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SALT WASTE PROCESSING FACILITY PROJECT

UTILITIES

SYSTEM DESCRIPTION

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This Document Affected By	
Design Change Document	Initial/Date

SUMMARY OF CHANGES

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0	08/12/2015	Develop per DMR-3115. Initial Issuance.
1	09/26/2019	Revise per DCN-1855, DCN-1990, DCN-2039, DCN-2101 and DCN-7015.

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ACRONYMS AND ABBREVIATIONS

%	Percent
°F	degrees Fahrenheit
ADS	Air Dilution System
AFF	Alpha Finishing Facility
AFP	Alpha Finishing Process
AHU	Air Handling Unit
AOD	Air Operated Diaphragm
APA	Air Pulse Agitator
ASDT	Alpha Sorption Drain Tank (TK-601)
ASME	American Society of Mechanical Engineers
ASP	Alpha Strike Process
AST-A	Alpha Sorption Tank-A (TK-101)
AST-B	Alpha Sorption Tank-B (TK-221)
BDT	Barium Decay Tank (TK-206)
CCA	Cold Chemicals Area
CFF	Cross-Flow Filter
CHW	Chilled Water
CLFL	Composite Lower Flammability Limit
CR	Control Room
CSDT-A	Cleaning Solution Dump Tank-A (TK-103)
CSDT-B	Cleaning Solution Dump Tank-B (TK-223)
CSSX	Caustic-side Solvent Extraction
CWS	Chilled Water System
DCS	Distributed Control System
DI	Deionized
DSS	Decontaminated Salt Solution
DWS	Domestic Water System
DWPF	Defense Waste Processing Facility
DWS	Domestic Water System
FFT-A	Filter Feed Tank-A (TK-102)
FFT-B	Filter Feed Tank-B (TK-102)
FSA	Facility Support Area
ft	Feet/Foot
gpm	Gallons per minute
GS	General Service
HNO_3	Nitric Acid
hp	Horsepower
HVAC	Heating, Ventilation, and Air Conditioning
kW	Kilowatt
IT	Information Technology
MBTU/hr	Million British Thermal Unit per hour
MH	Manhole
mRem/hr	Millirem per hour
MSTT	Monosodium Titanate/Sludge Transfer Tank (TK-224)

ACRONYMS AND ABBREVIATIONS (cont.)

N/A	Not Applicable
NEMA	National Electrical Manufacturers Association
NPH	Natural Phenomena Hazard
ORP	Oxidation Reduction Potential
P&ID	Piping and Instrumentation Diagram
PC	Performance Category
PCV	Pressure Control Valve
PFD	Process Flow Diagram
psig	Pounds per Square Inch Gauge
PMV	Pulse Mixer Vent
PVV	Process Vessel Vent
RPM	Revolutions per Minute
scfh	Standard Cubic Feet per Hour
scfm	Standard Cubic Feet per Minute
SDT	Solvent Drain Tank (TK-208)
SEHT	Strip Effluent Hold Tank (TK-205)
SHT	Solvent Hold Tank (TK-202)
SAST	Spent Acid Storage Tank (TK-127)
SQL	Structured Query Language
SRS	Savannah River Site
SS	Safety Significant
SSFT	Salt Solution Feed Tank (TK-109)
SSRT	Sludge Solids Receipt Tank (TK-104)
SWPF	Salt Waste Processing Facility
TDH	Total Dynamic Head
UPS	Uninterruptible Power Supply
V	Volt
VFD	Variable Frequency Drive
WWHT	Wash Water Hold Tank (TK-105)

DEFINITIONS/GLOSSARY

There are no definitions or glossary items for this System Description.

1.0 SCOPE

The scope of this System Description is the Salt Waste Processing Facility (SWPF) Utilities.

Utilities are comprised of the following Systems:

1. Building Heating, Ventilation, and Air Conditioning (HVAC) Chilled Water System (CWS): Supplies the Process Building, Cold Chemicals Area (CCA), and Alpha Finishing Facility (AFF) air handling units (AHUs) with chilled water (CHW) for space temperature control.
2. Plant Air System: Provides and distributes compressed air to users throughout the SWPF, including the NGS Building.
3. Process Water System: Supplies process water to a number of users including the Sludge Solids Receipt Tank (SSRT) (TK-104) (for sludge washing), the flush header, pump seal make-up, Caustic Dilution Feed Tank (TK-108), wet sump make-up, heat recovery water system, make-up to CHW and cooling water systems, building utility stations, and the NGS Building.
4. Deionized (DI) Water System: Supplies DI water for the Filter Cleaning Acid Feed Tank (TK-106) and the Filter Cleaning Caustic Tank (TK-107).
5. Air Dilution System (ADS): Provides a continuous air purge to process tanks that have a credible possibility of reaching Composite Lower Flammability Limit (CLFL).
6. Domestic Water System (DWS): Provides potable water to the Process Building, AFF, CCA, the Administration Building and the NGS Building.
7. Sanitary Sewer System: Discharges uncontaminated waste water generated in the Process and Administration Buildings.
8. Process CWS: Supplies CHW to the Alpha Strike Process (ASP) secondary loop cooler (HX-015) and the Alpha Finishing Process (AFP) secondary loop cooler (HX-025) to remove process heat loads from ASP and AFP equipment.
9. Control Room (CR) CWS: Supplies the CR AHUs with CHW for space temperature control.

The utilities systems interface with components in the following System Descriptions:

- E-SD-J-00002, *SWPF Electrical System Description*[1];
- M-SD-J-00004, *SWPF Heating, Ventilating, and Air Conditioning System Description*[2];
- M-SD-J-00006, *SWPF Material Handling System Description*[3];
- X-SD-J-00001, *SWPF Alpha Strike Process System Description*[4];
- X-SD-J-00002, *SWPF Caustic-side Solvent Extraction System Description*[5];
- X-SD-J-00003, *SWPF Cold Chemicals Area System Description*[6];
- X-SD-J-00004, *SWPF Alpha Finishing Process System Description*[7];
- X-SD-J-00005, *SWPF Drains System Description*[8];

- X-SD-J-00006, *SWPF Sampling System Description*[9];
- X-SD-J-00007, *SWPF Air Pulse Agitators System Description*[10];
- X-SD-J-00008, *SWPF Next Generation Solvent System Description*[11], *and*
- X-SD-J-00009, *SWPF Causticside Solvent Extraction with NGS System Description*[12].

The safety analysis requirements related to system functions for utility systems are documented in Chapter 4 of S-SAR-J-00002, *SWPF Documented Safety Analysis*[13].

The safety analysis requirements related to operability for utility systems are documented in Chapter 5 of S-SAR-J-00002[13].

The discrete project design requirements for utility systems are documented in P-DB-J-00002, *SWPF Design Criteria Database*[14].

As part of the maintenance of the SWPF Master Equipment List (See PP-EN-5042, *Master Equipment List*[15]), all permanent plant equipment is assigned a unique tag number. Each component (equipment, instrumentation, specialty item, etc.) is assigned to one (and only one) CSE system code. Structured Query Language (SQL) reports are generated (real time) off the controlled Master Equipment List. These are filterable by CSE system. A complete listing of all components associated with this system can be found using the following reports, and filtering by ELEC:

- MEL Cables;
- MEL Equipment;
- MEL Instruments;
- MEL Lines;
- MEL Manual Valves; and
- MEL Specialty Items.

Similarly, all essential and support drawings are coded to the appropriate CSE system code (with only one code allowed per drawing). Using the following link: Drawing Category Status, a report may be generated for ELEC and selecting the drawing type (Essential, Support). Reference drawings are not assigned System Codes and not required to be maintained current with facility modifications per PP-EN-5001[15], *Design Control* and P-CDM-J-00001, *Configuration Management Plan*[16].

2.0 GENERAL OVERVIEW

2.1 Process Building HVAC CWS

The Process Building HVAC CWS provides cooling capacity for the Process Building, CCA, and AFF AHUs. The only area of the Process Building air ventilation cooling that is not covered by

this section is the CR CWS, which has a separate CWS. Two 50 percent (%) capacity air-cooled chillers provide CHW to condition the supply air for building temperature control.

2.2 Plant Air System

The Plant Air System consists of compressor units and a distribution network to supply dried, oil-free compressed air throughout the SWPF, including the NGS building. The system is capable of supplying 3,000 standard cubic feet per minute (scfm) of compressed air. The primary equipment consists of: 3 air compressors of capacity 1,500 scfm each at a discharge pressure of 135 pounds per square inch gauge (psig); a 3,500-gallon-capacity air receiver; two Heat-of-Compression dryers, each capable of drying 3,000 scfm of compressed air to -40 degrees Fahrenheit (^{o}F) dew point; and two evaporative coolers, each sized to supply cooling water requirements of the operating compressors and dryer. The primary components that require compressed air include, but are not limited to: air pulse agitators (APAs), cross-flow filter (CFF) back-pulse cleaning, air diaphragm pumps, instrumentation, control valves, tank purging, and utility stations for air-driven tools.

2.3 Process Water System

The Process Water System supplies a number of users including the SSRT (TK-104) (for sludge washing), the flush header, pump seal make-up, Caustic Dilution Feed Tank (TK-108), wet sump make-up, heat recovery water system, make-up to CHW and cooling water systems, building utility stations and the NGS building.

The Process Water System also provides water to the Flush Water System which in turn provides flush water to SWPF vessels, equipment, cells, liners, and labyrinth areas. Flush water is used to spray down process vessel internals, cell and labyrinth areas to reduce contamination levels, and flush process equipment in preparation for contact maintenance.

2.4 DI Water System

A skid-mounted DI Water Package Unit, fed by the SWPF DWS, supplies DI water to the Cleaning Solution Dump Tank-A (CSDT-A) (TK-103), Cleaning Solution Dump Tank-B (CSDT-B) (TK-223), Nitric Acid Scrub Make-up Tank (TK-307), Filter Cleaning Caustic Tank (TK-107), Caustic Make-up Tank (TK-303), Filter Cleaning Acid Feed Tank (TK-106), the stripping section of the Caustic-side Solvent Extraction (CSSX) process (when mixed with Nitric Acid [HNO_3]) as strip feed make-up, and to the Analytical Laboratory area.

2.5 ADS

The primary function of the ADS is to provide a continuous air purge to the process tanks that have a credible possibility of reaching CLFL. The accident analysis in S-SAR-J-00002[13] assumes that, given an operational or Natural Phenomena Hazard (NPH)-type event that disables the normal purge air flow through the Plant Air System, the ADS will provide required purge air flow for a minimum of four days to allow for restoration of normal flow or for installation of portable air compressors through Safety Significant (SS) Performance Category (PC)-3 connection points.

2.6 DWS

The DWS provides potable water to the Process Building, AFF, CCA, the NGS building and the Administration Building from the Savannah River Site (SRS) site-wide DWS. Normal loads on the SWPF DWS include drinking fountains, sinks, showers, toilets, hose bibs, and water heaters. The domestic water (DW) header also provides make-up to the Process Water Tank (TK-301) and the DI Water System. The DWS provides an industrial safety function in areas with chemical hazards by providing safety showers and eyewash stations.

2.7 Sanitary Sewer System

The Sanitary Sewer System discharges uncontaminated waste water generated in the Process and Administration Buildings. Sources of uncontaminated waste water include restrooms (clean), change rooms (clean), janitorial closets, and water fountains. The Sanitary Sewer System accepts condensate from air compressors and HVAC equipment. The system does not accept waste streams from the process or rain water from building roof drains.

2.8 Process CWS

The Process CWS consists of a primary loop and two secondary loops that provide cooling capacity for the ASP and AFP process equipment loads. Segregated primary and secondary process CHW loops are utilized to prevent potentially radioactive contaminated CHW from being introduced to non-radioactive areas of SWPF. Process heat loads are removed from ASP and AFP equipment including but not limited to filter recirculation coolers, Alpha Sorption Tank-B (AST-B) (TK-221), Filter Feed Tank-B (FFT-B) (TK-222), Monosodium Titanate/Sludge Transfer Tank (MSTT) (TK-224), Salt Solution Feed Tank (SSFT) (TK-109), Strip Effluent Hold Tank (SEHT) (TK-205), Alpha Sorption Tank-A (AST-A) (TK-101), Filter Feed Tank-A (FFT-A) (TK-102), SSRT (TK-104), Solvent Hold Tank (SHT) (TK-202), and contactors. The Process CWS also removes condensables from the Process Vessel Vent (PVV) and the Pulse Mixer Vent (PMV) headers. The Process CWS utilizes two 100% capacity, redundant air cooled chillers.

2.9 CR CWS

The CR CWS provides cooling capacity for the CR area AHUs. The CR area includes the CR (R116), CR Access Area (R116A), Men/Women Toilet (R116B), Shift Supervisor Office (R117), Information Technology (IT) Server Room (R118), and Uninterruptible Power Supply (UPS) Room (R118A). Two 100% capacity, redundant air cooled chillers provide CHW to condition the supply air for temperature control.

3.0 PROCESS BUILDING HVAC CWS

3.1 System Functions

The Process Building HVAC CWS provides cooling capacity for the Process Building, CCA, and AFF AHUs. The only area of the Process Building air ventilation cooling that is not covered by

this section is the CR, which has a separate CWS. Two 50%-capacity air cooled chillers provide CHW to condition the supply air for building temperature control.

3.2 Operational Overview

The two building CHW chiller units (CHU-001A/B) and the two building CHW supply pumps (P-001A/B) are required to meet the maximum anticipated building cooling capacity. If one of the chillers or pumps fails during the summer months, the building air temperature may exceed design comfort ranges but will not limit the habitability of the building.

The building CHW is circulated through a closed-loop system by two supply pumps. The return loop is cooled by the two building CHW chillers. The Building Chilled Water Expansion Tank (TK-001) maintains system pressure by accommodating thermal expansion/contraction of the CHW solution. Make-up water is provided by the Process Water System via automatic pressure control valve (PCV) (PCV-2681).

3.3 Configuration Information

3.3.1 Description of System

Refer to Piping and Instrumentation Diagrams (P&IDs) and Air Flow and Control Diagrams listed in Table 3-1.

Table 3-1. P&IDs and Air Flow and Control Diagrams

Diagram Number	Diagram Title
M-M6-J-0098	*SWPF Process Building Chiller Units CHU-001A/B P&ID (U)*[17]
M-MW-J-0002	*SWPF Process Building HVAC Building Supply Air Handling Unit AHU-001 Air Flow and Control Diagram(U)*[18]
M-MW-J-0003	*SWPF Process Building HVAC Building Supply Air Handling Unit AHU-002 Air Flow and Control Diagram (U)*[19]
M-MW-J-0004	*SWPF Process Building HVAC Building Supply Air Handling Unit AHU-003 Air Flow and Control Diagram (U)*[20]
M-MW-J-0007	*SWPF Process Building Cold Chemicals Area Air Flow and Control Diagram (U)*[21]
M-MW-J-0023	*SWPF Process Building Alpha Finishing Facility Air Flow and Control Diagram (U)*[22]

3.3.2 Major Components

See Table 3-2 for a list of major components.

Table 3-2. Major Components

Component	Description
Building Chilled Water Chillers (CHU-001A/B)	Removes building heat load from Building CHW Capacity: 280 Tons Power Consumption: 360 Kilowatt (kW) (See M-M6-J-0098[17])
Building Chilled Water Supply Pumps (P-001A/B)	Circulates Building CHW Capacity: 580 gallons per minute (gpm) Horsepower (hp): 60 (See M-M6-J-0098[17])
Building Chilled Water Air Separator (SEP-001)	Removes air from Building CHW Capacity: 1,160 gpm (See M-M6-J-0098[17])
Building Chilled Water Expansion Tank (TK-001)	Provides location for thermal expansion of Building CHW Volume: 53 gallons (See M-M6-J-0098[17])
Building Chilled Water Chemical Bypass Feeder Tank (TK-002)	Location for addition of chemicals to Building CHW Volume: 5 gallons (See M-M6-J-0098[17])

3.3.3 Stream Data

See Table 3-3 for a listing of Streams.

Table 3-3. Streams

Stream	Description
Building CHW	25% Propylene glycol solution is circulated through the Building CWS.

3.3.4 Physical Location and Layout

The building CHW chillers are located outside, north of the Process Building. All other major components of the Process Building HVAC CWS are located in room R114 of the Northern Facility Support Area (FSA).

3.3.5 System Control Features and Interlocks

3.3.5.1 System Monitoring

The Process Building HVAC CWS normally operates with minimal Operator intervention. Instrumentation is provided to monitor the status of the system and initiate corrective action, if necessary. Remote alarm indications are provided to the Distributed Control System (DCS).

- Each chiller is equipped with a general trouble alarm that notifies the Operator of a chiller fault.
- The building CHW supply pumps have instrumentation to locally monitor suction and discharge pressures.
- The building CHW supply pumps have instrumentation to locally monitor suction temperatures.
- The pressure of the building CHW return header is continuously monitored.
- The temperature of the building CHW supply header is continuously monitored.
- The flow rate of building CHW in the supply header is continuously monitored.

See Table 3-4 for a listing of instruments.

Table 3-4. System Monitoring Instruments

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
UA-4210	M-M6-J-0098[17]	Not Applicable (N/A)	CHU-001B Status	fault
UA-4211	M-M6-J-0098[17]	N/A	CHU-001A Status	fault
PIT-4218	M-M6-J-0098[17]	J-JZ-J-00857, *SWPF PI-4218 Building Chilled Water Return Pressure*[23]	Building CHW Return Pressure	psig
TIT-4237	M-M6-J-0098[17]	J-JZ-J-00858, *SWPF TI-4237 Building Chilled Water Supply Temperature*[24]	Building CHW Supply Temperature	^{o}F
FIT-4233	M-M6-J-0098[17]	J-JZ-J-00856, *SWPF FI-4233 Building Chilled Water Supply Flowrate*[25]	Building CHW Supply Flowrate	gpm
PI-014	M-M6-J-0098[17]	N/A	Building Chilled Water Chemical Bypass Feeder Tank (TK-002) Pressure	psig
P-001A	M-M6-J-0098[17]	N/A	Pump Status	Run/Off
P-001B	M-M6-J-0098[17]	N/A	Pump Status	Run/Off
PI-4221	M-M6-J-0098[17]	N/A	P-001A Discharge Pressure	psig
PI-4222	M-M6-J-0098[17]	N/A	P-001B Discharge Pressure	psig
PI-3964	M-M6-J-0098[17]	N/A	P-001A Suction Pressure	psig
PI-3966	M-M6-J-0098[17]	N/A	P-001B Suction Pressure	psig
TI-3965	M-M6-J-0098[17]	N/A	P-001A Suction Temperature	^{o}F
TI-3967	M-M6-J-0098[17]	N/A	P-001B Suction Temperature	^{o}F

3.3.5.2 Control Functions

There are no control loops in the building CWS.

3.4 Operations

3.4.1 Initial Configuration

The building CHW loop is filled with the 25% propylene glycol solution. All valves are in their normal positions in accordance with the P&IDs.

3.4.2 System Startup

For the Process Building HVAC CWS, startup begins with opening the chiller isolation valves and starting the supply pumps. Then the chillers are started.

3.4.3 Normal Operations

The two 50% capacity chiller/pump combination runs constantly to maintain the target building CHW supply temperature. Both chillers are required to run at full capacity to meet the cooling load requirements of the AHUs. The supply pump(s) circulates water through the system acquiring building heat loads from the Process Building AHUs (AHU-001, AHU-002, and AHU-003), the AFF AHU (AHU-006), and the CCA AHUs (AHU-008 and AHU-009). The water then enters the chiller(s), where the heat load is removed and the water is cooled. Each pump operates at constant flow rate which is maintained by 3-way valves located at each AHU. The 3-way valves modulate the flow through the cooling coil based on cooling demand and bypass the remaining CHW flow back to the building chilled water return header.

3.4.4 Off-Normal and Recovery Operation

If one of the two 50% capacity chillers fails, the failed chiller is shutdown and the system will continue to operate with one 50% capacity chiller. During high cooling load times, one functioning chiller may not provide enough cooling capacity to meet design comfort space temperatures in the building. In such cases, the temperature may rise above designed set points but will not limit the habitability of the building.

If a loss of air pressure were to occur, all of the 3-way valves that control the direction of the CHW to the AHUs (TV-4114A, TV-4129A, TV-4134A, TV-4159A/B, and TV-6054A/B) are configured to fail in the position that would direct the building CHW flow to bypass the AHU cooling coils.

The pneumatic controlled valves upstream of the chiller units (HV-4208 and HV-4209) will fail open upon loss of air pressure, thus permitting the building CHW to flow on a loss of air pressure.

Table 3-5 shows equipment and component failures.

Table 3-5. Equipment and Component Failure

Condition	Detection	Immediate DCS Action	Recovery
Chiller Failure (CHU-001A)	DCS Alarm (UA-4211)	CHU-001A is shutdown.	Complete Repairs
Chiller Failure (CHU-001B)	DCS Alarm (UA-4210)	CHU-001B is shutdown.	Complete Repairs
Low/High CHW Flow Rate	DCS Flow Indication (FI-4233)	None	Operator to investigate cause of problem.
Low/High CHW Supply Temperature	DCS Temperature Indication (TI-4237)	None	Operator to investigate cause of problem.
Low/High CHW Return Pressure	DCS Pressure Indication (PI-4218)	None	Operator to investigate cause of problem.
Pump Failure (P-001A)	Pump Status on DCS	CHU-001A is shutdown.	Complete Repairs
Pump Failure (P-001B)	Pump Status on DCS	CHU-001B is shutdown.	Complete Repairs
Valve Failure (HV-4209)	Valve Status on DCS (HIS-4209)	CHU-001A is shutdown.	Complete Repairs
Valve Failure (HV-4208)	Valve Status on DCS (HIS-4208)	CHU-001B is shutdown.	Complete Repairs
High Make-Up Water Flow Rate (FSH-4215)	DCS Flow Indication (FA-4215)	None	Operator to investigate cause of problem.

3.4.5 System Shutdown

Both 50% capacity chiller/pump combinations are running, the chillers are first stopped. Then the chilled water supply pumps are stopped and the chiller isolation valve are closed.

4.0 PLANT AIR SYSTEM

4.1 System Functions

The Plant Air System function is to provide and distribute compressed air to users throughout the SWPF. Three 50%-capacity plant air compressors (CMP-501A/B/C) will supply all plant air and instrument air loads.

The Plant Air System is used to provide air to instruments, APAs, air operated diaphragm (AOD) pumps, utility stations, air purge system, Process Water Pressure Tank (TK-305), Back Pulse

Charge Tank-A (TK-122), Back Pulse Charge Tank-B (TK-233), and the Analytical Laboratory. The process vessel APAs account for the primary Plant Air loads. Instrumentation, actuated valves, air-driven pumps, and utility stations utilize a small portion of the required plant air supply.

The functional classification of the Plant Air System is General Services (GS) and the PC is PC-1, with the exception of the following:

- Plant air connections and supply lines to the APA pulse pots, which are required to maintain integrity (including post-seismic) to ensure that waste in the ASP tanks can be periodically agitated.
- Plant air connection and supply line to the ADS that would be used to supply air to the purge system following a seismic event.
- Mass flow-limiting orifices, which are installed on the air supply lines to the APAs for the SSFT (TK-109), FFT-A (TK-102), Wash Water Hold Tank (WWHT) (TK-105), and SSRT (TK-104) to limit the consequences of an aerosolization event in those vessels.

4.2 Operational Overview

The Plant Air System produces plant air/instrument air at a pressure sufficient enough to ensure the minimum pressure required at any user. The Plant Air System consists of three oil free centrifugal-type 50%-capacity compressors (CMP-501A/B/C). Two compressors are operational and the third is an on-line standby unit. The two operational compressors will be operated in a lead/lag arrangement. During low demand, only the lead compressor operates. When the air consumption rate increases beyond the output of the lead compressor, the lag compressor will start. Using two 50%-capacity units allows the Compressed Air System to match consumption needs during low and peak demands. The lead/lag operation will cycle among the three compressors to equalize compressor wear and ensure that any single compressor does not remain idle over an extended period.

Should one of the operational compressors fail, the standby compressor will automatically cycle into operation and the failed compressor will be isolated for maintenance. The remaining two operational compressors would be adequate to maintain full plant operations. As such, repairs and outages could be conveniently scheduled.

Each compressor is rated at 1,500 scfm, with a discharge pressure of 135 psig. The compressors are equipped with 500-hp direct-drive electric motors suitable for continuous service. A pre-filter, intercooler, and local control panel are provided for each compressor as a vendor package. The replaceable pre-filter is piped in-line with the compressor air intake.

The compressed air piping from the compressors is manifolded into a common header. Two 100%-capacity (3,000 scfm each) vendor-packaged air dryer units (DRY-501A/B) are provided to reduce the dew point of the compressed air to -40°F or lower. One dryer unit is operational and the other is an on-line standby unit. Each dryer is a Heat-of-Compression desiccant-type unit, with dual pressure vessels, that utilizes the waste heat developed by the air compressor during the

compression process. Each air dryer is fully packaged, including an after-cooler, moisture separator, drain traps, after-filter, and local control panel.

Two dedicated 100%-capacity evaporative coolers (CCL-501A/B) are provided, each capable of providing the cooling requirements of the two operating air compressor intercoolers and one dryer after-cooler. One evaporative cooler is operating while the other is a standby unit. The evaporative coolers and the Plant Air Receiver Tank (TK-501) are located on outdoor concrete pads adjacent to the Compressor Building.

The Plant Air System includes the Plant Air Receiver Tank (TK-501) with a minimum capacity of 3,500 gallons. The Plant Air Receiver Tank (TK-501) is a code-certified and stamped vessel in accordance with Section VIII: Division 1: "Rules for Construction of Pressure Vessels" of the American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code*[26]. The tank is equipped with dual ASME safety relief valves and a three-way valve, air pressure transmitter, line shut-off valve, and a suitable drain valve and outlet cock.

Electric motors are vendor-furnished with the Plant Air System equipment. The motors are in accordance with National Electrical Manufacturers Association (NEMA) MG 1, *Motors and Generators*[27] and M-DS-J-00092, *SWPF Compressed Air System CMP-501A/-501B/-501C, DRY-501A/-501B, CCL-501A/-501B, P-501A/-501B and TK-501*[28]. Each compressor train receives electrical power from dedicated 480 Volt (V) alternating current switchgear that is linked to normal onsite power. To prevent undesired demand surges on the power grid, the compressors are equipped with wye-delta starters. Each control panel is provided with dry contacts for remote alarms/indications and motor starting and stopping signals.

4.3 Configuration Information

4.3.1 Description of System

Refer to P&IDs listed in Table 4-1.

Table 4-1. P&IDs

Diagram Number	Diagram Title
M-M6-J-0084	*SWPF Process Building Facility Support Area Plant Air Distribution P&ID (U)*[29]
M-M6-J-0089	*SWPF Compressor Building Plant Air Dryers P&ID (U)*[30]
M-M6-J-0091 SH1	*SWPF Compressor Building Plant Air Compressors P&ID (U)*[31]
M-M6-J-0091 SH2	*SWPF Compressor Building Evaporative Coolers P&ID (U)*[32]
M-M6-J-0092	*SWPF Process Building Plant Air Distribution to Air Pulse Agitators P&ID (U)*[33]
M-M6-J-0130	*SWPF Process Building Tank Air Purge P&ID (U)*[34]
M-M6-J-0173	*SWPF Alpha Finishing Facility Tank Air Purge P&ID (U)*[35]
M-M6-J-0180	*SWPF Process Building Central Process Area Plant Air Distribution P&ID (U)*[36]
M-M6-J-0181	*SWPF Process Building Cold Chemicals Area Plant Air Distribution P&ID (U)*[37]
M-M6-J-0182	*SWPF Process Building Alpha Finishing Facility Plant Air Distribution P&ID (U)*[38]
M-M6-J-0196	*SWPF Process Building Analytical Lab Plant Air System P&ID (U)*[39]
M-M6-J-0204	*SWPF Next Generation Solvent Building Sumps and Utilities P&ID (U)*[40]

4.3.2 Major Components

See Table 4-2 for a list of major components.

Table 4-2. Plant Air Major Components

Component	Description
Plant Air Compressors (CMP-501A/B/C)	To supply plant air to SWPF users. Under peak loads two compressors are operating with the third in standby. Capacity: 1,500 scfm (see M-M6-J-0091 SH1[31]) hp: 500
Cooling Water Supply Pumps (P-501A/B)	To recirculate 25% propylene glycol cooling water solution through evaporative coolers, air dryer after cooler and air compressor inter-coolers. One pump is operating with the other in standby. Capacity: 256 gpm (see M-M6-J-0091 SH2[32]) hp: 15
Plant Air Dryers (DRY-501A/B)	To dry SWPF plant air to -40 °F dewpoint. One dryer is operating with the other in standby. Capacity: 3,000 scfm (see M-M6-J-0089[30])
Evaporative Coolers (CCL-501A/B)	To remove heat load from 25% propylene glycol cooling water solution. One cooler is operating with the other in standby. Capacity: 350 gpm (see M-M6-J-0091 SH2[32]) Entering Temperature: 107 °F Leaving Temperature: 85 °F Wet Bulb Temperature: 78.7 °F hp: 25 (fan) ; 5 (pump)

Table 4-2. Plant Air Major Components (cont.)

Component	Description
Cooling Water Air Separator (SEP-501)	To remove air from the plant air cooling water system. Capacity: 350 gpm (see M-M6-J-0091 SH2[32])
Evaporative Coolers Chemical Feeder Tank (TK-502)	To make chemical additions to plant air cooling water system. Capacity: 5 gallons (see M-M6-J-0091 SH2[32])
Evaporative Coolers Bladder Expansion Tank (TK-503)	To provide space for expansion of cooling water due to thermal expansion. Capacity: 23 gallons (see M-M6-J-0091 SH2[32])
Plant Air Receiver Tank (TK-501)	Capacity: 3,500 gallons (see M-M6-J-0089[30])

4.3.3 Stream Data

See Table 4-3 for a listing of streams.

Table 4-3. Streams

Stream	Description
Plant Air	Clean oil-free compressed air with -40 °F dewpoint is distributed throughout SWPF.
Cooling Water	A 25% propylene glycol solution is distributed to the plant air compressors and dryers to cool the plant air.

4.3.4 Physical Location and Layout

The plant air compressors and dryers are located in the Compressor Building. The plant air receiver, evaporative coolers and cooling water pumps are mounted on an exterior concrete pad east of the Compressor Building. The air lines are distributed throughout the facility to the various areas, tanks, pumps, APAs, and utility stations.

4.3.5 System Control Features

4.3.5.1 System Monitoring

The Plant Air System normally operates with minimal Operator intervention. Instrumentation is provided to monitor the status of the system and initiate corrective actions, if necessary. Remote alarm indications are provided to the DCS.

<u>Plant Air Compressors</u>

- A pressure switch is installed on the discharge of each compressor. It starts and stops the compressor based upon discharge pressure set points.
- Each compressor is equipped with a general trouble alarm that notifies the Operator of a compressor fault.
- Cooling water supply and return temperatures for each compressor are monitored locally.
- Cooling water flow through each compressor is locally monitored.

Plant Air Dryers

- Each dryer is equipped with a general trouble alarm that notifies the Operator of a dryer fault.
- The dew point of air exiting the plant air dryers is monitored.

Plant Air Receiver

- The air receiver pressure is monitored.

Evaporative Coolers

- Each cooler is equipped with a general trouble alarm that notifies the Operator of a cooler fault.
- The cooling water supply pumps have instrumentation to locally monitor discharge pressure.

See Table 4-4 for a listing of instruments.

Table 4-4. Plant Air System Monitoring Instruments

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
PIT-4455	M-M6-J-0091 SH2[32]	J-JZ-J-01173, *SWPF PI-4455 PA Cooling Water Return Pressure*[41]	Cooling Water Return Pressure	psig
UA-4401	M-M6-J-0091 SH2[32]	N/A	CCL-501B Status	Fault
UA-4411	M-M6-J-0091 SH2[32]	N/A	CCL-501A Status	fault
PI-4403	M-M6-J-0091 SH2[32]	N/A	P-501B discharge pressure	psig
PI-4413	M-M6-J-0091 SH2[32]	N/A	P-501A discharge pressure	psig
PI-018	M-M6-J-0091 SH2[32]	N/A	Evaporative Coolers Chemical Feeder Tank (TK-502) Pressure	psig

Table 4-4. Plant Air System Monitoring Instruments (cont.)

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
PI-4446	M-M6-J-0091 SH1[31]	N/A	Compressor Control Air Pressure	psig
TI-4421	M-M6-J-0091 SH1[31]	N/A	CMP-501A Cooling Water Supply Temperature	°F
TI-4423	M-M6-J-0091 SH1[31]	N/A	CMP-501B Cooling Water Supply Temperature	°F
TI-4426	M-M6-J-0091 SH1[31]	N/A	CMP-501C Cooling Water Supply Temperature	°F
TI-4429	M-M6-J-0091 SH1[31]	N/A	CMP-501A Cooling Water Return Temperature	°F
TI-4437	M-M6-J-0091 SH1[31]	N/A	CMP-501B Cooling Water Return Temperature	°F
TI-4441	M-M6-J-0091 SH1[31]	N/A	CMP-501C Cooling Water Return Temperature	°F
FG-4428	M-M6-J-0091 SH1[31]	N/A	CMP-501A Cooling Water Flow Sight Glass	N/A (visual)
FG-4438	M-M6-J-0091 SH1[31]	N/A	CMP-501B Cooling Water Flow Sight Glass	N/A (visual
FG-4439	M-M6-J-0091 SH1[31]	N/A	CMP-501C Cooling Water Flow Sight Glass	N/A (visual)
UA-4440	M-M6-J-0091 SH1[31]	N/A	CMP-501A Status	fault
UA-4450	M-M6-J-0091 SH1[31]	N/A	CMP-501B Status	fault
UA-4460	M-M6-J-0091 SH1[31]	N/A	CMP-501C Status	fault
UA-4420	M-M6-J-0089[30]	N/A	DRY-501A Status	fault
UA-4422	M-M6-J-0089[30]	N/A	DRY-501B Status	fault
MIT-4424	M-M6-J-0089[30]	J-JZ-J-00846, *SWPF MI-4424 Plant Air Dryer A Moisture*[42]	DRY-501A Exiting Air Dewpoint	°F
MIT-4425	M-M6-J-0089[30]	J-JZ-J-00847, *SWPF MI-4425 Plant Air Dryer B Moisture*[43]	DRY-501B Exiting Air Dewpoint	°F

Table 4-4. Plant Air System Monitoring Instruments (cont.)

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
PIT-4436	M-M6-J-0089[30]	J-JZ-J-00849, *SWPF PI-4436 Plant Air Receiver Tank Pressure*[44]	Plant Air Receiver Pressure	psig
PIT-4435	M-M6-J-0089[30]	J-JZ-J-00848, *SWPF PI-4435 Plant Air Header Pressure*[45]	Plant Air Header Pressure	psig
PIT-7518	M-M6-J-0173[35]	J-JZ-J-00805, *SWPF PI-7518 AFF Tank Air Purge Header Pressure*[46]	AFF Tank Purge Air Header Pressure	psig
FICV-7513	M-M6-J-0173[35]	N/A	Alpha Finishing Drain Tank (TK-228) Purge Air Rotameter	Standard cubic feet per hour (scfh)
FICV-7514	M-M6-J-0173[35]	N/A	Alpha Finishing Drain Tank (TK-228) Purge Air Rotameter	scfh
FICV-7511	M-M6-J-0173[35]	N/A	MSTT (TK-224) Purge Air Rotameter	scfh
FICV-7512	M-M6-J-0173[35]	N/A	MSTT (TK-224) Purge Air Rotameter	scfh
FICV-7507	M-M6-J-0173[35]	N/A	CSDT-B (TK-223) Purge Air Rotameter	scfh
FICV-7508	M-M6-J-0173[35]	N/A	CSDT-B (TK-223) Purge Air Rotameter	scfh
FICV-7509	M-M6-J-0173[35]	N/A	FFT-B (TK-222) Purge Air Rotameter	scfh
FICV-7510	M-M6-J-0173[35]	N/A	FFT-B (TK-222) Purge Air Rotameter	scfh
FICV-7505	M-M6-J-0173[35]	N/A	Decontaminated Salt Solution (DSS) Hold Tank (DSSHT) (TK-207) Purge Air Rotameter	scfh
FICV-7506	M-M6-J-0173[35]	N/A	DSSHT (TK-207) Purge Air Rotameter	scfh
FICV-7503	M-M6-J-0173[35]	N/A	AST-B (TK-221) Purge Air Rotameter	scfh
FICV-7504	M-M6-J-0173[35]	N/A	AST-B (TK-221) Purge Air Rotameter	scfh

Table 4-4. Plant Air System Monitoring Instruments (cont.)

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
FICV-7501	M-M6-J-0173[35]	N/A	Intermediate Storage Tank (TK-220) Purge Air Rotameter	scfh
FICV-7502	M-M6-J-0173[35]	N/A	Intermediate Storage Tank (TK-220) Purge Air Rotameter	scfh
PI-5275	M-M6-J-0180[36]	N/A	Contactor Purge Air Pressure	psig
PIT-8336	M-M6-J-0196[39]	J-JZ-J-01314, *SWPF PI-8336 Hot Cell Shield Door Seal Pressure*[47]	Hot Cell Shield Door Seal Pressure	psig

4.3.5.2 Control Functions

There are no control loops for the Plant Air System.

4.4 Operations

4.4.1 Initial Configuration

The air compressors, dryers, evaporative coolers and cooling water pumps are not running. The Plant Air System is not pressurized. The cooling water system is filled with cooling water and the evaporative cooler basin is full. The cooling water system has been treated, as necessary, with biocides. The isolation valves for air dryers are closed. The isolation valves upstream of plant air pressure regulators are also closed.

4.4.2 System Startup

The cooling water system is started up first. With a full basin, start the evaporative cooler water pump and begin circulating water within the evaporative cooler. Then begin evaporative cooler fan operation. After the cooler has been started then either P-501A or P-501B is started to begin recirculation of the Plant Air System cooling water.

Next the compressors are started. Complete all pre-startup checks on the compressors before starting compressors up. Press the start button on the control panels. Compressor is automatic in operation from this point forward.

Then the dryer is started. The inlet isolation valve is slowly opened to fill the dryer with plant air. Once filled, the dryer outlet isolation valve is then slowly opened and filling to the Plant Air Receiver Tank (TK-501) occurs. After the Plant Air Receiver Tank (TK-501) pressure stabilizes,

the isolation valve at the portable compressor connection is opened and the dryer is switched to the on position. Dryer operation is automatic in operation from this point forward.

The dewpoint of air exiting the dryer shall be monitored until it reaches -40 °F. Once the target dewpoint has been reached then the valve at the portable compressor connection is closed and the valves at the plant air regulators are placed into normal operating positions. The Plant Air System is now in its normal operating configuration.

4.4.3 Normal Operations

This Plant Air System provides a continuous supply of compressed air. Normal air supply pressure is monitored by the DCS via pressure transmitters located on the receiver and main supply manifolds. The compressors start and stop based upon pressure setpoints measured at each compressor discharge.

The Plant Air System is in operating mode in the following configuration:

- Two plant air compressors are in active operating mode,
- One plant air compressor is in standby mode,
- One plant air dryer is in operating mode,
- One plant air dryer is in standby mode,
- One evaporative cooler is in operating mode,
- One evaporative cooler is in standby mode,
- One cooling water supply pump is in operating mode, and
- One cooling water supply pump is in standby mode.

The Plant Air Receiver Tank (TK-501) must be periodically purged of accumulated moisture. The method or frequency of purging will be based on experience. Running system checks will include, but are not limited to:

- Monitor system pressure at air receivers and at specified end users,
- Removal (blowdown) of condensate at system drains, and
- Monitor plant air dew point.

The Plant Air System maintains Plant Air Receiver Tank (TK-501) between 110 – 135 psig at full design air flow to supply the plant header. The Plant Air Receiver Tank (TK-501) and piping are protected from over-pressure by pressure relief valves. Dual PCVs are provided with isolation valve(s). One pressure-regulating valve operates at a time with the other isolated. Either PCV may be isolated for performance testing or maintenance without disabling the entire system. The Plant Air Receiver Tank (TK-501) is also provided with a connection (V8684) for a portable engine-driven compressor for emergency use and a bypass (V9153) around the regulators (PCV-4431 and PCV-4432).

4.4.4 Off-Normal and Recovery Operation

A major system failure of the Plant Air System will result in relying on the Backup Air Receivers to supply the tank air purge and a loss of APA operation in all process vessels. Because there is only a 4-day air supply in the Backup Air Receivers, normal Plant Air System operation must be restored within 4 days or an alternate air source connected to the system. A 10-day time window is applicable to restoring APA operation.

Table 4-5 shows equipment and component failures.

Table 4-5. Equipment and Component Failure

Condition	Detection	Immediate DCS Action	Recovery
Compressor Failure (CMP-501A)	Alarm in DCS (UA-4440)	None	Operator to investigate cause of problem.
Compressor Failure (CMP-501B)	Alarm in DCS (UA-4450)	None	Operator to investigate cause of problem.
Compressor Failure (CMP-501C)	Alarm in DCS (UA-4460)	None	Operator to investigate cause of problem.
Dryer failure (DRY-501A)	Alarm in DCS (UA-4420)	None	Operator to investigate cause of problem.
Dryer Failure DRY-501B	Alarm in DCS (UA-4422)	None	Operator to investigate cause of problem.
High Moisture in Air Exiting DRY-501A	Moisture Indicator (MI-4424)	None	Operator to investigate cause of problem.
High Moisture in Air Exiting DRY-501B	Moisture Indicator (MI-4425)	None	Operator to investigate cause of problem.
High/Low Pressure in Air Receiver	Pressure Indicator (PI-4436)	None	Operator to investigate cause of problem.
High/Low Air Header Pressure	Pressure Indicator (PI-4435)	None	Operator to investigate cause of problem.
High/Low Cooling Water System Pressure	Pressure Indicator (PI-4455)	None	Operator to investigate cause of problem.
Evaporative Cooler Failure (CCL-501A)	Alarm in DCS (UA-4411)	None	Operator to investigate cause of problem.
Evaporative Cooler Failure (CCL-501B)	Alarm in DCS (UA-4401)	None	Operator to investigate cause of problem.
High/Low AFF Purge Air Pressure	Pressure Indicator (PI-7518)	None	Operator to investigate cause of problem.
High/Low Air Pressure to Hot Cell Shield Door Seal	Pressure Indicator (PI-8336)	None	Operator to investigate cause of problem.

4.4.5 System Shutdown

Shutting down the Plant Air System is started by closing the dryer isolation valves and switching off the dryer. Then unload the compressors and shut them down. Then the cooling water system is stopped by switching off the cooling water supply pump and evaporative cooler.

5.0 PROCESS WATER SYSTEM

5.1 System Functions

The Process Water System supplies a number of users including the SSRT (TK-104) (for sludge washing), the flush header, pump seal make-up, Caustic Dilution Feed Tank (TK-108), wet sump make-up, heat recovery water system, make-up to chilled and cooling water systems, the NGS building, and building utility stations.

5.2 Operational Overview

The Process Water System is supplied from the DW header and distributes process water to plant users through the process water supply header. A physical air gap is provided on the DW line at the Process Water System interface to prevent backflow contamination to the DWS. The Process Water Tank (TK-301) has a 9,500-gallon capacity. The Process Water Utility Pump (P-301-1) and Flush Pump (P-301-2) are used to supply the Process Water System. Pumps P-301-1 and P-301-2 have design capacities of 75 and 300 gpm, respectively.

The Process Water System is maintained at approximately 90 to 115 psig by the Process Water Pressure Tank (TK-305). The Process Water Pressure Tank (TK-305) is a 400-gallon tank that is pressurized by the Plant Air System through a self-contained pressure regulator valve PCV-2633. With inflow of Process Water into the Process Water Pressure Tank (TK-305) air is discharged from the Process Water Pressure Tank (TK-305) through a self-contained pressure regulator valve PCV-2634. The two pressure regulator valves maintain the Process Water Pressure Tank (TK-305) pressure within the range.

The Process Water System provides water to the Flush Water System which in turn provides flush water to SWPF vessels, equipment, cells, liners, and labyrinth areas. Flush water is used to spray down process vessel internals, cell and labyrinth areas to reduce contamination levels, and flush process equipment in preparation for contact maintenance. The Flush Water System is fed from the Process Water System and uses P-301-1 and P-301-2 as supply pumps. The Flush Water System will normally be maintained at the same pressure as the Process Water System via the Process Water Pressure Tank (TK-305). Hard-piped flush connections to contaminated waste piping allow flushing for maintenance or access to labyrinth areas.

Typically, flushes will be performed with process water only. Connections are provided to allow the injection of 50% caustic or 20% HNO_3 during the flush operations, if necessary. This activity is expected to be required on a very infrequent basis. To strictly control the ability to add HNO_3 or caustic to the flush water header, flexible hoses are provided on the HNO_3 and caustic injection

lines. The flexible hoses will normally be disconnected and connection to HNO_3 and caustic lines will be strictly controlled by operations personnel.

5.3 Configuration Information

5.3.1 Description of System

Refer to the P&IDs and Process Flow Diagrams (PFDs) listed in Table 5-1.

Table 5-1. P&IDs and PFDs

Diagram Number	Diagram Title
M-M5-J-0010	*SWPF Cold Chemical Makeup and Process Water Tank PFD (U)*[48]
M-M6-J-0076 SH1	*SWPF Process Building Process Water Tank TK-301 P&ID (U)*[49]
M-M6-J-0076 SH2	*SWPF Process Building Process Water Pressure Tank TK-305 P&ID (U)*[50]
M-M6-J-0077	*SWPF Process Building Process Water Distribution P&ID (U)*[51]
M-M6-J-0157	*SWPF Process Building Flush Main Header P&ID (U)*[52]
M-M6-J-0158	*SWPF Alpha Finishing Facility Flush Distribution Header P&ID (U)*[53]
M-M6-J-0160	*SWPF Process Building ASP and CSSX North Flush Header P&ID (U)*[54]
M-M6-J-0161	*SWPF Process Building CSSX South Pump and Valve Gallery Flush Header P&ID (U)*[55]
M-M6-J-0162 SH1	*SWPF Process Building CSSX South Contactor/Tank Cell Flush Header P&ID (U)*[56]
M-M6-J-0162 SH2	*SWPF Process Building CSSX South Contactor/Tank Cell Flush Header P&ID (U)*[57]
M-M6-J-0163 SH1	*SWPF Process Building CSSX South Contactor/Tank Cell Flush Header P&ID (U)*[58]
M-M6-J-00163 SH2	*SWPF Process Building CSSX South Contactor/Tank Cell Flush Header P&ID (U)*[59]
M-M6-J-0164	*SWPF Process Building ASP Tank and Cell Flush Header P&ID (U)*[60]
M-M6-J-0165	*SWPF Process Building ASP Pump Flush Header P&ID (U)*[61]
M-M6-J-0204	*SWPF Next Generation Solvent Building Sumps and Utilities P&ID (U)*[40]

5.3.2 Major Components

See Table 5-2 for a list of major components.

Table 5-2. Major Components

Component	Description	
Process Water Tank (TK-301)	Capacity: Dimensions: Material:	9,500 gallons (See M-M6-J-0076 SH1[48]) 10 feet (ft) diameter X 16 ft-9 1/8 inch Tangent–to-Bottom Polyethylene
P-301-1	Process Water Utility Pump Capacity: hp:	 75 gpm (See M-M6-J-0076 SH1[48]) 20
P-301-2	Flush Pump Capacity: hp:	 300 gpm (See M-M6-J-0076 SH1[48]) 50
FLT-301A/FLT-301B	Process Water Filter Cartridge filter area: Pore size: Cartridge Material: Housing Material:	 4,320 squared inches 200 Micron Polypropylene 316L Stainless Steel
Process Water Pressure Tank (TK-305)	Capacity: Dimensions: Material:	400 gallons (See M-M6-J-0076 SH2[50]) 4 ft diameter X 5 ft Tangent-to-Tangent 304L Stainless Steel

5.3.3 Stream Data

See Table 5-3 for a listing of Streams.

Table 5-3. Streams

Stream	Description
Process Water	Process water is stored in the Process Water Tank (TK-301) and distributed throughout the facility to various users.

5.3.4 Physical Location and Layout

The Process Water Tank (TK-301) and pumps are located in the northwest corner of the CCA (R151).

5.3.5 System Control Features and Interlocks

5.3.5.1 System Monitoring

The Process Water System normally operates with minimal Operator intervention. Instrumentation is provided to monitor the status of the system and initiate corrective actions, if necessary. Remote alarm indications are provided to the DCS.

Process Water Tank (TK-301)

- Tank level is continuously monitored, using redundant instrumentation.
- Tank temperature is monitored locally through the use of an element inserted into a thermowell.
- Tank oxidation-reduction potential is continuously monitored.
- The Process Water Utility Pump and the Flush Pump have local instruments for monitoring pump discharge pressure.
- A magnetic flow meter is installed on the discharge side of P-301-1 and P-301-2.
- Differential pressure across the Process Water Filters is continuously monitored.

Process Water Pressure Tank (TK-305)

- Tank level is continuously monitored.
- Tank pressure is monitored locally.

Process Water Piping

- Magnetic flow meters are installed in process water branch lines to the Caustic Dilution Feed Tank (TK-108) and the SSRT (TK-104).

Flush Water Piping

- Magnetic flow meters are installed in the two primary flush water distribution headers.
- Pressures of the two primary flush water distribution headers are continuously monitored.
- Magnetic flow meters are installed in flush water distribution headers to AFF, North ASP and CSSX, CSSX South Contactor/Tank Cell, ASP Tanks and Cells, and ASP Pumps.

See Table 5-4 for a listing of System Monitoring Instrumentation.

Table 5-4. System Monitoring Instrumentation

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
LV-2613	M-M6-J-0076 SH1[49]	N/A	Valve Position	Open/Closed
LIT-2613	M-M6-J-0076 SH1[49]	J-JZ-J-0009, *SWPF LIC-2613 Process Water Tank Level*[62]	Process Water Tank (TK-301) Level	gallons
LIT-2611	M-M6-J-0076 SH1[49]	J-JZ-J-0008, *SWPF LIC-2611 Process Water Tank Level*[63]	Process Water Tank (TK-301) Level	gallons
TI-2614	M-M6-J-0076 SH1[49]	N/A	Process Water Tank (TK-301) Temperature	°F
AE-2615	M-M6-J-0076 SH1[49]	J-JZ-J-00563, *SWPF AI-2615 Process Water Tank ORP*[64]	Process Water Tank (TK-301) Oxidation Reduction Potential	milli-volt
P-301-1	M-M6-J-0076 SH1[49]	N/A	Pump Status	Run/Off
PI-2623	M-M6-J-0076 SH1[49]	N/A	P-301-1 discharge pressure	psig
P-301-2	M-M6-J-0076 SH1[49]	N/A	Pump Status	Run/Off
PI-2622	M-M6-J-0076 SH1[49]	N/A	P-301-2 discharge pressure	psig
LV-2630A	M-M6-J-0076 SH1[49]	N/A	Valve Position	Open/Closed
LV-2630B	M-M6-J-0076 SH1[49]	N/A	Valve Position	Open/Closed
PDIT-2628	M-M6-J-0076 SH1[49]	J-JZ-J-00565, *SWPF PDI-2628 Process Water Filter dP*[65]	FLT-301 Differential Pressure	Pounds per square inch differential
HV-2609	M-M6-J-0076 SH1[49]	N/A	Valve Position	Open/Closed
FE-2626	M-M6-J-0076 SH1[49]	N/A	Process Water Flow	gpm
FE-2631	M-M6-J-0076 SH2[50]	J-JZ-J-00570, *SWPF FIC-2631 Process Water to SSRT Flow*[66]	Process Water Flow to SSRT (TK-104)	gpm
LIT-2630	M-M6-J-0076 SH2[50]	J-JZ-J-00076, *SWPF LIC-2630 Process Water Pressure Tank Level Control*[67]	Process Water Pressure Tank (TK-305) Level	gallons
PI-2636	M-M6-J-0076 SH2[50]	N/A	Process Water Pressure Tank (TK-305) Pressure	psig
HV-2635	M-M6-J-0076 SH2[50]	N/A	Valve Position	Open/Closed

Table 5-4. System Monitoring Instrumentation **(cont.)**

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
FE-2637	M-M6-J-0076 SH2[50]	N/A	Process Water Flow to Caustic Dilution Feed Tank (TK-108)	gpm
FE-2620	M-M6-J-0076 SH2[50]	N/A	Flush Water Flow	gpm
PIT-2627	M-M6-J-0076 SH2[50]	J-JZ-J-00572, *SWPF PI-2627 CCA/AFF/ASP Flush Header Pressure*[68]	Flush header pressure	psig
FE-2619	M-M6-J-0076 SH2[50]	N/A	Flush Water Flow	gpm
PIT-2621	M-M6-J-0076 SH2[50]	J-JZ-J-00571, *SWPF PI-2621 CSSX Flush Header Pressure*[69]	Flush Header Pressure	psig
FE-2423	M-M6-J-0076 SH2[50]	J-JZ-J-00567, *SWPF FIC-2423 Acid to Flush Header Flow*[70]	HNO_3 Flow to Flush Header	gpm
FV-2423	M-M6-J-0076 SH2[50]	N/A	Valve Position	Open/Closed
FE-2419	M-M6-J-0076 SH2[50]	J-JZ-J-00566, *SWPF FIC-2419 Caustic to Flush Header Flow*[71]	Caustic Flow to Flush Header	gpm
FV-2419	M-M6-J-0076 SH2[50]	N/A	Valve Position	Open/Closed
HV-2638	M-M6-J-0077[51]	N/A	Valve Position	Open/Closed
HV-2640	M-M6-J-0077[51]	N/A	Valve Position	Open/Closed
HV-2641	M-M6-J-0077[51]	N/A	Valve Position	Open/Closed
HV-2645	M-M6-J-0157[52]	N/A	Valve Position	Open/Closed
HV-2646	M-M6-J-0157[52]	N/A	Valve Position	Open/Closed
HV-2648	M-M6-J-0157[52]	N/A	Valve Position	Open/Closed
HV-2649	M-M6-J-0157[52]	N/A	Valve Position	Open/Closed
HV-2650	M-M6-J-0157[52]	N/A	Valve Position	Open/Closed
HV-2652	M-M6-J-0157[52]	N/A	Valve Position	Open/Closed
FE-7037	M-M6-J-0158[53]	N/A	Flush Water Flow	gpm
FE-2642	M-M6-J-0160[54]	N/A	Flush Water Flow	gpm
FE-2644	M-M6-J-0162 SH1[56]	N/A	Flush Water Flow	gpm
FE-2653	M-M6-J-0165[61]	N/A	Flush Water Flow	gpm
FE-2654	M-M6-J-0164[60]	N/A	Flush Water Flow	gpm

5.3.5.2 Control Functions

See Table 5-5 for a listing of Control Loops for the Process Water System.

Table 5-5. Control Loops

Loop Number	P&ID	Scale Sheet	Controlled Variable	Set point
LIC-2613	M-M6-J-0076 SH1[49]	J-JZ-J-0009[62]	Process Water Tank (TK-301) Level	6228 gallons (See J-JZ-J-0009[62])
LIC-2630	M-M6-J-0076 SH1[49]	J-JZ-J-00076[67]	Process Water Pressure Tank (TK-305) Level	- 234 gallons (start filling tank) -299 gallons (stop filling tank) (See J-JZ-J-00076[67])
FIC-2631	M-M6-J-0076 SH2[50]	J-JZ-J-00570[66]	Process Water Tank (TK-301) to SSRT (TK-104)	Set to match permeate flow from FLT-104 during sludge washing
FIC-2419	M-M6-J-0076 SH2[50]	J-JZ-J-00566[71]	Caustic Flow to Flush Header	Operator entered
FIC-2423	M-M6-J-0076 SH2[50]	J-JZ-J-00567[70]	HNO_3 Flow to Flush Header	Operator entered

5.4 Operations

5.4.1 Initial Configuration

Prior to startup, the DW supply is isolated from Process Water Tank (TK-301) by LV-2613. The Process Water Tank (TK-301) and Process Water Pressure Tank (TK-305) are either at the heel level or empty. The primary system isolation valve is closed.

5.4.2 System Startup

The Process Water Tank (TK-301) is filled by initiating the DCS automatic fill function. The DCS opens LV-2613 and controls flow based on the Process Water Tank (TK-301) level. The fill operation is terminated by DCS or manually by the Operator. The primary system isolation valve is opened and P-301-1 is started, and the system is filled with process water. Once the maximum level in the Process Water Pressure Tank (TK-305) is reached, the Process Water Pressure Tank (TK-305) isolation valve is closed and system filling continues. Once the system has been filled, P-301-1 is stopped. Then the Process Water Pressure Tank (TK-305) air supply valve is opened, followed by opening the Process Water Pressure Tank (TK-305) isolation valve. The Process Water Pressure Tank (TK-305) is pressurized to approximately 90 psig, using the Plant Air System and PCV-2633.

5.4.3 Normal Operations

The Process Water Tank (TK-301) is maintained in the in the normal operating range by DCS in the auto fill mode. The DCS opens LV-2613 and controls flow based on the Process Water Tank (TK-301) level. The Process Water Tank (TK-301) level is normally maintained above 25% to minimize flexing and fatigue of tank bottom.

There are two modes of operation for the Process Water System. The Normal Water Usage (low flow) mode provides for the process requirements using P-301-1. The High Water Usage (high flow) mode uses pump P-301-2 for meeting system flushing requirements. The Process Water Pressure Tank (TK-305) level and the PW system pressure are constantly maintained during both modes of operation. For Normal water usage (low flow) mode, the DCS controls the Process Water Pressure Tank (TK-305) level by starting/stopping the Process Water Utility Pump (P-301-1). For high water usage (high flow) mode, the DCS controls the level in the Process Water Pressure Tank by starting/stopping the Flush Pump (P-301-2) and by modulating LV-2630A and LV-2630B valves. These valves are located in the Process Water Storage Tank (TK-301) recirculation line.

The process sequences for the Process Water System are included in Section 8.0 of X-PCD-J-00002, *SWPF Automation Functional Control Sequence for: Cold Chemicals Area*[72].

5.4.4 Off-Normal and Recovery Operation

Connections are provided on the Process Water System to allow the injection of either 50% caustic or 20% HNO_3 during the flush operations, if necessary. This activity is expected to be required on a very infrequent basis.

Should addition of caustic to the process water be required, the Operator will connect SI-520 (flex hose) to either MIX-301A or MIX-301B. Connection to MIX-301A or MIX-301B is based upon the end use of the caustic flushing solution. Once the connection has been made, the caustic flow rate required to achieve a 20% caustic flushing solution will be calculated and entered into the FIC-2419 control loop. Then caustic addition will begin.

If addition of HNO_3 to the process water is required, the Operator will connect SI-521 (flex hose) to either MIX-301A or MIX-301B. Once again, connection to MIX-301A or MIX-301B is based upon the end use of the HNO_3 flushing solution. Once the connection has been made, the HNO_3 flow rate required to achieve a 1 Molar HNO_3 flushing solution will be calculated and entered into the FIC-2423 control loop. Then HNO_3 addition will begin.

See Table 5-6 for a listing of equipment and component failure.

Table 5-6. Equipment and Component Failure

Condition	Detection	Immediate DCS Action	Recovery
Process Water Tank (TK-301) Low Oxidation Reduction Potential (ORP) (AIT-2615)	AI-2615 Alarm in DCS	None	Start sodium hypochlorite addition to Process Water Tank (TK-301).
Process Water Tank (TK-301) Low-Low level	LIT-2613/ LIT-2611 level indication and alarm	The process water distribution equipment module is stopped.	Operator to investigate cause of problem.
Pump Failure (P-301-1)	Pump status indication in DCS	The process water distribution equipment module is stopped.	Complete repairs.
Pump Failure (P-301-2)	Pump status indication in DCS	The process water distribution equipment module is stopped.	Complete repairs.
High Filter Differential Pressure	PDI-2628 pressure indication and alarm	The process water distribution equipment module is stopped.	Operator to switch filters.
Failure of Commanded Equipment	DCS status indication	The process water distribution equipment module is stopped.	Operator to investigate cause of problem.

5.4.5 System Shutdown

Makeup to the Process Water System to Process Water Tank (TK-301) is terminated by closing LV-2613. The operating pump (P-301-1 or P-301-2) is stopped. Both the primary system isolation valve and the Process Water Pressure Tank (TK-305) air supply valves are closed.

6.0 DI WATER SYSTEM

6.1 System Functions

A skid-mounted DI Water Package Unit (IX-312) fed by the SWPF DWS, is provided to supply DI water to the CSDT-A (TK-103), CSDT-B (TK-223), Nitric Acid Scrub Make-up Tank (TK-307), Filter Cleaning Caustic Tank (TK-107), Caustic Make-up Tank (TK-303), Filter Cleaning Acid Feed Tank (TK-106), the stripping section of the CSSX process (with an HNO_3 bleed) as strip feed make-up, and to the Analytical Laboratory area.

6.2 Operational Overview

A skid-mounted DI Water Package Unit (IX-312) supplies DI water to the DI Water Storage Tank (TK-312). A physical air gap is provided on the supply line to the DI Water Storage Tank (TK-312) to prevent backflow contamination to the DWS. The DI Water Storage Tank (TK-312) has a 7,500-gallon capacity and is normally maintained at a water level above 25% to minimize flexing and fatigue in the tank bottom. This is sufficient volume to provide for more than a day of operation of the CSSX process, not including the additional volume of scrub solution that would normally be maintained in the Nitric Acid Scrub Make-up Tank (TK-307).

The DI water header is supplied by the DI Water Transfer Pump (P-312-1), which has a design capacity of 100 gpm. A flow meter with totalizing capability is installed on the supply header to allow automatic make-up of chemical supply tanks.

Continuous DI water makeup to the Nitric Acid Scrub Makeup Tank (TK-307) is provided from the DI Water Storage Tank (TK-312) by the Scrub Water Feed Pump (P-312-2). The Scrub Water Feed Pump is equipped with a variable frequency drive (VFD) and has a design capacity of 10 gpm.

Continuous DI water makeup to the stripping contactors is provided from the DI Water Storage Tank (TK-312) by either of the Strip Water Feed Pumps (P-312-3A/P-312-3B). The Strip Water Feed Pumps are equipped with VFDs and each has a design capacity of 5 gpm.

Specific information related to the required specification of the DI Water Package Unit (IX-312) is listed in M-DS-J-00175, *SWPF DI Water Package Unit IX-312*[73].

6.3 Configuration Information

6.3.1 Description of System

Refer to P&IDs and PFDs listed in Table 6-1.

Table 6-1. P&IDs and PFDs

Diagram Number	Diagram Title
M-M5-J-0010	*SWPF Cold Chemical Makeup and Process Water Tank PFD*[48]
M-M6-J-0078	*SWPF Process Building DI Water Generation and Storage IX-312/TK-312 P&ID (U)*[74]
M-M6-J-0159	*SWPF Process Building Analytical Lab Deionized Water System P&ID (U)*[75]

6.3.2 Major Components

See Table 6-2 for a list of major components.

Table 6-2. Major Components

Component	Description	
DI Water Storage Tank (TK-312)	Capacity: Dimensions: Material:	7,500 gallons (see M-M6-J-0078[74]) 8 ft-6 inch (diameter) x 18 ft-8 inch Tangent-Bottom Polyethylene
IX-312	Vendor-supplied skid-mounted DI Water Package Unit (IX-312) with a design capacity of 20 gpm.	
DI Water Transfer Pump (P-312-1)	Capacity: hp:	100 gpm at 149 ft Total Dynamic Head (TDH) 10
Scrub Water Feed Pump (P-312-2)	Capacity: hp: Design Features:	10 gpm 1.5 VFD
Strip Water Feed Pump (P-312-3A/B)	Capacity: hp: Design Features:	5 gpm 1.0 VFD
DI Water Expansion Tank (TK-314)	Capacity: Material:	53 gallons Stainless Steel

6.3.3 Stream Data

See Table 6-3 for a listing of Streams.

Table 6-3. Streams

Stream	Description
DI Water	DI water is produced by DI Water Package Unit (IX-312) and distributed to various SWPF users.

6.3.4 Physical Location and Layout

The DI Water Package Unit (IX-312) is located outside, west of the CCA. The DI Water Storage Tank (TK-312) and pumps are located in the southwest corner of the CCA.

6.3.5 System Control Features

6.3.5.1 System Monitoring

The DI Water System normally operates with minimal Operator intervention. Instrumentation is provided to monitor the status of the system and initiate corrective actions, if necessary. Remote alarm indications are provided to the DCS.

DI Water Package Unit (IX-312)

- A pressure switch is installed on the discharge side of the skid booster pump and starts/stops the booster pump.
- A conductivity meter is installed on the outlet of the DI Water Package Unit (IX-312). A high conductivity of the DI water indicates that the train of ion exchange beds currently in use is reaching the end of its useful life.

DI Water Storage Tank (TK-312)

- Tank level is continuously monitored and is used to control the supply of water from the DI Water Package Unit (IX-312) into DI Water Storage Tank (TK-312).
- Tank temperature is monitored locally through the use of an element inserted into a thermowell.
- P-312-1, P-312-2, P-312-3A and P-312-3B each have instrumentation to monitor pump discharge pressure. Pressure instrumentation on the discharge side of P-312-1 is used to maintain a minimum pressure in the DI water header.
- A vortex flow meter is installed on the discharge side of P-312-1.

See Table 6-4 for a listing of System Monitoring Instrumentation.

Table 6-4. System Monitoring Instrumentation

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
CAH-3020	M-M6-J-0078[74]	N/A	DI Water Conductivity	Fault
HV-3010	M-M6-J-0078[74]	N/A	Valve Position	Open/Closed
TI-3016	M-M6-J-0078[74]	N/A	DI Water Storage Tank (TK-312) Temperature (Local)	°F
LIT-3015	M-M6-J-0078[74]	J-JZ-J-0038, *SWPF LI-3015 DI Water Storage Tank*[76]	DI Water Storage Tank (TK-312) level	gallons
P-312-1	M-M6-J-0078[74]	N/A	Pump Status	Run/Off
PI-3018	M-M6-J-0078[74]	N/A	P-312-1 Discharge Pressure (Local)	psig
PIT-3017	M-M6-J-0078[74]	J-JZ-J-01198, *SWPF PI-3017 DI Water Header Pressure*[77]	DI Water Header Pressure	psig
FIT-3032	M-M6-J-0078[74]	N/A	P-312-1 Discharge Flow	gpm

Table 6-4. System Monitoring Instrumentation (cont.)

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
SC-2525	M-M6-J-0078[74]	J-JZ-J-01144, *SWPF SIC-2525 Scrub Water Feed Pump Speed*[78]	P-312-2 Pump Speed	Revolutions per minute (RPM)
PI-3004	M-M6-J-0078[74]	N/A	P-312-2 Discharge Pressure (Local)	psig
SC-2483	M-M6-J-0078[74]	J-JZ-J-01139, *SWPF SIC-2483 Strip Water Feed Pump A Speed*[79]	P-312-3A Pump Speed	RPM
PI-3000	M-M6-J-0078[74]	N/A	P-312-3A Discharge Pressure (Local)	psig
SC-2484	M-M6-J-0078[74]	J-JZ-J-01140, *SWPF SIC-2484 Strip Water Feed Pump B Speed*[80]	P-312-3B Pump Speed	RPM
PI-3005	M-M6-J-0078[74]	N/A	P-312-3B Discharge Pressure (Local)	psig

6.3.5.2 Control Functions

There are no control loops for DI Water System. Control loops for P-312-2, P-312-3A and P-312-3B are included in Table 4-5 of X-SD-J-00003[6].

6.4 Operations

6.4.1 Initial Configuration

DI Water Package Unit (IX-312) is not operating. The DI Water Storage Tank (TK-312) level is at or below the heel level.

6.4.2 System Startup

The Operator starts the production of DI water, using the DCS to start the DI Water Package Unit (IX-312). The DCS monitors the DI Water Storage Tank (TK-312) level. The DCS stops DI water production when the DI Water Storage Tank (TK-312) reaches the maximum level. Once the maximum level has been reached in the DI Water Storage Tank (TK-312), pump P-312-1 is started and the DI water System is filled and pressurized.

6.4.3 Normal Operations

The DI Water Storage Tank (TK-312) is maintained in the normal operating range by DCS in the auto-fill mode. The DI Water System has three different flow paths. DI Water Transfer Pump (P-

312-1) supplies the header for feed of DI water to chemical supply tanks. The isolation valve to the tank to receive the batch flow is opened and the transfer is begun. Flow totalizer can be used to auto-fill the tanks to match the required volume of DI water for the respective batch.

Scrub Water Feed Pump (P-312-2) is started to provide normal DI water flow to the Nitric Acid Scrub Make-up Tank (TK-307). It is controlled by a level indicating controller (LIC-2525) (Nitric Acid Scrub Make-up Tank [TK-307] level), which provides permissive and stop signals.

Strip Water Feed Pumps (P-312-3A/B) are operated to provide dilution water for the CSSX strip feed. Pump speed is controlled, via the DCS, by flow requirement for the strip feed HNO_3 Molarity, and is adjusted by using input from either flow indicating controllers (FIC-2483 or FIC-2483).

6.4.4 Off-Normal and Recovery Operation

Table 6-5 lists conditions (failures/malfunctions) of system components.

Table 6-5. Equipment and Component Failure

Condition	Detection	Immediate DCS Action	Recovery
DI Water High Conductivity	CAH-3020 status on DCS	None	Wait one minute. If problem persists, close HV-3010. Then switch DI water trains on DI Water Package Unit (IX-312).
DI Water Storage Tank (TK-312) Low level (Below minimum distribution level)	DCS level indication (LI-3015)	DI water distribution equipment module will be stopped.	Investigate cause of condition and add DI water to DI Water Storage Tank (TK-312).
Pump Failure (P-312-1)	Pump status on DCS	DI water distribution equipment module will be stopped.	Complete repairs.
Pump Failure (P-312-2)	Pump status on DCS	Sequence for continuous HNO_3 makeup of Nitric Acid Scrub Make-Up Tank (TK-307) will be stopped.	Complete repairs.
Pump Failure (P-312-3A/B)	Pump status on DCS	Switch to alternate pump. (automatic switchover feature is enabled)	Complete repairs.

6.4.5 System Shutdown

The skid-mounted DI Water Package Unit (IX-312) is shut down manually. The operating pumps (P-312-1, P-312-2, P-312-3A, or P-312-3B) are manually stopped or automatically shut down by controls.

7.0 ADS

7.1 System Functions

The primary function of the ADS is to provide a continuous air purge to the process tanks that have a credible possibility of reaching CLFL. The accident analysis in S-SAR-J-00002[13] assumes that, given an operational or NPH-type event that disables the normal purge air flow through the Plant Air System, the ADS will provide required purge air flow for a minimum of four days to allow for restoration of normal flow or for installation of portable air compressors through SS PC-3 connection points.

The following are specific functional requirements for the ADS:

- SHT (TK-202), DSS Coalescer (TK-201), Solvent Strip Feed Tank (TK-217), and CSSX Contactor Header:
  - The ADS supplies sufficient purge air to the SHT (TK-202). DSS Coalescer (TK-201), Solvent Strip Feed Tank (TK-217), and CSSX Contactor Header to maintain the vapor spaces below 25% of CLFL. The Backup Air Receivers provide a 4-day supply of air to these pathways following a loss of normal supply from the Plant Air System.
- Solvent Drain Tank (TK-208):
  - There are two flow paths from the ADS to the SDT (TK-208). The first provides sufficient flow to maintain SDT (TK-208) vapor space below CLFL, with purge air being provided from either the Plant Air System or the Back-Up Air Receivers (TK-505 and TK-506). The second provides sufficient flow to maintain the SDT (TK-208) vapor space below 25% of the CLFL and is supplied only from the Plant Air System. It is not aligned to the Back-Up Air Receivers (TK-505 and TK-506).
- AST-A (TK-101), FFT-A (TK-102), SSFT (TK-109), SEHT (TK-205), Alpha Sorption Drain Tank (ASDT) (TK-601), CSDT-A (TK-103), Lab Drain Tank (TK-235), Spent Acid Storage Tank (SAST) (TK-127), SSFT (TK-109), SSRT (TK-104) and WWHT (TK-105):
  - The ADS supplies sufficient purge air to the process vessels to maintain the flammable vapor concentration in the vapor space below the CLFL. The Backup Air Receivers provide a 4-day supply of air to these pathways following a loss of normal supply from the Plant Air System.
  - ADS piping in the AST-A (TK-101), FFT-A (TK-102), SEHT (TK-205), ASDT (TK-601), SSFT (TK-109), and SSRT (TK-104)/WWHT (TK-105) process cells must remain intact to allow for connection of a portable compressed air supply following an NPH event.
- CSSX Tank Cell Vessels (Caustic Wash Tank [TK-204], Barium Decay Tank [BDT] [TK-206], Strip Effluent Pump Tank [TK-215], Strip Effluent Stilling Tank [TK-212], Strip Effluent Coalescer [TK-203], and DSS Stilling Tank [TK-211]):
  - The ADS supplies sufficient purge air to the process vessels to maintain the flammable vapor concentration in the vapor space below the CLFL. The Backup Air Receivers provide

a 4-day supply of air to these pathways following a loss of normal supply from the Plant Air System.

7.2 Operational Overview

Purge air to vessel vapor spaces is normally provided to the ADS by the Plant Air System, with the flow rate to each vessel being regulated by a rotameter.

The ADS is equipped with a back-up air supply that consists of the Back-Up Air Receiver compressor (CMP-504), the Back-Up Air Receivers (TK-505 and TK-506), pressure regulators and interconnecting piping. CMP-504 fills and maintains a pressure between 2,450 and 2,750 psig in the Back-Up Air Receivers (TK-505 and TK-506).

In the event that the normal purge air supply from the Plant Air System is lost, the pressure regulator in the back-up air supply opens and the Back-Up Air Receivers (TK-505 and TK-506) begin supplying the purge air to vessel vapor spaces. Combined, the Back-Up Air Receivers (TK-505 and TK-506) will provide purge air to process vessels for four days.

7.3 Configuration Information

7.3.1 Description of System

The basic configuration of the ADS is provided in the P&IDs listed in Table 7-1.

Table 7-1. P&IDs

Diagram Number	Diagram Title
M-M6-J-0130	*SWPF Process Building Tank Air Purge P&ID (U)*[34]
M-M6-J-0131	*SWPF Process Building Tank Air Purge P&ID (U)*[81]
M-M6-J-0139	*SWPF Process Building Tank Air Purge P&ID (U)*[82]
M-M6-J-0140	*SWPF Process Building Tank Air Purge P&ID (U)*[83]

7.3.2 Major Components

See Table 7-2 for a list of major components.

Table 7-2. Major Components

Component	Description
CMP-504	Supplies air to fill Back-Up Air Receivers (TK-505 and TK-506). Capacity: 10 scfm @ 2,750 psig hp: 7.5
Back-Up Air Receiver (TK-505)	Capacity: 600 gallons (M-M6-J-0130[34]) Dimensions: 3 ft diameter X 14 ft-11 inch Tangent-Tangent Height
Back-Up Air Receiver (TK-506)	Capacity: 600 gallons (M-M6-J-0130[34]) Dimensions: 3 ft diameter X 14 ft-11 inch Tangent-Tangent Height

7.3.3 Stream Data

See Table 7-3 for a listing of streams.

Table 7-3. Streams

Stream	Description
Purge Air	Purge air is normally supplied from the Plant Air System to select process vessel vapor spaces. In the event of loss of plant air, purge air is provided to vapor spaces from Back-Up Air Receivers (TK-505 and TK-506).

7.3.4 Physical Location and Layout

A compressor (CMP-504) is located outside of the western wall of the process building, adjacent to Room R180. The Back-Up Air Receivers (TK-505 and TK-506), pressure regulators, and associated piping are located in Room R180.

7.3.5 System Control Features

7.3.5.1 System Monitoring

The ADS normally operates with minimal Operator intervention. Instrumentation is provided to monitor the status of the system. Remote alarm indications are provided to the DCS.

<u>CMP-504</u>

- A pressure switch that starts/stops the compressor (CMP-504) is installed on the discharge piping of the compressor.
- The compressor (CMP-504) will notify the DCS of a fault condition via General Trouble Alarm (UA-7301).

Back-up Air Receivers (TK-505 and TK-506)

- Tank pressure is monitored using a pressure transmitter located on downstream piping.

Back-up Air Supply

- Purge air supply pressure is monitored using a pressure transmitter located on the back-up air supply header. It provides purge air pressure during both normal and off-normal operations.

Plant Air Supply to ADS

- Pressure of compressed air supply to the ADS is monitored using a pressure transmitter.

See Table 7-4 for a listing of System Monitoring Instrumentation.

Table 7-4. System Monitoring Instrumentation

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
UA-7301	M-M6-J-0130[34]	N/A	General status of CMP-504	fault
PI-7311	M-M6-J-0130[34]	J-JZ-J-00866, *SWPF PI-7311 HP Purge Air Pressure*[84]	Back-Up Air Receiver (TK-505 and TK-506) Pressure	psig
PI-7318	M-M6-J-0130[34]	N/A	Back-Up Air Receiver (TK-505 and TK-506) Pressure	psig
PI-7314	M-M6-J-0130[34]	J-JZ-J-00867, *SWPF PI-7314 LP Purge Air Pressure*[85]	ADS Purge Air Pressure	psig
PI-7323	M-M6-J-0130[34]	J-JZ-J-00868, *SWPF PI-7323 Plant Air Pressure to Tank Purge*[86]	Pressure of Plant Air Supply to ADS	psig
FICV-7342	M-M6-J-0131[81]	N/A	SSFT (TK-109) Purge Air Rotameter	scfh
FICV-7343	M-M6-J-0131[81]	N/A	SSFT (TK-109) Purge Air Rotameter	scfh
FICV-7344	M-M6-J-0131[81]	N/A	SEHT (TK-205) Purge Air Rotameter	scfh
FICV-7345	M-M6-J-0131[81]	N/A	SEHT (TK-205) Purge Air Rotameter	scfh
FICV-7330	M-M6-J-0131[81]	N/A	AST-A (TK-101) Purge Air Rotameter	scfh

Table 7-4. System Monitoring Instrumentation (cont.)

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
FICV-7331	M-M6-J-0131[81]	N/A	AST-A (TK-101) Purge Air Rotameter	scfh
FICV-7332	M-M6-J-0131[81]	N/A	FFT-A (TK-102) Purge Air Rotameter	scfh
FICV-7333	M-M6-J-0131[81]	N/A	FFT-A (TK-102) Purge Air Rotameter	scfh
FICV-7382	M-M6-J-0131[81]	N/A	SDT (TK-208) Purge Air Rotameter	scfh
FICV-7383	M-M6-J-0131[81]	N/A	SDT (TK-208) Purge Air Rotameter	scfh
FICV-7370	M-M6-J-0131[81]	N/A	SDT (TK-208) Purge Air Rotameter	scfh
FICV-7371	M-M6-J-0131[81]	N/A	SDT (TK-208) Purge Air Rotameter	scfh
FICV-7378	M-M6-J-0139[82]	N/A	SAST (TK-127) Purge Air Rotameter	scfh
FICV-7379	M-M6-J-0139[82]	N/A	SAST (TK-127) Purge Air Rotameter	scfh
FICV-7346	M-M6-J-0139[82]	N/A	Lab Drain Tank (TK-235) Purge Air Rotameter	scfh
FICV-7347	M-M6-J-0139[82]	N/A	Lab Drain Tank (TK-235) Purge Air Rotameter	scfh
FICV-7336	M-M6-J-0139[82]	N/A	ASDT (TK-601) Purge Air Rotameter	scfh
FICV-7337	M-M6-J-0139[82]	N/A	ASDT (TK-601) Purge Air Rotameter	scfh
FICV-7338	M-M6-J-0139[82]	N/A	CSDT-A (TK-103) Purge Air Rotameter	scfh
FICV-7339	M-M6-J-0139[82]	N/A	CSDT-A (TK-103) Purge Air Rotameter	scfh
FICV-7340	M-M6-J-0139[82]	N/A	WWHT (TK-105) Purge Air Rotameter	scfh
FICV-7341	M-M6-J-0139[82]	N/A	WWHT (TK-105) Purge Air Rotameter	scfh
FICV-7334	M-M6-J-0139[82]	N/A	SSRT (TK-104) Purge Air Rotameter	scfh

Table 7-4. System Monitoring Instrumentation (cont.)

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
FICV-7335	M-M6-J-0139[82]	N/A	SSRT (TK-104) Purge Air Rotameter	scfh
FICV-7372	M-M6-J-0140[83]	N/A	DSS Coalescer (TK-201) Purge Air Rotameter	scfh
FICV-7373	M-M6-J-0140[83]	N/A	DSS Coalescer (TK-201) Purge Air Rotameter	scfh
FICV-7374	M-M6-J-0140[83]	N/A	Strip Effluent Pump Tank (TK-215) Purge Air Rotameter	scfh
FICV-7375	M-M6-J-0140[83]	N/A	Strip Effluent Pump Tank (TK-215) Purge Air Rotameter	scfh
FICV-7362	M-M6-J-0140[83]	N/A	Strip Effluent Stilling Tank (TK-212) Purge Air Rotameter	scfh
FICV-7363	M-M6-J-0140[83]	N/A	Strip Effluent Stilling Tank (TK-212) Purge Air Rotameter	scfh
FICV-7376	M-M6-J-0140[83]	N/A	Solvent Strip Feed Tank (TK-217) Purge Air Rotameter	scfh
FICV-7377	M-M6-J-0140[83]	N/A	Solvent Strip Feed Tank (TK-217) Purge Air Rotameter	scfh
FICV-7360	M-M6-J-0140[83]	N/A	STRIP Effluent Coalescer (TK-203) Purge Air Rotameter	scfh
FICV-7361	M-M6-J-0140[83]	N/A	STRIP Effluent Coalescer (TK-203) Purge Air Rotameter	scfh
FICV-7356	M-M6-J-0140[83]	N/A	DSS Stilling Tank (TK-211) Purge Air Rotameter	scfh
FICV-7357	M-M6-J-0140[83]	N/A	DSS Stilling Tank (TK-211) Purge Air Rotameter	scfh
FICV-7358	M-M6-J-0140[83]	N/A	BDT (TK-206) Purge Air Rotameter	scfh

Table 7-4. System Monitoring Instrumentation (cont.)

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
FICV-7359	M-M6-J-0140[83]	N/A	BDT (TK-206) Purge Air Rotameter	scfh
FICV-7354	M-M6-J-0140[83]	N/A	SHT (TK-202) Purge Air Rotameter	scfh
FICV-7355	M-M6-J-0140[83]	N/A	SHT (TK-202) Purge Air Rotameter	scfh
FICV-7352	M-M6-J-0140[83]	N/A	Caustic Wash Tank (TK-204) Purge Air Rotameter	scfh
FICV-7353	M-M6-J-0140[83]	N/A	Caustic Wash Tank (TK-204) Purge Air Rotameter	scfh
FICV-7350	M-M6-J-0140[83]	N/A	Contactor Vent Header Purge Air Rotameter	scfh
FICV-7351	M-M6-J-0140[83]	N/A	Contactor Vent Header Purge Air Rotameter	scfh
NOTE: Additional details for the FICV's listed above can be found in M-CLC-J-00179, *SWPF Minimum Required Capacity for Process Building air Purge System*[87]				

7.3.5.2 Control Functions

There are no control loops in the ADS.

7.4 Operations

7.4.1 Initial Configuration

The Back-Up Air Receivers (TK-505 and TK-506) are empty and must be filled by the compressor (CMP-504). The Plant Air System is operating and supplying compressed air to the ADS.

7.4.2 System Startup

Once the Plant Air System is providing compressed air to the ADS, the Operator will start the compressor (CMP-504). The compressor (CMP-504) will operate until the Back-Up Air Receivers (TK-505 and TK-506) are charged to a pressure of approximately 2750 psig. The compressor (CMP-504) will then stop running.

7.4.3 Normal Operations

Compressed air to the ADS is normally provided by the Plant Air System. Plant air pressure is reduced to approximately 65 psig before entering the ADS distribution header. From the ADS distribution header, a branch line supplies purge air to each process vessel vapor space. The branch line contains two parallel rotameters that controls the purge air flow rate to the vapor space. One of the two rotameters is normally in operation, with the second in standby.

During normal operations, the Back-Up Air Receivers (TK-505 and TK-506) are charged to a pressure between 2,450 and 2,750 psig and are in standby. The Back-Up Air Receivers (TK-505 and TK-506) are isolated from the ADS by pressure regulators that are closed when the ADS is within the normal operating pressure range.

7.4.4 Off-Normal and Recovery Operation

If the Plant Air System is unavailable to supply compressed air to the ADS, then back-up air is automatically supplied to the ADS header by the Back-Up Air Receivers (TK-505 and TK-506). The Back-Up Air Receivers (TK-505 and TK-506) are of sufficient combined size to supply continuous purge air to the ADS for four days.

The back-up air supply system includes a connection point for a portable compressed air supply in the event that the normal compressed air supply cannot be recovered within four days.

Table 7-5 lists conditions (failures/malfunctions) of system components.

Table 7-5. Equipment and Component Failure

Condition	Detection	Immediate DCS Action	Recovery
Compressor Failure (CMP-504)	UA-7301 status on DCS	None	Complete Repairs.
Back-Up Air Receivers (TK-505 & TK-506) Low/Low-Low Pressure	DCS pressure indication and alarm (PI-7311)	None	Operator to investigate cause of problem.
ADS Backup Air Supply Pressure Low/Low-Low Pressure	DCS pressure indication and alarm (PI-7314)	None	Operator to investigate cause of problem.
ADS Backup Air Supply Pressure Low/Low-Low Pressure	DCS pressure indication and alarm (PI-7323)	None	Operator to investigate cause of problem.

7.4.5 System Shutdown

All equipment is shut down locally by the Operator.

8.0 DWS

8.1 System Functions

The DWS provides potable water to the Process Building, AFF, CCA, the NGS building, and the Administration Building from the SRS Site-wide DWS. Normal loads on the DWS include drinking fountains, sinks, showers, toilets, and hose bibs. The DW header also supplies make-up water to both the Process Water and DI Water systems. The DWS provides an industrial safety function in areas with chemical hazards by providing safety showers and eyewash stations.

8.2 Operational Overview

The SWPF DWS is connected to the S-Area DWS via tie-in to the 4-inch DW header located near Building 717-11S. The DWS header runs from the S-Area fence to the valve housing, then to a valve box just outside the Process Building. The 4-inch main header is approximately 485 ft long and has an approximately 180 ft long 2-inch branch that runs to the Administration Building. The header is buried underground and has valve boxes located at the J-Area boundary and 5 ft from the north side of the SWPF Administration Building. In addition, there are isolation valves located at the connection to the branch between the Process Building header and the SWPF Administration Building header that are capable of isolating either of the headers. An isolation valve for the process building is located near the north wall inside Mechanical Room R114. Isolation valves for the system, are also located at the J-Area and S-Area boundary fence.

Upon entering J-Area, the water flow in the header is monitored and metered by flow indicator (FQI-5210) and the pressure is regulated by a pressure control valve (PCV-5212). The DWS is capable of delivering at peak loads 180 gpm at a pressure between 52 and 58 psig. The DWS pressure is monitored by a pressure indicator (PI-5216) and will alarm in the CR on a low pressure signal from a pressure-indicating transmitter (PIT-5216).

The DW header enters the Mechanical Room on the on the north side of the facility, the DWS header necks down from a 4-inch line to a 3-inch line and branches off to the Safety Shower and Eyewash Supply, CR Water Closet and Rest Room Sink, FSA Break Room, FSA Rest Rooms, Personnel Decon Room Sink and Shower, and the General Maintenance Area drinking fountain and mop sink. An additional line also supplies DW to the CCA Lab Sink, Rest Room Sink, and Water Closet.

The DWS also provides water to the Process Water Tank (TK-301) and DI Water Storage Tank (TK-312). The connection to the DI Water Package Unit (IX-312) is protected by backflow preventer SI-157. An air gap at the DI Water Storage Tank (TK-312) provides supplemental isolation from bulk chemical storage units. The connection to the Process Water System is protected by an air gap to the Process Water Tank (TK-301). Because the Analytical Laboratory requires a higher DW pressure to overcome the hydraulic head due to the height of the Analytical Laboratory, there is a booster pump (BTR-001) on the DW header that increases the pressure on the system from its nominal operating pressure to approximately 110 psig. The higher-pressure water is provided to the Analytical Labs gloveboxes, radio hoods, bench sinks, and rest room sink and water closet.

Additional information in the interface between the Defense Waste Processing Facility (DWPF) and SWPF DWS can be found in V-ESR-J-00002, *Domestic Water System Interface Control Document [ICD-02]*[88].

8.3 Configuration Information

8.3.1 Description of System

Refer to the Plans and P&IDs listed in Table 8-1.

Table 8-1. Plans and P&IDs

Diagram Number	Diagram Title
C-CY-J-0020	*SWPF Civil Overall Domestic Water Piping Plan (U)*[89]
M-M6-J-0076, SH1	*SWPF Process Building Process Water Tank TK-301 P&ID (U)*[90]
M-M6-J-0078	*SWPF Process Building DI Water Generation and Storage IX-312/TK-312 P&ID (U)*[74]
M-M6-J-0095 SH1	*SWPF Process Building Domestic Water System Distribution P&ID (U)*[91]
M-M6-J-0095 SH2	*SWPF Process Building Safety Shower/Eyewash System Distribution P&ID (U)*[92]
M-M6-J-0135	*SWPF Process Building Radiochemistry Lab Glove Boxes, Radio Hoods, and Bench Sink P&ID (U)*[93]
M-M6-J-0136	*SWPF Process Building Radiochemistry Lab Glove Boxes, Radio Hoods and Bench Sinks P&ID (U)*[94]
M-M6-J-0137	*SWPF Process Building Radiochemistry Lab Glove Boxes and Radio Hoods P&ID (U)*[95]
M-M6-J-0190	*SWPF Process Building Inorganic Lab Glove Boxes and Radio Hoods P&ID (U)*[96]
M-M6-J-0191	*SWPF Process Building Inorganic Lab Glove Boxes, Radio Hoods and Bench Sink P&ID (U)*[97]
M-M6-J-0192	*SWPF Process Building Organic Lab Radio Hoods P&ID (U)*[98]
M-M6-J-0193	*SWPF Process Building Organic Lab Radio Hoods and Bench Sink P&ID (U)*[99]
M-M6-J-0194	*SWPF Process Building Analytical Lab Service Water System P&ID (U)*[100]
M-M6-J-0204	*SWPF Next Generation Solvent Building Sumps and Utilities P&ID)*[40]

8.3.2 Major Components

See Table 8-2 for a list of major components.

Table 8-2. Major Components

Component	Description
Pressure Booster (BTR-001)	Increases DW system pressure to Analytical Lab users Capacity: 2 x 50 gpm hp: 2 x 2 (See M-M6-J-0095 SH1[91])
Instantaneous Water Heater (HTR-003)	Heats DW for Gen Maintenance Mop Sink Capacity: 2 gpm at temperature rise of 68°F Power Consumption: 20 kW (See M-M6-J-0095 SH1[91])
Instantaneous Water Heater (HTR-004)	Heats DW for Analytical Lab Restroom sink Capacity: 1 gpm at temperature rise of 61°F Power Consumption: 9 kW (See M-M6-J-0095 SH1[91])
Instantaneous Water Heater (HTR-005)	Heats DW for Personnel Decon Room Capacity: 2 gpm at temperature rise of 68°F Power Consumption: 20 kW (See M-M6-J-0095 SH1[91])
Instantaneous Water Heater (HTR-008)	Heats DW for FSA Break Room Sink Capacity: 1 gpm at temperature rise of 61°F Power Consumption: 9 kW (See M-M6-J-0095 SH1[91])
Instantaneous Water Heater (HTR-009)	Heats DW for Analytical Lab Bench Sinks BS-001 and BS-002 Capacity: 2 gpm at temperature rise of 55°F Power Consumption: 16 kW (See M-M6-J-0095 SH1[91])
Instantaneous Water Heater (HTR-010)	Heats DW for Analytical Lab Bench Sinks BS-003 and BS-004 Capacity: 2 gpm at temperature rise of 55°F Power Consumption: 16 kW (See M-M6-J-0095 SH1[91])
Instantaneous Water Heater (HTR-011)	Heats DW for Cold Chemical Lab Sink Capacity: 1 gpm at temperature rise of 61°F Power Consumption: 9 kW (See M-M6-J-0095 SH1[91])
Instantaneous Water Heater (HTR-012)	Heats DW for Cold Chemical Restroom Sink Capacity: 1 gpm at temperature rise of 61°F Power Consumption: 9 kW (See M-M6-J-0095 SH1[91])
Instantaneous Water Heater (HTR-013)	Heats DW for CR Restroom Sink Capacity: 1 gpm at temperature rise of 61°F Power Consumption: 9 kW (See M-M6-J-0095 SH1[91])

8.3.3 Stream Data

See Table 8-3 for a listing of Streams.

Table 8-3. Streams

Stream	Description
DW	DW enters the facility from S-Area DWS and is distributed throughout the facility.

8.3.4 Physical Location and Layout

See C-CY-J-0020[89] for location of DW Valve Metering and PCV Valve Housing. The Pressure Booster (BTR-001) is located in the CSSX Contactor Staging Area R212. The instantaneous water heaters are located at the users listed in Table 8-2 above.

8.3.5 System Control Features and Interlocks

8.3.5.1 System Monitoring

The DWS normally operates with minimal operator intervention. Instrumentation is provided to monitor the status of the system. Remote alarm indications are provided to the DCS.

- DW flow rate is monitored locally through the use of a flow indicator.
- DW pressure is continuously monitored.

See Table 8-4 for a listing of System Monitoring Instrumentation.

Table 8-4. System Monitoring Instrumentation

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
FQI-5210	M-M6-J-0095 SH1[91]	N/A	DW Supply Flow Rate	gpm
PI-5216	M-M6-J-0095 SH1[91]	J-JZ-J-00590, *SWPF PI-5216 Domestic Water Pressure*[101]	DW Supply Pressure	psig

8.3.5.2 Control Functions

There are no control loops for the DWS.

8.4 Operations

8.4.1 Initial Configuration

The SWPF DWS is fed from the S-Area DWS. It has been inspected, tested, flushed, sterilized, and put into service.

8.4.2 System Startup

The SWPF DWS is pressurized from the S-Area DWS to approximately 60 psig and will deliver approximately 180 gpm of DW during peak demand to the various DW users. A booster pump in the Analytical Lab line boosts the pressure from 60 psig to 110 psig, which is automatically started on a lack of sufficient pressure.

8.4.3 Normal Operations

The Site Management and Operating Contractor is responsible for inspection and maintenance of the DWS from the supply source to the SWPF interface point during Construction and Operations. The Engineering, Procurement, and Construction Contractor will be responsible for inspection and maintenance of the DW lines from the SWPF operational interface to and including the DWS during Construction and the first year of Hot Operations. After the first year of operations, the organization responsible for inspection and maintenance of the DWS within the SWPF will be a U.S. Department of Energy-selected operator.

8.4.4 System Shutdown

There is an ability to isolate various lines within the DWS, but the system is not envisioned to shut down until the Decontamination and Decommissioning phase of operations.

9.0 SANITARY SEWER SYSTEM

9.1 System Functions

The Sanitary Sewer System discharges uncontaminated waste water generated in the Process and Administration Buildings. Sources of uncontaminated waste water include restrooms (clean), change rooms (clean), janitorial closets, and water fountains. The Sanitary Sewer System will handle condensate from air compressors and HVAC equipment. The system does not accept waste streams from the process or rain water from building roof drains.

9.2 Operational Overview

The Sanitary Sewer System interfaces with existing manhole (MH) (MH 96) in S-Area via an eight inch polyvinyl chloride gravity line.

The Sanitary Sewer System handles uncontaminated waste water generated in the Process and Administration Buildings. Sources of uncontaminated waste water include restrooms (clean), change rooms (clean), janitorial closets, and water fountains. The Sanitary Sewer System will

handle condensate from air compressors and HVAC equipment. The system will not accept waste streams from the process or rain water from building roof drains.

Sanitary waste flows in lines routed from the Process and Administration Buildings via gravity. Sanitary waste and condensate are combined at a new lift station and a force main routes the combined flow to a new Drop MH inside the SWPF site fence near MH 96. From the Drop MH, the waste is routed via a gravity line to MH 96. No sanitary waste treatment is performed at the SWPF.

The line sizing methods outlined in the *International Plumbing Code – 2003*[102] were utilized to estimate the SWPF gravity line sizes. The SWPF line sizes are based on the number of drainage fixture units and water supply fixture units for each building, estimated from the Preliminary Design and layout of the facility, and estimated peak condensate flows. These sizes were compared to the minimum requirements for gravity lines and force mains as used at SRS. When there was a difference between the two, the larger required line size was chosen. The lift station, force main size, and flows into MH 96 are based on Unit Contributory Loads, as required by SRS and South Carolina Regulation 61-67.300, *Construction Permits*[103],) requirements.

9.3 Configuration Information

9.3.1 Description of System

Refer to the Plans and Diagrams listed in Table 9-1.

Table 9-1. Plans and Diagrams

Diagram Number	Diagram Title
C-CY-J-0010	*SWPF Civil Overall Sanitary Sewer Piping Plan (U)*[104]
P-PP-J-0001	*SWPF Process Building Plumbing Central Process Area Control Room Floor Plan at EL 100'-0" (U)*[105]
P-PP-J-0002	*SWPF Process Building Plumbing Cold Chemicals Area Floor Plan at EL 100'-0" (U)*[106]
P-PP-J-0003	*SWPF Process Building Plumbing Northern Facility Support Area Floor Plan at EL 100'-0" and Riser Diagram (U)*[107]
P-PP-J-0004	*SWPF Process Building Plumbing Eastern Facility Support Area Floor Plan at EL 100'-0" and Riser Diagrams (U)*[108]
P-PP-J-0005	*SWPF Process Building Plumbing Alpha Finishing Facility Floor Plan at EL 95'-0" and 100'-0" and Riser Diagram (U)*[109]
P-PP-J-0006	*SWPF Process Building Plumbing Central Process Area Cell Inlet Air HEPA Filter Room #2 and CSSX Contactor Staging Area FLR Plan at EL 116'-0" (U)*[110]
P-PP-J-0008	*SWPF Process Building Plumbing Central Process Area Floor Plan at EL 139'-0" (U)*[111]
P-PP-J-0009	*SWPF Process Building Plumbing Facility Support Area Riser Diagrams (U)*[112]
P-PP-J-0010	*SWPF Process Building Plumbing Central Process Area Control Room Riser Diagrams (U)*[113]
P-PP-J-0012	*SWPF Compressor Building Plumbing Floor Plan at EL 100'-0" and Riser Diagram (U)*[114]
P-PP-J-0013	*SWPF Process Building Plumbing Cold Chemicals Area Riser Diagrams (U)*[115]
P-PP-J-0014	*SWPF Process Building Plumbing Central Process Area Riser Diagrams (U)*[116]

9.3.2 Major Components

There are no major components in the Sanitary Sewer System.

9.3.3 Stream Data

The Sanitary Sewer System will handle uncontaminated waste water generated in the Process and Administration Buildings. Sources of uncontaminated waste water include restrooms (clean), change rooms (clean), janitorial closets, and water fountains. The Sanitary Sewer System will handle condensate from air compressors and HVAC equipment. The system will not accept waste streams from the process or rain water from building roof drains.

9.3.4 Physical Location and Layout

The location and layout for the Sanitary Sewer System is shown on the drawings listed in Table 9-1.

9.3.5 System Control Features and Interlocks

There are no control features associated with the Sanitary Sewer System.

9.4 Operations

There are no operational requirements for the Sanitary Sewer System.

10.0 PROCESS CWS

10.1 System Functions

The Process CWS consists of a primary loop and two secondary loops that provide cooling capacity for the ASP and AFP process equipment loads. Segregated primary and secondary CHW loops are utilized to prevent potentially radioactive contaminated CHW from being introduced to non-radioactive areas of SWPF. Process heat loads are removed from ASP and AFP equipment including but not limited to filter recirculation coolers, AST-B (TK-221), FFT-B (TK-222), MSTT (TK-224), SSFT (TK-109), SEHT (TK-205), AST-A (TK-101), FFT-A (TK-102), SSRT (TK-104), SHT (TK-202), and contactors. The Process CWS also removes condensables from the PVV and PMV headers. The Process CWS utilizes two 100% capacity, redundant chillers.

10.2 Operational Overview

10.2.1 Primary CWS

One process chilled water chiller (CHU-005A/B) and one process chilled water supply pump (P-005A/B) is required to meet the anticipated ASP and AFP process cooling loads. The non-operating chiller and pump are in standby, ready for operation in the event that either the running chiller or pump fails.

The process CHW is circulated through a closed-loop system by one of the process chilled water pumps, where the process heat load is transferred from the secondary loops to the primary loop via the ASP secondary loop cooler (HX-015) and the AFP secondary loop cooler (HX-025). The returning CHW is cooled by the operating process chilled water chiller. The Process Chilled Water Expansion Tank (TK-005) prevents system over-pressurization by providing a location for thermal expansion of process CHW.

10.2.2 ASP Secondary Process CWS

The secondary process CHW is circulated through a closed-loop system by one of the secondary loop pumps (P-015A/B), where the process heat load is gained from heat exchangers, the contactors, and tank cooling coils and then transferred to the primary loop via HX-015. The Process Chilled Water Secondary Loop Expansion Tank (TK-015) prevents system over-pressurization by providing a location for thermal expansion of process CHW.

10.2.3 AFP Secondary Process CWS

The secondary process CHW is circulated through a closed-loop system by one of the secondary loop pumps (P-025A/B), where the process heat load is gained from heat exchangers and tank cooling coils and then transferred to the primary loop via HX-025. The Process Chilled Water Secondary Loop Expansion Tank (TK-025) prevents system over-pressurization by providing a location for thermal expansion of process CHW.

10.3 Configuration Information

10.3.1 Description of System

Refer to P&IDs listed in Table 10-1.

Table 10-1. P&IDs

Diagram Number	Diagram Title
M-M6-J-0072 SH1	*SWPF Process Building ASP Secondary Process Chilled Water Supply Header P&ID (U)*[117]
M-M6-J-0072 SH2	*SWPF Process Building ASP Secondary Process Chilled Water Return Header P&ID (U)*[118]
M-M6-J-0100	*SWPF Process Building Process Chiller Units CHU-005/A P&ID (U)*[119]
M-M6-J-0184	*SWPF Alpha Finishing Facility AFP Secondary Process Chilled Water Cooler and Pumps P&ID (U)*[120]
M-M6-J-0185	*SWPF Process Building ASP Secondary Process Chilled Water Cooler and Pumps P&ID (U)*[121]

10.3.2 Major Components

See Table 10-2 for a list of major components.

Table 10-2. Major Components

Component	Description
Process Chilled Water Chillers (CHU-005A/B)	Removes process heat load from primary Process CHW. Capacity: 230 Tons Power Consumption: 293 kW (See M-M6-J-0100[119])
Process Chilled Water Supply Pumps (P-005A/B)	Circulates primary Process CHW. Capacity: 472 gpm hp: 40 (See M-M6-J-0100[119])
Process Chilled Water Expansion Tank (TK-005)	Provides location for thermal expansion of primary Process CHW. Capacity: 34 gallons (See M-M6-J-0100[119])
Process Chilled Water Air Separator (SEP-005)	Removes air from primary Process CHW. Capacity: 472 gpm (See M-M6-J-0100[119])
Process Chilled Water Chemical Bypass Feeder Tank (TK-006)	Location for addition of chemicals to primary Process CHW. Capacity: 5 gallons (See M-M6-J-0100[119])
ASP Secondary Cooler (HX-015)	Transfers the ASP process heat load from the ASP secondary loop to the primary loop. Capacity: 2.0 Million British Thermal Unit per hour (MBTU/hr) (See M-M6-J-0185[121])
ASP Secondary Loop Pumps (P-015A/B)	Circulates ASP secondary Process CHW. Capacity: 612 gpm hP: 40, VFD (See M-M6-J-0185[121])
Process Chilled Water Secondary Loop Expansion Tank (TK-015)	Provides location for thermal expansion of ASP secondary Process CHW. Capacity: 53 gallons (See M-M6-J-0185[121])
Process Chilled Water Air Separator (SEP-015)	Removes air from ASP secondary Process CHW. Capacity: 612 gpm (See M-M6-J-0185[121])
Process Chilled Water Secondary Loop Chemical Bypass Feeder Tank (TK-016)	Location for addition of chemicals to ASP secondary Process CHW. Capacity: 5 gallons (See M-M6-J-0185[121])
AFP Secondary Cooler (HX-025)	Transfers the AFP process heat load from the AFP secondary loop to the primary loop. Capacity: 0.7 MBTU/hr (See M-M6-J-0184[120])

Table 10-2. Major Components (cont.)

Component	Description
AFP Secondary Loop Pumps (P-025A/B)	Circulates AFP secondary Process CHW. Capacity: 155 gpm hP: 15, VFD (See M-M6-J-0184[120])
Process Chilled Water Secondary Loop Expansion Tank (TK-025)	Provides location for thermal expansion of AFP secondary Process CHW. Capacity: 10 gallons (See M-M6-J-0184[120])
Process Chilled Water Air Separator (SEP-025)	Removes air from AFP secondary Process CHW. Capacity: 155 gpm (See M-M6-J-0184[120])
Process Chilled Water Secondary Loop Chemical Bypass Feeder Tank (TK-026)	Location for addition of chemicals to AFP secondary Process CHW. Capacity: 5 gallons (See M-M6-J-0184[120])

10.3.3 Stream Data

See Table 10-3 for a listing of Streams.

Table 10-3. Streams

Stream	Description
Primary CHW	25% Propylene glycol solution is circulated through the primary process CWS.
Secondary CHW	Inhibited water (<0.02 M NaOH) is circulated through both the AFP and ASP secondary process CWSs.

10.3.4 Physical Location and Layout

The primary process chilled water chillers are located outside, North of the process building. All other major components of the primary Process CWS is located in room R100B of the Northern FSA.

The major components of the ASP secondary Process CWS are located in R131F of the CPA, North ASP Labyrinth #1.

The major components of the AFP secondary Process CWS are located in R140.

10.3.5 System Control Features

10.3.5.1 System Monitoring

The process CWS normally operates with minimal Operator intervention. Instrumentation is provided to monitor the status of the system and initiate corrective action, if necessary. Remote alarm indications are provided to the DCS.

Primary Process CWS

- Each chiller is equipped with a general trouble alarm that notifies the Operator of a chiller fault.
- The process chilled water supply pumps have instrumentation to locally monitor suction and discharge pressures.
- The process chilled water supply pumps have instrumentation to locally monitor suction temperatures.
- The pressures of the process chilled water supply and return headers are continuously monitored.
- The temperature of the process chilled water supply header is continuously monitored.
- The flow rate of process CHW in the supply header is continuously monitored.

ASP Secondary Process CWS

- The secondary loop pumps have instrumentation to locally monitor discharge pressures.
- The secondary loop pumps have instrumentation to monitor and control pump speed.
- The radioactivity of the secondary process CWS is continuously monitored.
- The pressures of the secondary process chilled water supply and return headers are continuously monitored.
- The temperature of the secondary process chilled water supply header is continuously monitored.
- The flow rate of secondary process CHW in the supply header is continuously monitored.

AFP Secondary Process CWS

- The secondary loop pumps have instrumentation to locally monitor discharge pressures.
- The secondary loop pumps have instrumentation to monitor and control pump speed.
- The radioactivity of the secondary process CWS is continuously monitored.
- The pressures of the secondary process chilled water supply and return headers are continuously monitored.

- The temperature of the secondary process chilled water supply header is continuously monitored.
- The flow rate of secondary process CHW in the supply header is continuously monitored.

See Table 10-4 for a listing of instruments.

Table 10-4. System Monitoring Instruments

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
UA-4290	M-M6-J-0100[119]	N/A	CHU-005B Status	fault
UA-4291	M-M6-J-0100[119]	N/A	CHU-005A Status	fault
PIT-4294A	M-M6-J-0100[119]	J-JZ-J-00863, *SWPF PI-4295 Process Chilled Water Return Pressure*[122]	Process CHW Return Pressure	psig
PIT-4294B	M-M6-J-0100[119]	J-JZ-J-00864, *SWPF PI-4294B Process Chilled Water Supply Pressure*[123]	Process CHW Supply Pressure	psig
TIT-4314	M-M6-J-0100[119]	J-JZ-J-00865, *SWPF IT-4314 Process Chilled Water Supply Temperature*[124]	Process CHW Supply Temperature	°F
FIT-4312	M-M6-J-0100[119]	J-JZ-J-00862, *SWPF IT-4314 Process Chilled Water Supply Temperature*[125]	Process CHW Supply Flowrate	gpm
PI-016	M-M6-J-0100[119]	N/A	Process Chilled Water Chemical Bypass Feeder Tank (TK-006) Pressure	psig
P-005A	M-M6-J-0100[119]	N/A	Pump Status	Run/Off
P-005B	M-M6-J-0100[119]	N/A	Pump Status	Run/Off
PI-4301	M-M6-J-0100[119]	N/A	P-005A Discharge Pressure	psig
PI-4302	M-M6-J-0100[119]	N/A	P-005B Discharge Pressure	psig
PI-3956	M-M6-J-0100[119]	N/A	P-005A Suction Pressure	psig
PI-3958	M-M6-J-0100[119]	N/A	P-005B Suction Pressure	psig
TI-3957	M-M6-J-0100[119]	N/A	P-005A Suction Temperature	°F
TI-3959	M-M6-J-0100[119]	N/A	P-005B Suction Temperature	°F
P-025A	M-M6-J-0184[120]	N/A	Pump Status	Run/Off

Table 10-4. System Monitoring Instruments (cont.)

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
SC-4809	M-M6-J-0184[120]	J-JZ-J-01205, *SWPF SIC-4809 AFP Secondary Loop Pump A Speed*[126]	P-025A Speed	RPM
P-025B	M-M6-J-0184[120]	N/A	Pump Status	Run/Off
SC-4810	M-M6-J-0184[120]	J-JZ-J-01206, *SWPF SIC-4810 AFP Secondary Loop Pump B Speed*[127]	P-025B Speed	RPM
PI-4808	M-M6-J-0184[120]	N/A	P-025A Discharge Pressure	psig
PI-4807	M-M6-J-0184[120]	N/A	P-025B Discharge Pressure	psig
RIT-4811	M-M6-J-0184[120]	J-JZ-J-00818, *SWPF RI-4811 AFP Secondary PCW Loop Radiation Monitor*[128]	AFF Secondary Process CHW Radiation	Millirem per hour (mRem/hr)
PIT-4804	M-M6-J-0184[120]	J-JZ-J-00817, *SWPF PI-4804 AFF Secondary PCW Return Pressure*[129]	AFF Secondary Process CHW Return Pressure	psig
PIT-4803	M-M6-J-0184[120]	J-JZ-J-00816, *SWPF PI-4803 AFF Secondary PCW Supply Pressure*[130]	AFF Secondary Process CHW Supply Pressure	psig
TIT-4812	M-M6-J-0184[120]	J-JZ-J-00819, *SWPF TI-4812 AFF Secondary PCW Temp*[131]	AFF Secondary Process CHW Supply Temperature	° F
FIT-4813	M-M6-J-0184[120]	J-JZ-J-00815, *SWPF FI-4813 AFF Secondary PCW Flow*[132]	AFF Secondary Process CHW Flowrate	gpm
PI-020	M-M6-J-0184[120]	N/A	Process Chilled Water Secondary Loop Chemical Bypass Feeder Tank (TK-026) Pressure	psig
P-015A	M-M6-J-0185[121]	N/A	Pump Status	Run/Off
SC-4829	M-M6-J-0185[121]	J-JZ-J-01207, *SWPF SIC-4829 ASP Secondary Loop Pump A Speed*[133]	P-015A Speed	RPM
P-015B	M-M6-J-0185[121]	N/A	Pump Status	Run/Off
SC-4830	M-M6-J-0185[121]	J-JZ-J-01208, *SWPF SIC-4830 ASP Secondary Loop Pump B Speed*[134]	P-015B Speed	RPM
PI-4828	M-M6-J-0185[121]	N/A	P-015A Discharge Pressure	psig
PI-4827	M-M6-J-0185[121]	N/A	P-015B Discharge Pressure	psig

Table 10-4. System Monitoring Instruments (cont.)

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
RIT-4831	M-M6-J-0185[121]	J-JZ-J-00823, *SWPF RI-4831 ASP Secondary PCW Loop Radiation Monitor*[135]	ASP Secondary Process CHW Radiation	mRem/hr
PIT-4824	M-M6-J-0185[121]	J-JZ-J-00822, *SWPF PI-4824 ASP Secondary PCW Return Pressure*[136]	ASP Secondary Process CHW Return Pressure	psig
PIT-4823	M-M6-J-0185[121]	J-JZ-J-00821, *SWPF PI-4823 ASP Secondary PCW Supply Pressure*[137]	ASP Secondary Process CHW Supply Pressure	psig
TIT-4832	M-M6-J-0185[121]	J-JZ-J-00824, *SWPF TI-4832 ASP Secondary PCW Temp*[138]	ASP Secondary Process CHW Supply Temperature	° F
FIT-4833	M-M6-J-0185[121]	J-JZ-J-00820, *SWPF FIC-4833 ASP Secondary PCW Flow*[139]	ASP Secondary Process CHW Flowrate	gpm
PI-019	M-M6-J-0185[121]	N/A	Process Chilled Water Secondary Loop Chemical Bypass Feeder Tank (TK-016) Pressure	psig

10.3.5.2 Control Functions

Table 10-5 is a list of the control loops for the Caustic System.

Table 10-5. Control Loops

Loop Number	P&ID	Scale Sheet	Controlled Variable	Set Point
PDIC-4294	M-M6-J-0100[119]	J-JZ-J-00863[122] J-JZ-J-00864[123]	Process CHW Differential Pressure	65 psig

10.4 Operations

10.4.1 Initial Configuration

The primary chilled water loop is filled with the 25% propylene glycol solution and the secondary loops are filled with inhibited water. All valves are in their normal positions in accordance with the P&IDs.

10.4.2 System Startup

For the primary process CWS, startup begins with opening the chiller isolation valves and starting the supply pump, then the chiller is started.

For the secondary loops the pumps are started.

10.4.3 Normal Operations

Primary Process CWS

During normal operations of the primary process CWS, a single chiller and supply pump combination are operating. The supply pump circulates water through the system, acquiring process equipment heat loads from the secondary Process CHW loops via heat exchangers (HX-015 and HX-025). The water then enters the operating chiller, where the heat load is removed and the water is cooled. A constant flow rate through the primary loop is achieved by a bypass valve that modulates to maintain a differential pressure between the supply and return headers.

ASP Secondary Process CWS

During normal operations of the ASP secondary process CWS, one pump is operating. The pump circulates water through the system, gaining heat from the process equipment loads and transferring it to the primary Process CWS via a heat exchanger (HX-015). The pump is equipped with a VFD and the speed of the pump is continuously adjusted to maintain a constant supply header pressure. Between the supply and return headers there is a bypass line that contains a valve set to a partially open position. This ensures a minimum flow rate in the system.

AFP Secondary Process CWS

During normal operations of the AFP secondary process CWS, one pump is operating. The pump circulates water through the system, gaining heat from the process equipment loads and transferring it to the primary Process CWS via a heat exchanger (HX-025). The pump is equipped with a VFD and the speed of the pump is continuously adjusted to maintain a constant supply header pressure. Between the supply and return headers there is a bypass line that contains a valve set to a partially open position. This ensures a minimum flow rate in the system.

10.4.4 Off-Normal and Recovery Operation

Primary Process CWS

If the operating chiller or supply pump fails during normal operations, then an automatic switchover will occur. The switchover will automatically shutdown the failed chiller and pump combination, and then start up the standby chiller and pump.

ASP Secondary Process CHW

If the operating secondary loop pump fails, then an Operator will switch over to the standby pump.

AFP Secondary Process CHW

If the operating secondary loop pump fails, then an Operator will switch over to the standby pump.

Table 10-6 shows equipment and component failures.

Table 10-6. Equipment and Component Failure

Condition	Detection	Immediate DCS Action	Recovery
Chiller Failure (CHU-005A)	DCS Alarm (UA-4291)	Automatic Switchover to CHU-005B	Complete Repairs
Chiller Failure (CHU-005B)	DCS Alarm (UA-4290)	Automatic Switchover to CHU-005A	Complete Repairs
Valve Failure (HV-4289)	Valve Status on DCS (HIS-4289)	Automatic Switchover to CHU-005B	Complete Repairs
Valve Failure (HV-4288)	Valve Status on DCS (HIS-4288)	Automatic Switchover to CHU-005A	Complete Repairs
Pump Failure (P-005A)	Pump Status on DCS	Automatic Switchover to CHU-005B	Complete Repairs
Pump Failure (P-005B)	Pump Status on DCS	Automatic Switchover to CHU-005A	Complete Repairs
Low/High Supply Header Pressure	DCS Pressure Indication (PI-4294B)	None	Operator to investigate cause of problem.
Low/High Return Header Pressure	DCS Pressure Indication (PI-4294A)	None	Operator to investigate cause of problem.
Low/High Process CHW Supply Temperature	DCS Temperature Indication (TI-4314)	None	Operator to investigate cause of problem.
Low/High Process CHW Flow Rate	DCS Flow Indication (FI-4312)	None	Operator to investigate cause of problem.
Low/High Process CHW Differential Pressure	DCS Differential Pressure Indication (PDI-4294)	None	Operator to investigate cause of problem.
Pump Failure (P-025A)	Pump Status on DCS	None	Operator to switch over to P-025B. Complete repairs.
Pump Failure (P-025B)	Pump Status on DCS	None	Operator to switch over to P-025A. Complete repairs.
High Radiation	DCS Radiation Indication (RI-4811)	None	Contact Radiation Protection Group
Low/High Return Header Pressure	DCS Pressure Indication (PI-4804)	None	Operator to investigate cause of problem.
Low/High Supply Header Pressure	DCS Pressure Indication (PI-4803)	None	Operator to investigate cause of problem.

Table 10-6. Equipment and Component Failure (cont.)

Condition	Detection	Immediate DCS Action	Recovery
Low/High Process CHW Supply Temperature	DCS Temperature Indication (TI-4812)	None	Operator to investigate cause of problem.
Low/High Process CHW Flow Rate	DCS Flow Indication (FI-4813)	None	Operator to investigate cause of problem.
Pump Failure (P-015A)	Pump Status on DCS	None	Operator to switch over to P-015B. Complete repairs.
Pump Failure (P-015B)	Pump Status on DCS	None	Operator to switch over to P-015A. Complete repairs.
High Radiation	DCS Radiation Indication (RI-4831)	None	Contact Radiation Protection Group
Low/High Return Header Pressure	DCS Pressure Indication (PI-4824)	None	Operator to investigate cause of problem.
Low/High Supply Header Pressure	DCS Pressure Indication (PI-4823)	None	Operator to investigate cause of problem.
Low/High Process CHW Supply Temperature	DSC Temperature Indication (TI-4832)	None	Operator to investigate cause of problem.
Low/High Process CHW Flow Rate	DCS Flow Indication (FI-4833)	None	Operator to investigate cause of problem.

10.4.5 System Shutdown

Primary Process CWS

The chiller is stopped first to prevent chiller unit freeze up. Then the active process chilled water pump is stopped and the chiller isolation valve is closed.

ASP Secondary Process CWS

The active supply pump is shut down.

AFP Secondary Process CWS

The active supply pump is shut down.

11.0 CR CWS

11.1 System Functions

The CR CWS provides cooling capacity for the CR area AHUs. The CR area includes the CR (R116), CR Access Area (R116A), Men/Women Toilet (R116B), Shift Supervisor Office (R117),

IT Server Room (R118), and UPS Room (R118A). Two 100% capacity, redundant air cooled chillers provide CHW to condition the supply air for temperature control.

11.2 Operational Overview

One CR CHW chiller (CHU-003A/B) and one CR CHW supply pump are required to meet the anticipated CR cooling loads. The non-operating chiller and pump are in standby, ready for operation in the event of a failure of either the operating chiller or pump.

The CR CHW is circulated through a closed-loop system by one of the CR CHW pumps to the operating CR AHU (AHU-004 or AHU-005). The return loop is cooled by the operating CR CHW chiller. The CR Chilled Water Expansion Tank (TK-003) maintains system pressure by accommodating thermal expansion/contraction of the CHW solution. Make-up water is provided by the Process Water System via automatic PCV (PCV-2682).

11.3 Configuration Information

11.3.1 Description of System

Refer to P&IDs and Air Flow Diagrams listed in Table 11-1.

Table 11-1. P&IDs and Air Flow and Control Diagrams

Diagram Number	Diagram Title
M-M6-J-0099	*SWPF Process Building Control Room Chiller Units CHU-003A/B P&ID (U)*[140]
M-MW-J-0022	*SWPF Process Building Control Room Air Flow and Control Diagram (U)*[141]

11.3.2 Major Components

See Table 11-2 for a list of major components.

Table 11-2. Major Components

Component	Description
CR Chilled Water Chillers (CHU-003A/B)	Removes CR heat load from CR CHW Capacity: 7 Tons Power Consumption: 13kW (See M-M6-J-0099[140])
CR Chilled Water Supply Pumps (P-003A/B)	Circulates CR CHW Capacity: 16 gpm hp: 1.5 (See M-M6-J-0099[140])
CR Chilled Water Air Separator (SEP-003)	Removes air from CR CHW Capacity: 16 gpm (See M-M6-J-0099[140])
CR Chilled Water Expansion Tank (TK-003)	Provides location for thermal expansion of CR CHW Capacity: 10 gallons (See M-M6-J-0099[140])
CR Chilled Water Chemical Bypass Feeder Tank (TK-004)	Location for addition of chemicals to CR CHW Capacity: 5 gallons (See M-M6-J-0099[140])

11.3.3 Stream Data

See Table 11-3 for a listing of Streams.

Table 11-3. Streams

Stream	Description
CR CHW	25% Propylene glycol solution is circulated through the building CWS.

11.3.4 Physical Location and Layout

The CR chilled water chillers are located outside, north of the Process Building. All other major components of the CR CWS are located in room R114 of the Northern FSA.

11.3.5 System Control Features and Interlocks

11.3.5.1 System Monitoring

The CR CWS normally operates with minimal Operator intervention. Instrumentation is provided to monitor the status of the system and initiate corrective action, if necessary. Remote alarm indications are provided to the DCS.

- Each chiller is equipped with a general trouble alarm that notifies the Operator of a chiller fault.
- The building chilled water supply pumps have instrumentation to locally monitor suction and discharge pressures.
- The building chilled water supply pumps have instrumentation to locally monitor suction temperatures.
- The pressure of the building chilled water return header is continuously monitored.
- The temperature of the building chilled water supply header is continuously monitored.
- The flow rate of building CHW in the supply header is continuously monitored.

See Table 11-4 for a listing of instruments.

Table 11-4. System Monitoring Instruments

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
UA-4253	M-M6-J-0099[140]	N/A	CHU-003A Status	fault
UA-4254	M-M6-J-0099[140]	N/A	CHU-003B Status	fault
PIT-4261	M-M6-J-0099[140]	J-JZ-J-00860, *SWPF PI-4261 Control Room Chilled Water Return Pressure*[142]	CR CHW Return Pressure	psig
TIT-4279	M-M6-J-0099[140]	J-JZ-J-00861, *SWPF TI-4279 Control Room chilled Water Supply Temperature*[143]	CR CHW Supply Temperature	°F
FIT-4275	M-M6-J-0099[140]	J-JZ-J-00859, *SWPF FI-4275 Control Room Chilled Water Supply Flowrate*[144]	CR CHW Supply Flowrate	gpm
PI-015	M-M6-J-0099[140]	N/A	CR Chilled Water Chemical Bypass Feeder Tank (TK-004) Pressure	psig
P-003A	M-M6-J-0099[140]	N/A	Pump Status	Run/Off

Table 11-4. System Monitoring Instruments (cont.)

Equipment/ Instrument Number	P&ID	Scale Sheet	Monitored Variable	Indications
P-003B	M-M6-J-0099[140]	N/A	Pump Status	Run/Off
PI-4281	M-M6-J-0099[140]	N/A	P-003A Discharge Pressure	psig
PI-4282	M-M6-J-0099[140]	N/A	P-003B Discharge Pressure	psig
PI-3960	M-M6-J-0099[140]	N/A	P-003A Suction Pressure	psig
PI-3962	M-M6-J-0099[140]	N/A	P-003B Suction Pressure	psig
TI-3961	M-M6-J-0099[140]	N/A	P-003A Suction Temperature	^{o}F
TI-3963	M-M6-J-0099[140]	N/A	P-003B Suction Temperature	^{o}F

11.3.5.2 Control Functions

Table 11-5 is a list of the control loops for the CR CWS.

Table 11-5. Control Loops

Loop Number	P&ID	Scale Sheet	Controlled Variable	Set Point
TIC-4159	M-MW-J-0022[141]	J-JZ-J-01336, *SWPF TIC-4159 IT Server Room Temperature*[145]	IT Server Room Temperature	75°F

11.4 Operations

11.4.1 Initial Configuration

The CR CHW loop is filled with the 25% propylene glycol solution. All valves are in their normal positions in accordance with the P&IDs.

11.4.2 System Startup

For the CR CWS, startup begins with opening the chiller isolation valves and starting the supply pump, then the chiller is started.

11.4.3 Normal Operations

During normal operations of the CR CWS, a single chiller and supply pump combination are operating. The supply pump circulates water through operating CR AHU acquiring the heat load from the space. The water then enters the operating chiller, where the heat load is removed and the water is cooled. A constant flow rate through the system is maintained by 3-way valves at the AHUs. The 3-way valves modulate flow through the cooling coil based on cooling demand and bypass the remaining CHW flow back to the CR chilled water return header.

11.4.4 Off-Normal and Recovery Operation

If the operating chiller or supply pump fails during normal operations, then an automatic switchover will occur. The switchover will automatically shutdown the failed chiller and pump combination, and then start up the standby chiller and pump.

If a loss of air pressure were to occur, both of the 3-way valves that control the direction of the CHW to the AHUs (TV-4159A/B) are configured to fail open the flow path that would direct the building CHW flow to the AHU cooling coils.

The pneumatic controlled valves upstream of the chiller units (HV-4251 and HV-4252) will fail open upon loss of air pressure, thus permitting the building CHW to flow on a loss of air pressure.

Table 11-6 shows equipment and component failures.

Table 11-6. Equipment and Component Failure

Condition	Detection	Immediate DCS Action	Recovery
Chiller Failure (CHU-003A)	DCS Alarm (UA-4253)	Automatic Switchover to CHU-003B	Complete Repairs
Chiller Failure (CHU-003B)	DCS Alarm (UA-4254)	Automatic Switchover to CHU-003A	Complete Repairs
Valve Failure (HV-4251)	Valve Status on DCS (HIS-4251)	Automatic Switchover to CHU-003B	Complete Repairs
Valve Failure (HV-4252)	Valve Status on DCS (HIS-4252)	Automatic Switchover to CHU-003A	Complete Repairs
Pump Failure (P-003A)	Pump Status on DCS	Automatic Switchover to CHU-003B	Complete Repairs
Pump Failure (P-003B)	Pump Status on DCS	Automatic Switchover to CHU-003A	Complete Repairs
Low/High Return Header Pressure	DCS Pressure Indication (PI-4261)	None	Operator to investigate cause of problem.
Low/High Supply Temperature	DCS Temperature Indication (TI-4279)	None	Operator to investigate cause of problem.
Low/High Process CHW Flow Rate	DCS Flow Indication (FI-4275)	None	Operator to investigate cause of problem.

11.5 System Shutdown

The active chiller is stopped first to prevent chiller freeze up. Then the active CR CHW supply pump is stopped and the chiller isolation valve is closed.

12.0 REFERENCES

[1] E-SD-J-00002, *SWPF Electrical System Description.* Parsons, Aiken, South Carolina.

[2] M-SD-J-00004, *SWPF Heating, Ventilating, and Air Conditioning System Description*. Parsons, Aiken, South Carolina.

[3] M-SD-J-00006, *SWPF Material Handling System Description*. Parsons, Aiken, South Carolina.

[4] X-SD-J-00001, *SWPF Alpha Strike Process System Description*. Parsons, Aiken, South Carolina.

[5] X-SD-J-00002, *SWPF Caustic-side Solvent Extraction System Description*. Parsons, Aiken, South Carolina.

[6] X-SD-J-00003, *SWPF Cold Chemicals Area System Description*. Parsons, Aiken, South Carolina.

[7] X-SD-J-00004, *SWPF Alpha Finishing Process System Description*. Parsons, Aiken, South Carolina.

[8] X-SD-J-00005, *SWPF Drains System Description*. Parsons, Aiken, South Carolina.

[9] X-SD-J-00006, *SWPF Sampling System Description*. Parsons, Aiken, South Carolina.

[10] X-SD-J-00007, *SWPF Air Pulse Agitators System Description*. Parsons, Aiken, South Carolina.

[11] X-SD-J-00008, *SWPF Next Generation Solvent System Description.* Parsons, Aiken, South Carolina.

[12] X-SD-J-00009, *SWPF Causticside Solvent Extraction with NGS System Description.* Parsons, South Carolina.

[13] S-SAR-J-00002, *Salt Waste Processing Facility Project Documented Safety Analysis.* Parsons, Aiken, South Carolina.

[14] P-DB-J-00002, *SWPF Design Criteria Database*. Parsons, Aiken, South Carolina.

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[16] P-CDM-J-00001, *Configuration Management Manual*. Parsons, Aiken, South Carolina.

[17] M-M6-J-0098, *SWPF Process Building Building Chiller Units CHU-001A/B P&ID (U)*. Parsons, Aiken, South Carolina.

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[19] M-MW-J-0003, *SWPF Process Building HVAC Building Supply Air Handling Unit AHU-002 Air Flow and Control Diagram (U)*. Parsons, Aiken, South Carolina.

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[21] M-MW-J-0007, *SWPF Process Building Cold Chemicals Area Air Flow and Control Diagram (U)*. Parsons, Aiken, South Carolina.

[22] M-MW-J-0023, *SWPF Process Building Alpha Finishing Facility Air Flow and Control Diagram (U)*. Parsons, Aiken, South Carolina.

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[24] J-JZ-J-00858, *SWPF TI-4237 Building Chilled Water Supply Temperature*. Parsons, Aiken, South Carolina.

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[30] M-M6-J-0089, *SWPF Compressor Building Plant Air Dryers P&ID (U)*. Parsons, Aiken, South Carolina.

[31] M-M6-J-0091 SH1, *SWPF Compressor Building Plant Air Compressors P&ID (U)*. Parsons, Aiken, South Carolina.

[32] M-M6-J-0091 SH2, *SWPF Compressor Building Evaporative Coolers P&ID (U)*. Parsons, Aiken, South Carolina.

[33] M-M6-J-0092, *SWPF Process Building Plant Air Distribution to Air Pulse Agitators P&ID (U)*. Parsons, Aiken, South Carolina.

[34] M-M6-J-0130, *SWPF Process Building Tank Air Purge P&ID (U)*. Parsons, Aiken, South Carolina.

[35] M-M6-J-0173, *SWPF Alpha Finishing Facility Tank Air Purge P&ID (U)*. Parsons, Aiken, South Carolina.

[36] M-M6-J-0180, *SWPF Process Building Central Process Area Plant Air Distribution P&ID (U)*. Parsons, Aiken, South Carolina.

[37] M-M6-J-0181, *SWPF Process Building Cold Chemicals Area Plant Air Distribution P&ID (U)* Parsons, Aiken, South Carolina.

[38] M-M6-J-0182, *SWPF Process Building Alpha Finishing Facility Plant Air Distribution P&ID (U)*. Parsons, Aiken, South Carolina.

[39] M-M6-J-0196, *SWPF Process Building Analytical Lab Plant Air System P&ID (U)*. Parsons, Aiken, South Carolina.

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[41] J-JZ-J-01173, *SWPF PI-4455 PA Cooling Water Return Pressure*. Parsons, Aiken, South Carolina.

[42] J-JZ-J-00846, *SWPF MI-4424 Plant Air Dryer A Moisture*. Parsons, Aiken, South Carolina.

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[49] M-M6-J-0076 SH1, *SWPF Process Building Process Water Tank TK-301 P&ID (U)*. Parsons, Aiken, South Carolina.

[50] M-M6-J-0076 SH2, *SWPF Process Building Process Water Pressure Tank TK-305 P&ID (U)*. Parsons, Aiken, South Carolina.

[51] M-M6-J-0077, *SWPF Process Building Process Water Distribution P&ID (U)*. Parsons, Aiken, South Carolina.

[52] M-M6-J-0157, *SWPF Process Building Flush Main Header P&ID (U)*. Parsons, Aiken, South Carolina.

[53] M-M6-J-0158, *SWPF Alpha Finishing Facility Flush Distribution Header P&ID (U)*. Parsons, Aiken, South Carolina.

[54] M-M6-J-0160, *SWPF Process Building ASP and CSSX North Flush Header P&ID (U)*. Parsons, Aiken, South Carolina.

[55] M-M6-J-0161, *SWPF Process Building CSSX South Pump and Valve Gallery Flush Header P&ID (U)*. Parsons, Aiken, South Carolina.

[56] M-M6-J-0162 SH1, *SWPF Process Building CSSX South Contactor/Tank Cell Flush Header P&ID (U)*. Parsons, Aiken, South Carolina.

[57] M-M6-J-0162 SH2, *SWPF Process Building CSSX South Contactor/Tank Cell Flush Header P&ID (U)*. Parsons, Aiken, South Carolina.

[58] M-M6-J-0163 SH1, *SWPF Process Building CSSX South Contactor/Tank Cell Flush Header P&ID (U)*. Parsons, Aiken, South Carolina.

[59] M-M6-J-0163 SH2, *SWPF Process Building CSSX South Contactor/Tank Cell Flush Header P&ID (U)*. Parsons, Aiken, South Carolina.

[60] M-M6-J-0164, *SWPF Process Building ASP Tank and Cell Flush Header P&ID (U)*. Parsons, Aiken, South Carolina.

[61] M-M6-J-0165, *SWPF Process Building ASP Pump Flush Header P&ID (U)*. Parsons, Aiken, South Carolina.

[62] J-JZ-J-0009, *SWPF LIC-2613 Process Water Tank Level*. Parsons, Aiken, South Carolina.

[63] J-JZ-J-0008, *SWPF LIC-2611 Process Water Tank Level*. Parsons, Aiken, South Carolina.

[64] J-JZ-J-00563, *SWPF AI-2615 Process Water Tank ORP*. Parsons, Aiken, South Carolina.

[65] J-JZ-J-00565, *SWPF PDI-2628 Process Water Filter dP*. Parsons, Aiken, South Carolina.

[66] J-JZ-J-00570, *SWPF FIC-2631 Process Water to SSRT Flow*. Parsons, Aiken, South Carolina.

[67] J-JZ-J-00076, *SWPF LIC-2630 Process Water Pressure Tank Level Control.* Parsons, Aiken, South Carolina.

[68] J-JZ-J-00572, *SWPF PI-2627 CCA/AFF/ASP Flush Header Pressure*. Parsons, Aiken, South Carolina.

[69] J-JZ-J-00571, *SWPF PI-2621 CSSX Flush Header Pressure*. Parsons, Aiken, South Carolina.

[70] J-JZ-J-00567, *SWPF FIC-2423 Acid to Flush Header Flow*. Parsons, Aiken, South Carolina.

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[75] M-M6-J-0159, *SWPF Process Building Analytical Lab Deionized Water System P&ID (U)*. Parsons, Aiken, South Carolina.

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[79] J-JZ-J-01139, *SWPF SIC-2483 Strip Water Feed Pump A Speed*. Parsons, Aiken, South Carolina.

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[82] M-M6-J-0139, *SWPF Process Building Tank Air Purge P&ID (U)*. Parsons, Aiken, South Carolina.

[83] M-M6-J-0140, *SWPF Process Building Tank Air Purge P&ID (U)*. Parsons, Aiken, South Carolina.

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[85] J-JZ-J-00867, *SWPF PI-7314 LP Purge Air Pressure*. Parsons, Aiken, South Carolina.

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[92] M-M6-J-0095 SH2, *SWPF Process Building Safety Shower/Eyewash System Distribution P&ID (U)*. Parsons, Aiken, South Carolina.

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[111] P-PP-J-0008, *SWPF Process Building Plumbing Central Process Area Floor Plan at EL 139'-0" (U)*. Parsons, Aiken, South Carolina.

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[118] M-M6-J-0072 SH2, *SWPF Process Building ASP Secondary Process Chilled Water Return Header P&ID (U)*. Parsons, Aiken, South Carolina.

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