## GENERAL GEOTHERMAL NOTES

1. ALL WORK SHALL BE IN COMPLIANCE WITH STATE AND LOCAL CODES.
2. THE CONTRACTOR SHALL PAY FOR ALL FEES, PERMITS, LICENSES, ETC., NECESSARY FOR PROPER COMPLETION OF THE WORK.
3. INSTALL ALL EQUIPMENT IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS.
4. VERIFY ALL EXISTING CONDITIONS. NOTIFY ENGINEER OF ANY CONFLICTS BETWEEN CONTRACT DRAWINGS AND ACTUAL CONDITIONS.
5. EXISTING UTILITIES TO BE ABANDONED SHALL BE PROPERLY DISCONNECTED AND CAPPED AS REQUIRED BY CODE OR LOCAL ORDINANCE.
6. THESE DRAWINGS ARE DIAGRAMMATIC AND SHALL NOT BE SCALED. ADDITIONAL DATA SHALL BE FROM THE ENGINEER THROUGH WRITTEN CLARIFICATION ONLY. VERIFY ALL EXISTING CONDITIONS, ELEVATIONS, AND DIMENSIONS BEFORE PROCEEDING WITH ANY PORTION OF ANY WORK. THE CONTRACTOR SHALL PROVIDE ALL OFFSETS AND TRANSITIONS REQUIRED TO MEET EXISTING CONDITIONS.
7. THE CONTRACTOR SHALL PERFORM WORK IN A SKILLED AND PROFESSIONAL MANNER.
8. ALL CONTRACTORS ARE RESPONSIBLE TO FIELD COORDINATE WORK SCHEDULE WITH OWNER REPRESENTATIVE.
9. THE CONTRACTOR SHALL WORK AND COORDINATE WITH THE OTHER TRADES.
10. ALL EQUIPMENT SHALL BE NEW AND IN UNDAMAGED CONDITION. ANY EQUIPMENT FOUND DEFECTIVE SHALL BE IMMEDIATELY REMOVED FROM THE PROJECT.
11. PROVIDE 3 COPIES OF AN OPERATION AND MAINTENANCE MANUAL FOR ALL EQUIPMENT. EACH PIECE OF EQUIPMENT SHALL STATE THE CONTRACT DATE AND THE NAME, ADDRESS AND PHONE NUMBER FOR THE PRIME CONTRACTOR, SUBCONTRACTOR PERFORMING THE INSTALLATION, AND THE LOCAL VENDOR FOR SPARE PARTS. THE MANUALS SHALL CONTAIN MAINTENANCE INSTRUCTIONS REQUIRED FOR THE INSTALLED EQUIPMENT. MANUALS SHALL BE BOUND IN A THREE RING HARD COVER BINDER. O & M MANUALS SHALL BE SUBMITTED TO THE OWNER PRIOR TO FINAL WALK THROUGH OF THE PROJECT.
12. PROVIDE OWNER TRAINING FOR THE INSTALLED EQUIPMENT. TRAINING SHALL BE HELD ONLY AFTER ALL OF THE EQUIPMENT IS INSTALLED AND PROPER OPERATION IS VERIFIED.
13. CONTRACTOR SHALL SUBMIT A CERTIFIED REPORT INDICATING SYSTEM PERFORMANCE INCLUDING, BUT NOT LIMITED TO, VOLTAGE AND AMPERAGE MEASUREMENTS OF ALL EQUIPMENT GREATER THAN 1/3 H.P. WATER BALANCE MEASUREMENTS OF EACH COIL AND PUMP. AIR BALANCE MEASUREMENTS OF OUTSIDE AIR DELIVERY, AIR HANDLING UNIT SUPPLY, SUPPLY DIFFUSERS, EXHAUST AND RETURN GRILLES. AIR BALANCE SHALL BE WITHIN 10% OF DESIGN CONDITIONS. THE REPORT CERTIFICATION SHALL BE AS FOLLOWS:
    I (name) of (company) CERTIFY THAT ALL MEASUREMENTS, FIGURES AND STATEMENTS INDICATED IN THIS REPORT WERE TAKEN BY ME OR UNDER MY SUPERVISION AND ARE ACCURATE AS OF (date). DESIGN FLOWS WERE BASED UPON PLANS DATED (xx/xx/xx).
14. MECHANICAL CONTRACTOR TO REPAIR ANY DAMAGE DONE TO THE FIRE STOPPING WHILE INSTALLING THE MECHANICAL TRADES. SEAL ALL PENETRATIONS THROUGH RATED STRUCTURES WITH UL LISTED FIRE SEAL DESIGNED FOR THE SPECIFIED APPLICATION.
15. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES TO PROTECT THE PUBLIC AND ADJACENT PROPERTIES FROM DAMAGE THROUGHOUT CONSTRUCTION.
16. THE CONTRACTOR SHALL GUARANTEE ALL WORKMANSHIP AND MATERIALS FOR A PERIOD OF ONE (1) YEAR FROM THE DATE OF SUBSTANTIAL COMPLETION OR AS OTHERWISE REQUIRED IN THE SPECIFICATIONS.
17. MECHANICAL CONTRACTOR TO INCLUDE THE TEST AND BALANCE, AND ANY PERMIT FEES IN THEIR BID.
18. UPON PROJECT COMPLETION, RECORD (AS-BUILT) DRAWINGS SHALL BE PROVIDED BY THE CONTRACTOR TO THE OWNER AND ENGINEER IN PDF FORMAT. ALL CHANGES IN PIPING AND DUCTWORK ARRANGEMENTS SHALL BE NOTED ON THE RECORD DRAWINGS.

## GEOTHERMAL PIPING LEGEND

| | | | |
|---|---|---|---|
| DOUBLE ELBOW DOWN | | | DOUBLE ELBOW DOWN (AT CORNER) |
| ELBOW DOWN | | | ELBOW UP |
| TEE | | | TEE DOWN |
| ELBOW | | | TEE UP |
| ELBOW DOWN TO TEE | | | END CAP |
| TYPICAL TEE CONNECTION (PLANS ONLY) | | | REDUCER |
| AUTOMATIC AIR VENT | | | NEW TO EXISTING PIPE CONNECTION |
| WATER FLOW MEASURING DEVICE | | | FLOW DIRECTION ARROW |
| PIPE ANCHOR | | | MANUAL AIR VENT (MAV) |
| PIPE GUIDE / SLEEVE | | | PRESSURE GAUGE |
| BALANCING VALVE | | | UNION |
| CIRCUIT SETTER | | | PRESSURE RELIEF VALVE |
| PRESSURE REDUCING VALVE | | PT | PRESSURE/TEMPERATURE PORT |
| BALL VALVE/SHUT-OFF VALVE | | | AIR SEPARATOR |
| SILENT CHECK VALVE | | | PUMP |
| GLOBE VALVE | | | OR PUMP |
| TWO-WAY VALVE | | | FLEX CONNECTION |
| THREE-WAY VALVE | | | THERMOMETER |
| BUTTERFLY VALVE | | | STEAM GAUGE SIPHON |
| TRIPLE DUTY VALVE | | | |
| SHUT-OFF COCK | | | COIL |
| STRAINER | | | PIPE VIEW |
| STRAINER WITH BLOWDOWN | | AI | ANALOG INPUT |
| SUCTION DIFFUSER W/ STRAINER AND BLOWDOWN | SD | AO | ANALOG OUTPUT |
| DRAIN VALVE | | DI | DIGITAL INPUT |
| VACUUM BREAKER | | DO | DIGITAL OUTPUT |
| FLOW CONTROL VALVE W/ PRESSURE DIFFERENTIAL SENSOR | DP | | CONNECT TO EXISTING |
| DIFFERENTIAL PRESSURE SENSOR | DP | | |

## CONTROL DIAGRAM LEGEND

| | | | |
|---|---|---|---|
| CS | CURRENT SENSOR | SAT | SUPPLY AIR TEMPERATURE |
| P | PRESSURE SENSOR | FMS | AIR FLOW MEASURING STATION |
| T | TEMPERATURE SENSOR | DP | DIFFERENTIAL PRESSURE SENSOR |
| LL | LOW LEVEL SENSOR | R | CONTROL RELAY |
| VFD | VARIABLE FREQUENCY DRIVE | AI | ANALOG INPUT |
| FM | WATER FLOW METER | AO | ANALOG OUTPUT |
| PANEL | MANUFACTURER'S CONTROL PANEL | DI | DIGITAL INPUT |
| MAT | MIXED AIR TEMPERATURE | DO | DIGITAL OUTPUT |

## ABBREVIATIONS

| | |
|---|---|
| A | AMP |
| ADD | ADDENDUM |
| ADDL | ADDITIONAL |
| ADJ | ADJUSTABLE |
| ADS | AIR DIRT SEPARATOR |
| AFF | ABOVE FINISH FLOOR |
| AFG | ABOVE FINISH GRADE |
| AHU | AIR HANDLER UNIT |
| AI | ANALOG INPUT |
| ALP | AMBIENT LOOP PUMP |
| ANNC | ANNUNCIATOR |
| AO | ANALOG OUTPUT |
| APPRX | APPROXIMATE |
| ARCH | ARCHITECT, ARCHITECTURAL |
| BDD | BACK DRAFT DAMPER |
| BHP | BRAKE HORSEPOWER |
| BLDG | BUILDING |
| BI | BLACK IRON |
| BOD | BOTTOM OF DUCTWORK |
| BOP | BOTTOM OF PIPE |
| BOT | BOTTOM |
| BSMT | BASEMENT |
| BTU | BRITISH THERMAL UNITS |
| BTUH | BRITISH THERMAL UNITS PER HOUR |
| C | CENTER |
| CD | CEILING DIFFUSER |
| CFM | CUBIC FEET PER MINUTE |
| CHAR | CHARACTERISTICS |
| CI | CAST IRON |
| CIRC | CIRCUIT |
| CL | CENTERLINE |
| CLR | CLEAR |
| CO | CLEAN OUT |
| COL | COLUMN |
| COMP | COMPRESSOR |
| CONC | CONCRETE |
| COND | CONDENSATE |
| CONT | CONTINUOUS |
| COP | COEFFICIENT OF PERFORMANCE |
| CR | CEILING REGISTER |
| CW | CHILLED/COLD WATER |
| CWR | COLD WATER RETURN |
| CWS | COLD WATER SUPPLY |
| DB | DRY BULB |
| DCS | DISTRICT CONTROL SYSTEM |
| DEG | DEGREE |
| DEPT | DEPARTMENT |
| DET | DETAIL |
| DF | DRINKING FOUNTAIN |
| DG | DOOR GRILLE |
| DI | DIGITAL INPUT |
| DIA OR Ø | DIAMETER |
| DIM | DIMENSION |
| DN | DOWN |
| DO | DIGITAL OUTPUT |
| DW | DEIONIZED WATER |
| DWG | DRAWING |
| (E) | EXISTING |
| EA | EXHAUST AIR |
| EAT | ENTERING AIR TEMPERATURE |
| EC | ELECTRICAL CONTRACTOR |
| ECM | ELECTRONIC CONTROL MODULE |
| EER | ENERGY EFFICIENCY RATIO |
| EF | EXHAUST FAN |
| EG | EXHAUST GRILLE |
| EL | ELEVATION |
| ELEC | ELECTRICAL |
| ELEV | ELEVATOR |
| ELT | ENTERING LIQUID TEMPERATURE |
| EQ | EQUAL |
| EQUIP | EQUIPMENT |
| ERU | ENERGY RECOVERY UNIT |
| ESP | EXTERNAL STATIC PRESSURE |
| EST | ESTIMATE OR ESTIMATED |
| ET | DIAPHRAGM EXPANSION TANK |
| ETR | EXISTING TO REMAIN |
| EWT | ENTERING WATER TEMPERATURE |
| F&T | FLOAT AND THERMOSTATIC |
| FA | FRESH AIR |
| FCO | FLOOR CLEANOUT |
| FD | FLOOR DRAIN |
| FLR | FLOOR |
| FPM | FEET PER MINUTE |
| FT | FOOT (FEET) |
| FURN | FURNACE |
| GA | GAUGE/GAGE |
| GAL | GALLON |
| GALV | GALVANIZED |
| GC | GENERAL CONTRACTOR |
| GFS | GLYCOL FEED STATION |
| GLHX | GROUND LOOP HEAT EXCHANGER |
| GP | GEOTHERMAL PUMP |
| GPM | GALLONS PER MINUTE |
| GSP | GEOTHERMAL SOURCE PUMP |
| GSR | GEOTHERMAL SOURCE RETURN |
| GSS | GEOTHERMAL SOURCE SUPPLY |
| HD | HEAD |
| HDPE | HIGH DENSITY POLYETHYLENE |
| HORIZ | HORIZONTAL |
| HP | HORSEPOWER |
| HR | HOUR (HOURS) |
| HT | HEIGHT |
| HW | HOT WATER |
| HWR | HOT WATER RETURN |
| HWS | HOT WATER SUPPLY |
| I/O | INPUT/OUTPUT |
| IA | INSTRUMENT AIR |
| IE | INVERT ELEVATION |
| IN | INCH |
| INSUL | INSULATION |
| J-BOX | JUNCTION BOX |
| LAT | LEAVING AIR TEMPERATURE |
| LB | POUND |
| LLT | LEAVING LIQUID TEMPERATURE |
| LOC | LOCATION |
| LV | LOW VOLTAGE |
| LWT | LEAVING WATER TEMPERATURE |
| MA | MAKE-UP AIR OR MIXED AIR |
| MAX | MAXIMUM |
| MBH | 1000 BTU PER HOUR |
| MC | MECHANICAL CONTRACTOR |
| MCA | MINIMUM CIRCUIT AMPS |
| MECH | MECHANICAL |
| MIN | MINIMUM |
| MFR | MANUFACTURER |
| MOCP | MAX OVER CURRENT PROTECTION |
| NFC | NOT FOR CONSTRUCTION |
| NG | NATURAL GAS |
| NIC | NOT IN CONTRACT |
| NTS | NOT TO SCALE |
| OA | OUTSIDE AIR |
| OC | ON CENTER |
| OED | OPEN END DUCT |
| OPNG | OPENING |
| OPP | OPPOSITE |
| P | PUMP |
| PC | PLUMBING CONTRACTOR |
| PERP | PERPENDICULAR |
| PG | PROPYLENE GLYCOL |
| PLBG | PLUMBING |
| PNL | PANEL |
| PPH | POUNDS PER HOUR |
| PRES | PRESSURE |
| PRV | PRESSURE RELIEF VALVE |
| PSF | POUNDS PER SQUARE FOOT |
| PSI | POUNDS PER SQUARE INCH |
| PSIG | POUNDS PER SQUARE INCH GAUGE |
| PWR | POWER |
| QTY | QUANTITY |
| R | RADIUS |
| RA | RETURN AIR |
| RD | ROOF DRAIN |
| REL | RELIEF |
| REQD | REQUIRED |
| REV | REVERSE OR REVISION |
| RG | RETURN AIR GRILLE |
| RPM | REVOLUTIONS PER MINUTE |
| RTU | ROOF TOP UNIT |
| SA | SUPPLY AIR |
| SAN | SANITARY |
| SCH | SCHEDULE |
| SECT | SECTION |
| SEP | SEPARATOR |
| SF | SQUARE FEET |
| SG | SUPPLY GRILLE |
| SHT | SHEET |
| SHWR | SHOWER |
| SIM | SIMILAR |
| SP | STATIC PRESSURE |
| SPEC | SPECIFICATIONS |
| SQ | SQUARE |
| SS | STAINLESS STEEL |
| STM | STEAM |
| T&B | TEST AND BALANCE OR TOP AND BOTTOM |
| T&P | TEMPERATURE AND PRESSURE RELIEF VALVE |
| TEMP | TEMPERATURE OR TEMPORARY |
| TG | TRANSFER GRILLE |
| TYP | TYPICAL |
| UNO | UNLESS NOTED OTHERWISE |
| V | VOLT |
| VAR | VARIABLE OR VARIES |
| VEL | VELOCITY |
| VERT | VERTICAL |
| VFD | VARIABLE FREQUENCY DRIVE |
| VOL | VOLUME |
| VS | VENT STACK |
| VTR | VENT THRU ROOF |
| W/ | WITH |
| W/IN | WITHIN |
| W/O | WITHOUT |
| WB | WET BULB |
| WC | WATER COLUMN (INCHES OF) |
| WCO | WALL CLEANOUT |
| WG | WATER GAUGE |
| WOG | WATER, OIL, GAS |
| WP | WEATHER PROOF |
| WP | WORKING PRESSURE |
| WSHP | WATER SOURCE HEAT PUMP |
| WT | WEIGHT |

## GEOTHERMAL SHEET INDEX




Salas O'Brien

salasobrien.com

Eau Claire
2720 Arbor Court
Eau Claire, WI 54701




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City of Framingham, MA

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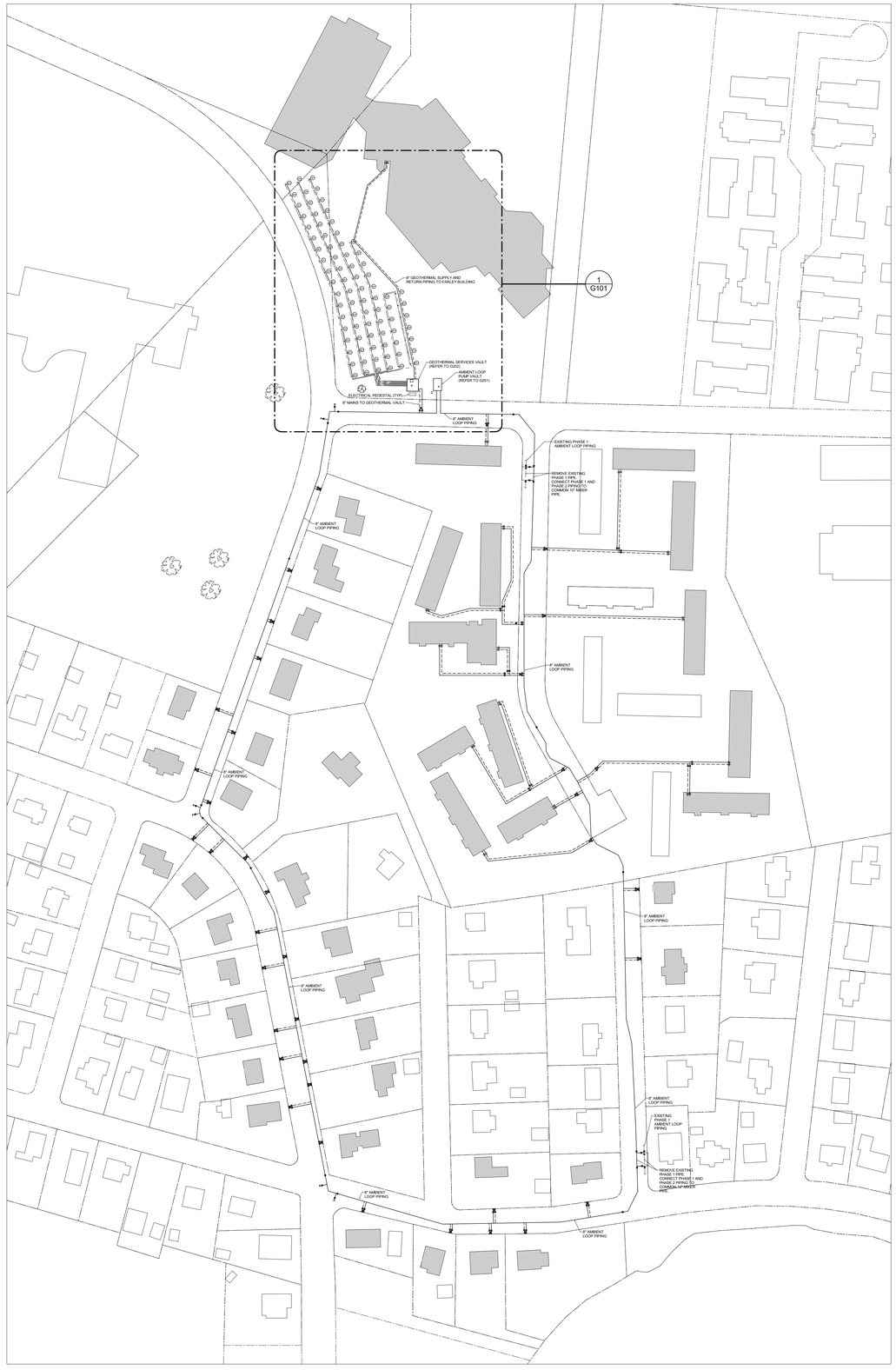
SHEET NAME

GEOTHERMAL NOTES, LEGENDS & ABBREVIATIONS

SHEET NUMBER: G001
REVISION:

## GENERAL NOTES

1. REFER TO CIVIL PLANS FOR COORDINATION OF AMBIENT LOOP AND UTILITIES.
2. REFER TO G701 FOR BUILDING CONNECTION PIPE SIZING.
3. REFER TO G501 FOR BUILDING PENETRATION DETAILS.




## 2 GEOTHERMAL SITE PLAN - AMBIENT LOOP

1" = 80'-0"


Salas O'Brien

salasobrien.com

**Eau Claire**
**2720 Arbor Court**
**Eau Claire, WI 54701**

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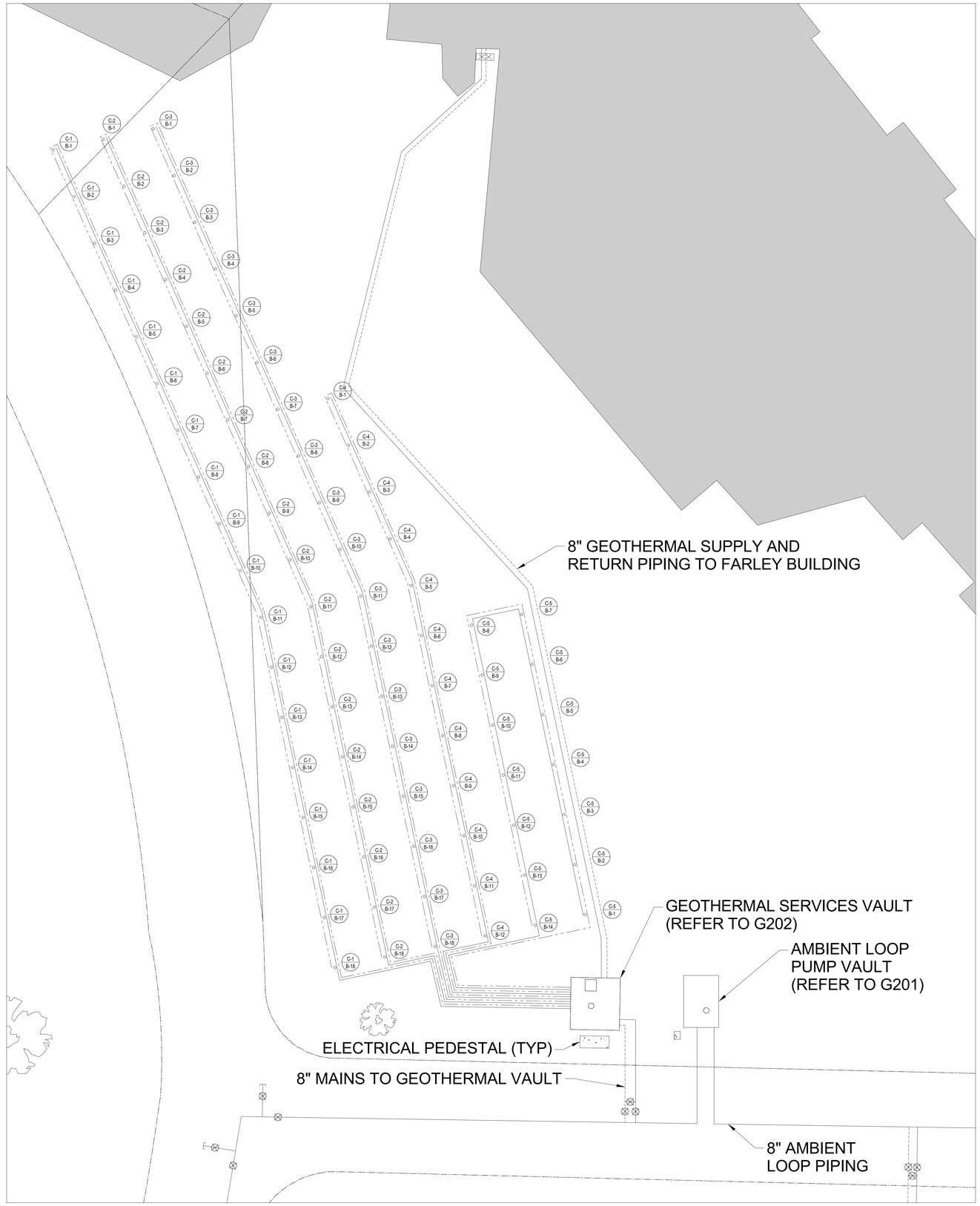
**SHEET NAME**

GEOTHERMAL SITE PLAN - AMBIENT LOOP

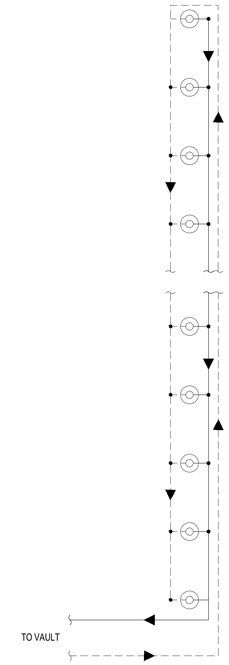
**SHEET NUMBER** G100
**REVISION**




## 1 GEOTHERMAL BORE FIELD - ENLARGED VIEW

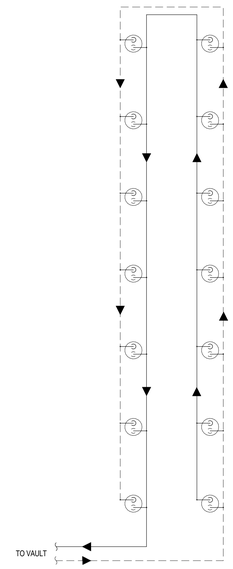
1/16" = 1'-0"

| GENERAL NOTES |
|---|
| 1. REFER TO CIVIL PLANS FOR COORDINATION OF VAULT AND BORE LOCATIONS. |




## 2 CIRCUITS #1-4 REVERSE-RETURN PIPING DETAIL

NOT TO SCALE




## 3 CIRCUIT #5 REVERSE-RETURN PIPING DETAIL

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salasobrien.com
Eau Claire
2720 Arbor Court
Eau Claire, WI 54701



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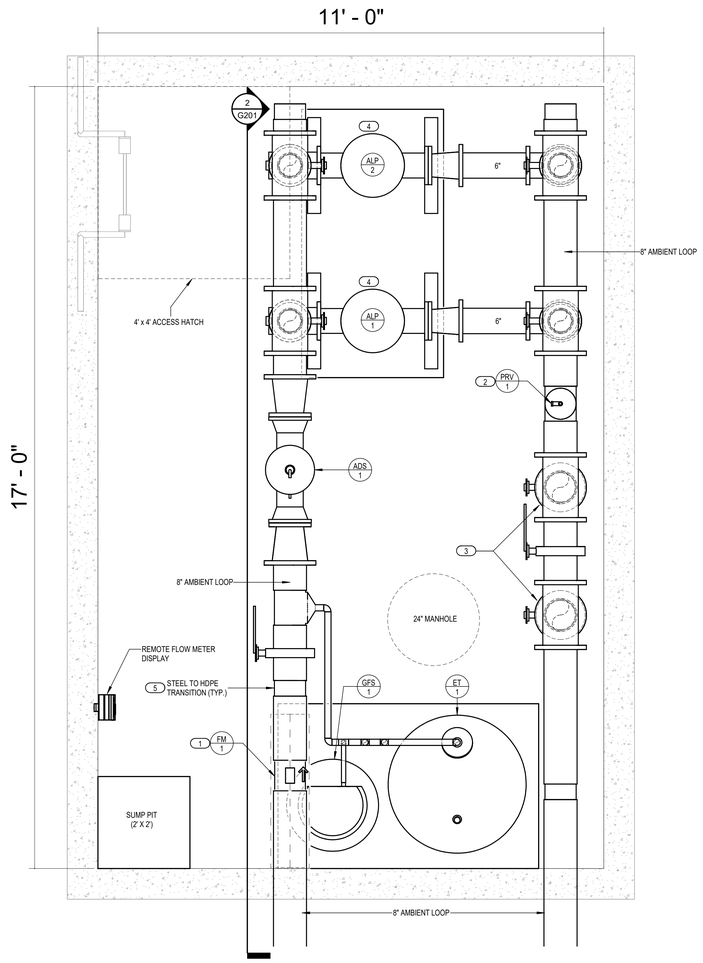
**SHEET NAME**

GEOTHERMAL SITE PLAN - ENLARGED VIEW

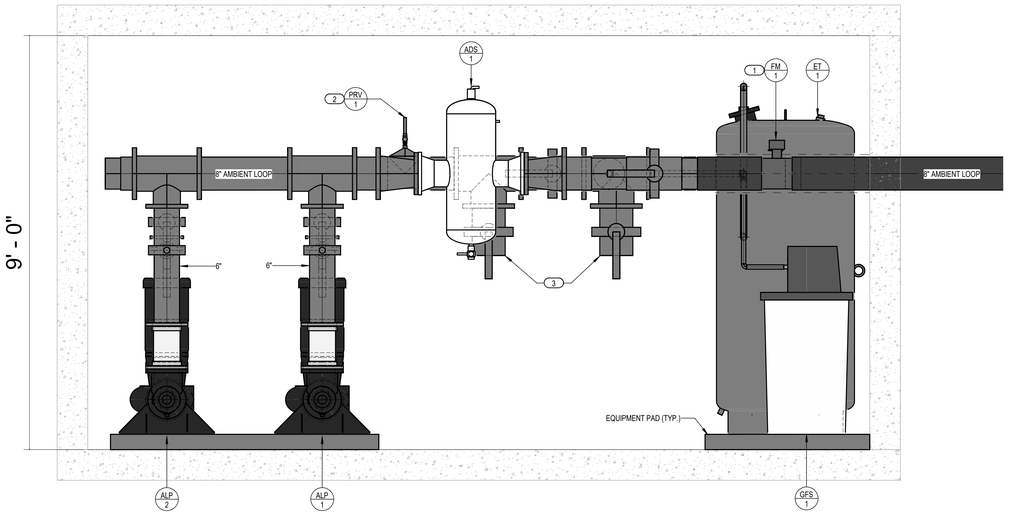
**SHEET NUMBER** G101

**REVISION**



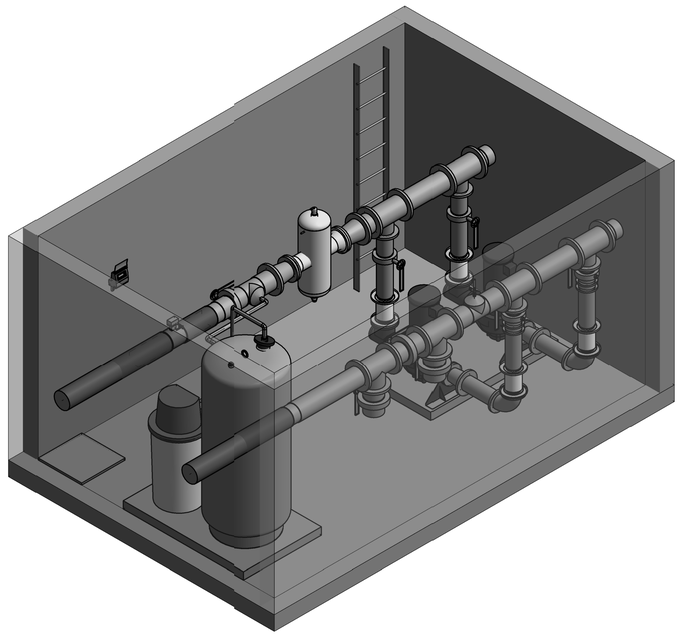

## 1 AMBIENT LOOP VAULT LAYOUT

3/4" = 1'-0"

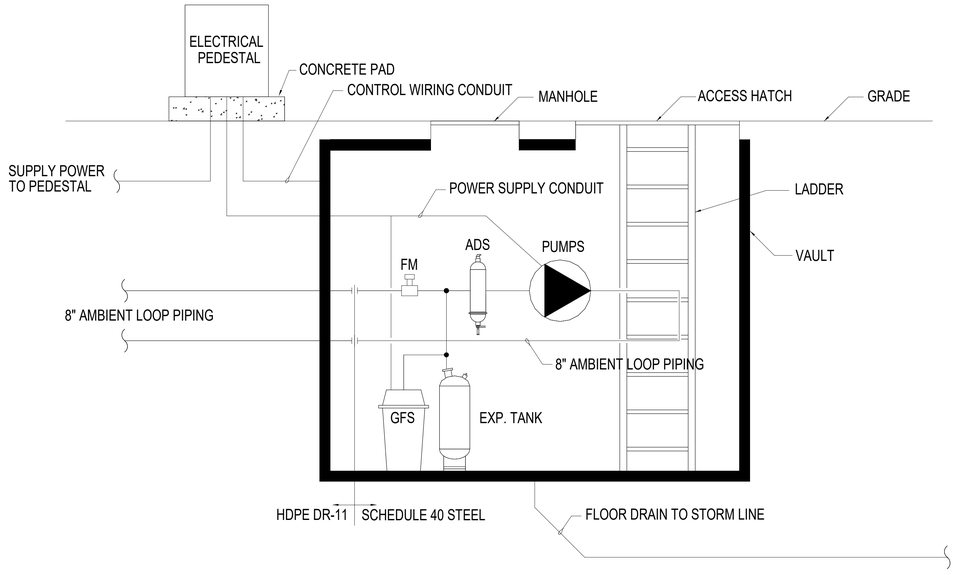



## 2 AMBIENT LOOP VAULT SECTION VIEW

3/4" = 1'-0"



## 3 AMBIENT LOOP VAULT ISOMETRIC VIEW




## 4 AMBIENT LOOP VAULT SCHEMATIC

NOT TO SCALE

### GENERAL NOTES

1. REFER TO CIVIL AND STRUCTURAL DRAWINGS FOR ADDITIONAL VAULT STRUCTURE INFORMATION.

### KEYED NOTES

1. REFER TO DETAIL 7/G501 FOR FLOW METER INSTALLATION.
2. PRESSURE RELIEF VALVE SHALL BE PIPED TO GLYCOL FEED STATION GFS-1.
3. 8" FILL/PURGE PORT WITH BUTTERFLY VALVES.
4. INSTALL TEMPORARY BYPASS PIPING IN PLACE OF AMBIENT LOOP PUMP ALP-2 TO BE UTILIZED FOR SYSTEM FLUSHING. AFTER FLUSHING IS COMPLETE, INSTALL AMBIENT LOOP PUMPS ALP-1 AND ALP-2.
5. REFER TO DETAIL 7/G502 FOR HDPE PENETRATION THRU WALL TO STEEL TRANSITION.

Salas O'Brien
salasobrien.com
Eau Claire
2720 Arbor Court
Eau Claire, WI 54701



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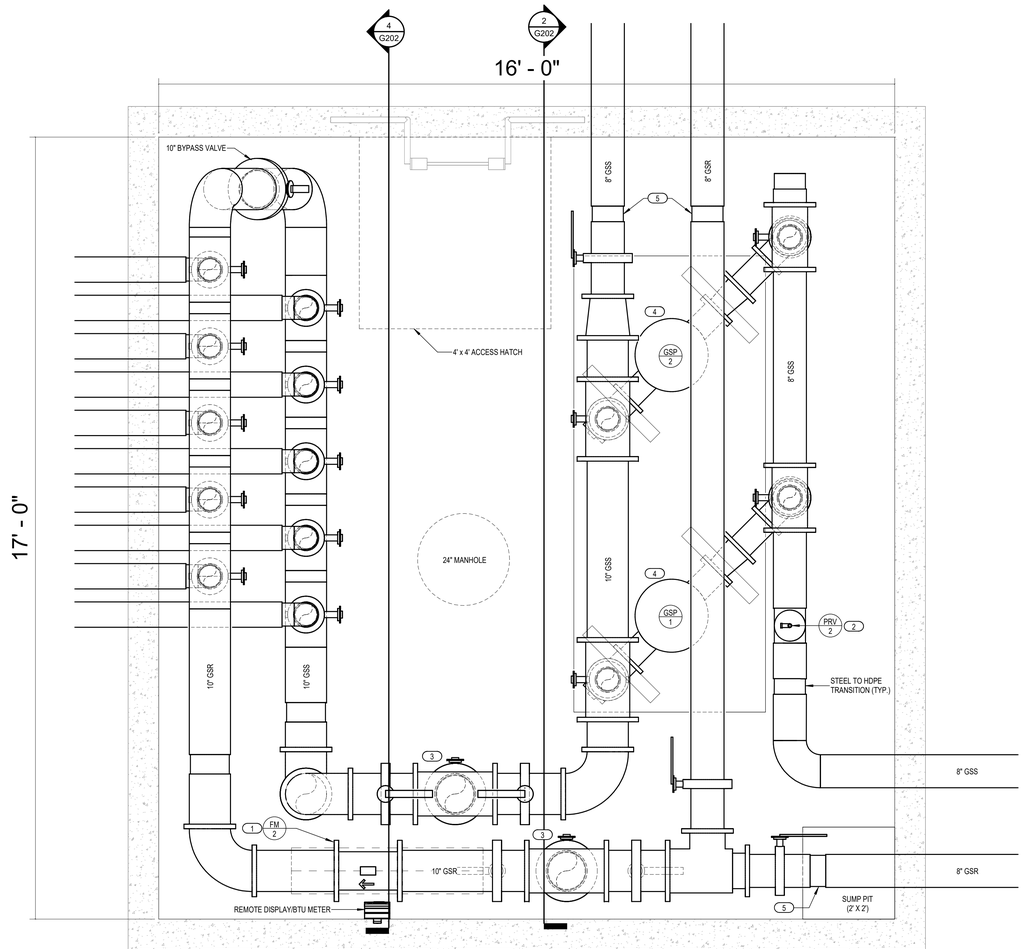
**SHEET NAME**

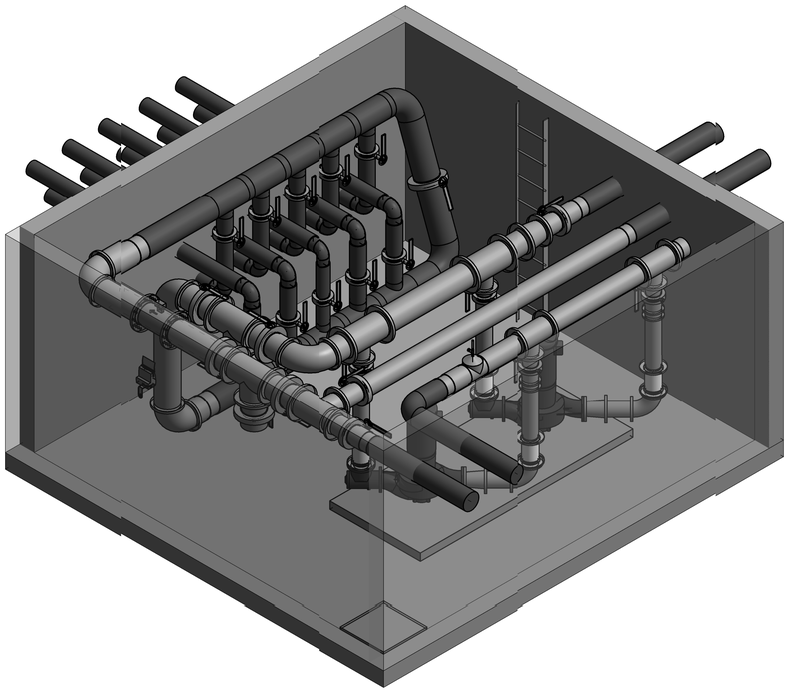
AMBIENT LOOP VAULT PLAN

**SHEET NUMBER** G201
**REVISION**

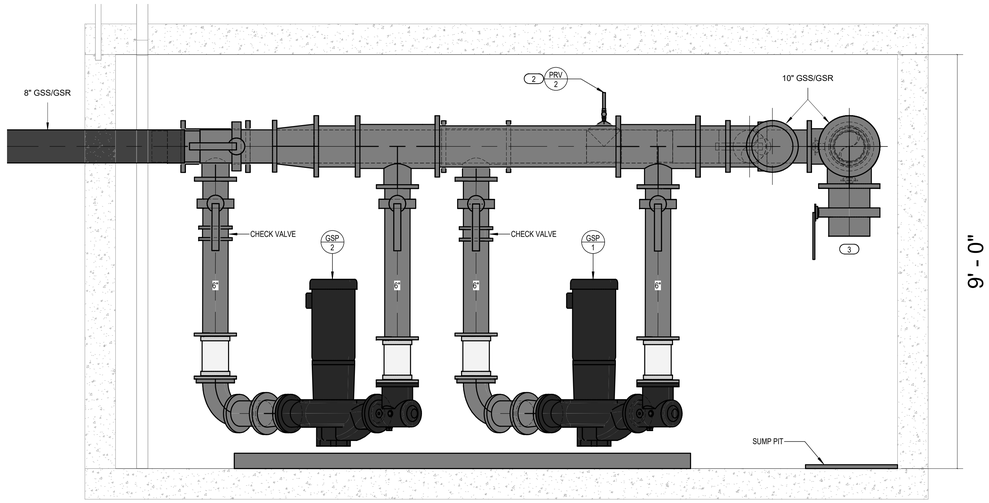



## 1 GEOTHERMAL PUMP AND MANIFOLD VAULT LAYOUT

3/4" = 1'-0"

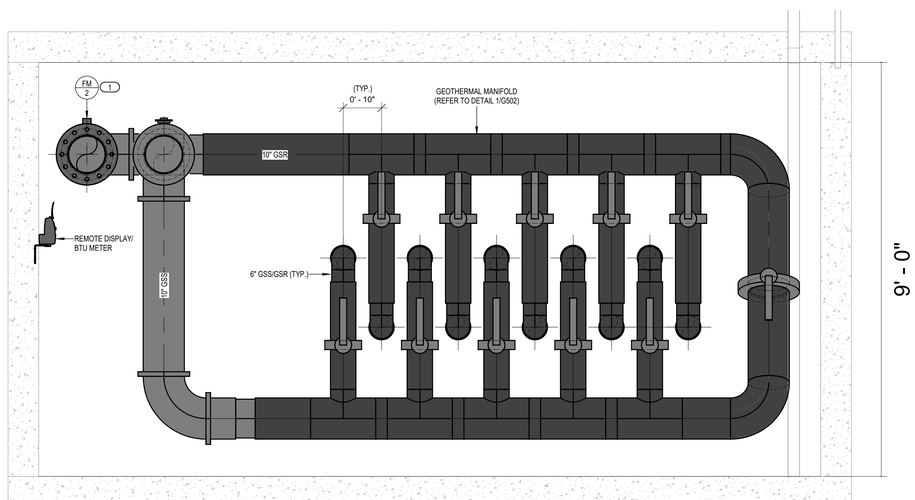


## 3 GEOTHERMAL PUMP AND MANIFOLD VAULT ISOMETRIC VIEW




## 2 GEOTHERMAL PUMP SECTION VIEW

3/4" = 1'-0"




## 4 GEOTHERMAL MANIFOLD SECTION VIEW

3/4" = 1'-0"

| GENERAL NOTES |
|---|
| 1. REFER TO CIVIL AND STRUCTURAL DRAWINGS FOR ADDITIONAL VAULT STRUCTURE INFORMATION. |

| KEYED NOTES | |
|---|---|
| 1 | REFER TO DETAIL 10/G501 FOR FLOW METER INSTALLATION. |
| 2 | PRESSURE RELIEF VALVE SHALL BE PIPED TO FLOOR DRAIN. |
| 3 | 10" FILL/PURGE PORT WITH BUTTERFLY VALVES. |
| 4 | INSTALL TEMPORARY BYPASS PIPING IN PLACE OF GEOTHERMAL PUMP GSP-2 TO BE UTILIZED FOR SYSTEM FLUSHING. AFTER FLUSHING IS COMPLETE, INSTALL GEOTHERMAL PUMPS GSP-1 AND GSP-2. |
| 5 | REFER TO DETAIL 7/G502 FOR HDPE PENETRATION THRU WALL TO STEEL TRANSITION. |

Salas O'Brien
salasobrien.com
Eau Claire
2720 Arbor Court
Eau Claire, WI 54701



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|---|---|
| Checker | Author |

**SHEET NAME**

GEOTHERMAL VAULT PLAN

| SHEET NUMBER | REVISION |
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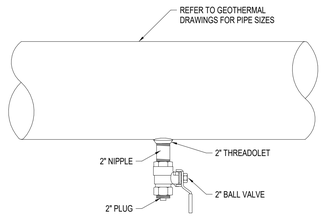
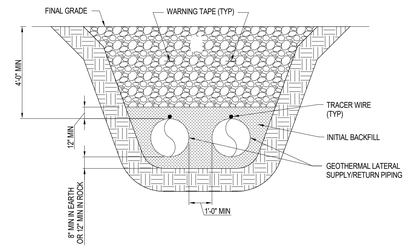
| G202 | |

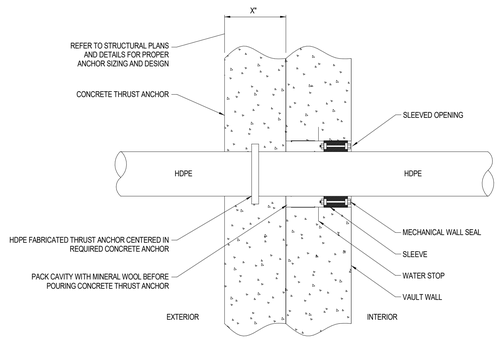



## 1 TYPICAL AUXILIARY DRAIN DETAIL
NOT TO SCALE

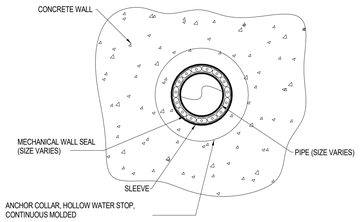



NOTES:
1. REFER TO THE GEOTHERMAL LATERAL AND CIRCUIT PIPING SPECIFICATIONS FOR TRACER WIRE AND PIPING REQUIREMENTS. TRACER WIRE TO BE INSTALLED ON ALL CIRCUIT PIPES.
2. MAINTAIN THE REQUIRED MINIMUM PIPE BEND RADIUS IN ACCORDANCE WITH PPI GUIDELINES.
3. REFER TO SITE UTILITY DRAWINGS FOR PIPE BEDDING, TRENCH BACKFILL AND WARNING TAPE REQUIREMENTS.
4. REFER TO CIVIL PLANS FOR FINISHED GRADE ELEVATIONS.

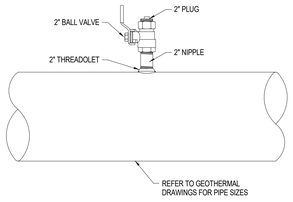
## 2 GEOTHERMAL/AMBIENT LOOP PIPING SECTION BELOW GRADE
NOT TO SCALE



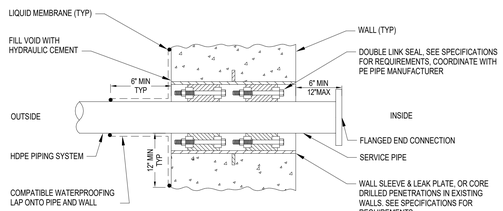

## 3 HDPE PIPE PENETRATION THRU FOUNDATION WALL DETAIL
NOT TO SCALE



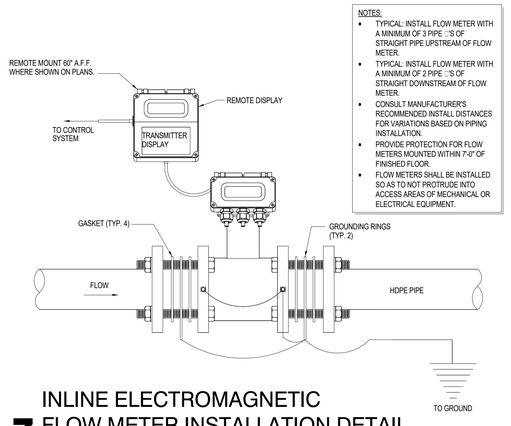

## 4 TYPICAL WALL PENETRATIONS FOR SLEEVED OPENINGS
NOT TO SCALE




## 5 TYPICAL MANUAL AIR VENT DETAIL
NOT TO SCALE

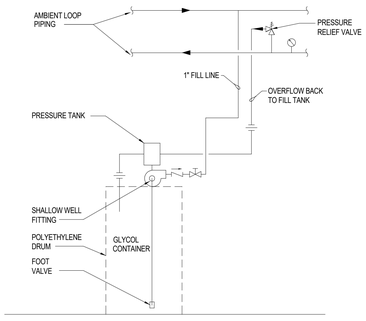



## 6 HDPE PIPING WALL PENETRATION DETAIL - BELOW GRADE
NOT TO SCALE

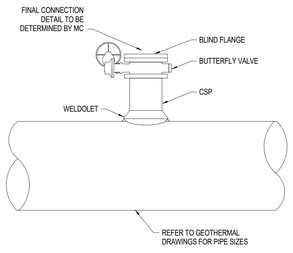



NOTES:
- TYPICAL: INSTALL FLOW METER WITH A MINIMUM OF 3 PIPE ◌'S OF STRAIGHT PIPE UPSTREAM OF FLOW METER.
- TYPICAL: INSTALL FLOW METER WITH A MINIMUM OF 2 PIPE ◌'S OF STRAIGHT DOWNSTREAM OF FLOW METER.
- CONSULT MANUFACTURER'S RECOMMENDED INSTALL DISTANCES FOR VARIATIONS BASED ON PIPING INSTALLATION.
- PROVIDE PROTECTION FOR FLOW METERS MOUNTED WITHIN 7'-0" OF FINISHED FLOOR.
- FLOW METERS SHALL BE INSTALLED SO AS TO NOT PROTRUDE INTO ACCESS AREAS OF MECHANICAL OR ELECTRICAL EQUIPMENT.

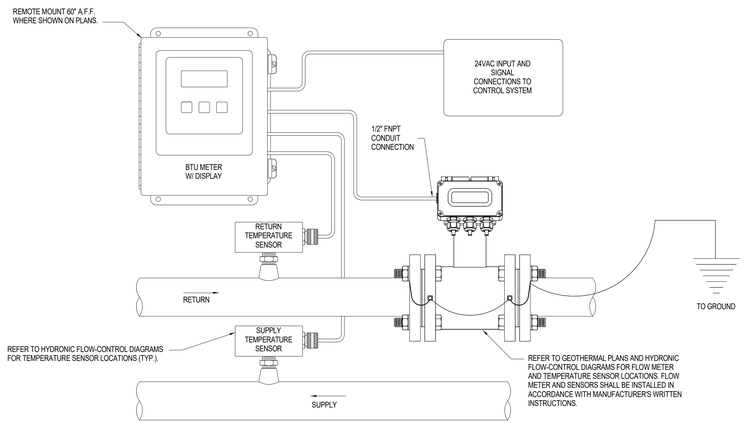
## 7 INLINE ELECTROMAGNETIC FLOW METER INSTALLATION DETAIL
NOT TO SCALE




## 8 GLYCOL FILL SYSTEM
NOT TO SCALE




## 9 TYPICAL FILL/PURGE VALVE DETAIL
NOT TO SCALE




NOTES:
- TYPICAL: INSTALL FLOW METER WITH A MINIMUM OF 3 PIPE ◌'S OF STRAIGHT PIPE UPSTREAM OF FLOW METER.
- TYPICAL: INSTALL FLOW METER WITH A MINIMUM OF 2 PIPE ◌'S OF STRAIGHT DOWNSTREAM OF FLOW METER.
- CONSULT MANUFACTURER'S RECOMMENDED INSTALL DISTANCES FOR VARIATIONS BASED ON PIPING INSTALLATION.
- PROVIDE PROTECTION FOR FLOW METERS MOUNTED WITHIN 7'-0" OF FINISHED FLOOR.
- FLOW METERS SHALL BE INSTALLED SO AS TO NOT PROTRUDE INTO ACCESS AREAS OF MECHANICAL OR ELECTRICAL EQUIPMENT.

## 10 INLINE ELECTROMAGNETIC FLOW METER INSTALLATION (W/ BTU METER) DETAIL
NOT TO SCALE

Salas O'Brien
salasobrien.com
Eau Claire
2720 Arbor Court
Eau Claire, WI 54701



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**2023-06199-00**

Eversource Pilot - Ambient Loop 2

**FRAMINGHAM**

City of Framingham, MA

**REVISIONS**

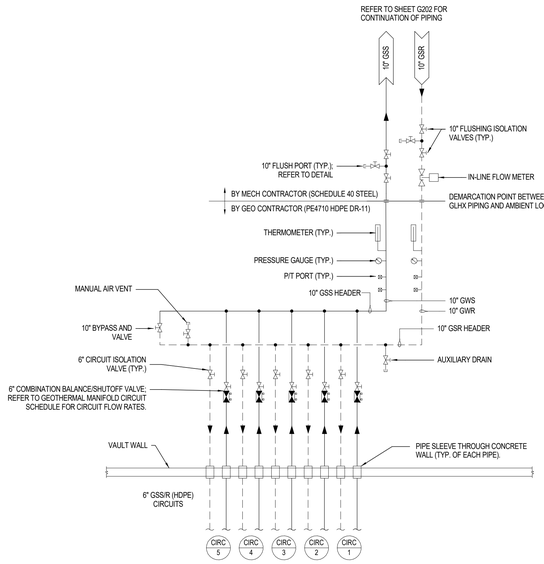
| Δ | DESCRIPTION | DATE |
|---|---|---|

| CHECKED BY | DRAWN BY |
|---|---|
| Checker | Author |

**SHEET NAME**

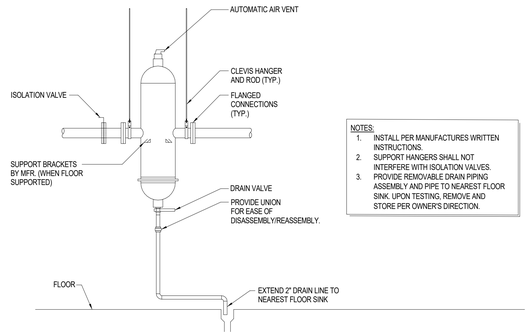
GEOTHERMAL DETAILS

| SHEET NUMBER | REVISION |
|---|---|
| G501 | |



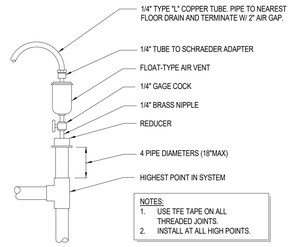

GENERAL NOTES:
1. REFER TO SPECIFICATION SECTION 23 21 56 FOR ADDITIONAL GEOTHERMAL MANIFOLD REQUIREMENTS. REFER ALSO TO SPECIFICATION SECTIONS 23 21 42, 23 21 53, AND 23 21 59.
2. REFER TO G501 FOR MANUAL AIR VENT, AUXILIARY DRAIN, AND FLUSH PORT DETAILS.
3. GEOTHERMAL MANIFOLDS SHALL BE SUPPORTED FROM FLOOR. REFER TO FLOOR MOUNT PIPE SUPPORT DETAIL 9/G502.
4. COORDINATE PIPE PENETRATIONS AND REQUIRED SLEEVES THROUGH SLAB AND FOUNDATION WALL WITH CONSTRUCTION MANAGER.
5. ALL GSS/GSR PIPING WITHIN GEOTHERMAL MANIFOLD ROOM SHALL BE INSULATED PER SPECIFICATION. THIS CONTRACTOR SHALL BE RESPONSIBLE FOR INSULATING ALL GSS/GSR PIPING EXTENDING TO/FROM DEMARCATION POINT AS INDICATED ON DIAGRAM.
6. GEOTHERMAL MANIFOLD DIAGRAM IS DIAGRAMMATIC AND NOT TO SCALE.

## 1 GEOTHERMAL LOOP MANIFOLD (GM-1) DETAIL
NOT TO SCALE



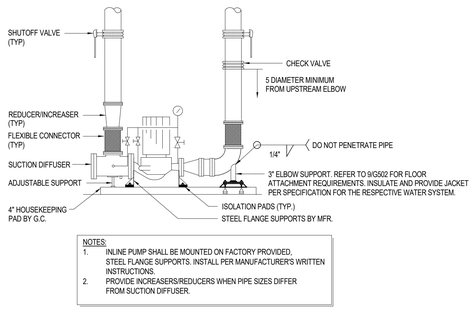

NOTES:
1. INSTALL PER MANUFACTURES WRITTEN INSTRUCTIONS.
2. SUPPORT HANGERS SHALL NOT INTERFERE WITH ISOLATION VALVES.
3. PROVIDE REMOVABLE DRAIN PIPING ASSEMBLY AND PIPE TO NEAREST FLOOR SINK. UPON TESTING, REMOVE AND STORE PER OWNER'S DIRECTION.

## 2 AIR/DIRT SEPARATOR DETAIL
NOT TO SCALE



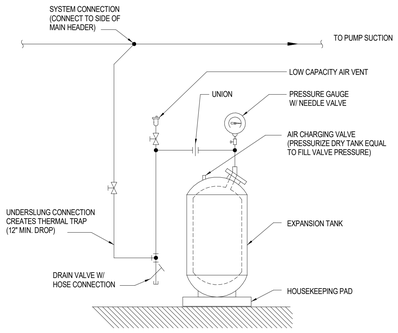

NOTES:
1. USE TFE TAPE ON ALL THREADED JOINTS.
2. INSTALL AT ALL HIGH POINTS.

## 3 AUTOMATIC AIR VENT ASSEMBLY DETAIL
NOT TO SCALE

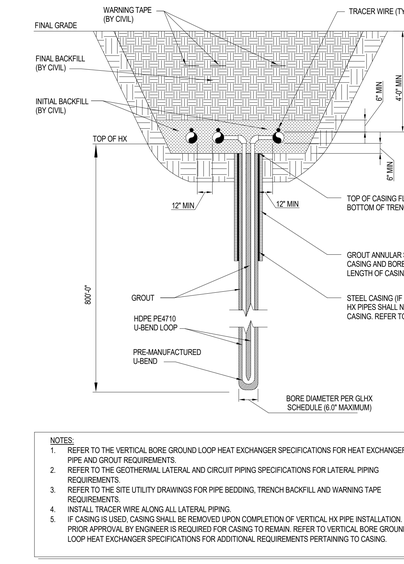



NOTES:
1. INLINE PUMP SHALL BE MOUNTED ON FACTORY PROVIDED, STEEL FLANGE SUPPORTS. INSTALL PER MANUFACTURERS WRITTEN INSTRUCTIONS.
2. PROVIDE INCREASERS/REDUCERS WHEN PIPE SIZES DIFFER FROM SUCTION DIFFUSER.

## 4 FLOOR-MOUNT INLINE PUMP DETAIL (TYP.)
NOT TO SCALE

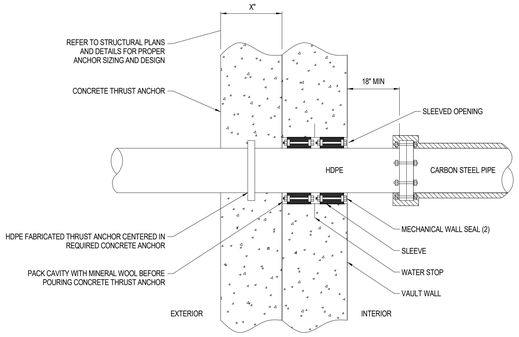



## 5 EXPANSION TANK DETAIL
NOT TO SCALE

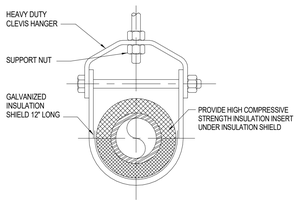



NOTES:
1. REFER TO THE VERTICAL BORE GROUND LOOP HEAT EXCHANGER SPECIFICATIONS FOR HEAT EXCHANGER PIPE AND GROUT REQUIREMENTS.
2. REFER TO THE GEOTHERMAL LATERAL AND CIRCUIT PIPING SPECIFICATIONS FOR LATERAL PIPING REQUIREMENTS.
3. REFER TO THE SITE UTILITY DRAWINGS FOR PIPE BEDDING, TRENCH BACKFILL AND WARNING TAPE REQUIREMENTS.
4. INSTALL TRACER WIRE ALONG ALL LATERAL PIPING.
5. IF CASING IS USED, CASING SHALL BE REMOVED UPON COMPLETION OF VERTICAL HX PIPE INSTALLATION. PRIOR APPROVAL BY ENGINEER IS REQUIRED FOR CASING TO REMAIN. REFER TO VERTICAL BORE GROUND LOOP HEAT EXCHANGER SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS PERTAINING TO CASING.

## 6 VERTICAL HEAT EXCHANGER DETAIL
NOT TO SCALE

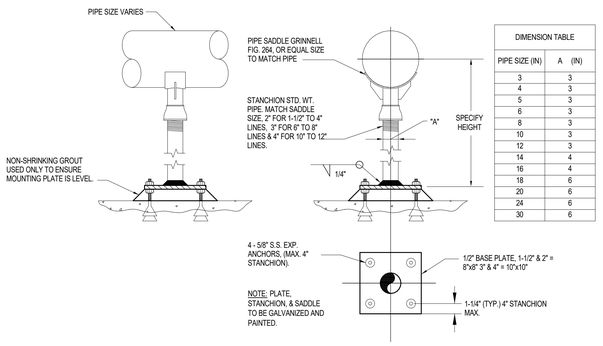



## 7 HDPE TO STEEL TRANSITION THRU FOUNDATION WALL DETAIL
NOT TO SCALE




NOTES:
1. REFER TO PLANS FOR SUPPLEMENTAL PIPE HANGERS AND SUPPORTS AT PUMP HEADERS.
2. SEE SPECIFICATIONS FOR HANGER SIZES.

## 8 SUPPLEMENTAL PIPE HANGER DETAIL
NOT TO SCALE




| DIMENSION TABLE | |
|---|---|
| PIPE SIZE (IN) | A (IN) |
| 3 | 3 |
| 4 | 3 |
| 5 | 3 |
| 6 | 3 |
| 8 | 3 |
| 10 | 3 |
| 12 | 3 |
| 14 | 4 |
| 16 | 4 |
| 18 | 6 |
| 20 | 6 |
| 24 | 6 |
| 30 | 6 |

## 9 FLOOR MOUNTED PIPE SUPPORT DETAIL
NOT TO SCALE


Salas O'Brien
salasobrien.com
Eau Claire
2720 Arbor Court
Eau Claire, WI 54701

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2023-06199-00

Eversource Pilot - Ambient Loop 2

FRAMINGHAM

City of Framingham, MA

REVISIONS

| Δ | DESCRIPTION | DATE |
|---|---|---|

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DRAWN BY: Author

SHEET NAME

GEOTHERMAL DETAILS

SHEET NUMBER: G502
REVISION:

## PUMP SCHEDULE

| TAG | SERVES | PUMP TYPE | WORKING FLUID | DESIGN FLOW (GPM) | DESIGN HEAD (FT. HD) | DEAD HEAD (FT. HD) | MINIMUM FLOW @ 100% | PUMP EFFICIENCY (%) | VIBRATION ISOLATION | | MOTOR | | | ELECTRICAL | | | | | | | PUMP SIZE (IN.) | | IMPELLER SIZE (IN.) | WEIGHT (LBS) | FRAME | SUCTION DIFFUSER | MANUFACTURER | MODEL | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | DISCONNECT | | CONTROLLER/STARTER | | | | | | | | | | |
| | | | | | | | | | TYPE | DEFL. | BHP | HP | RPM | VOLT | PHASE | FREQUENCY (HZ) | BY | TYPE | BY | TYPE | SUCTION | DISCHARGE | | | | | | | |
| ALP-1 | AMBIENT LOOP | IN-LINE | 25% PG | 500 | 60 | 68.7 | 113 | 77.3 | | | 10.1 | 15 | 1,647 | 208 | 3 | 60 | | | | | 5 | 5 | 8.875 | 465 | 254TC | GF-3X | BELL & GOSSETT | E-80SC 5x5x9.5B | 1 - 5 |
| ALP-2 | AMBIENT LOOP | IN-LINE | 25% PG | 500 | 60 | 68.7 | 113 | 77.3 | | | 10.1 | 15 | 1,647 | 208 | 3 | 60 | | | | | 5 | 5 | 8.875 | 465 | 254TC | GF-3X | BELL & GOSSETT | E-80SC 5x5x9.5B | 1 - 5 |
| GSP-1 | GLHX-1 | IN-LINE | 25% PG | 500 | 90 | 102 | 118 | 75.9 | | | 15.4 | 20 | 1,738 | 208 | 3 | 60 | | | | | 5 | 5 | 10.125 | 630 | 256TC | GF-3X | BELL & GOSSETT | E-80SC 5x5x11 | 1 - 5 |
| GSP-2 | GLHX-1 | IN-LINE | 25% PG | 500 | 90 | 102 | 118 | 75.9 | | | 15.4 | 20 | 1,738 | 208 | 3 | 60 | | | | | 5 | 5 | 10.125 | 630 | 256TC | GF-3X | BELL & GOSSETT | E-80SC 5x5x11 | 1 - 5 |

NOTES:
1. REFER TO SPECIFICATION SECTION 23 21 23 FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
2. PROVIDE SHAFT GROUNDING AS REQUIRED PER MOTOR SPECIFICATION 23 05 13.
3. MOTOR ENCLOSURE SHALL BE TOTALLY ENCLOSED, FAN COOLED, AND RATED FOR OUTDOOR OPERATION.
4. IMPELLER SIZE TO BE THE MAX SIZE FOR THE RATED HORSEPOWER. DO NOT TRIM TO SELECTION POINT.
5. SUCTION DIFFUSER SELECTION BASED ON BELL & GOSSETT MODELS.

## EXPANSION TANK SCHEDULE

| TAG | QUANTITY | SYSTEM | TYPE | SIZE | | CAPACITY | | FIELD AIR CHARGE (PSIG) | SYSTEM WATER VOLUME (GAL) | FLUID TYPE | SYSTEM OPERATING RANGE (GAUGE PSI) | | SYSTEM TEMPERATURE RANGE (°F) | | CONNECTION (IN.) | WET WEIGHT (LBS) | MANUFACTURER | MODEL | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | HEIGHT (IN.) | DIAMETER (IN.) | MIN. ACCEPT. VOLUME (GAL) | MIN. TANK VOLUME (GAL) | | | | MIN | MAX | MIN | MAX | | | | | |
| ET-1 | 1 | AMBIENT LOOP | FULL ACCEPTANCE BLADDER | 88 | 36 | 280 | 317 | 17 | 28,500 | PROPYLENE - 25% | 18 | 79 | 40 | 90 | 1 1/2 | 3,320 | BELL & GOSSETT | B-1200 | 1, 2 |

NOTES:
1. TANK SHALL BE CHARGED IN FIELD WITH OIL-FREE COMPRESSED AIR. CHECK AIR VALVE FOR LEAKS DURING FILL. IF LEAKS OCCUR, RELIEVE PRESSURE AND REPLACE AIR VALVE.
2. CONTRACTOR SHALL DOCUMENT WATER VOLUME REQUIRED FOR SYSTEM FILL AND NOTIFY ENGINEER OF THE ACTUAL SYSTEM WATER VOLUME (GAL.). RECORD SYSTEM VOLUMES IN CORRESPONDING O&M MANUALS AND TAB REPORT.

## PRESSURE RELIEF VALVE SCHEDULE

| TAG | SERVES | INLET | | OUTLET | | LOCATION | RELIEF SETTING (PSIG) | MANUFACTURER | MODEL | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|
| | | SIZE (IN.) | ANSI CLASS | SIZE (IN.) | ANSI CLASS | | | | | |
| PRV-1 | AMBIENT LOOP | 3/4" | 125 | 3/4" | 125 | DISCHARGE SIDE OF PUMP | 110 | BELL & GOSSETT | 790-110 | 1, 2 |
| PRV-2 | GLHX LOOP | 3/4" | 125 | 3/4" | 125 | DISCHARGE SIDE OF PUMP | 110 | BELL & GOSSETT | 790-110 | 1 |

NOTES:
1. REFER TO FLOW DIAGRAMS AND/OR PLANS FOR INSTALLATION LOCATION.
2. PIPE OUTLET TO GLYCOL FEED STATION GFS-1.

## GLYCOL FEED SYSTEM

| TAG | LOCATION | SERVES | FLUID MIX | TANK VOLUME (GAL) | DIMENSIONS | | PRESSURE RANGE (PSIG) | SYSTEM PRESSURE (PSIG) | ELECTRICAL | | | | MANUFACTURER | MODEL | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | DIAMETER (IN.) | HEIGHT (IN.) | | | AMPS | VOLT | PHASE | FREQUENCY (HZ) | | | |
| GFS-1 | AMBIENT LOOP VAULT | AMBIENT LOOP | 25% PG | 55 | 24 | 49 | 5 - 55 | 21 | 0.7 | 115 | 1 | 60 | AXIOM | SF100 | 1 - 3 |

NOTES:
1. SEE SPECIFICATION SECTIONS 23 21 15 FOR ADDITIONAL SYSTEM REQUIREMENTS.
2. PROVIDE LOW LEVEL ALARM PANEL WITH REMOTE MONITORING DRY CONTACTS AND SELECTABLE AUDIBLE ALARM.
3. UNIT SHALL BE PROVIDED WITH THE FOLLOWING:
   A. PUMP SUCTION HOSE WITH INLET STRAINER.
   B. PRESSURE PUMP WITH THERMAL CUT-OUT.
   C. INTEGRAL PRESSURE SWITCH.
   D. INTEGRAL CHECK VALVE.
   E. CORD AND PLUG.
   F. PRE-CHARGED ACCUMULATOR TANK WITH EPDM DIAGPHRAGM.
   G. MANUAL DIVERTER VALVE FOR PURGING AIR AND AGITATING CONTENTS OF STORAGE TANK.
   H. ADJUSTABLE PRESSURE REGULATING VALVE (5 - 55 PSIG) WITH PRESSURE GAUGE.
   I. LOW LEVEL CUT-OUT.

## SYSTEM PIPE FLUSHING REQUIREMENT SCHEDULE

| SYSTEM | GEO MANIFOLD # | CIRCUITS | | | | | MANIFOLD HEADER (NOTE 5) | | | | DISTRIBUTION MAINS (NOTE 5) | | | | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | # OF CIRCUITS | CIRCUIT SIZE (IN.) | MIN. FLUSH VELOCITY (FPS) | FLUSHING FLOW (GPM) | PRESSURE (FT HD) | HEADER SIZE (IN) | MIN. FLUSH VELOCITY (FPS) | MIN. FLUSH FLOW (GPM) | PRESSURE (FT HD) | MAIN SIZE (IN) | MIN. FLUSH VELOCITY (FPS) | FLUSHING FLOW (GPM) | PRESSURE (FT HD) | |
| GLHX-1 | GM-1 | 5 | 6 | 5.0 | NOTE 6 | NOTE 6 | 10 | 5.0 | 1,250 | 15 | 8 | 5.0 | 800 | NOTE 7 | 1 - 7 |
| AMBIENT LOOP | - | - | - | - | - | - | - | - | - | - | 8 | 5.0 | 800 | 130 | 1 - 4 |

NOTES:
1. REFER TO SPECIFICATION SECTION 23 21 59 FOR ADDITIONAL FLUSHING PROCEDURES AND REQUIREMENTS.
2. FLUSHING SHALL OCCUR FOLLOWING PRESSURE TESTING IN ACCORDANCE WITH SPECIFICATION SECTIONS 23 21 42 AND 23 21 53.
3. FLUSHING CONTRACTOR TO DEVELOP AND SUBMIT A FLUSHING PLAN FOR ENGINEER APPROVAL PRIOR TO FLUSHING.
4. MECHANICAL CONTRACTOR SHALL COORDINATE FLUSH/PURGE PORT REQUIREMENTS WITH FLUSHING CONTRACTOR TO ENSURE FLUSHING PLAN CAN BE ACHIEVED.
5. MANIFOLD HEADERS SHALL BE FLUSHED SEPARATE FROM THE DISTRIBUTION MAINS. FLUSHING OF MAINS AND MANIFOLD HEADERS SHALL BE PERFORMED FROM THE CUP WITH A FLOW RATE AND PRESSURE AS SCHEDULED. ALL MANIFOLD CIRCUIT VALVES SHALL BE CLOSED AND MANIFOLD HEADER BYPASS VALVE OPEN WHEN FLUSHING MANIFOLD HEADER. FLUSHING FLOW RATES SHALL NOT BE LESS THAN THE SCHEDULED MINIMUM FLUSH FLOW REQUIRED TO MAINTAIN MINIMUM FLUSH VELOCITIES. REFER TO PLANS FOR BYPASS VALVE LOCATIONS WITHIN GEOTHERMAL VAULT.
6. REFER TO GEOTHERMAL MANIFOLD (GM-1) CIRCUIT SCHEDULE FOR FLUSHING FLOW AND PRESSURE REQUIREMENTS.
7. DISTRIBUTION MAINS TO THE FARLEY BUILDING AND TO THE AMBIENT LOOP SHALL BE FLUSHED SEPARATELY. PRESSURE FOR FLUSHING THE DISTRIBUTION MAINS TO THE FARLEY BUILDING = 30'. PRESSURE FOR FLUSHING THE DISTRIBUTION MAINS TO THE AMBIENT LOOP = 15'.

## AIR/DIRT SEPARATOR SCHEDULE

| TAG | LOCATION | SYSTEM | TYPE | STRAINER | GPM | MAX. PRESSURE DROP (FT. HD) | SIZE (IN.) | DRY WEIGHT (LBS) | WET WEIGHT (LBS) | MANUFACTURER | MODEL | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ADS-1 | AMBIENT LOOP VAULT | AMBIENT LOOP | COALESCING | YES | 500 | 3 | 6 | 165 | 366 | BELL & GOSSETT | CRSN-6F | 1 - 3 |

NOTES:
1. REFER TO SPECIFICATION SECTION 23 05 15 FOR ADDITIONAL REQUIREMENTS.
2. UNIT SHALL BE INSTALLED TO ALLOW FOR PROPER REMOVEABLE OF STRAINER. COORDINATE SERVICE CLEARANCE BELOW UNIT.
3. UNIT SHALL BE PROVIDED WITH AIR VENT AND BLOW DOWN PORT WITH VALVE.

## WATER FLOW METER SCHEDULE

| TAG | LOCATION | SERVES | METER TYPE | FLUID | PIPE SIZE (IN.) | FLOW RANGE | | REMOTE DISPLAY (YES/NO) | PRESSURE RATING | POWER SUPPLY (BY TCC) | BTU METER | | MANUFACTURER | MODEL NO. | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | MIN. (GPM) | MAX. (GPM) | | | | REQUIRED (YES/NO) | MODEL | | | |
| FM-1 | AMBIENT LOOP VAULT | AMBIENT LOOP | INLINE ELECTROMAGNETIC | 25% PG | 8 | 15 | 5,072 | YES | ASME CLASS 150 | 24V | NO | - | ONICON | F-3108 | 1, 2 |
| FM-2 | GLHX VAULT | GLHX-1 | INLINE ELECTROMAGNETIC | 25% PG | 10 | 24 | 7,925 | YES | ASME CLASS 150 | 24V THRU BTU METER | YES | SYSTEM-20 | ONICON | F-3110 | 1 - 3 |

NOTES:
1. SEE SPECIFICATION SECTION 23 09 13 FOR ADDITIONAL INFORMATION.
2. FLOW METER SHALL BE CALIBRATED BY MANUFACTURER PRIOR TO SHIPPING FOR MINIMUM AND MAXIMUM FLOW RATES.
3. PROVIDE BTU METER COMPATIBLE WITH FLOW METER TO FUNCTION AS A BTU MEASUREMENT SYSTEM PER SECTION 23 09 13. BTU METER SHALL BE INTEGRATED TO THE DISTRICT CONTROL SYSTEM BY TEMPERATURE CONTROL CONTRACTOR.

## GEOTHERMAL MANIFOLD (GM-1) CIRCUIT SCHEDULE

CIRCUIT SIZING SUMMARY FOR GM-1 LOCATED WITHIN GLHX-1

| CIRCUIT ID # | C1 | | C2 | | C3 | | C4 | | C5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| CIRCUIT SIZE (IN.) | 6 | | 6 | | 6 | | 6 | | 6 | |
| # OF BORES / CIRCUIT [TOTAL BORE COUNT = 80] | 18 | | 18 | | 18 | | 12 | | 14 | |
| FLOW RATE PER BORE (GPM) | 13.8 | | 13.8 | | 13.8 | | 13.8 | | 13.8 | |
| CIRCUIT FLOW RATE (GPM) [MANIFOLD TOTAL = 1,100 GPM] | 248 | | 248 | | 248 | | 165 | | 193 | |
| CIRCUIT FLUSHING FLOW RATE (GPM) @ FT HD [MINIMUM FLUSH VELOCITY = 5 FPS] | 590 @ 210' | | 590 @ 205' | | 590 @ 205' | | 395 @ 180' | | 460 @ 185' | |
| APPROXIMATE DISTANCE FROM MANIFOLD TO FIRST BORE ON CIRCUIT (FT) [CONTRACTOR TO VERIFY] | 100 | | 80 | | 60 | | 70 | | 100 | |
| APPROXIMATE DISTANCE FROM LAST BORE ON CIRCUIT (FT) TO MANIFOLD [CONTRACTOR TO VERIFY] | 406 | | 386 | | 366 | | 268 | | 80 | |
| CIRCUIT PIPE SIZING BETWEEN BORES (IN.) | GSR | GSS | GSR | GSS | GSR | GSS | GSR | GSS | GSR | GSS |
| GEO MANIFOLD → BORE 1 | 6 | | 6 | | 6 | | 6 | | 6 | |
| BORE 1 → BORE 2 | 6 | 1.5 | 6 | 1.5 | 6 | 1.5 | 4 | 1.5 | 4 | 1.5 |
| BORE 2 → BORE 3 | 6 | 2 | 6 | 2 | 6 | 2 | 4 | 2 | 4 | 2 |
| BORE 3 → BORE 4 | 6 | 3 | 6 | 3 | 6 | 3 | 4 | 3 | 4 | 3 |
| BORE 4 → BORE 5 | 6 | 3 | 6 | 3 | 6 | 3 | 4 | 3 | 4 | 3 |
| BORE 5 → BORE 6 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 |
| BORE 6 → BORE 7 | 4 | 3 | 4 | 3 | 4 | 3 | 3 | 3 | 4 | 3 |
| BORE 7 → BORE 8 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 4 |
| BORE 8 → BORE 9 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 3 | 4 |
| BORE 9 → BORE 10 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 3 | 4 |
| BORE 10 → BORE 11 | 4 | 4 | 4 | 4 | 4 | 4 | 2 | 4 | 3 | 4 |
| BORE 11 → BORE 12 | 4 | 4 | 4 | 4 | 4 | 4 | 1.5 | 4 | 3 | 4 |
| BORE 12 → BORE 13 | 3 | 4 | 3 | 4 | 3 | 4 | | | 2 | 4 |
| BORE 13 → BORE 14 | 3 | 4 | 3 | 4 | 3 | 4 | | | 1.5 | 4 |
| BORE 14 → BORE 15 | 3 | 6 | 3 | 6 | 3 | 6 | | | | |
| BORE 15 → BORE 16 | 3 | 6 | 3 | 6 | 3 | 6 | | | | |
| BORE 16 → BORE 17 | 2 | 6 | 2 | 6 | 2 | 6 | | | | |
| BORE 17 → BORE 18 | 1.5 | 6 | 1.5 | 6 | 1.5 | 6 | | | | |
| LAST BORE → GEO MANIFOLD | | 6 | | 6 | | 6 | | 6 | | 6 |

NOTES:
1. REFER TO SPECIFICATION SECTIONS 23 21 42, 23 21 53, 23 21 59 AND 23 21 56 FOR ADDITIONAL REQUIREMENTS.
2. REFER TO DETAILS FOR ADDITIONAL SIZING AND ROUTING REQUIREMENTS.
3. GPS COORDINATES SHALL BE DOCUMENTED FOR ALL BORES.
4. GSR = GEOTHERMAL SOURCE WATER RETURN FROM BUILDING TO GEOTHERMAL MANIFOLD.
5. GSS = GEOTHERMAL SOURCE WATER SUPPLY FROM GEOTHERMAL MANIFOLD TO BUILDING.
6. EACH CIRCUIT SHALL BE PIPED IN A REVERSE-RETURN ARRANGEMENT.
7. GSR PIPE REDUCERS SHALL BE INSTALLED DOWNSTREAM OF THE RESPECTIVE BORE CONNECTION WHEN PIPE SIZE CHANGES; GSS PIPE INCREASERS SHALL BE INSTALLED UPSTREAM OF THE RESPECTIVE BORE CONNECTION WHEN PIPE SIZE CHANGES.

## GEOTHERMAL HEAT EXCHANGER SCHEDULE

| | |
|---|---|
| **GROUND LOOP HEAT EXCHANGER PARAMETERS** | |
| GROUND LOOP HEAT EXCHANGER (GLHX) I.D. # | GLHX-1 |
| BORE COUNT (QTY) | 80 |
| BORE DEPTH (FT) | 800 |
| TOTAL GLHX LENGTH (FT) | 64,000 |
| BORE SPACING (FT) | 18 |
| BORE PIPE DIAMETER (IN) | 1.5 |
| BORE HOLE DIAMETER (IN) | 5.5 |
| NUMBER OF MANIFOLDS (QTY) | 1 |
| NUMBER OF CIRCUITS/MANIFOLD (QTY) | 5 |
| NUMBER OF BORES/CIRCUIT (QTY) NOTE: BORE COUNT VARIES PER CIRCUIT | (REFER TO GEO MANIFOLD CIRCUIT PIPING SCHEDULE) |
| **HYDRAULIC PARAMETERS** | |
| FLUID | 25% PROPYLENE GLYCOL |
| FLOW RATE PER GLHX (GPM) | 1,100 |
| FLOW RATE PER BORE (GPM) | 13.8 |
| MAXIMUM CIRCUIT PRESSURE DROP (FT HD) | 70 |
| MANIFOLD PRESSURE DROP (FT HD) | 5 |
| GEO MAINS PRESSURE DROP (FT HD) | 5 |
| GLHX PRESSURE DROP (FT HD) | 80 |
| APPROXIMATE WATER VOLUME PER GLHX (GAL) [INCLUDES MANIFOLD, CIRCUITS AND BORES] | 16,000 |
| EXTERIOR GLHX PRESSURE DROP (FT HD) [AS MEASRUED ACROSS SUPPLY/RETURN ENTERING/EXITING BLDG.] | 80 |
| APPROXIMATE SYSTEM WATER VOLUME (GAL) [INCLUDES EXTERIOR DISTRIBUTION PIPE AND GLHX VOLUME + 10%] | 28,500 |
| **PIPING REQUIREMENTS** | |
| VERTICAL BORE PIPE | SDR-11 HDPE (4710 RESIN) |
| CIRCUIT PIPE | SDR-11 HDPE (4710 RESIN) |
| LATERAL PIPE (CUP TO VAULTS) | SDR-11 HDPE (4710 RESIN) |
| **SOIL BORING REMOVAL** | |
| ESTIMATED VERTICAL BORE SOIL REMOVAL (CU. YD) [APPROXIMATE, T.B.D. BY CONTRACTOR] | 400 |

NOTES:
1. REFER TO SPECIFICATION SECTIONS 23 21 42, 23 21 53, 23 21 59 AND 23 21 62 FOR ADDITIONAL REQUIREMENTS.
2. REFER TO DETAILS FOR ADDITIONAL SIZING AND ROUTING REQUIREMENTS.
3. PROVIDE GEOTHERMAL VAULTS AS INDICATED ON PLANS AND AS SPECIFIED.
4. COORDINATE ALL SITE ROUTINGS WITH UTILITIES. REFER TO CIVIL PLANS.

## VARIABLE FREQUENCY DRIVE (VFD) SCHEDULE

| SERVICE | LOCATION | ELECTRICAL | | | | | | MANUFACTURER | MODEL | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|
| | | VOLTAGE/ PHASE | MOTOR BHP | MOTOR HP | INTEGRAL BYPASS | FURNISHED BY | INSTALLED BY | | | |
| ALP-1 | AMBIENT LOOP VAULT | 208 / 3 | 10.1 | 15 | | M.C. | E.C. | ABB | ACH580-01 | 1 |
| ALP-2 | AMBIENT LOOP VAULT | 208 / 3 | 10.1 | 15 | | M.C. | E.C. | ABB | ACH580-01 | 1 |
| GSP-1 | GLHX VAULT | 208 / 3 | 15.4 | 20 | | M.C. | E.C. | ABB | ACH580-01 | 1 |
| GSP-2 | GLHX VAULT | 208 / 3 | 15.4 | 20 | | M.C. | E.C. | ABB | ACH580-01 | 1 |

NOTES:
1. REFER TO SPECIFICATION SECTION 23 05 14 FOR ADDITIONAL REQUIREMENTS.

## GLHX SIZING PARAMETERS SCHEDULE

| | |
|---|---|
| **FORMATION THERMAL CONDUCTIVITY TEST (TEST BORE TW-FP \| SEPTEMBER 22-23, 2022)** | |
| FORMATION THERMAL CONDUCTIVITY | 1.78 BTU/FT-HR-°F |
| FORMATION THERMAL DIFFUSIVITY | 1.10 FT2/DAY |
| UNDISTURBED FORMATION TEMPERATURE | 53.9 °F |
| TEST BORE DEPTH | 615 FT |
| **THERMAL PROPERTIES** | |
| PIPE RESISTANCE | 0.xxx H-FT-°F/BTU |
| GROUT THERMAL CONDUCTIVITY | 1.4 BTU/FT-HR-°F |
| BORE HOLE THERMAL RESISTANCE | 0.245 H-FT-°F/BTU |
| **SIZING PARAMETERS - LOAD AND WATER CONDITIONS** | |
| PEAK COOLING LOAD (BTU/HR) | - |
| SOURCE WATER - COOLING MODE (ENTERING/LEAVING SOURCE TEMP) | - |
| PEAK HEATING LOAD (BTU/HR) | - |
| SOURCE WATER - HEATING MODE (ENTERING/LEAVING SOURCE TEMP) | - |
| **RESULTING GLHX PARAMETERS** | |
| WORKING FLUID | 25% PROPYLENE GLYCOL |
| GEOTHERMAL SYSTEM FLOW RATE | 1100 GPM |
| TOTAL BORE COUNT (QTY) | 80 |
| BORE DEPTHS (FT) | 800 |
| TOTAL BORE LENGTH (FT) | 64,000 |

NOTES:
1. -


Salas O'Brien
salasobrien.com
Eau Claire
2720 Arbor Court
Eau Claire, WI 54701




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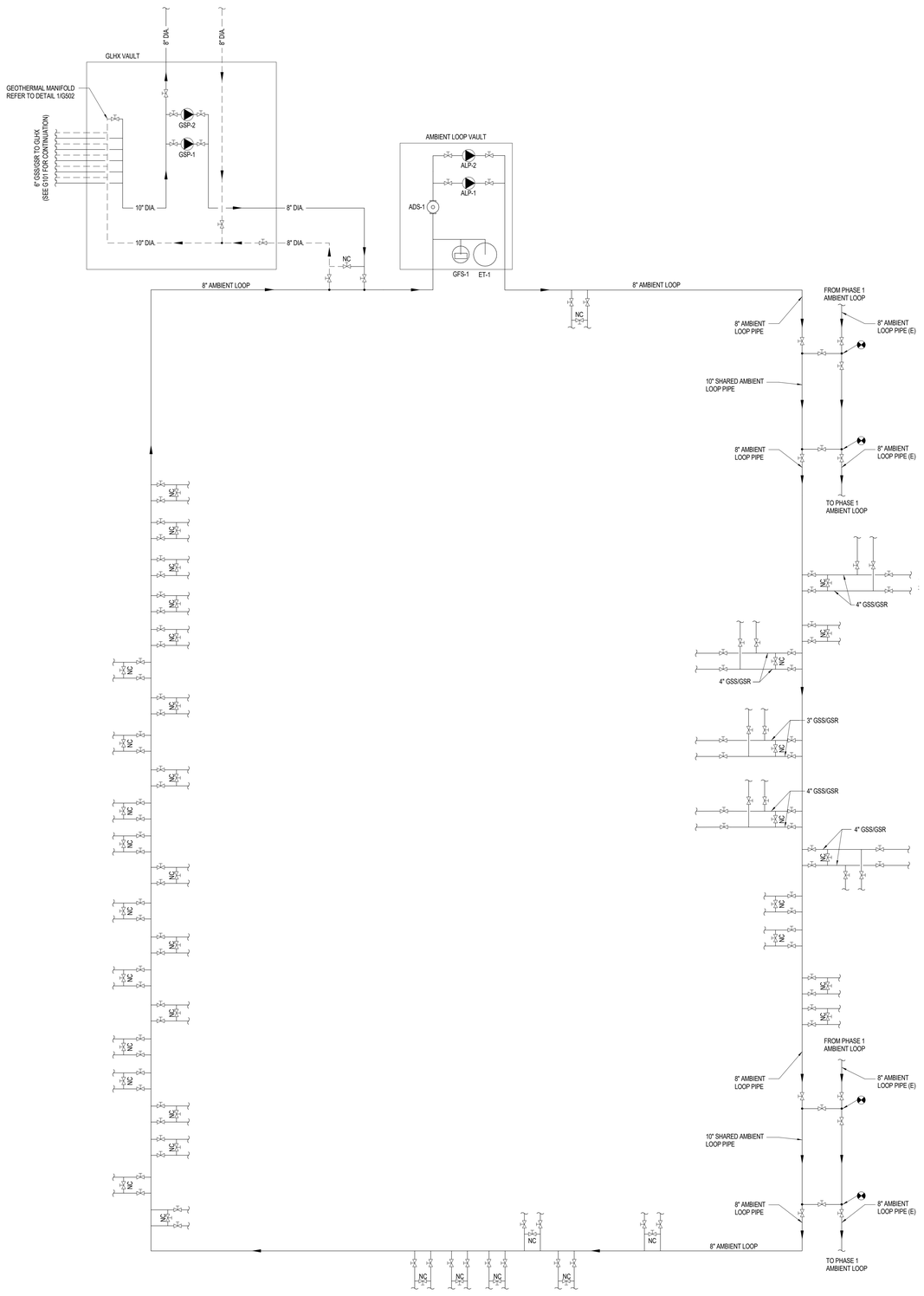
SHEET NAME
GEOTHERMAL SCHEDULES

SHEET NUMBER: G601
REVISION:




## 1 AMBIENT LOOP SIMPLIFIED FLOW DIAGRAM

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Salas O'Brien

salasobrien.com

Eau Claire
2720 Arbor Court
Eau Claire, WI 54701




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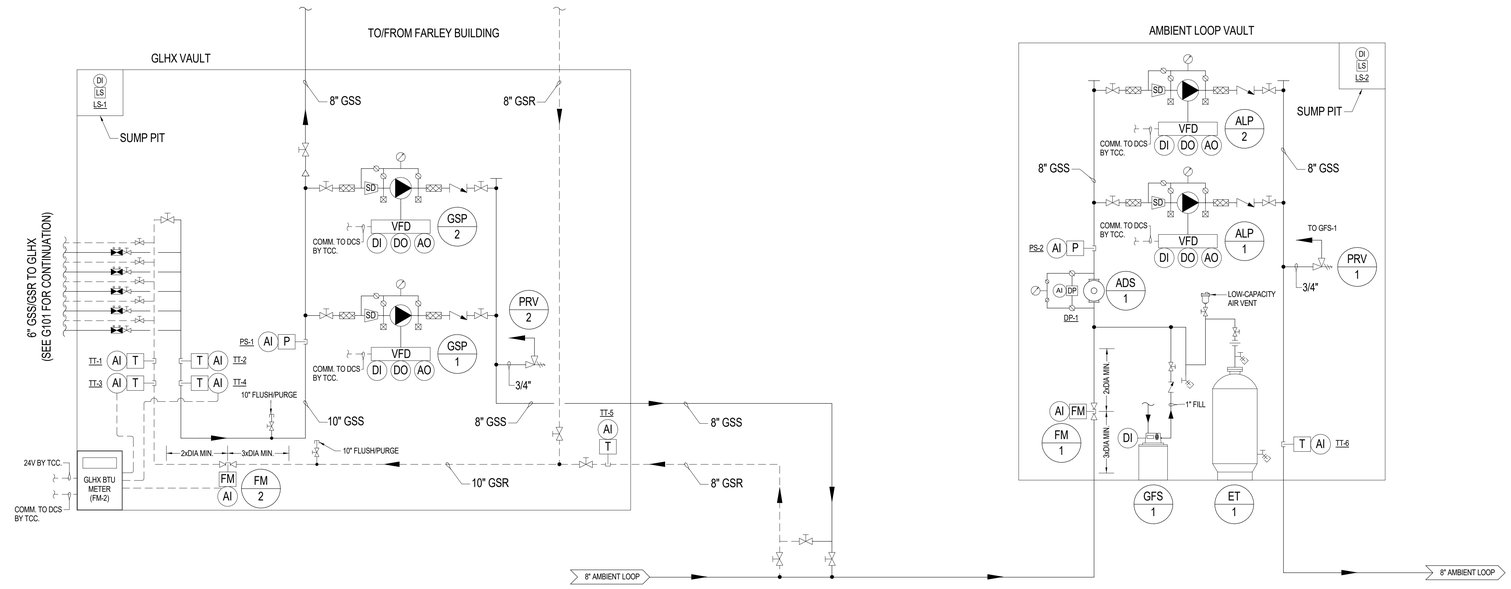
FLOW DIAGRAM - AMBIENT LOOP

**SHEET NUMBER** G701

**REVISION**

## GENERAL NOTES

1. CONTROLS CONTRACTOR TO INTEGRATE, AND ENSURE COMPATIBILITY OF, PHASE 2 SCADA SYSTEMS WITH EXISTING PHASE 1 SCADA SYSTEM.




## 1 AMBIENT LOOP CONTROL DIAGRAM

NOT TO SCALE

## GEOTHERMAL LOOP: INPUT / OUTPUT SUMMARY TABLE

| POINT DESCRIPTION | HARDWARE POINTS | | | | SOFTWARE POINTS | | | WIRELESS | NETWORK | ALARMS | | | | | TREND | RUNTIME | TOTAL | SHOW ON GRAPHIC | DEVICE TAG | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | INPUTS | | OUTPUTS | | ANALOG VALUE | BINARY VALUE | SCHED. | | | HIGH ANALOG LIMIT | LOW ANALOG LIMIT | BINARY | LATCH DIAGNOSTIC | SENSOR FAILURE | | | | | | |
| | DIGITAL | ANALOG | DIGITAL | ANALOG | | | | | | | | | | | | | | | | |
| **I/O POINT TOTAL** | 6 | 9 | 4 | 4 | 8 | 4 | 0 | 0 | 0 | 5 | 6 | 11 | 0 | 9 | 26 | 4 | 1 | 30 | | |
| **POINT DESCRIPTION** | DI | AI | DO | AO | AV | BV | SCHED | WIRELESS | NETWORK | H.LIMIT | L.LIMIT | BINARY | LATCH | SENSOR FAIL | TREND | RUNTIME | TOTAL | GRAPHIC | TAG | |
| | | | | | | | | | | | | | | | | | | | | |
| **GLHX-1 VAULT POINTS** | | | | | | | | | | | | | | | | | | | | |
| GSP-1 START/STOP | | | X | | | | | | | | | X | | | X | X | | X | GSP-1 | INCLUDE LEAD/LAG ASSIGNMENT |
| GSP-1 VFD SPEED | | | | X | X | | | | | | | | | | X | | | X | GSP-1 | |
| GSP-1 VFD STATUS | | | | | | X | | | | | | | | | X | | | X | GSP-1 | |
| GSP-1 VFD FAULT | X | | | | | | | | | | | X | | | X | | | X | GSP-1 | |
| GSP-2 START/STOP | | | X | | | | | | | | | X | | | X | X | | X | GSP-2 | INCLUDE LEAD/LAG ASSIGNMENT |
| GSP-2 VFD SPEED | | | | X | X | | | | | | | | | | X | | | X | GSP-2 | |
| GSP-2 VFD STATUS | | | | | | X | | | | | | | | | X | | | X | GSP-2 | |
| GSP-2 VFD FAULT | X | | | | | | | | | | | X | | | X | | | X | GSP-2 | |
| | | | | | | | | | | | | | | | | | | | | |
| GHLX-1 GEO LOOP RETURN TEMPERATURE | | X | | | | | | | | X | X | | | X | X | | | X | TT-1 | |
| GHLX-1 GEO LOOP SUPPLY TEMPERATURE | | X | | | | | | | | X | X | | | X | X | | | X | TT-2 | |
| GHLX-1 PUMP INLET PRESSURE | | X | | | | | | | | | X | | | X | X | | | X | PS-1 | |
| | | | | | | | | | | | | | | | | | | | | |
| AMBIENT LOOP RETURN TEMPERATURE | | X | | | | | | | | X | X | | | X | X | | | X | TT-5 | |
| | | | | | | | | | | | | | | | | | | | | |
| **BTU METER (GLHX-1)** | | | | | | | | | | | | | | | | | | | | |
| GHLX-1 GEO LOOP RETURN TEMPERATURE (FM-2) | | | | | X | | | | | | | | | | | | | X | TT-3 | |
| GHLX-1 GEO LOOP SUPPLY TEMPERATURE (FM-2) | | | | | X | | | | | | | | | | | | | X | TT-4 | |
| GHLX-1 GEO LOOP FLOW RATE (FM-2) | | X | | | X | | | | | | | | | X | X | | | X | FM-2 | |
| GHLX-1 GEO LOOP BTU | | | | | X | | | | | | | | | | X | | X | X | | |
| | | | | | | | | | | | | | | | | | | | | |
| SUMP PIT - HIGH WATER LEVEL ALARM | | | | | | | | | | | | | | | | | | | LS-1 | |
| | | | | | | | | | | | | | | | | | | | | |
| **AMBIENT LOOP VAULT POINTS** | | | | | | | | | | | | | | | | | | | | |
| ALP-1 START/STOP | | | X | | | | | | | | | X | | | X | X | | X | ALP-1 | INCLUDE LEAD/LAG ASSIGNMENT |
| ALP-1 VFD SPEED | | | | X | X | | | | | | | | | | X | | | X | ALP-1 | |
| ALP-1 VFD STATUS | | | | | | X | | | | | | | | | X | | | X | ALP-1 | |
| ALP-1 VFD FAULT | X | | | | | | | | | | | X | | | X | | | X | ALP-1 | |
| ALP-2 START/STOP | | | X | | | | | | | | | X | | | X | X | | X | ALP-2 | INCLUDE LEAD/LAG ASSIGNMENT |
| ALP-2 VFD SPEED | | | | X | X | | | | | | | | | | X | | | X | ALP-2 | |
| ALP-2 VFD STATUS | | | | | | X | | | | | | | | | X | | | X | ALP-2 | |
| ALP-2 VFD FAULT | X | | | | | | | | | | | X | | | X | | | X | ALP-2 | |
| | | | | | | | | | | | | | | | | | | | | |
| AMBIENT LOOP SUPPLY TEMPERATURE | | X | | | | | | | | X | X | | | X | X | | | X | TT-6 | |
| AMBIENT LOOP FLOW RATE | | X | | | | | | | | | | | | X | X | | | X | FM-1 | |
| AMBIENT LOOP PUMP INLET PRESSURE | | X | | | | | | | | | X | | | X | X | | | X | PS-2 | |
| | | | | | | | | | | | | | | | | | | | | |
| AMBIENT LOOP ADS-1 DIFFERENTIAL PRESSURE | | X | | | | | | | | X | | X | | X | X | | | X | DP-1 | |
| GFS-1 LOW LEVEL ALARM | X | | | | | | | | | | | X | | | | | | X | GFS-1 | |
| | | | | | | | | | | | | | | | | | | | | |
| SUMP PIT - HIGH WATER LEVEL ALARM | X | | | | | | | | | | | X | | | | | | X | LS-2 | |
| | | | | | | | | | | | | | | | | | | | | |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