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D	<p>OTHER TECHNICAL REQUIREMENTS FOR CLOSED LOOP COOLING SKIDS</p> <p>1) FLANGES OF FLEX HOSES SHALL BE LOCATED AT THE EDGE OF THE VIBRATION PADS (DND 310801-201203). CONTRACTOR SHALL ALSO PROVIDE AND INSTALL PIPING, FITTINGS AND SEALS BETWEEN THESE FLANGES AND THE EXISTING 2" DIAMETER PIPING PENETRATING THE WALL OF THE UTILITY MEZZANINE (WITH VICTAULIC ENDS). THIS APPLIES TO BOTH THE SUPPLY AND RETURN, AND INCLUDES ALL CONNECTING HARDWARE.</p> <p>2) VALVES 1-1/2" AND 2" DIAMETER SHALL BE WORCESTER SERIES 44 BALL VALVES OR ANL APPROVED EQUIVALENT. BODY, BOLTING, ENDS, BALL AND STEM SHALL BE 316 S.S. SEAT AND BODY SEAL SHALL BE TFE. END CONNECTIONS SHALL BE SOCKET WELD. IT SHALL BE POSSIBLE TO REPLACE SEATS AND PACKING IN-SITU.</p> <p>3) VALVES 1/4", 1/2" AND 3/4" DIAMETER SHALL BE WORCESTER SERIES 44 BALL VALVES OR ANL APPROVED EQUIVALENT. BODY, BOLTING, ENDS, BALL AND STEM SHALL BE 316 S.S. SEAT AND BODY SEAL SHALL BE TFE. END CONNECTIONS SHALL BE FNPT THREADED. IT SHALL BE POSSIBLE TO REPLACE SEATS AND PACKING IN-SITU.</p> <p>4) CONTROL VALVE SHALL BE WORCESTER MODEL CPT4467TSE-080/1575-SW 120VAC CHARACTERIZED SEAT BALL VALVE, 316SS CONSTRUCTION, 60 DEGREE V-SEAT, TEFLON DOWNSTREAM SEAT AND SEALS, NPT ENDS, MOUNT TO 1575SW-120V/6717-4 ELECTRIC ACTUATOR, 100% DUTY CYCLE, 120 VOLT WITH INTEGRAL 4-20 mA POSITIONER.</p> <p>5) CHECK VALVES SHALL BE MISSION DUO-CHECK #72-1HH-3W (316 SS).</p> <p>6) FLOW SWITCH SHALL BE FLOW & LEVEL CONTROLS, INC. MODEL FX-L-1000-S (WITH HIGH FLOW OPTION), 1" FNPT MOUNTED IN A 1" FNPT HALF-COUPLING PERPENDICULAR TO THE FLOW DIRECTION. CIRCUIT BOARD MOUNTED INSIDE CONDUIT HUB PROVIDED WITH SWITCH. CONTRACTOR SHALL INSTALL SWITCH SO THAT THERE IS AT LEAST 5 PIPE DIAMETERS OF STRAIGHT PIPE UPSTREAM AND 5 PIPE DIAMETERS DOWNSTREAM OF SWITCH.</p> <p>7) PRESSURE INDICATORS SHALL BE ASHCROFT MODEL 25-100RSW-04L-200 PSI OR ANL APPROVED EQUIVALENT. INDICATORS ARE ALL 316 S.S. 2.5" DIA. 1/2" FNPT CONNECTION, LOWER MOUNTING, 0-200 PSIG RANGE.</p> <p>8) DIFFERENTIAL PRESSURE GAUGES SHALL BE ORANGE RESEARCH CO.</p> <p>** PUMP D-P: 1518-DC-2.5L 0-50 PSI 316SS ** FILTER D-P: 1201-PG-10-2.5L 0-10 PSI 316SS</p> <p>9) TEMPERATURE INDICATORS SHALL BE AS RECOMMENDED BY CONTRACTOR. THESE SHALL BE THERMOMETER TYPE INDICATORS ACCURATE TO WITHIN .25F OR BETTER.</p> <p>10) LEVEL INDICATOR SHALL BE: KOBOLD NKK-0361-1A-L8-RZ, (INCLUDES 2 SWITCHES)</p> <p>11) THERMOWELL SHALL BE OMEGA MODEL HW/MS-2 TYPE 2-2/DH-1-20-1-1/15-2604/U1.625-316SS OR ANL APPROVED EQUAL.</p> <p>12) LEVEL SWITCHES MOUNTED IN THE EXPANSION TANKS SHALL BE INCORPORATED INTO LEVEL INDICATOR.</p>								D																																		
C	<p>13) FLEXHOSES SHALL BE FLEXONICS 401M SERIES OR EQUAL, 2" (NOM) I.D. X 18' LENGTH, ONE END PROVIDED WITH ANSI 150# 316 FLANGES, OTHER END PROVIDED WITH FEMALE SOCKET WELD, 2" NPS, 150# RATING; DESIGN PRESSURE 180 PSIG; TEST PRESSURE 270 PSIG; DESIGN TEMPERATURE 100F.</p> <p>14) FLANGES SHALL BE 150# WIG-STONE TYPE BACKING FLANGE W/ TYPE "A" SCH. 10, 304SS STUB END. GASKETS SHALL BE GARLOCK GYLON 3500. BOLTING SHALL BE GRADE 5 STUDS AND NUTS, TORQUED TO 48 FT-LBS. ALL FLANGES AND SHALL COMPLY WITH ANSI B16.5, CLASS 150.</p> <p>15) COMPONENTS AND DESIGN SHALL BE SUCH THAT MAINTENANCE AND REPLACEMENT ARE CONVENIENT AFTER INSTALLATION OF PIPING SYSTEM IS COMPLETE. PIPING UNIONS SHALL BE INSTALLED TO THE EXTENT NECESSARY TO BE ABLE TO REMOVE FROM THE SKID ANY COMPONENT WHICH IS SUPPLIED WITH THREADED CONNECTIONS.</p> <p>16) THREADED CONNECTIONS SHALL BE NPT TYPE. CONNECTIONS SHALL BE MADE USING LOCTITE THREAD SEALANT NO. 568 AND APPROPRIATE USE OF PRIMER 1" (#747).</p> <p>17) THE EXPANSION TANK SHALL BE MOUNTED WITH ITS AXIS PARALLEL TO THE HORIZONTAL PLANE. ITS LOWEST POINT SHALL BE NO LESS THAN 12 INCHES ABOVE THE HIGHEST OF EITHER THE HIGHEST POINT OF 2" DIAMETER PIPING, THE PUMPS, THE FILTER OR THE HEAT EXCHANGER.</p> <p>18) CONNECTION OF 480 VAC POWER TO CONTROL PANEL, SUPPLY AND INSTALLATION OF PANEL, AND ALL WIRING FROM PANEL TO COOLING SKID COMPONENTS (SUCH AS MOTOR, INSTRUMENTS, ETC.) WILL BE PERFORMED BY OTHERS.</p> <p>19) THE USE OF COPPER OR COPPER BASED ALLOYS IS STRICTLY FORBIDDEN IN THE CLOSED LOOP PORTION OF THE SKID (IE, IN THE PIPING LABELED ON THE PAD AS "2" DIAM SUPPLY" AND "2" DIAM. RETURN", OPERATING AT THE NOMINAL 75F TEMPERATURE).</p> <p>20) ENVIRONMENT: INDOOR AREA; GENERAL PURPOSE, NON-HAZARDOUS</p> <p>21) TEMPERATURE RANGE: 60-95F AMBIENT</p> <p>22) ALL COMPONENTS PROVIDED BY CONTRACTOR SHALL BE COMMERCIALY AVAILABLE ITEMS WHICH CAN BE READILY REPLACED AND PROCURED.</p> <p>23) CONTRACTOR SHALL SUPPLY AND INSTALL ALL MATERIALS NECESSARY TO PROPERLY SUPPORT AND ANCHOR EQUIPMENT AND PIPING LINES.</p> <p>23.1 PIPE SUPPORT SYSTEM COMPONENTS SHALL BE CAPABLE OF WITHSTANDING DEAD LOADS IMPOSED BY THE WEIGHT OF THE PIPES FILLED WITH WATER AND SHALL HAVE A MINIMUM SAFETY FACTOR OF 5.</p> <p>23.2 PIPING SHALL BE SUPPORTED IN MANNER WHICH SHALL PREVENT UNDE. STRESSES (INCLUDING THERMAL STRESS) ON ANY VALVE, FITTING, OR PIECE OF EQUIPMENT. IN ADDITION, PIPE SUPPORTS SHALL BE PROVIDED AT CHANGES IN DIRECTION OR ELEVATION OR ADJACENT TO FLEXIBLE COUPLINGS. PIPE SUPPORTS AND HANGERS SHALL NOT BE INSTALLED IN EQUIPMENT ACCESS AREAS.</p> <p>24) PIPING SHALL BE INSTALLED AS DIRECTLY AS POSSIBLE BETWEEN CONNECTING POINTS. ANL SHALL APPROVE FINAL PIPING LAYOUT PRIOR TO INSTALLATION.</p> <p>25) PIPING SHALL BE INSTALLED WITH PROPER ALIGNMENT AND SLOPE. PIPING SHALL BE INSTALLED SO THAT THE SYSTEM CAN BE PROPERLY DRAINED AND VENTED.</p> <p>26) PIPING SHALL BE CUT ACCORDING TO FINAL MEASUREMENTS TAKEN AT SITE, NOT FROM DRAWINGS.</p>								C																																		
B	<p>27) PIPING IN THE 2" DIAMETER SUPPLY AND RETURN (CLOSED LOOP PIPING) SHALL BE TESTED AT 175 PSIG FOR 90 MINUTES AND AT 270 PSIG FOR 30 MINUTES.</p> <p>28) NEW PIPING IN THE CHILLED WATER CIRCUIT SHALL BE TESTED AT 175 PSIG FOR TWO HOURS.</p> <p>29) ALL PRESSURE TESTING SHALL BE PERFORMED HYDROSTATICALLY.</p> <p>30) ALL PIPING MATERIALS SHALL BE 304 OR 316 STAINLESS STEEL.</p> <p>31) PIPING SHALL BE HANDLED SO AS TO AVOID DAMAGE, BENDING, OR ENTRANCE OF DIRT AND DEBRIS. PIPING SHALL BE DELIVERED IN A PRE-CLEANED AND SEALED CONDITION FREE OF SCALE, LIQUID CONTAMINANTS AND PARTICULATES.</p> <p>32) CONTRACTOR SHALL PROVIDE ALL MECHANICAL COUPLINGS REQUIRED FOR CONNECTING TO EXISTING PIPING SYSTEMS (EG. VICTAULIC FITTINGS).</p> <p>33) ALL FASTENERS AND BOLTS SHALL BE IDENTIFIABLE BY APPROPRIATE MARKINGS SUCH AS GRADE 5 OR GRADE 8.</p> <p>34) CONTRACTOR SHALL ENSURE THAT ALL PIPES ARE PROVIDED WITH IDENTIFYING MARKERS INDICATING FLOW DIRECTION AND FLUID TYPE PER ANSI A13.1.</p> <p>35) CONTRACTOR SHALL SUPPLY DRAIN VALVES AT ALL LOW POINTS IN THE PIPING SYSTEM.</p> <p>36) CONTRACTOR SHALL SUPPLY AIR BLEED VALVES AT ALL HIGH POINTS IN THE SYSTEM.</p> <p>37) THE FOLLOWING SHALL BE OBSERVED WITH REGARD TO PIPE HANGERS:</p> <p>37.1 HANGERS AT STEEL JOISTS SHALL BE LOCATED AT THE JOIST PANEL POINTS.</p> <p>37.2 PIPE HANGERS SHALL BE AS MANUFACTURED BY ELZEN, GRINNELL, FEE AND WASON, UNISTRUT, OR ANL APPROVED EQUIVALENT.</p> <p>37.3 CONTRACTOR MAY USE EXISTING HANGERS WHERE THEY ARE ADEQUATE.</p> <p>37.4 NO WIRE OR PERFORATED STRAP HANGERS SHALL BE PERMITTED IN ANY PERMANENT PIPING INSTALLATION.</p> <p>37.5 FOR HORIZONTAL PIPING, UNLESS OTHERWISE SPECIFIED OR INDICATED, SPACER HANGERS AS FOLLOWS:</p> <table border="1"> <thead> <tr> <th>PIPE SIZE</th> <th>CENTER TO CENTER SPACING</th> </tr> </thead> <tbody> <tr> <td>THROUGH 2"</td> <td>8'</td> </tr> <tr> <td>2-1/2" AND 3"</td> <td>10'</td> </tr> <tr> <td>4" AND 5"</td> <td>15'</td> </tr> <tr> <td>6" AND 8"</td> <td>15'</td> </tr> </tbody> </table> <p>38) CONTRACTOR SHALL PERFORM ALL WELDING BY THE GTAW PROCESS (GAS TUNGSTEN ARC) WITH APPROPRIATE BACKUP PURGE.</p>								PIPE SIZE	CENTER TO CENTER SPACING	THROUGH 2"	8'	2-1/2" AND 3"	10'	4" AND 5"	15'	6" AND 8"	15'	B																								
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REV	DESCRIPTION	DATE	BY
1	ISSUED FOR CONSTRUCTION	10/15/04	R.L. KEITHLEY
2	REVISED	10/15/04	R.L. KEITHLEY
3	REVISED	10/15/04	R.L. KEITHLEY
4	REVISED	10/15/04	R.L. KEITHLEY
5	REVISED	10/15/04	R.L. KEITHLEY
6	REVISED	10/15/04	R.L. KEITHLEY
7	REVISED	10/15/04	R.L. KEITHLEY
8	REVISED	10/15/04	R.L. KEITHLEY
9	REVISED	10/15/04	R.L. KEITHLEY
10	REVISED	10/15/04	R.L. KEITHLEY

01 SEE DCN NO. 941003-05 MAL B14

ARGONNE NATIONAL LABORATORY

ADVANCED PHOTON SOURCE

STORAGE RING WATER SOURCE

VACUUM CHAMBERS - COOLING

GENERAL ALL SECTORS AT LEVEL #2

CLOSED-LOOP COOLING SKID

PIPING & INSTRUMENT DIAGRAM

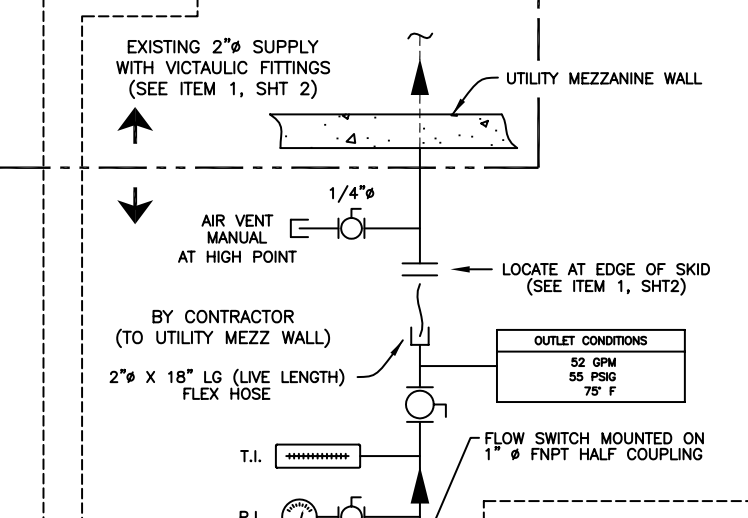
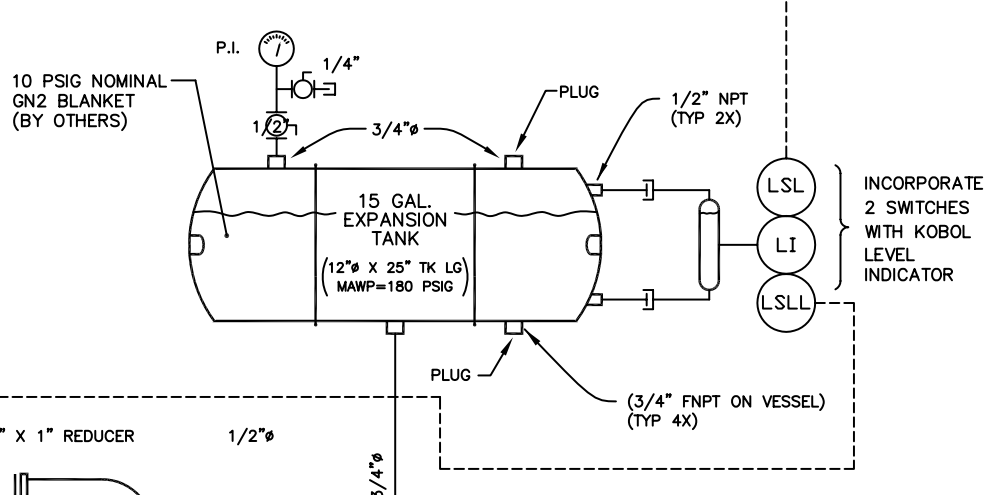
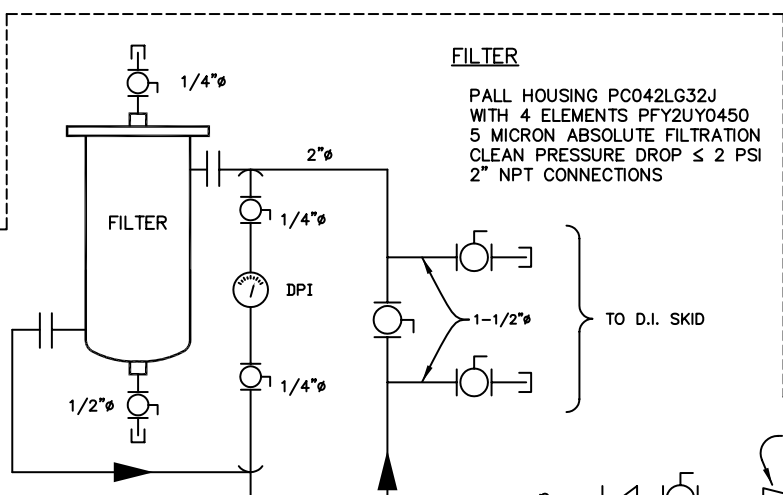
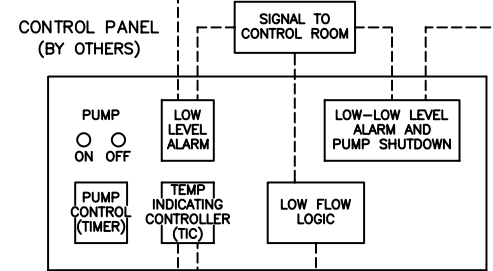
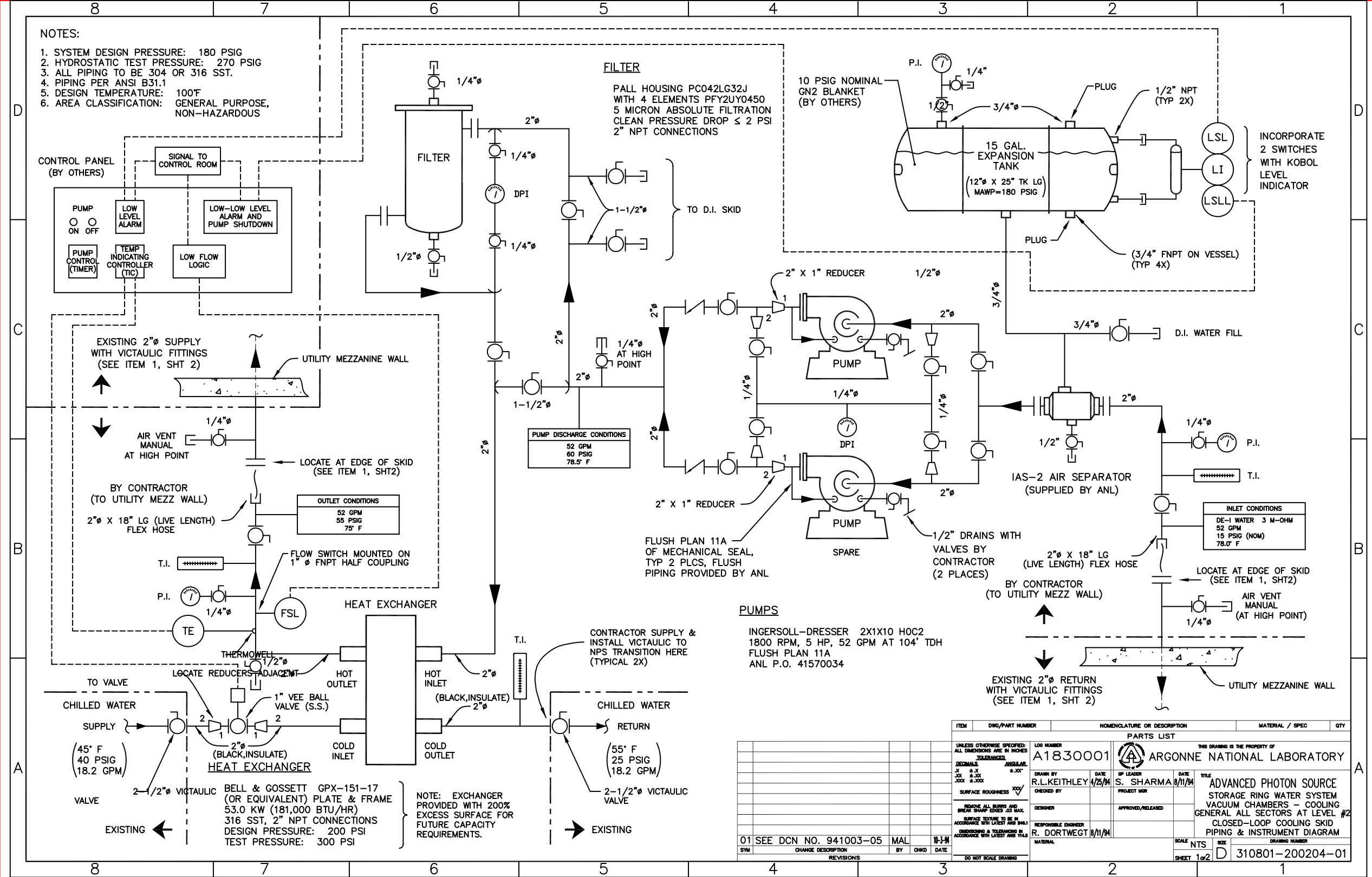
NTS

DATE: 2/2

310801-200204-01

NOTES:

1. SYSTEM DESIGN PRESSURE: 180 PSIG
2. HYDROSTATIC TEST PRESSURE: 270 PSIG
3. ALL PIPING TO BE 304 OR 316 SST.
4. PIPING PER ANSI B31.1
5. DESIGN TEMPERATURE: 100°F
6. AREA CLASSIFICATION: GENERAL PURPOSE, NON-HAZARDOUS



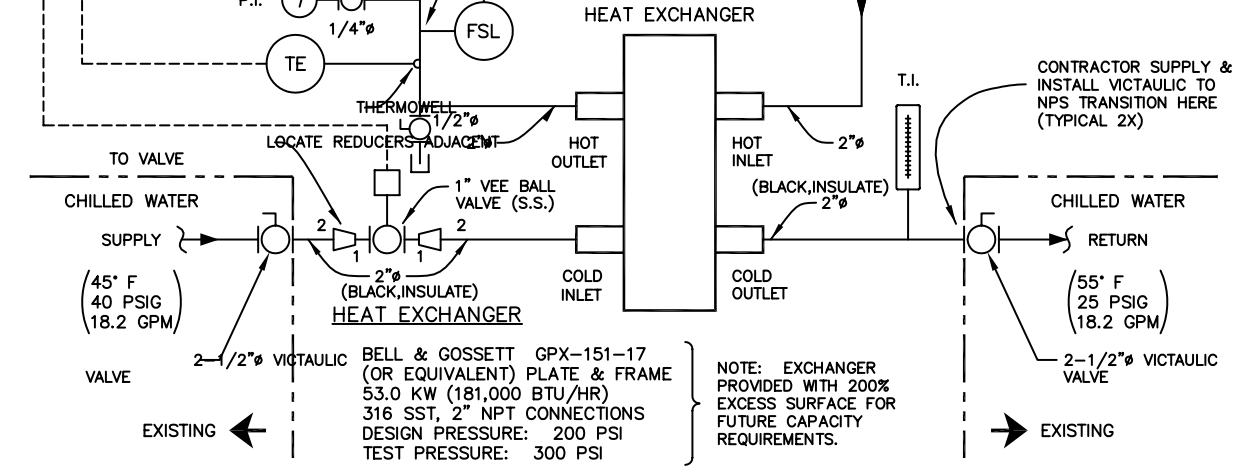
PUMP DISCHARGE CONDITIONS

52 GPM
60 PSIG
78.5° F

INLET CONDITIONS

DE-I WATER
3 M-OHM
52 GPM
15 PSIG (NOM)
78.0° F

PUMPS
 INGERSOLL-DRESSER 2X1X10 H0C2
 1800 RPM, 5 HP, 52 GPM AT 104' TDH
 FLUSH PLAN 11A
 ANL P.O. 41570034



NOTE: EXCHANGER PROVIDED WITH 200% EXCESS SURFACE FOR FUTURE CAPACITY REQUIREMENTS.

REVISIONS

NO.	DATE	BY	CHKD	DESCRIPTION
01	SEE DCN NO. 941003-05	MAL	11-3-94	

ITEM	DWG/PART NUMBER	NOMENCLATURE OR DESCRIPTION	MATERIAL / SPEC	QTY
PARTS LIST				
UNLESS OTHERWISE SPECIFIED: ALL DIMENSIONS ARE IN INCHES TOLERANCES: DECIMALS: .005 ANGULAR: .005 SURFACE FINISH: .005				
ARGONNE NATIONAL LABORATORY				
DRAWN BY: R.L. KEITHLEY DATE: 4/25/94				
CHECKED BY: S. SHARMA DATE: 8/11/94				
DESIGNER: R. DORTWEG DATE: 8/11/94				
APPROVED/RELEASED:				
PROJECT NO.:				
TITLE: ADVANCED PHOTON SOURCE STORAGE RING WATER SYSTEM VACUUM CHAMBERS - COOLING GENERAL ALL SECTORS AT LEVEL #2 CLOSED-LOOP COOLING SKID PIPING & INSTRUMENT DIAGRAM				
SCALE: NTS				DRAWING NUMBER: 310801-200204-01
SHEET: 1 of 2				