASKET.
5. PUMP: ALL BRONZE CONSTRUCTION WITH SEMI_OPEN FACE IMPELLER. PUMP MOTOR: TEFC, SUITABLE FOR OUTDOOR SERVICE.
6. INTERCONNECTING PIPING: FACTORY ASSEMBLED, SCHEDULE 80 PVC, WITH BRONZE BODIED SIGHT GLASS FOR FIELD INSTALLATION ON BACKWASH LINE.
7. FURNISH TWO INTERLINKED 3_WAY BALL VALVES WITH ELECTRIC ACTUATOR. VALVES SHALL HAVE TWO POSITIONS: ONE TO ALLOW LIQUID TO BE FILTERED, THE OTHER FOR REVERSE OF LIQUID FLOW FOR CLEANING OF FILTER MEDIA. VALVES: BRONZE CONSTRUCTION, CHROME_PLATE BALLS, TEFLON SEATS.
8. MOUNT COMPONENTS ON COMMON ABS BASE.

C. AUTOMATIC BACKWASH SYSTEM

1. FACTORY PIPED AND WIRED.
2. ENCLOSED PRESSURE SWITCH: NEMA_4, ADJUSTABLE FROM 0 TO 30 PSIG.
3. BACKWASH AND MOTOR CONTROLS: NEMA_4 ENCLOSURE, FUSIBLE DISCONNECT SWITCH (OPERABLE WITHOUT OPENING PANEL), THERMAL OVERLOAD PROTECTION FOR PUMP MOTOR, ADJUSTABLE BACKWASH TIMER, PUSH_BUTTON SWITCH FOR MANUAL BACKWASH CONTROL, INDICATING DEVICE FOR FILTER STATUS.

D. EACH UNIT SHALL BE FULLY ASSEMBLED (EXCEPT MEDIA), TESTED, ADJUSTED AT FACTORY.

2.09 COUPON RACK

A. A TWO TIER CORROSION COUPON RACK SHALL BE PROVIDED TO MONITOR THE CHEMICAL TREATMENT PROGRAM IN THE CONDENSER WATER, CHILLED WATER, AND HOT WATER SYSTEMS. THE RACK SHALL BE CONSTRUCTED OF SCHEDULE 80 WITH TWO COUPON HOLDERS. THE INLET AND OUTLET SHALL BE 3/4" NPT WITH A 0-10 GPM FLOW INDICATOR. METALLURGY OF THE TWO COUPON PER RACK SHALL BE STEEL AND COPPER.

2.10 WATER TREATMENT CONTROL TESTING EQUIPMENT

A. PROVIDE TESTING CHEMICALS TO PROPERLY ANALYZE THE OPEN CONDENSER WATER FOR ORGANIC PHOSPHORATE AND THE CLOSED WATER SYSTEM FOR NITRATE. FURNISH THE NECESSARY TEST KITS FOR THESE TESTS.
B. PROVIDE A MYRON-L TDS METER, THREE RANGE, 0-50, 0-500, AND 0_5,000 MMHOS/CM AUTO-TEMP COMPENSATION 50-160 F, 9 VOLT TRANSISTOR BATTERIES, AND BUILT-IN CELL.
C. FURNISH A SUPPLY OF LOG SHEETS ON WHICH TO RECORD THE TEST RESULTS AND A BOUND COPY OF FULL TEST INSTRUCTIONS.

PART 3: EXECUTION

3.01 INSTALLATION

A. AT CONTRACTOR'S OPTION, THE WATER TREATMENT COMPANY MAY PERFORM ALL SERVICES SPECIFIED IN GLYCOL SYSTEM SECTION.
B. THE WATER TREATMENT SUBCONTRACTOR SHALL SUBMIT A COMPLETE REPORT, INCLUDING ANALYSIS, TO THE MECHANICAL CONTRACTOR. INCLUDE A COPY IN THE OPERATION AND MAINTENANCE MANUALS.

MECHANICAL INSULATION

SUBMITTALS
1. FURNISH MANUFACTURER'S SUBMITTAL DATA FOR INSULATION.

2. SUBMITTALS SHALL INDICATE COMPLETE MATERIAL DATA PROPOSED AND THICKNESS OF MATERIAL FOR INDIVIDUAL SERVICES.

QUALITY ASSURANCE
1. INSULATING MATERIALS AND FINISHES SHALL COMPLY WITH APPLICABLE CODES.

2. DETERMINE THAT CODE AUTHORITIES WILL APPROVE ANY PRODUCT INSTALLED.

JOB CONDITIONS
1. PERFORM WORK AT AMBIENT AND EQUIPMENT TEMPERATURES AS RECOMMENDED BY MANUFACTURER.

ACCEPTABLE MANUFACTURERS
1. CERTAINTEED
2. KNAUF
3. OWENS-CORNING
4. JOHNS MANVILLE

GENERAL
1. ADHESIVES AND INSULATION MATERIALS: COMPOSITE FIRE AND SMOKE HAZARD RATINGS MAXIMUM 25 FOR FLAME SPREAD AND 50 FOR SMOKE DEVELOPED. ADHESIVES SHALL BE WATERPROOF.

MECHANICAL INSULATION (CONT.)

MATERIALS AND COMPONENTS
1. PIPE INSULATION
A. TYPE A: HEAVY DENSITY ONE_PIECE FIBERGLASS, FACTORY APPLIED VAPOR BARRIER JACKET, DOUBLE SURFACE ADHESIVE SELF_SEALING LAP, "K" FACTOR 0.23 AT 75 F MEAN TEMPERATURE.

B. INSULATION EXPOSED TO WEATHER: PROTECT INSULATION WITH WEATHERPROOF METAL JACKET. JACKET SHALL BE FACTORY APPLIED ALUMINUM, 0.016" THICK, WITH LAMINATED VAPOR BARRIER AND "Z" GROOVE WATERTIGHT SEAL. SEAL EACH JOINT WITH SNAP STRAPS CONTAINING PERMANENT PLASTIC SEALING COMPOUND. SECURE WITH 1/2" WIDE STAINLESS STEEL BANDS. INSULATE FITTINGS WITH MITERED SECTIONS OF SAME MATERIAL. SEAL JOINTS WITH SEALING COMPOUND AND PREFORMED ALUMINUM BANDS.

2. HOT EQUIPMENT INSULATION
A. TYPE A (80 F - 350 F): SEMI-RIGID, 3 LB. DENSITY FIBERGLASS BOARD, "K" FACTOR 0.23 AT 75 F MEAN OPERATING TEMPERATURE. SECURE INSULATION WITH WELD PINS OR STICK CLIPS ON FLAT SURFACES. POINT ALL JOINTS, FINISH WITH WIRE MESH AND INSULATING CEMENT. COVER WITH GLASS CLOTH.

3. COLD EQUIPMENT INSULATION
A. TYPE A: 1" THICK, 3 LB. DENSITY FIBERGLASS BOARD WITH FACTORY APPLIED VAPOR BARRIER FACING, "K" FACTOR 0.22 AT 75 F MEAN TEMPERATURE, VAPOR TRANSMISSION RATE 0.02 PERMS. SECURE WITH 1/2" STAINLESS STEEL BANDS, WELD PINS, OR STICK CLIPS SPACED 12" APART. POINT ALL VOIDS AND JOINTS, SEAL ALL BREAKS AND JOINTS WITH VAPOR BARRIER MASTIC AND HEAT SEALED TAPE. FINISH WITH TWO COATS OF VAPOR BARRIER MASTIC BETWEEN GLASS CLOTH COVER.

PREPARATION
1. SURFACE SHALL BE CLEAN AND DRY PRIOR TO INSTALLATION. INSULATION SHALL BE DRY BEFORE AND DURING APPLICATION. FINISH WITH SYSTEMS AT OPERATING TEMPERATURES.

INSTALLATION
1. INSULATION SHALL BE CONTINUOUS THROUGH INSIDE WALLS. PACK AROUND PIPES WITH FIREPROOF SELF_SUPPORTING INSULATION MATERIAL, FULLY SEALED.

2. FINISH INSULATION NEATLY AT HANGERS, SUPPORTS, OTHER PROTRUSIONS, AND WHERE THE INSULATION BREAKS FOR SERVICE OR ACCESS REQUIREMENTS.

3. DO NOT INSULATE THE FOLLOWING UNLESS SPECIFIED:
A. DRAIN PIPING DOWNSTREAM OF SYSTEM DRAIN VALVE.
B. RELIEF VALVE AND DISCHARGE PIPING.
C. RADIATION PIPING INSIDE RADIATION COVER.
D. UNIONS AND FLANGED VALVES ON HOT LINES (65 F TO 250 F).
E. STEAM CONTROL VALVE BODIES.
F. BONNET ON SCREWED VALVE BODIES.
G. STEAM TRAPS.
H. EXPANSION JOINTS, FLEXIBLE CONNECTIONS.
I. REMOVABLE PLATES ON CHECK VALVES.

4. DO NOT COVER PIPING UNTIL TESTED.

5. REMOVE AND REAPPLY INSULATION IF, IN OPINION OF ARCHITECT, IT HAS NOT BEEN INSTALLED IN FIRST CLASS WORKMANLIKE MANNER.

6. LOCATE INSULATION SEAMS IN LEAST VISIBLE LOCATIONS.

7. CLEAN INSULATION FINISHES AFTER INSTALLATION, LEAVING CLEAN SURFACE FOR PAINTING. REPLACE SURFACES IF DAMAGED DURING CONSTRUCTION. REAPPLY TAPE FOUND PEELING DURING CONSTRUCTION OR GUARANTEE PERIOD.

8. WHERE REMOVED FOR NEW CONNECTION OR REMODELING, REPLACE EXISTING INSULATION TO MATCH EXISTING THICKNESS, DENSITY, FINISH.

9. REPAIR SEPARATION OF JOINTS OR CRACKING OF INSULATION DUE TO THERMAL MOVEMENT OR POOR WORKMANSHIP.

INSTALLATION OF PIPE INSULATION
1. SEAL LONGITUDINAL LAPS WITH VAPOR BARRIER ADHESIVE OR WITH FACTORY APPLIED DOUBLE SURFACE PRESSURE SENSITIVE ADHESIVE SYSTEM. SEAL END JOINTS WITH 3" WIDE BUTT STRIPS SECURED WITH VAPOR BARRIER ADHESIVE. SEAL ALL SEAMS ON COLD WATER PIPING WITH BENJAMIN FOSTER 30_35 SEAL FAST MASTIC.

INSTALLATION OF INSULATION ON FITTINGS AND VALVES
1. INSULATE FITTINGS AND VALVES WITH FIRMLY COMPRESSED FOIL-FACED FIBERGLASS BLANKET AND 25/50 UL RATED PVC FITTING COVERS (ZESTON OR EQUAL).

2. WHERE INSTALLATION OF PVC FITTING COVERS IS PROHIBITED BY LOCAL AUTHORITIES, INSULATE FITTINGS AND VALVES WITH MOLDED FIBERGLASS FITTINGS OR FIRMLY COMPRESSED FOIL-FACED FIBERGLASS BLANKET. SECURE IN PLACE WITH 20 GAUGE CORROSION RESISTANT WIRE AND APPLY SMOOTHING COAT OF INSULATING CEMENT. FINISH WITH LAYER OF GLASS CLOTH EMBEDDED BETWEEN TWO COATS OF VAPOR BARRIER MASTIC. LAP GLASS FABRIC 2" ONTO ADJACENT INSULATION.

3. INSULATION ON FITTINGS AND VALVES SHALL BE SAME THICKNESS AS ON PIPE.

4. TROWEL INSULATION CEMENT TO NEAT BEVEL AT UNIONS, FLANGES, AND WHENEVER INSULATION TERMINATES. ALLOW ROOM TO REMOVE FLANGE BOLTS, DISCONNECT UNIONS, ETC.

INSTALLATION OF HOT EQUIPMENT INSULATION
1. CUT, CONTOUR, AND MITER INSULATION BOARD AND APPLY WITH EDGES TIGHTLY BUTTED, JOINTS STAGGERED WHERE TWO OR MORE LAYERS ARE NECESSARY, SECURED WITH 1/2" X 0.015" GALVANIZED STEEL BANDS ON 12" CENTERS OR WITH WELD PINS OR STICK CLIPS WITH WASHERS ON 18" CENTERS.

INSTALLATION OF COLD EQUIPMENT INSULATION
1. CUT AND MITER INSULATION BOARD TO FIT CONTOUR OF VESSEL AND APPLY WITH EDGES TIGHTLY BUTTED, JOINTS STAGGERED WHERE TWO OR MORE LAYERS ARE NECESSARY, SECURED WITH 1/2" X 0.015" GALVANIZED STEEL BANDS ON 12" CENTERS.

2. SEAL ALL JOINTS, BREAKS, PUNCTURES IN FACING WITH FIRE RETARDANT VAPOR BARRIER ADHESIVE AND 4" WIDE FACING MATERIAL TAPE.

3. WHERE MAINTENANCE ACCESS FOR DISASSEMBLY IS REQUIRED ON PUMPS, CHILLERS, ETC., INSTALL INSULATION SO REMOVAL OF INSULATION FROM PARTS IS NOT REQUIRED.

4. IF CHILLER HAS FACTORY APPLIED INSULATION, PROVIDE INSULATION ON ALL COLD PARTS NOT FACTORY INSULATED SUCH AS CHILLER WATER BOXES, CHILLER COOLING LINES, ETC.

PIPE INSULATION CHART

PIPE CLASSIFICATION		PIPE SIZE	INSULATION THICKNESS
			TYP A - INSULATION
HEATING HOT WATER	LOW PRESS./TEMP. (250F-201F)	TO 2"	1-1/2"
		2-1/2" - 6"	2"
		8" & LARGER	3-1/2"
	LOW TEMP. (200F-120F)	ALL	1-1/2"
CHILLED WATER	---	ALL	1-1/2"
COLD EQUIPMENT INSULATION	CHILLER EVAP.	ALL	1"
	CHILLED WATER PUMP	ALL	1"
	AIR SEPARATOR	ALL	1"
	EXPANSION TANK	ALL	1"

GLYCOL SYSTEM

WORK INCLUDED
1. FILL TANK, PRESSURE SENSOR, PRESSURE RELIEF VALVE, CHECK VALVE.

2. INHIBITED PROPYLENE GLYCOL SOLUTION.

3. FEED PUMP.

4. SOLUTION TESTER.

SUBMITTALS AND SHOP DRAWINGS
1. FURNISH SHOP DRAWINGS AND MANUFACTURER'S SUBMITTAL DATA FOR GLYCOL AND EQUIPMENT.

WARRANTY
1. REPLACE GLYCOL SOLUTION LOST FROM SYSTEM DURING FIRST YEAR OF OPERATION.

ACCEPTABLE MANUFACTURERS
1. ARCO
2. DOW CHEMICAL

INHIBITED PROPYLENE GLYCOL SOLUTION
1. CORROSION PROTECTION: LESS THAN OR EQUAL TO 5 MIL PER YEAR WHEN LABORATORY TESTED TO ASTM D1384.

GLYCOL FEEDER SYSTEM
1. TANK: POLYETHYLENE, 55 GALLON CAPACITY, SUITABLE FOR 180 F OPERATING TEMPERATURE, WITH HINGED COVER, LEVEL GAUGE, LEVEL MARKINGS ON SIDE OF TANK IN GALLONS, AND LOW WATER LEVEL SWITCH WITH DRY CONTACTS FOR REMOTE ALARM AND PUMP SHUT-OFF.

2. PUMP: POSITIVE DISPLACEMENT ROTARY GEAR TYPE, ALL BRONZE CONSTRUCTION, 1.5 GPM AT 100 PSIG, 1750 RPM, ADJUSTABLE PRESSURE SWITCH, ADJUSTABLE TIME DELAY RELAY.

3. TRANSFER PUMP: HAND OPERATED ROTARY TYPE, 8'-0" LONG 1" HOSE WITH 3/4" NONSPARKING NOZZLE, 1" TELESCOPING SUCTION PIPE, BUNG ADAPTOR WITH 2" THREAD.

SOLUTION TESTER
1. PORTABLE REFRACTOMETER TYPE.

INSTALLATION
1. PERFORM LABORATORY GLYCOL SOLUTION STRENGTH TESTS BEFORE SYSTEM IS TURNED OVER TO OWNER AND AT END OF FIRST YEAR OF OPERATION. REPLENISH AS REQUIRED.

2. SUBMIT A COPY OF LABORATORY REPORT TO OWNER.

HYDRONIC SPECIALTIES

PART 1 GENERAL

1.01 WORK INCLUDED

A. AIR VENT.
B. EXPANSION TANK.
C. AIR SEPARATOR.
D. RELIEF VALVE.
E. END SUCTION DIFFUSER
F. PRESSURE REDUCING VALVE.
G. FLOW SWITCH.

1.02 SUBMITTALS

A. FURNISH MANUFACTURER'S SUBMITTAL DATA FOR:
1. AIR VENT
2. EXPANSION TANK.
3. AIR SEPARATOR.
4. RELIEF VALVE.
5. PUMP INLET FLOW STRAIGHTENING FITTING.
6. PRESSURE REDUCING VALVE.
7. FLOW SWITCH.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. EXPANSION TANK
1. ARMSTRONG
2. AMTROL
3. BELL & GOSSETT
4. TACO

B. AIR SEPARATOR
1. AMTROL
2. ARMSTRONG
3. BELL & GOSSETT
4. TACO ACT

C. RELIEF VALVE
1. BELL & GOSSETT
2. MCDONNELL & MILLER, INC.
3. WATTS REGULATOR CO.

D. END SUCTION DIFFUSER
1. AMTROL
2. ARMSTRONG
3. BELL & GOSSETT
4. TACO

H. PRESSURE REDUCING VALVE
1. ARMSTRONG
2. BELL & GOSSETT
4. TACO
6. WATTS REGULATOR CO.

2.02 MANUAL AIR VENT

A. COIN OR KEY OPERATED TYPE SIMILAR TO BELL & GOSSETT #4V.

2.03 AUTOMATIC AIR VENT

A. FLOAT ACTUATED, CAST IRON BODY, POSITIVE SHUT-OFF AGAINST NEGATIVE PRESSURE, SUITABLE FOR MAXIMUM OPERATING PRESSURE OF 150 PSIG AND MAXIMUM OPERATING TEMPERATURE OF 250 F, SIMILAR TO BELL & GOSSETT MODEL 107A.

2.04 EXPANSION TANK

A. CLOSED TYPE, WELDED STEEL RATED FOR WORKING PRESSURE OF 125 PSIG, CLEANED, PRIME COATED, SUPPLIED WITH STEEL SUPPORT SADDLES, TAPPINGS FOR INSTALLATION OF ACCESSORIES, GAUGE GLASS SET CONSISTING OF BRASS COMPRESSION STOPS AND GUARD.

2.05 AIR SEPARATOR

A. TANGENTIAL AIR SEPARATOR: CAST IRON OR STEEL TANK, REMOVABLE GALVANIZED STEEL STRAINER, PERFORATED STAINLESS STEEL AIR COLLECTOR TUBE, ASME RATED FOR 125 PSIG WORKING PRESSURE.

2.06 END SUCTION DIFFUSER

A. ANGLE TYPE CAST IRON BODY AND COVER WITH SUITABLE NPT, FLANGED, OR GROOVED PIPE CONNECTIONS, STRAIGHTENING VANES, ORIFICE CYLINDER, 16 MESH BRONZE START-UP STRAINER, AND EPDM O-RING SEALS, SUITABLE FOR 175 PSIG WORKING PRESSURE AND 300 F OPERATING TEMPERATURE. PROVIDE EXTRA SET OF O-RING SEALS FOR START-UP STRAINER REMOVAL.

2.07 PRESSURE REDUCING VALVE

A. ALL BRONZE, SPRING AND DIAPHRAGM, MANUAL ADJUSTMENT FOR OUTLET WATER PRESSURE, INTEGRAL STRAINER, FEMALE THREAD CONNECTIONS, SIMILAR TO BELL & GOSSETT MODEL #12.

2.08 FLOW SWITCH

A. SIMILAR TO MCDONNELL_MILLER NO. FS4_3.

PART 3 EXECUTION

3.01 AIR VENT

A. PROVIDE 1/4" VALVES AT THE HIGH POINTS OF ALL MAINS AND RISERS FOR SYSTEM VENTING. PROVIDE 1/4" OVERFLOW TO NEAREST DRAIN.

B. PROVIDE VENT TUBING TO NEAREST DRAIN FOR AUTOMATIC AIR VENTS AND AIR VENTS IN CONCEALED LOCATIONS.

C. PROVIDE ACCESS TO ALL AIR VENTS.

3.02 END SUCTION DIFFUSER

A. SUPPORT FITTINGS WITH FLOOR MOUNTED PIPE AND FLANGE SUPPORTS. REMOVE START-UP STRAINER AFTER 30 DAYS OPERATION.

3.03 FLOW SWITCH

A. INSTALL IN HORIZONTAL SECTION OF PIPING.

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Reviewed for Code Compliance

11/17/2023

TORIAN PLUM SNOW MELT UPGRADES
STEAMBOAT SPRINGS, COLORADO

ISSUE	DATE
CONSTRUCTION DOCUMENTS	11/10/23

MEP JOB: 22336
DESIGNED: MAB
CHECKED: KVB

MECHANICAL SPECIFICATIONS

COLORADO REGISTERED 35133 11.09.23 PROFESSIONAL ENGINEER

M3.1

DIVISION 230000 - MECHANICAL SNOW MELT SPECIFICATIONS

SNOW MELT SYSTEM REQUIREMENTS

1.01 WORK INCLUDED

A. ALL LABOR, MATERIALS, TRANSPORTATION, EQUIPMENT, AND SERVICES TO INSTALL A HYDRONIC SNOW MELTING SYSTEM.

1.02 SUBMITTALS

A. MANUFACTURER'S SUBMITTAL DATA SHALL CONSIST OF SHOP DRAWINGS, AND/OR DESCRIPTIONS OF MATERIALS, DETAILS OF INSTALLATION, CAPACITY RATINGS, AND CONTROL SEQUENCING.

1.03 SINGLE SOURCE RESPONSIBILITY

A. COMPONENTS OF THE BURIED TUBING SYSTEM SHALL BE PROVIDED BY ONE MANUFACTURER, INCLUDING TUBE, FITTINGS, MANIFOLDS, CONTROLS, AND OTHER ANCILLARY ITEMS REQUIRED FOR A COMPLETE INSTALLATION.

B. BOILERS, PUMP, EXPANSION TANK AIR SEPARATOR, ETC., SHALL BE APPROVED BY SYSTEM MANUFACTURER.

1.04 MANUFACTURER'S WARRANTY

A. TUBE SHALL CARRY A TWENTY-FIVE (25) YEAR NON-PRORATED WARRANTY AGAINST FAILURE DUE TO DEFECT IN MATERIAL AND WORKMANSHIP OR EXPOSURE TO STRESS CRACKING AGENTS. MANIFOLDS AND OTHER ANCILLARY COMPONENTS SHALL BE WARRANTED FOR 24 MONTHS FROM DATE OF OWNER ACCEPTANCE OF PROJECT.

1.05 SCOPE OF WORK

A. THE SNOWMELT SYSTEM CONTROL PANEL, OUTDOOR SENSOR, AND SNOW/ICE SENSOR SHALL BE FURNISHED BY THE SNOWMELT SYSTEM MANUFACTURER. THE BAS CONTRACTOR SHALL INSTALL THE COMPLETE SNOWMELT CONTROL SYSTEM AND SHALL FURNISH ALL CONTROL DEVICES, VALVES, WIRING, AND TUBING NOT FURNISHED BY THE SNOWMELT SYSTEM MANUFACTURER.

SNOW MELT SYSTEM PRODUCTS

2.01 TUBE

A. TUBE SHALL BE CROSS-LINKED POLYETHYLENE, WITH MAXIMUM WORKING PRESSURE/TEMPERATURE OF 160 PSI AT 73.4 F, 100 PSI AT 180 F, 80 PSI AT 200 F.

B. THE TUBE SHALL BE MANUFACTURED IN ACCORDANCE WITH ASTM STANDARD SPECIFICATION F876-01. THE TUBE SHALL BE LISTED TO ASTM BY INDEPENDENT THIRD PARTY TESTING LABORATORY.

C. THE TUBE SHALL HAVE AN OXYGEN DIFFUSION BARRIER CAPABLE OF LIMITING OXYGEN DIFFUSION THROUGH THE TUBE TO NO GREATER THAN 0.10 g / M^3 / DAY AT 104 F WATER TEMPERATURE.

D. THE TUBE SHALL BE A MAXIMUM OF 3/4" DIAMETER IN ACCORDANCE WITH ASTM STANDARD SPECIFICATION AS ABOVE.

E. THE MINIMUM BEND RADIUS FOR COLD BENDING OF THE TUBE SHALL NOT BE LESS THAN SIX (6) 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.

2.02 MANIFOLDS

A. MULTIPLE CONNECTION MANIFOLDS SHALL BE OF CAST BRASS CONSTRUCTION, MANUFACTURED OF ALLOYS TO PREVENT DEZINCIFICATION, AND SHALL HAVE INTEGRAL CIRCUIT BALANCING VALVES. MANIFOLDS SHALL BE ABLE TO VENT AIR FROM THE SYSTEM AND SHALL BE PROVIDED WITH SUPPORT BRACKETS AND TUBE BEND SUPPORTS. MANIFOLD CIRCUITS SHALL BE ISOLATED FROM SUPPLY AND RETURN TUBING WITH VALVES THAT ARE SUITABLE FOR ISOLATION AND BALANCING.

2.03 FITTINGS

A. FITTINGS SHALL BE MANUFACTURED OF DEZINCIFICATION RESISTANT BRASS. THESE FITTINGS SHALL BE SUPPLIED BY THE TUBE MANUFACTURER. THE FITTINGS SHALL CONSIST OF A COMPRESSION FITTING WITH INSERT COMPRESSION RING AND A COMPRESSION NUT.

2.04 ACCESS COVERS

A. REMOVABLE ACCESS COVERS SHALL BE OF REINFORCED CONCRETE FORMED IN PLACE OR PRE-CAST CONCRETE OVER PIPE CONNECTIONS, FITTINGS, AND DISTRIBUTION MANIFOLDS. THEY SHALL BE BOTH INCONSPICUOUS AND HEAVY ENOUGH TO PREVENT UNAUTHORIZED REMOVAL. TAPERED FORMS FOR COVERS SHALL BE FURNISHED. COVERS SUBJECT TO VEHICULAR TRAFFIC SHALL BE TRAFFIC RATED.

2.05 SNOWMELT CONTROLS

A. PROVIDE A MICROPROCESSOR BASED CONTROL PANEL THAT ACTIVATES THE SNOW MELTING SYSTEM BASED ON SIGNALS FROM A SNOW SENSOR AND AN OUTDOOR AIR TEMPERATURE SENSOR. THE CONTROL PANEL SHALL INCLUDE THE FOLLOWING FEATURES:

1. SELECTABLE LCD DISPLAY OF SLAB SURFACE TEMPERATURE, SURFACE TEMPERATURE SETTING, MELT SEQUENCE TIME REMAINING, ACCUMULATED HOURS OF USE, AND PERCENT HEAT OUTPUT. CONTROL PANEL SHALL BE CAPABLE OF ENABLING OR DISABLING THE SYSTEM AS NECESSARY.
2. STATUS LIGHTS INDICATING POWER ON, REMOTE ENABLE SIGNAL PRESENT, WARM WEATHER CUT-OFF, MELTING MODE ACTIVATED, WATER DETECTED, COLD WEATHER CUT-OFF, IDLING MODE ACTIVATED, PUMP ACTIVATED, SYSTEM MELTING, AND SENSOR FAULT.
3. SLAB SURFACE MELTING TEMPERATURE SETPOINT ADJUSTMENT.
4. SLAB SURFACE IDLING TEMPERATURE SETPOINT ADJUSTMENT.
5. MOISTURE SENSOR SENSITIVITY SETPOINT ADJUSTMENT.
6. MELTING SYSTEM MINIMUM ON TIME ADJUSTMENT.
7. COLD WEATHER CUT-OFF TEMPERATURE SETPOINT ADJUSTMENT.
8. TEST BUTTON TO INITIATE TEST SEQUENCE.

B. PROVIDE AN OUTDOOR AIR TEMPERATURE SENSOR CONSISTING OF A 10,000 OHM THERMISTOR PROTECTED WITHIN A WHITE U.V. RESISTANT PVC PLASTIC ENCLOSURE.

C. PROVIDE A SNOW/ICE SENSOR WHICH SITS FLUSH WITH THE SLAB SURFACE AFTER BEING MOUNTED INTO A SENSOR SOCKET. THE SENSOR SHALL MEASURE SLAB SURFACE TEMPERATURE AND SENSOR CORE TEMPERATURE AND SHALL DETECT MOISTURE ON THE SENSOR SURFACE. THE SENSOR SOCKET SHALL BE CONSTRUCTED OF DIE CAST BRASS.

SNOW MELT SYSTEM INSTALLATION

3.01 INSTALLATION

A. HYDRONIC RADIANT HEAT TUBING LOOPS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS.

B. ALL FITTINGS AND MANIFOLDS SHOULD BE ACCESSIBLE THROUGH ACCESS COVERS FOR MAINTENANCE. TUBING LOOPS SHALL BE INSTALLED WITHOUT SPLICES, AS A MINIMUM, FROM THE POINT AT WHICH THE TUBING ENTERS THE MANIFOLD TO THE POINT AT WHICH IT EXITS THE MANIFOLD.

C. INSTALLATION SHALL FOLLOW THE MANUFACTURER'S SHOP DRAWINGS FOR TUBING LAYOUT, TUBE SPACING, MANIFOLD CONFIGURATION, MANIFOLD LOCATION, AND CONTROLS. ALL NOTES ON THE SHOP DRAWINGS SHALL BE FOLLOWED.

D. DISTRIBUTION MANIFOLDS SHALL BE ATTACHED TO SUPPLY AND RETURN MAINS AT ACCESS COVER LOCATIONS. A MINIMUM OF ONE SUPPLY AND ONE RETURN MANIFOLD IS REQUIRED AND FOR ALTERNATE EXPANSION/CONSTRUCTION JOINTS.

E. PIPING SHALL BE ATTACHED TO REINFORCING STEEL USING WIRE TIES. ALL LOOPS SHALL BE FORM A CONTINUOUS CONDUIT WITHOUT JOINTS FROM SUPPLY TO RETURN MANIFOLDS.

F. NO PIPE SHALL EXTEND THROUGH EXPANSION, CONSTRUCTION, OR WORKING JOINTS IN CONCRETE SLAB. COORDINATE EXPANSION JOINTS INSTALLED DURING, OR CUT AFTER, CONCRETE POUR WITH TUBING LAYOUT.

G. ALL PIPE CONNECTIONS, FITTINGS, AND DISTRIBUTION MANIFOLDS SHALL BE FREE OF CONCRETE AND ARRANGED TO BE EASILY SERVICED BY REMOVAL OF POURED-IN-PLACE CONCRETE ACCESS COVERS.

H. COORDINATE SYSTEM FLUSHING AND GLYCOL FILL WORK WITH WATER TREATMENT CONTRACTOR.

I. ALL PIPING CONNECTIONS SHALL BE FIELD WRAPPED WITH INSULATION. WRAP AND INSTALL PER MANUFACTURER'S RECOMMENDATIONS.

3.02 TESTING

A. THE TUBING SYSTEM SHALL BE PRESSURIZED WITH WATER OR AIR TO A PRESSURE OF 60 PSIG 24 HOURS PRIOR TO ENCASEMENT IN THE CONCRETE SLAB. THE TUBING SYSTEM SHALL REMAIN AT THIS PRESSURE DURING THE SLAB INSTALLATION AND FOR A MINIMUM OF 24 HOURS THEREAFTER TO ENSURE SYSTEM INTEGRITY.

3.03 SYSTEM STARTUP

A. AT STARTUP TIME, THE CONTRACTOR SHALL FOLLOW THE MANUFACTURER'S RECOMMENDATIONS FOR SYSTEM WATER AND TEMPERATURE BALANCING, RECORD BALANCE SETTINGS AT EACH MANIFOLD LOCATION, AND INCLUDE A COMPLETE RECORD OF THESE SETTINGS IN THE OPERATION AND MAINTENANCE MANUALS.

B. VERIFY CONTROL OPERATION IS IN ACCORDANCE WITH SEQUENCE SPECIFIED.

3.04 SEQUENCE OF CONTROL

A. SNOWMELT SYSTEM CONTROL

B. THE SNOWMELT SYSTEM SHALL BE CONTROLLED BY A MICROPROCESSOR BASED CONTROL PANEL FURNISHED BY THE SNOWMELT SYSTEM MANUFACTURER. THE OUTDOOR TEMPERATURE SENSOR AND SNOW/ICE SENSOR SHALL ALSO BE FURNISHED BY THE SNOWMELT SYSTEM MANUFACTURER.

C. THE CONTROL PANEL SHALL CONTINUOUSLY MONITOR THE SNOW/ICE SENSOR LOCATED IN THE SLAB. WHEN SNOW, ICE, OR WATER ARE DETECTED THE MELTING MODE SHALL BE INITIATED, UNLESS THE WARM WEATHER OR COLD WEATHER CUT-OFF CONTROLS HAVE BEEN ACTIVATED.

D. IF THE OUTDOOR AIR TEMPERATURE IS ABOVE 40 deg.F (ADJUSTABLE), THE SNOWMELT SYSTEM SHALL ENTER THE WARM WEATHER CUT-OFF MODE. IT SHALL REMAIN THERE UNTIL THE OUTDOOR AIR TEMPERATURE DROPS BELOW THE MELTING TEMPERATURE SETPOINT. THE WARM WEATHER CUT-OFF MODE SHALL DEACTIVATE THE SNOWMELT SYSTEM.

E. THE MELTING MODE SHALL BE CAPABLE OF BEING ACTIVATED EITHER THROUGH THE SNOW/ICE SENSOR OR THROUGH A REMOTE ENABLE SIGNAL FROM THE BAS. WHEN THE MELTING MODE IS ACTIVATED, THE PUMP SHALL BE ENERGIZED AND THE HEAT RELAY SHALL CYCLE ON AND OFF, USING PULSE WIDTH MODULATION (PWM) CONTROL, TO MAINTAIN THE SLAB SURFACE AT THE MELTING TEMPERATURE SETPOINT.

F. THE SLAB SHALL BE MAINTAINED AT AN IDLING TEMPERATURE WHEN THE SNOWMELT SYSTEM IS NOT IN THE MELTING MODE. CONTROL OPERATION IS SIMILAR TO THE MELTING MODE EXCEPT THE SLAB IS MAINTAINED AT A LOWER IDLING TEMPERATURE SETPOINT.

G. IF A SENSOR FAULT OCCURS, A WARNING LIGHT SHALL BE ACTIVATED AT THE CONTROL PANEL.

H. DESIRED SLAB SURFACE MELTING TEMPERATURE, SLAB SURFACE IDLING TEMPERATURE, AND COLD WEATHER CUT-OFF TEMPERATURE SETPOINTS SHALL BE ADJUSTABLE AT THE CONTROL PANEL.

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Reviewed for Code Compliance
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TORIAN PLUM SNOW MELT UPGRADES
STEAMBOAT SPRINGS, COLORADO

ISSUE	DATE
CONSTRUCTION DOCUMENTS	11/10/23

MEP JOB: 22336
DESIGNED: MAB
CHECKED: KVB

MECHANICAL SPECIFICATIONS

COLORADO REGISTERED 35133 11.09.23 PROFESSIONAL ENGINEER

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