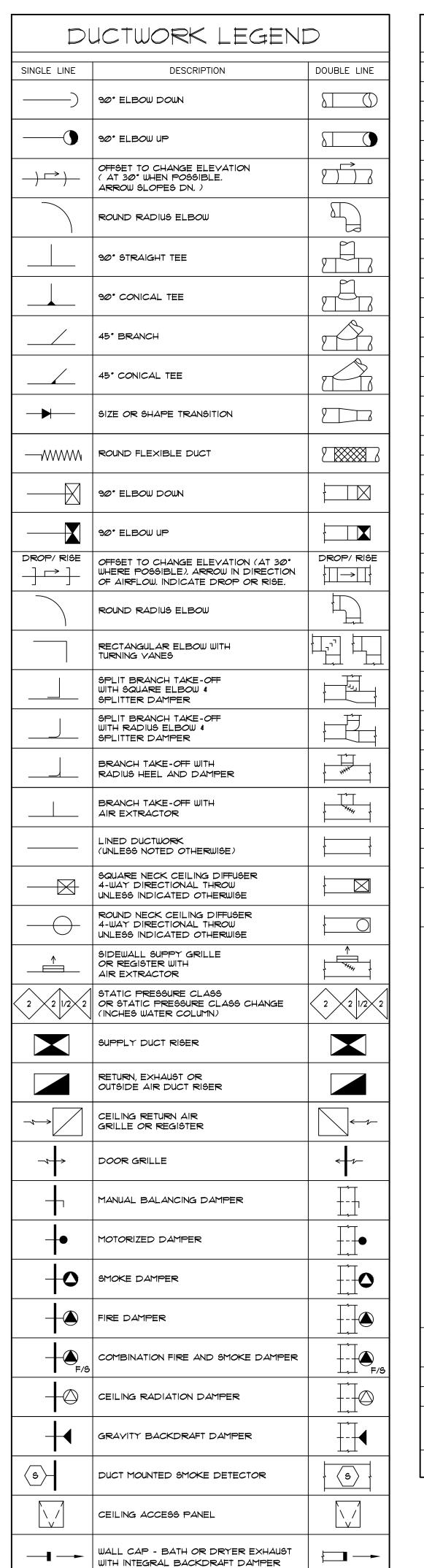
DESIGN CONDITIONS WINTER DESIGN TEMPERATURES: INDOOR: 70 F DB OUTDOOR: -21 F DB ELEVATION 6900' FEET WALL R-VALUE (AVG) 13 (CAY.) 7.5 (CONT.) ROOF R-VALUE (AVG) GLASS U-VALUE (AVG) Ø.45

120/1, 240/1

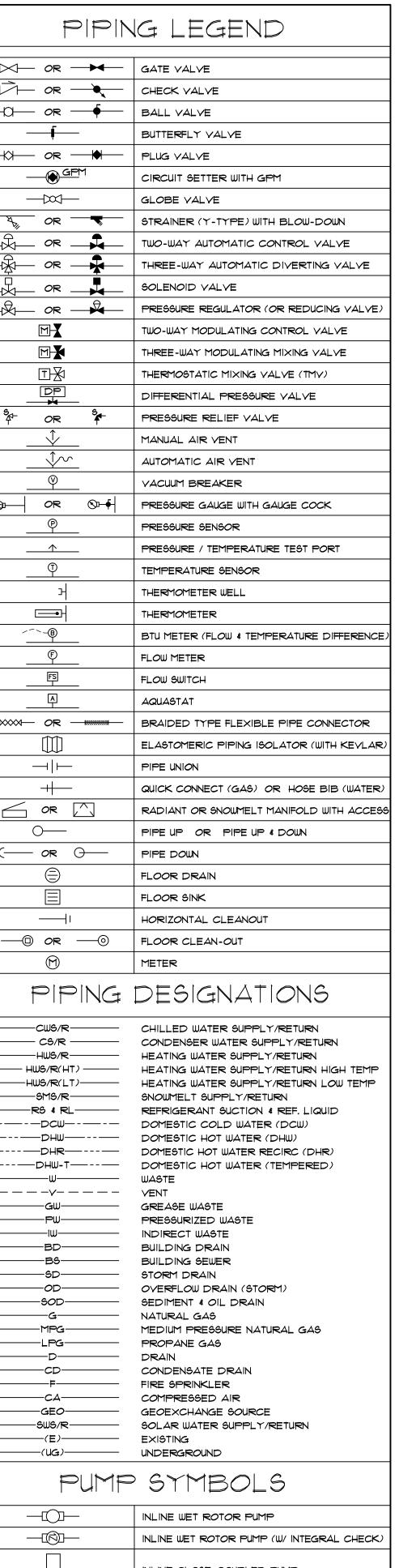
	SHEET INDEX
<u>SHEET</u>	DESCRIPTION
MØ.Ø	MECHANICAL COVER SHEET
MI.Ø	MECHANICAL SCHEDULES
M2.0	MECHANICAL PLANS
M3.Ø	MECHANICAL SCHEMATICS
M4.Ø	MECHANICAL SPECIFICATIONS AND SEQUENCE

OF OPERATION

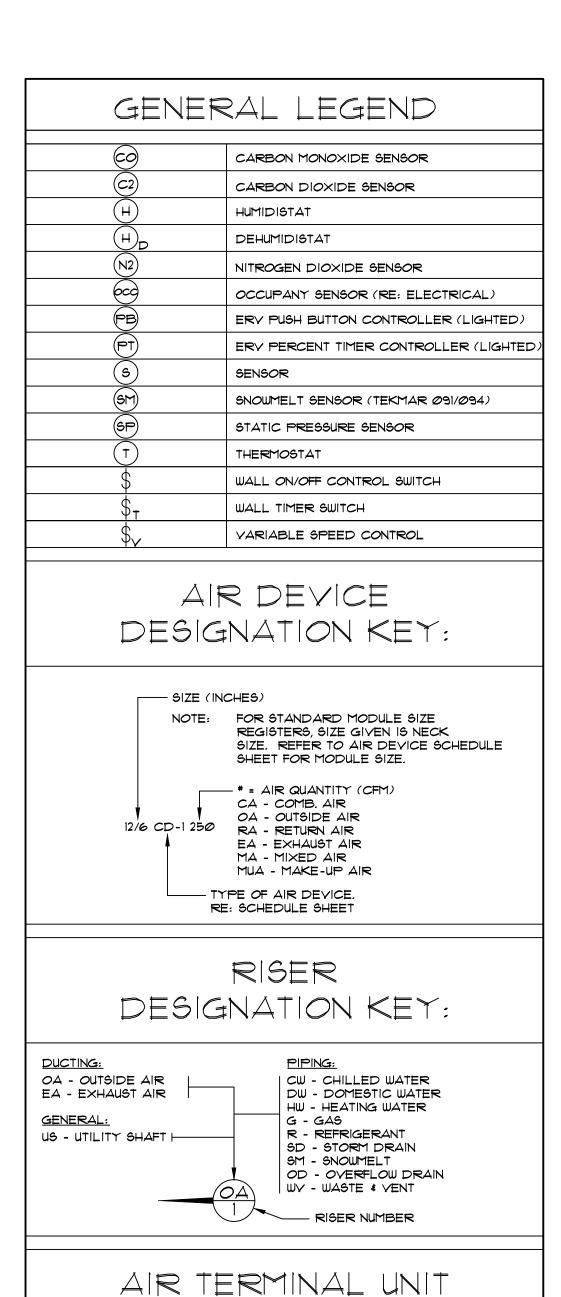
ELECTRICAL POWER AVAILABLE

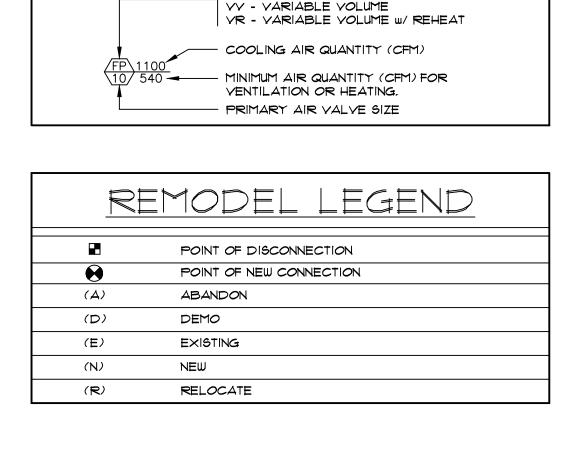


PIPIN	G LEGEND
OR —	GATE VALVE
	CHECK VALVE
	BALL VALVE BUTTERFLY VALVE
	PLUG VALVE
GPM	CIRCUIT SETTER WITH GPM
	GLOBE VALVE
OR -	STRAINER (Y-TYPE) WITH BLOW-DOWN
OR	TWO-WAY AUTOMATIC CONTROL VALVE
	THREE-WAY AUTOMATIC DIVERTING VALVE
	SOLENOID VALVE
OR	PRESSURE REGULATOR (OR REDUCING VALVE)
M	TWO-WAY MODULATING CONTROL VALVE
	THREE-WAY MODULATING MIXING VALVE
	THERMOSTATIC MIXING VALVE (TMV)
DP s	DIFFERENTIAL PRESSURE VALVE
St OR ST	PRESSURE RELIEF VALVE
<u></u>	MANUAL AIR VENT
	AUTOMATIC AIR VENT
	VACUUM BREAKER PRESSURE GAUGE WITH GAUGE COCK
	PRESSURE GAUGE WITH GAUGE COCK PRESSURE SENSOR
<u> </u>	PRESSURE SENSOR PRESSURE / TEMPERATURE TEST PORT
<u>— — — — — — — — — — — — — — — — — — — </u>	TEMPERATURE SENSOR
	THERMOMETER WELL
	THERMOMETER
	BTU METER (FLOW & TEMPERATURE DIFFERENCE)
<u> </u>	FLOW METER
FS	FLOW SWITCH
A	AQUASTAT
—>>>> OR —	BRAIDED TYPE FLEXIBLE PIPE CONNECTOR
	ELASTOMERIC PIPING ISOLATOR (WITH KEVLAR)
→ ⊢	PIPE UNION
+	QUICK CONNECT (GAS) OR HOSE BIB (WATER)
	RADIANT OR SNOWMELT MANIFOLD WITH ACCESS
(— or)—	PIPE UP OR PIPE UP & DOWN
	PIPE DOWN FLOOR DRAIN
	FLOOR SINK
	HORIZONTAL CLEANOUT
	FLOOR CLEAN-OUT
Θ	METER
PIPING	DESIGNATIONS
CW5/R	CHILLED WATER SUPPLY/RETURN
C5/R	CONDENSER WATER SUPPLY/RETURN
HWS/R	HEATING WATER SUPPLY/RETURN HEATING WATER SUPPLY/RETURN HIGH TEMP
HWS/R(LT)	HEATING WATER SUPPLY/RETURN LOW TEMP SNOWMELT SUPPLY/RETURN
R6 & RL	REFRIGERANT SUCTION & REF. LIQUID
DCW DHW	DOMESTIC COLD WATER (DCW) DOMESTIC HOT WATER (DHW)
	DOMESTIC HOT WATER RECIRC (DHR) DOMESTIC HOT WATER (TEMPERED)
——————————————————————————————————————	WASTE
GW	VENT GREASE WASTE
PW	PRESSURIZED WASTE INDIRECT WASTE
BD	BUILDING DRAIN BUILDING SEWER
SD	STORM DRAIN
	OVERFLOW DRAIN (STORM) SEDIMENT & OIL DRAIN
	NATURAL GAS MEDIUM PRESSURE NATURAL GAS
LPG	PROPANE GAS
	DRAIN CONDENSATE DRAIN
—————————————————————————————————————	FIRE SPRINKLER COMPRESSED AIR
GEO	GEOEXCHANGE SOURCE SOLAR WATER SUPPLY/RETURN
(E)	EXISTING
(UG)	UNDERGROUND
PUMP	SYMBOLS
— ———	INLINE WET ROTOR PUMP
	INLINE WET ROTOR PUMP (W/ INTEGRAL CHECK)
	INLINE CLOSE-COUPLED PUMP



BASE MOUNTED END SUCTION PUMP





DESIGNATION KEY:

TERMINAL TYPE:

CY - CONSTANT YOLUME BOX (SERIES)

FP - FAN POWERED BOX (PARALLEL)

PLAN	ABBREVIATIONS
AAV	AIR ADMITTANCE VALVE (STUDOR OR EQUAL)
AFF	ABOVE FINISHED FLOOR
ABY	ABOVE
BLW	BELOW
CFM	CUBIC FEET PER MINUTE (AIR QUANTITY)
CLG	CEILING
co	CLEANOUT
CONC	CONCRETE
COTG	CLEAN-OUT TO GRADE
DN	DOWN
DMPR	DAMPER
EA	EACH
EC	ELECTRICAL CONTRACTOR
ER / EG	EXHAUST REGISTER / EXHAUST GRILLE
ETR	EXISTING TO REMAIN
EXH	EXHAUST
FCO	FLOOR CLEAN-OUT
FD	FIRE DAMPER OR FLOOR DRAIN
FPC	FIRE PROTECTION CONTRACTOR
GPM	GALLONS PER MINUTE (WATER FLOW RATE)
LD	SUPPLY DIFFUSER (LINEAR)
MC	MECHANICAL CONTRACTOR
MOD	MOTOR OPERATED DAMPER
0A (OR 0SA)	OUTSIDE AIR
PC	PLUMBING CONTRACTOR
PLNM	PLENUM
PR	PIPE RISER
RA (OR R/A)	RETURN AIR
RR	RETURN REGISTER
RG (RAG)	RETURN AIR GRILLE
SA (OR S/A)	SUPPLY AIR
9. DMPR	SMOKE DAMPER
SR	SUPPLY REGISTER (SIDEWALL OR DUCT MOUNTED)
5 ∨	STUDOR VENT (SIZED BY CONTRACTOR)
TYP	TYPICAL
TRANS	TRANSITION
T/A	THROW AWAY
UNO	UNLESS NOTED OTHERWISE
us	UTILITY SHAFT
VTR	VENT THROUGH ROOF
W/	WITH
wco	WALL CLEAN-OUT
XFER	TRANSFER
EQUIPM	ENT ABBREVIATIONS

AIR HANDLING UNIT

BOILER (HOT WATER)

AIR SEPARATOR

CHILLER

COILING COIL

EXHAUST FAN

FAN COIL

EXPANSION TANK

FAN POWERED BOX

GLYCOL FEEDER

HEAT EXCHANGER

KITCHEN EXHAUST FAN

RETURN/RELIEF AIR FAN

TOILET EXHAUST FAN

THERMOSTATIC MIXING VALVE

VARIABLE VOLUME BOX W/ REHEAT

VARIABLE VOLUME BOX

PUMP (SEE PIPING LEGEND FOR DETAILS)

HEATING COIL

HEAT PUMP

HUMIDIFIER

MIXING VALVE

SUPPLY FAN

UNIT HEATER

WATER HEATER

CABINET HEATER

COOLING TOWER CELL

CONSTANT VOLUME BOX

DISHWASHER EXHAUST FAN

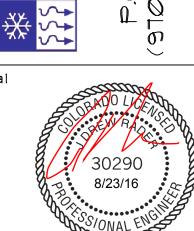
ELECTRIC BASEBOARD HEATER

ENERGY RECOVERY VENTILATOR (AIR TO AIR HX)

EVAPORATIVE COOLING UNIT

	SSKC ALFINE COASIEK	
issue	d For	
No.	Date	C
2	8/12/16	CO
	J. 25/10	
	CHANI VER S	

INC



CIRCLE WERNER SPRINGS, 2305 MT. AMBOAT

Comment PORDINATION DNSTRUCTION EET

Project No. 16053.00 Drawn By: Checked By: JDR DRC

M0.0

	RADIANT ZONE SCHEDULE - LOWER BUILDING												
MARK	ROOM(S)	EFFECTIVE	BTU/H	BTU/H	GPM	TUBE	TOTAL	# OF	LOOP	GPM/LOOP	P.D.	HEADER	FLOOR
		AREA (SF)		PER SF		CENTERS	LENGTH	LOOPS	LENGTHS		(FT)	SIZE	COVERINGS
RZ-I	OPERATOR/ EQUIP	132	3100	23	0.4	6	264	1	264	0.4	1.9	3/4"	CONC
RZ-2	STORAGE	713	10000	14	1.1	12	713	4	178	0.3	0.9	3/4"	CONC
TOTALS		845	13100	16	1.5		977	5					
NOTES:						FLOOR COVERINGS							
SEE MECHANICAL 2	ZONING PLANS FOR DETA	ILED ZONE LA	AYOUTS.			C = CARPET			S = STONE			CONC =	CONCRETE
U.N.O. ZONES INCL	LUDE ASSOCIATED BATHS	6, CLOSETS	# HALLS.			W = WOC	D		T = TILE				

	SNOWMELT AREA SCHEDULE													
NOWMELT	SNOEMELT	DESCRIPTION	EFFECTIVE	BTU/H	BTU/H	GPM	TUBE	TOTAL	# OF	LOOP	GPM/LOOP	P.D.	MANIFOLD	TUBING
ZONE	AREA		AREA (SF)	PER SF			CENTERS	LENGTH	LOOPS	LENGTHS		(FT)	SIZE	SIZE
SZ-I	SA-Ta	LOADING AREA	644	160	103040	7.8	9	859	4	225	2.0	14.4	Lu	5/8"
JZ-1	SA-1b	UNLOADING AREA	364	160	58240	4.4	9	485	2	253	2.2	20.3	1	5/8"
SZ-2	SA-2	UPPER RAMP	629	160	100640	7.6	9	839	4	220	1.9	13.5	I u	5/8"
SZ-3	SA-3	MIDDLE RAMP	393	160	62880	4.8	9	524	3	185	1.6	8.1	Lu	5/8"
SZ-4	SA-4	LOWER RAMP	652	160	104320	7.9	9	869	4	227	2.0	14.9] 11	5/8"
TOTALS			2682		429120	32.6		3576						

								ACCES	SORIES				
	BOILERS							1 - HIGH ALTITUDE KIT 4 - FLOW SWITCH 2 - CSD-1 CONTROLS 5 - LOW WATER CUTOFF 3 - ASME RATED (H-STAMP) 6 - 50% PROPYLENE GLYCOL					
SYM. (SERVES)	TYPE	S.L. INPUT MBH	ALT OUTPUT MBH	FUEL	DELTA T	8/20	ELEC.	MANUFACT # MOD		EFF	ACCESSORIES		
B-1 \$ 2 (CENTRAL)	WALL MOUNT STAINLESS STEEL CONDENSING	285	227	NAT. GAS	3Ø	\$\(\)	12 <i>Ø</i> /1 2 A	LOCHINY WHN 285	'AR	95%	1, 2, 3, 4, 5, 6		

	AIR SEPARATOR											
SYM.	SERVES	RECOMMENDED GPM P.D. MAX GPM (FT.)			MANUF, & MODEL	REMARKS						
AS-1	CENTRAL BOILER SYSTEM			1	SPIROTHERM VJR-200TM	2"						
EQUALS: SF	PIROTHERM, TACO, BELL & GC	DSSETT.				-						

		Ε×	(PANSIC	N TANK	•	
SYM.	SERVES	MOUNTING	ACCEPT. VOL. (GALS)	TOTAL VOL. (GALS)	MANUF. & MODEL	REMARKS
ET-1	CENTRAL BOILER SYSTEM	PIPE	6	15	FLEXCON HTX 90	3/4" MNPT

	GLYCOL FEEDER											
SYM.	SERVES	VOLT/PH	ELEC NOTES	AMPS	MANUF. & MODEL	REMARKS						
GF-1	CENTRAL BOILER SYSTEM	115/1	3-PRONG PLUG FURNISHED STANDARD	Ø.4	AXIOM MF200	6.6 GALLONS, LOW LEVEL ALARM PANEL WITH REMOTE MONITORING DRY CONTACTS						

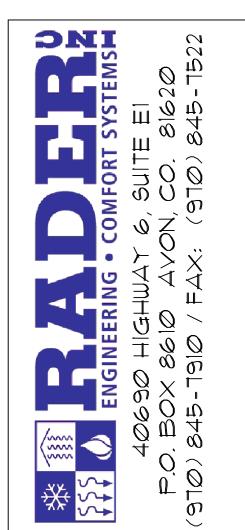
	CONDENSATE NEUTRALIZATION TANK											
SYM.	SERVES	MAXIMUM MBH	MAXIMUM GPH	PIPE CONN. SIZE	MANUF, & MODEL	REMARKS						
CNT-1	CENTRAL BOILER SYSTEM	7,000 4.8		1" NPT	AXIOM NT25	FURNISH WITH NEUTRALIZING MEDIA						

	PUMPS													
SYM.	GPM	TDH (FT.)	HP	VOLT/PH	MANUFACTURER & MODEL NO.	DESCRIPTION	of the state of th	State of the state	Y A A A A A A A A A A A A A A A A A A A	S. A. O.				
P-I	17	11	1/6	115/1	GRUNDFOS UPS 26-99 FC	B-I BOILER	A	2	A	1				
P-2	lΠ	11	1/6	115/1	GRUNDFOS UPS 26-99 FC	B-2 BOILER	Д	2	Д	1				
P-3	2	2Ø	1/6	115/1	GRUNDFOS UPS 26-99 FC	SPACE HEATING (LOWER BUILDING RADIANT FLOORS)	Д	1	Д	1				
₽-4	12	32	1/2	115/1	GRUNDFOS UPS 26-15Ø F	<u>6Z-1</u> SNOWMELT ZONE	В	2	Д	1				
P-5	8	37	1/2	115/1	GRUNDFOS UPS 26-15Ø F	<u>6Z-2</u> SNOWMELT ZONE	В	2	Д	1				
P-6	5	38	1/2	115/1	GRUNDFOS UPS 26-150 FC	<u>6Z-3</u> SNOWMELT ZONE	В	2	A	1				
P-7	8	37	1/2	115/1	GRUNDF05 UPS 26-150 F	<u>SZ-4</u> SNOWMELT ZONE	В	2	Д	1				

CHECK VALVE A. INTEGRAL B. EXTERNA	_ CHECK V	 2. 3- 3. 3- 4. OI 5. V	-SPEED PUI -SPEED PUI -SPEED PUI N/OFF ARIABLE SI	MP, OPERATE ON SPEED MP, OPERATE ON SPEED MP, OPERATE ON SPEED PEED VIA INTEGRAL CON PEED VIA TEKMAR CONTI	1 2 3 ITROL	1ATERIAL: A. CAST IRON B. BRONZE	<u>CC</u> 1.	ONTROL: RE: 95 OPER	EQUENCE ATION	<i>O</i> F

GAS PRESSURE REGULATORS							
SYM.	DESCRIPTION	CAPACITY	MANUF, & MODEL	REMARKS			
GPR-1	GAS PRESSURE REGULATOR (B-1)	178 CFH 2.0 PSI INLET MAX 1.0 PSI INLET MIN	PIETRO FIORENTINI GOVERNOR 30052	8-11" W.C. OUTLET, BLACK SPRING, 3/4" BODY INLET, 3/4" BODY OUTLET 341 CFH GAS LOAD			
GPR-2	GAS PRESSURE REGULATOR (B-2)	118 CFH 2.0 PSI INLET MAX 1.0 PSI INLET MIN	PIETRO FIORENTINI GOVERNOR 30052	8-11" W.C. OUTLET, BLACK SPRING, 3/4" BODY INLET, 3/4" BODY OUTLET 341 CFH GAS LOAD			

ELECTRIC UNIT HEATER							
SYM.	DESCRIPTION	CAPACITY	ELECTRIC	MANUF. & MODEL	REMARKS		
EUH-1	ELECTRIC UNIT HEATER	6824 BTU/H	240/1, 2000 W	OUELLET OAEU2000T	BUILT-IN THERMOSTAT		





SSRC ALPINE COASTER 2305 MT. WERNER CIRCLE STEAMBOAT SPRINGS, COLORADO

		• • • • • • • • • • • • • • • • • • • •		
Issue	d For			
No.	Date	Comment		
1	8/12/16	COORDINATION		
2	8/23/16	CONSTRUCTION		

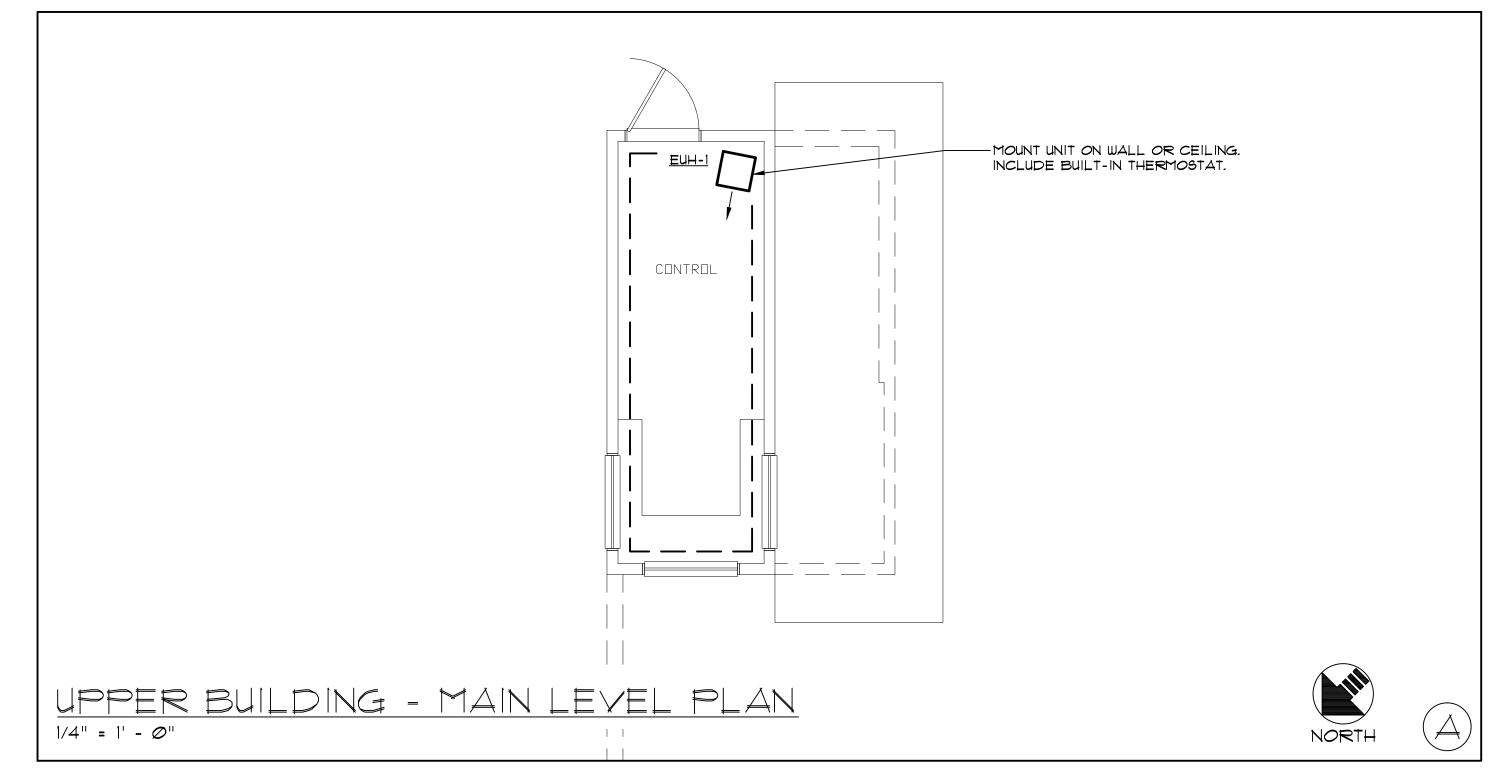
MECHANICAL SCHEDULES

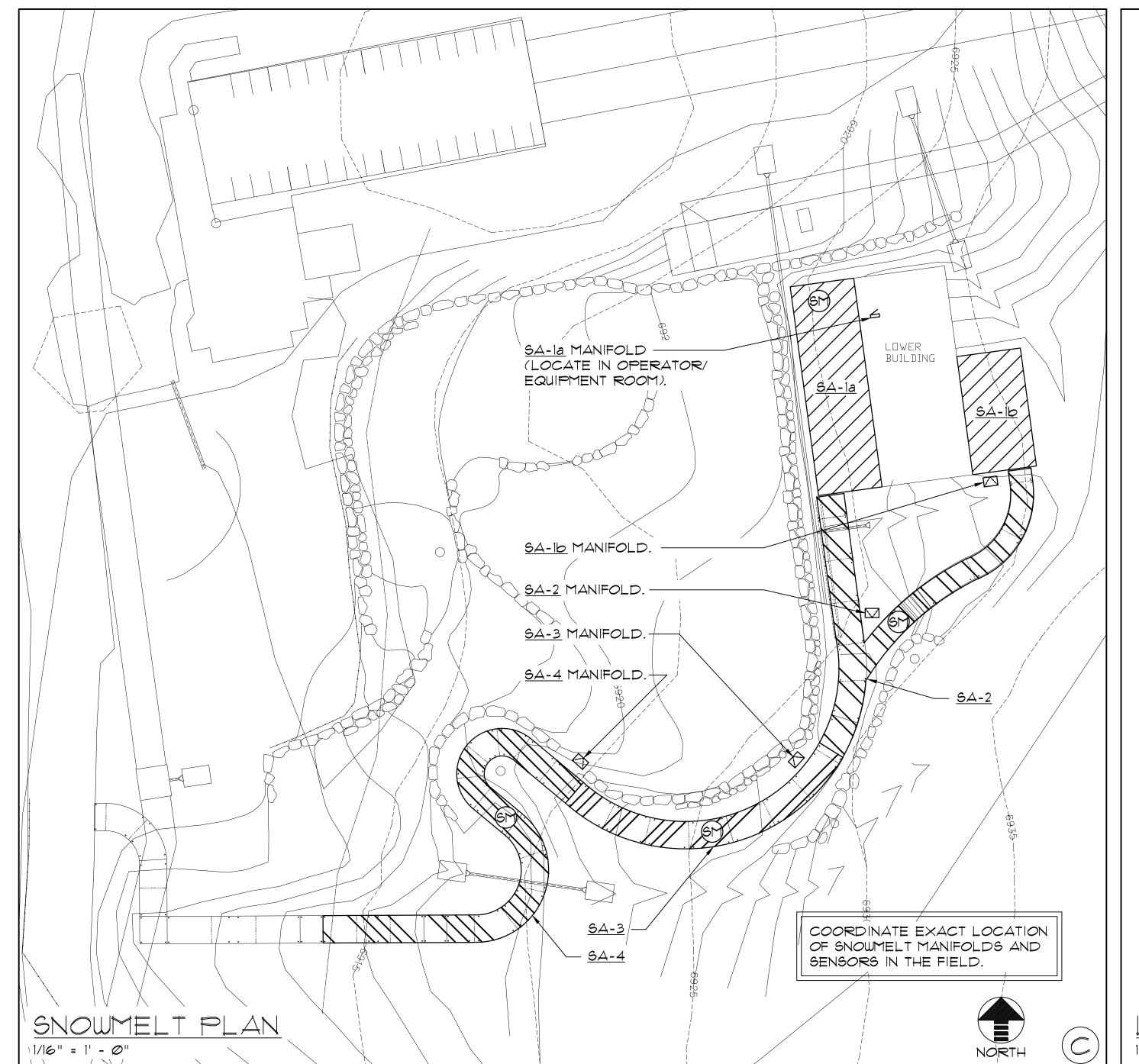
Project No. Scale:
16053.00 N/A

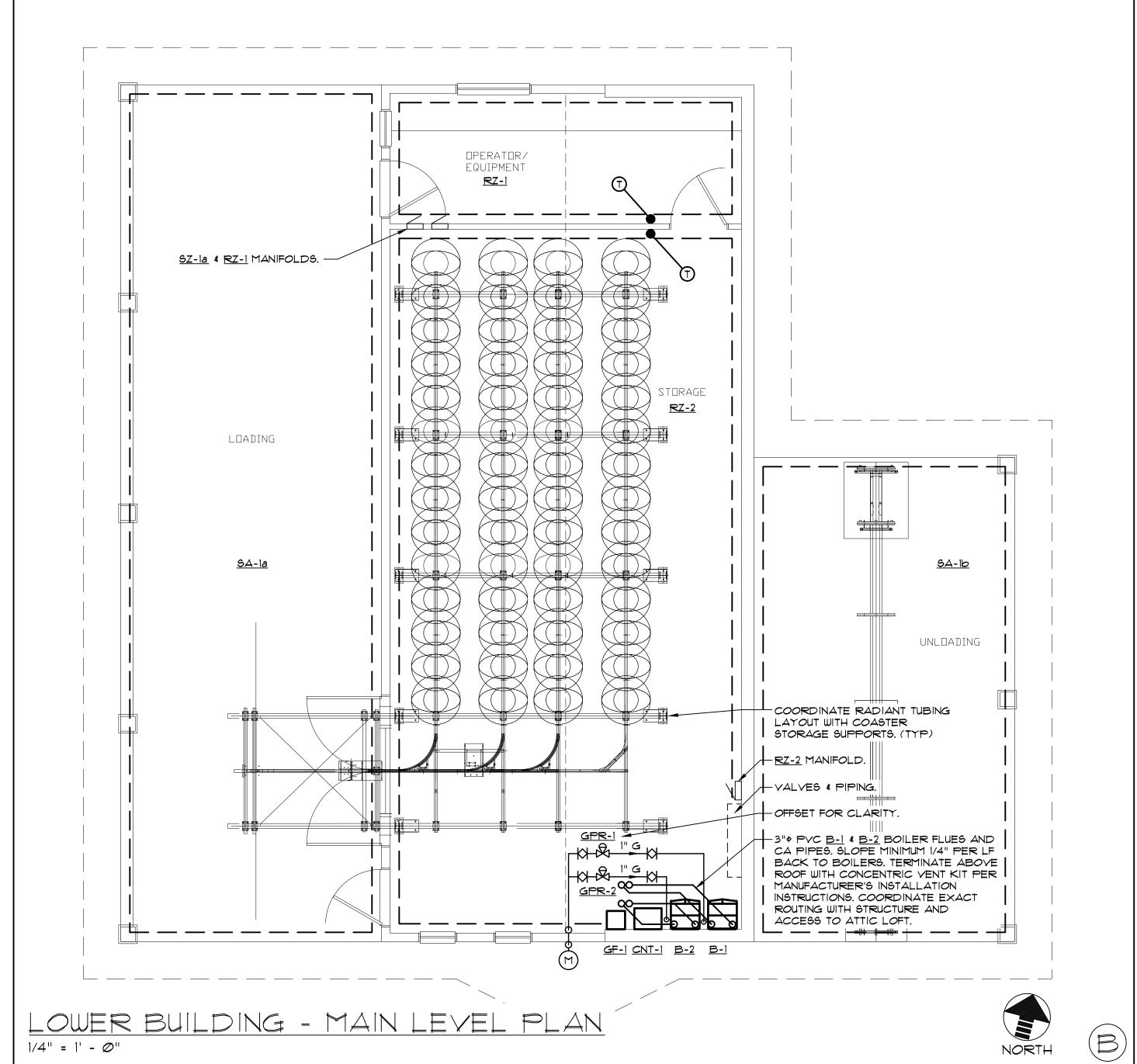
Drawn By: Checked By:
DRC JDR

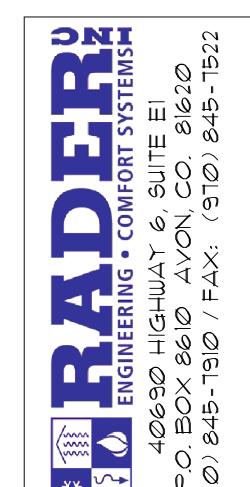
M1.0

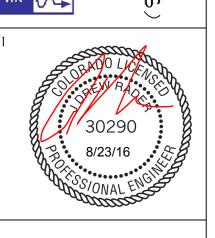
SHEET LEGEND						
60	CARBON MONOXIDE SENSOR					
HD	DEHUMIDISTAT	I I I HEATING ZONE				
H	HUMIDISTAT					
HP	HEAT PUMP (GROUND SOURCE)					
IRH	INFRARED RADIANT HEATER	SNOWMELT ZONE #1				
MUA	MAKE-UP AIR UNIT					
OS	OCCUPANCY SENSOR					
PB	PUSH BUTTON CONTROL WITH DELAY OFF	SNOWMELT ZONE #2				
PT	PERCENT TIMER CONTROL					
RZ	RADIANT ZONE	7// 7/				
(5)	SLAB TEMPERATURE SENSOR	SNOWMELT ZONE #3				
SA	SNOWMELT AREA					
SM	SNOW / ICE SENSOR (TEKMAR @91/@94)					
7	THERMOSTAT/ WALL SENSOR	SNOWMELT ZONE *4				
\$_	WALL TIMER SWITCH					







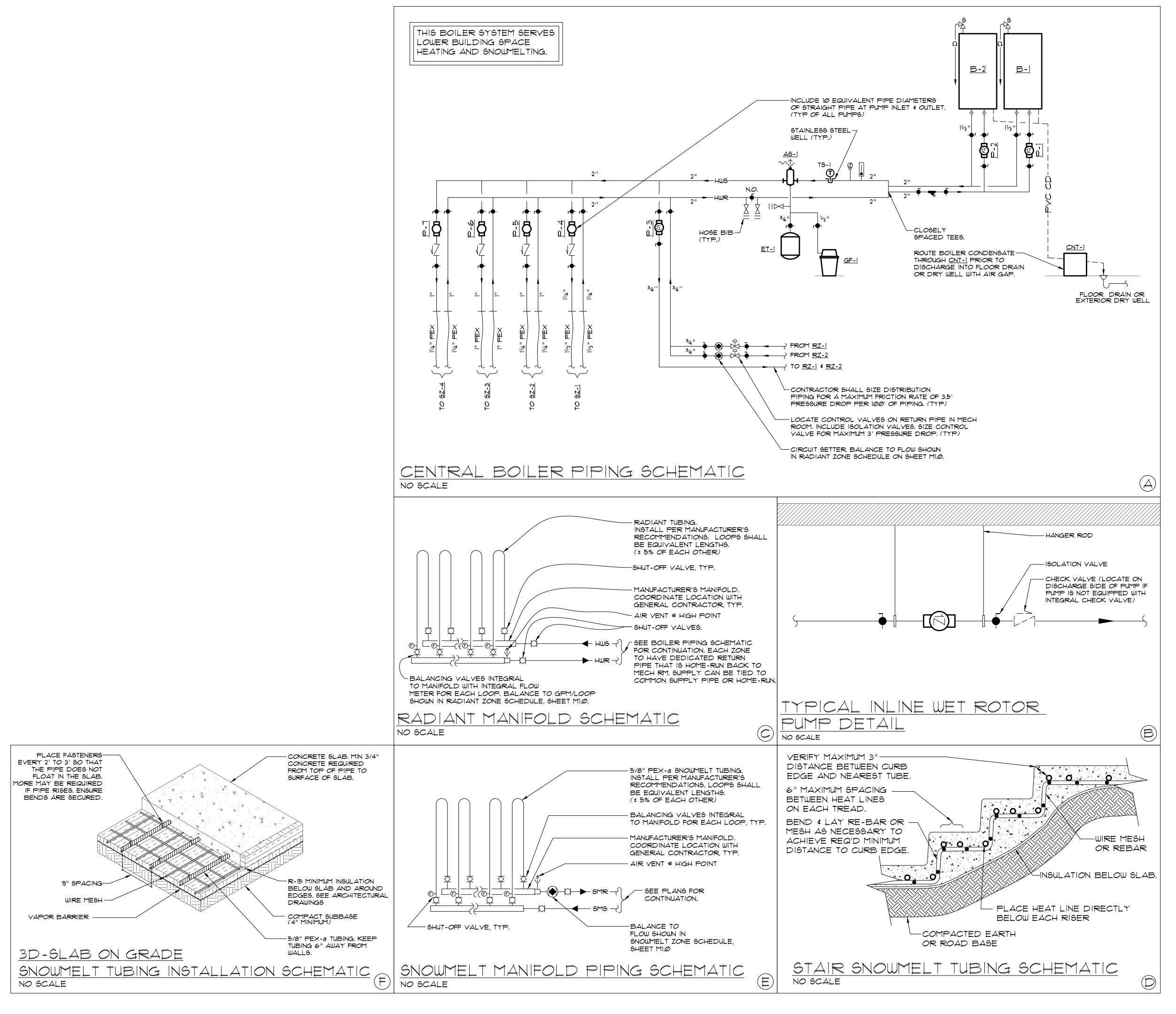




SSRC ALPINE COASTER 2305 MT. WERNER CIRCLE STEAMBOAT SPRINGS, COLORADO

	1			
lssue	ed For			
No.	Date		Comment	
1	8/12/16	C	DORDIN.	ATION
2	8/23/16	C	ONSTRUC	CTION
	-			
ME	CHANI		٠ ۱ ا	
	CHAINI ANS	4ر	→ L	
· -	_			
	ect No.		Scale:	
160	053 <i>.00</i>		RE: F	PLANS
Drau	ın By:		Checke	d By:
1	DRC		JE	P

M2.0







CIRCLE WERNER SPRINGS, INE 2305 MT. STEAMBOAT S

Issue	ed For	1
No.	Date	Comment
1	8/12/16	COORDINATION
2	8/23/16	CONSTRUCTION
ME	CHANI	CAL
SC	HEMAT	ICS
Proj	ect No	Scale
	ect No. 053.00	Scale:

M3.0

S

Mechanical Specifications

General

- 1. Immediately notify the Engineer of any discrepancies.
- 2. It shall be assumed that all subcontractors are experienced and thoroughly knowledgeable in their respective areas of the construction industry and shall perform in a responsible manner in an appropriate construction sequence.
- 3. Do not scale drawings. Verify dimensions in field prior to commencement of work.
- 4. It is the intent of these drawings and specifications to establish a standard of quality. The Engineer reserves the right to take exceptions to approve methods and materials not reflected herein.
- 5. Failure to order, or release order, for materials and/or equipment will not be accepted as a reason to substitute alternate materials, equipment, or installation methods.
- 6. Work shall be performed in a workmanlike manner to the satisfaction of the Architect & the Engineer.
- 7. Labor, materials, and equipment shall conform to the latest applicable editions of local, State of Colorado, and National Codes and ordinances. If conflict between those publications exists, the most stringent requirement shall apply.
- 8. The drawings show the intent of the mechanical systems but do not show all details required. It is the responsibility of the Contractors to install complete & operable systems, which conform to the manufacturers' installations instructions & industry standards.
- 9. Systems shall be tested for proper operation. If tests show work is defective, Contractor shall make corrections necessary at no cost to Owner.
- 10. It is the Contractors' and manufacturers' responsibility to assure themselves that the code authorities will approve any product to be installed on the project.
- 11. Provide necessary trenching, backfill, excavation, supports, piping, insulation, saw cutting and patching, concrete/paving, etc., as required. Backfill trenches in 6" layers and to 90% compaction and patch to match existing grade.
- 12. Coordinate architectural, structural, electrical, landscaping, and fire protection drawings with mechanical drawings prior to installation.
- 13. Verify exact locations of existing and new underground utilities, piping, and raceway systems prior to trenching. Contractor shall obtain and verify exact utility company drawings and requirements.

Electrical

- 14. Contractor must carefully verify electrical service voltage and phase available before ordering any equipment.
- 15. The following are to be furnished by MC and wired by EC: equipment motors, magnetic starters, line voltage thermostats, factory disconnect switches (if specified as part of factory wired equipment) resistance heaters, fire and smoke detectors.
- 16. The following are to be furnished and wired by EC: disconnect switches, thermal overload switches, manual operating switches and contactors.
- 17. The following are to be furnished and wired by MC: low voltage thermostats, control transformers, control relays, control panels, motorized valves, motorized dampers, pilot lights, multi-speed switches and interlocks.

Insulation

18. Piping Insulation Schedule:

Service	Thickness (in.)
HWS/R (less than 1.5" pipe)	1.5
HWS/R (1.5" pipe and greater)	2.0
SMS/R (less than 1.5" pipe)	1.5
SMS/R (1.5" pipe and greater)	2.0

Piping insulation exposed inside shall be U.L. approved, white, all service, glass fiber, snap-on, pipe insulation. Insulate fittings with glass fiber blanket insulation and premolded PVC covers.

- 19. Insulation shall be installed under all radiant heated floors on slab. Insulation shall have a minimum R-value of 10 at a mean testing temperature of 75 F.
- 20. Insulation shall be installed under all exterior snowmelt areas. Insulation shall be Dow Styrofoam Highload extruded polysterene foam board insulation that has an R-10 insulation value. Insulation must have pressure rating suitable for application.
- 21. All buried snowmelt piping shall be either A) Pre-insulated PEX piping, Urecon or equivalent or B) Insulated with Armaflex or equivalent and run inside a watertight conduit. Product must meet requirements of ASTM C 534. Insulation shall have a maximum thermal conductivity of 0.27 Btu-in/h-ft2F at 75 F mean temperature.
- 22. Insulation for all types of piping shall be carried full size through pipe hangers or pipes shall be supported with vibration

Piping

- 23. Heating Water piping For non-buried piping, type 'L' copper, wrought copper fittings, and no lead solder.
- 24. Snowmelt distribution piping buried underground outdoors shall be sized per plans and shall be PEX-a crosslinked polyethylene with an oxygen diffusion barrier, manufactured by the Engle method.
- 25. Condensing Boiler Condensate shall be neutralized via a neutralization basin before discharge into building drainage system. Condensate piping shall be PVC or other approved material suitable for pH levels of 3.
- 26. Gas Piping Schedule 40 black steel pipe, 150 lb. malleable iron screwed fittings on above ground pipe, welded fittings with all piping coated and wrapped on buried pipe. CSST pipe is permitted for final connections only.
- 27. Underground Gas Piping shall be Gastite Polyethylene plastic conforming to ASTM D 2513, or approved equal. Pipe shall be marked "Gas" and "ASTM D 2513".
- 28. Gas Valves Lubricated plug valve 175 lb. W.O.G. iron screwed or flanged.
- 29. Gas Pressure Regulator (GPR) Valves Install GPR's where specified and/or shown on plans. Include shut-off valve upstream of valve and capped tees upstream and downstream of valve for pressure testing. For modulating condensing boilers, install a minimum of 10' of gas piping downstream of regulator to serve as a buffer during start-up. Refer to boiler manufacturer installation instructions for additional requirements. Install vent limiting device or vent pipe to the outside, as required.

30. Copper pipe Valves and Specialties:

Bronze, Class 125, 200 lb. W.O.G. Gate Valves: Bronze, Class 125, 200 lb. W.O.G. Ball Valves: Bronze, Class 125, 200 lb. W.O.G. Check Valves:

Balancing Valves: 125 psig w.p. for 250F service tight shut-off, Illinois dual-purpose, balancing/shut-off valve,

Hoffman, Sarco, or equivalent.

- 31. Support pipe with rod and clevis or clamps. No pipe tape allowed.
- 32. Dielectric Unions Furnish and install a dielectric union at all connections where non-ferrous material is in contact with ferrous material and fluid is not protected with corrosion inhibitors.
- 33. Grade and valve all heating water piping with ³/₄" hose end valves to permit drainage of the system. Vent all high points in equipment rooms as necessary with automatic air vents piped to convenient drain. All high points in system outside of equipment rooms with manual air vents as required to relieve air in the system.

Boiler Flue & Combustion Air Piping

34. Boiler flue piping and combustion air piping shall be PVC, complying with ASTM D1785.

Antifreeze Solutions

- 35. DILUTION WATER QUALITY: Contractor shall be responsible for testing the water and submitting a report to the Owner & Engineer, prior to system fill. "Hard" water shall not be used. The water used to dilute the concentrated inhibited glycol-based heat transfer fluid must be either distilled, deionized, or contain less than 25 ppm of chloride, 25 ppm of sulfate, 50 ppm of calcium, and 50 ppm of magnesium, with a total hardness not to exceed 100 ppm. If good quality water is unavailable, the manufacturer of the glycol product will provide the heat transfer fluid and water to meet the specifications of the system.
- 36. Fill heating water system with 50% propylene glycol / 50% water solution, by volume, for freeze protection to -28°F and burst protection to -60°F. Include corrosion inhibitors.

- 37. Mount all thermostats 5'-0" above finished floor unless integral to equipment.
- 38. Thermostats shall not be installed above heat emitting equipment, including wall mounted touch screen controls. Do not mount on exterior walls.
- 39. All thermostats shall have a temperature range suitable for the application and have adjustable set points. The thermostats shall be able to display temperature setpoint and room temperature. All thermostats shall be approved by the Owner.
- 40. Install emergency gas shutoff switch inside mechanical rooms containing boilers. Switch plate shall be red in color and labeled "GAS BURNER EMERGENCY SWITCH". Switch shall be compliant with Section 1006.8 of the 2009 IMC. Refer to electrical drawings for additional information.
- 41. See Sequence of Operation for additional control information.

Radiant Floor Heating

- 42. Radiant tubing shall be 1/2" nominal diameter. Tubing shall be PEX-a crosslinked polyethylene with an oxygen diffusion barrier, manufactured by the Engle method.
- 43. Piping shall be installed in continuous loops, no splices allowed. Tube centers and the maximum loop lengths are specified in the Radiant Zone Schedule on the plans.
- 44. Tubing loops off each manifold shall be installed in equivalent lengths (+/- 5%).
- 45. The Contractor shall install manifolds as provided by the tubing manufacturer. The manifolds shall consist of a return header (including: balancing valve for each loop, compression fitting to receive tubes and air vent) and supply header (including: manual shut-off valve for each loop and compression fitting to receive tubes).

Snowmelt

- 46. Snowmelt tubing shall be 5/8" nominal diameter. Tubing shall be PEX-a crosslinked polyethylene with an oxygen diffusion barrier, manufactured by the Engle method.
- 47. Piping shall be installed in continuous loops, no splices allowed. Tube centers and the maximum loop lengths are specified in the Snowmelt Zone Schedule on the plans.
- 48. Tubing loops off each manifold shall be installed in equivalent lengths (+/- 5%).
- 49. The Contractor shall install manifolds as provided by the tubing manufacturer. The manifolds shall consist of a return header (including: balancing valve for each loop, compression fitting to receive tubes and air vent) and supply header (including: manual shut-off valve for each loop and compression fitting to receive tubes).
- 50. Snowmelt distribution piping shall be sized per plans. Piping shall be PEX-a crosslinked polyethylene with an oxygen diffusion barrier, manufactured by the Engle method.
- 51. Secure piping in snowmelt areas by attaching tubing to wire mesh using plastic tie straps, every 3' on straight runs and at apex of turn for any change of direction. No metal wiring shall be used.
- 52. Snowmelt system shall be pressure tested in accordance with tubing manufacturer's instructions as required for warranty protection. In the absence of manufacturer's instruction, pressurize the entire snowmelt system with compressed air. Charge system to a pressure of not less than 80 psig or more than 100 psig. Pressure test shall last for 24 hours with not less than a 2 psig drop. With system air charged, soap test all joint on and within the manifolds. After hydrostatic test pressure has been applied, examine piping, joints and connections for leakage. Eliminate any leaks as necessary & re-test. Any portion of tubing layout that rises as a result of being pressurized shall be re-secured to be at the proper level within the slab structure when poured.
- 53. Entire snowmelt system shall be left pressurized with monitoring pressure gauge throughout installation of concrete. Continually monitor pressure on system to make certain tubing system remains intact with no leaks or punctures.
- 54. Manifolds shall be tagged to identify area served. Each connection on supply & return manifolds shall be permanently labeled with loop number.
- 55. Prior to final system fill and commissioning, the PEX tubing system and manifolds shall be chemically cleaned as

prescribed by the tubing manufacturer. Supply all tools, connections, labor, and accessories necessary to properly remove all foreign material, chemical, and residue within the tubing system before permanently charging system and placing into

56. After entire system has been properly cleaned and flushed, fill system with clean water to proper cold fill pressure. Add propylene glycol to the snowmelt system to the concentration specified using a positive displacement pump. Antifreeze fluid shall include corrosion inhibitors. Purge each individual loop to eliminate air pockets in the system. After purging remove fill connection to any potable water lines to prevent any possibility of contamination.

END OF SPECIFICATIONS

-Sequence of Operation

1. B-1 & B-2 Boilers

- a. Integral boiler controls shall stage, modulate, and rotate B-1 & B-2 boilers to maintain heating water setpoint at temperature sensor TS-1
- b. Set up boilers for lead/lag operation.
- c. Heating water supply temperature setpoint shall be reset based on outside air temperatures (120°F @ -20°F to 90°F @ 60°F).
- d. HWS setpoint shall be ramped up to 120°F on a call for snowmelting.

2. GF-1 Glycol Feeder

- a. Unit shall be controlled by integral controls.
- b. Set pressure setting so that GF-1 automatically maintains closed loop system pressure at approximately 15 psi (adj.).

3. Radiant Floor Heating

a. Upon a call for heating, on/off zone valve on heating water return pipe shall open to flow zone, boilers shall be enabled, and <u>P-3</u> heating water pump shall run.

4. Snowmelting

- a. Provide (4) Tekmar 091/094 snow/ice sensors and sockets, one for each snowmelt zone. Refer to M2.0/C for sensor
- b. Provide (4) Tekmar 654 snowmelt controls with manual override, one for each snowmelt zone.
- c. Upon a call for snowmelting from snow/ice sensor, associated snowmelt zone pump shall start and boilers shall be enabled. d. Tekmar system shall be set up for WWSD (warm weather shut down) at approximately 45°F (adj.). Snowmelt system shall not operate if outdoor temperature is above this setting.

- a. P-1 B-1 Boiler Pump: on whenever boiler is called to fire.
- b. P-2 B-2 Boiler Pump: on whenever boiler is called to fire.
- c. P-3 Space Heating Pump: on whenever there is a call for space heating.
- d. $\underline{P-4}$ SZ-1 Snowmelt Pump: on whenever there is a call for snowmelting from sensor located in SA-1a. e. P-5 SZ-2 Snowmelt Pump: on whenever there is a call for snowmelting from sensor located in SA-2.
- f. P-6 SZ-3 Snowmelt Pump: on whenever there is a call for snowmelting from sensor located in SA-3.
- g. P-7 SZ-4 Snowmelt Pump: on whenever there is a call for snowmelting from sensor located in SA-4.

6. EUH-1 Electric Unit Heater

a. Electric Unit Heater shall be controlled by built-in thermostat.

END OF SEQUENCE OF OPERATION



30290 8/23/16

AD0 CIRCLE COLOR WERNER SPRINGS, MT. 2305 AMB(STE,

INE

RC

S

S

Issued For No. | Date | Comment 1 8/12/16 COORDINATION 2 8/23/16 CONSTRUCTION

MECHANICAL SPECIFICATIONS AND SEQUENCE OF OPERATION

Project No. 16053.00 Drawn By: Checked By: DRC JDR

M4.0