J-SD-J-00002
Revision: 5
Date: September 19, 2019

SALT WASTE PROCESSING FACILITY PROJECT

INSTRUMENTATION AND CONTROLS

SYSTEM DESCRIPTION

Prepared, reviewed, and accepted by:

GARY FRANKLIN WARD ORC1890000932.ID Digitally signed by GARY FRANKLIN WARD ORC1890000932.ID Date: 2019.09.19 17:02:49 -04'00'

Gary F. Ward
Cognizant System Engineer

Date

Bill Brasel
SWPF Engineering Integration Manager

9/20/19
Date

Dr. Thomas D. Burns, Jr., Ph.D., P.E.
SWPF Director of Engineering

9/20/19
Date

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SUMMARY OF CHANGES

Revision No.	Date	Description of Change
0	01/15/10	Develop per DMR-0778, to reflect design development.
1	06/04/12	Revised and reviewed per DCNs 1055 and 1106.
2	12/19/14	Revise per DCN-1471.
3	03/24/15	Revise per DCN-1503.
4	05/15/18	Revise per DCN-1778 and DCN-1869. In addition to the DCN changes, the Change Summary page and references were updated to reflect current format (e.g., no revision number for Parsons internal documents). In addition, all references were updated, if needed, to reflect current title.
5	09/19/19	Revise per DCN-7015, DCN-1995 Rev 1, and DCN-2101.

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ACRONYMS AND ABBREVIATIONS

AFF	Alpha Finishing Facility
ANSI	American National Standards Institute
BPCS	Basic Process Control System
CCA	Cold Chemicals Area
CCTV	Closed Circuit Television
CP	Cable Plant
CR	Control Room
CSSX	Caustic-side Solvent Extraction
DCS	Distributed Control System
DG	Diesel Generator
DWPF	Defense Waste Processing Facility
EL	Elevation
EWS	Engineering Work Station
FF	Foundation Fieldbus
GS	General Service
HART	Highway Addressable Remote Transducer
HEPA	High-Efficiency Particulate Air
HMI	Human-Machine Interface
HSE	High-Speed Ethernet
I/O	Input/Output
ICP	Instrument Control Panel
ISA	Instrumentation, Systems, and Automation Society
IT	Information Technology
LAN	Local Area Network
LIMS	Laboratory Information Management System
M&O	Management & Operating (Contractor)
NIC	Network Interface Card
OTS	Operator Training System
OWS	Operator Work Station
P&ID	Piping and Instrumentation Diagram
P&VG	Pump and Valve Gallery
PA	Public Address
PC	Performance Category
POTS	Plain Old Telephone Service
PP	Project Procedure
PTZ	Pan-Tilt-Zoom
SIF	Safety Instrumented Function
SIS	Safety Instrumented System
SQAP	Software Quality Assurance Plan
SQL	Structured Query Language
SRS	Savannah River Site
SRSOC	Savannah River Site Operations Center
SS	Safety Significant

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ACRONYMS AND ABBREVIATIONS (cont.)

SSP	Safe Shutdown Panel
SWPF	Salt Waste Processing Facility
TMR	Triple Modular Redundant
UPS	Uninterruptible Power Supply
VAC	Volts Alternating Current
VDC	Volts Direct Current
WTE	Waste Transfer Enclosure

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DEFINITIONS/GLOSSARY

DeviceNet	A communication protocol used in the automation industry to interconnect control devices for data exchange. Typical applications include information exchange and large Input/Output (I/O) control networks
Foundation Fieldbus	An all-digital, serial, two-way communications system that serves as the base-level network in a plant or factory automation environment. It is an open architecture, developed and administered by the Foundation Fieldbus (FF)
HART	A Communications Protocol for smart transducers. Descended from the Acronym for Highway Addressable Remote Transducer (HART)
Smart Instrument	Device with embedded firmware, which provides diagnostic data and executes control system function blocks such as Proportional Integral Derivative algorithms. Virtually all instruments in the Salt Waste Processing Facility (SWPF) control system are smart instruments.

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1.0 SCOPE

This system description includes all control, signaling, and communications systems used in the SWPF with the exception of the Fire Alarm system which is described in F-SD-J-00001, *SWPF Fire Detection/Protection System Description*[1]. These include the Distributed Control System (DCS), the Closed Circuit Television (CCTV) system, the Public Address (PA) system, radio communications system, access management system, and installed radiological monitoring equipment.

This system interfaces with components in the following System Descriptions:

- E-SD-J-00002, *SWPF Electrical System Description*;
- F-SD-J-00001, *SWPF Fire Detection/Protection System Description*[1];
- M-SD-J-00004, *SWPF Heating, Ventilating and Air Conditioning System Description*[2];
- M-SD-J-00005, *SWPF Utilities System Description*;
- 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]; and
- X-SD-J-00007, *SWPF Air Pulse Agitator System Description*[10].
- X-SD-J-00008, *SWPF Next Generation Solvent (NGS) System Description*.[11]
- X-SD-J-00009, *SWPF Caustic-side Solvent Extraction with NGS System Description*[12].

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

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

The discrete project design requirements for this system 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

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components associated with this system can be found using the following reports, and filtering by DCS:

- 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 DCS 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, *Design Control*[15] and P-CDM-J-00001, *Configuration Management Plan*[16].

2.0 GENERAL OVERVIEW

The Control Room (CR) is the central control point for all process and facility support functions for monitoring, controlling, alarming, and communications internal and external of the facility. It is equipped to monitor and control the entire process via the DCS Operator Work Stations (OWSs). Communications provided in the CR are site radio system, regular telephone, and direct telephone lines to the Savannah River Site Operations Center (SRSOC) and the CRs at the Defense Waste Processing Facility (DWPF), H-Area Tank Farm, Effluent Treatment Project), and Saltstone.

A backup system is provided in the safe shutdown panel room, which has one Engineering Work Station (EWS) and a duplicate of the communications capabilities. The intent is that this remote workstation could be used for monitoring of the facility in the event the CR becomes uninhabitable. The workstation has full capabilities and can be used to stop all process systems.

The Basic Process Control System (BPCS) monitoring and control is provided by an Emerson DeltaV DCS. The system is fully redundant above the I/O level and power is provided via an Uninterruptible Power Supply (UPS) backed by the standby diesel generator. To the extent possible, FF and DeviceNet have been used to link to the field devices. A significant advantage of the Emerson DeltaV DCS and FF is the maintenance information reporting system, which tracks maintenance information and data for the field devices constantly monitoring the state of health of the field devices. For functions where no FF or DeviceNet solution is available, traditional I/O is used. The Safety Instrumented System (SIS) is provided by an Invensys Triconex system using HART enabled Traditional I/O. HART transmitters are used for all SIS transmitters except the Gamma Detectors and the Turbidity Transmitters, which do not offer a HART option. The HART signals are not captured or used by the Triconex system, but are stripped off and sent to the BPCS for processing.

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The SWPF PA system is connected to the site-wide PA system, which will override local announcements.

The CCTV system provides wall mounted radiation hardened color cameras in the labyrinth areas, and permanently installed cameras on the Operating Deck crane. It provides a portable camera system for insertion into process cells and Waste Transfer Enclosure (WTE) if necessary. The CCTV system has full switching and recording capabilities, allowing the recording of various cameras and remote display as required.

An access management system is provided to monitor and control access into J-Area and provide roll call data for response to emergencies.

The SWPF uses the Savannah River Site (SRS) trunking radio system. Within the process building, the metal and concrete walls and floors preclude reliable communications. To alleviate this, an in-building repeater system may be required to assure reliable communications both within J-Area and to other areas of the site as required.

General area radioactivity levels and airborne radioactive material concentrations within the building are monitored by a series of radiation monitoring instruments. These are equipped with local audible and visual alarm and transmit data values to the BPCS and is also accessible in the Health Physics office. In addition, an alarm on any device will generate a trouble alarm that alerts the CR that there is a problem. The CR operator or shift supervisor has access to the radiation monitoring system directly via the BPCS to determine the specifics of the alarm.

The Communications pathways and cable comprise the Cable Plant (CP), which supports the telephone and data system. These systems provide the normal and emergency voice and data communication for facility communications.

3.0 DISTRIBUTED CONTROL SYSTEM DESCRIPTION

3.1 General

There are two independent systems that comprise the SWPF DCS, the BPCS, and the SIS. All safety functions that require an automatic detection and action to mitigate an unsafe condition or initiate mitigative action by an operator are executed by the SIS. The BPCS executes normal process controls and interlocks. The SIS is required to be independent of the BPCS so no actions or failures in the BPCS will alter the actions of the SIS. The SIS equipment is required to have reliability standards, which are not normally prudent to require of the BPCS. In implementation, all I/Os related to the SIS connect directly to the SIS logic processor; therefore, a failure in the BPCS cannot cause a false signal to be sent to the SIS. Conversely, the SIS passes information to the BPCS. An example is a transmitter, which has a Safety Significant (SS) interlock that will initiate a mitigative action but is also used in the BPCS to control a valve without an SS function. The transmitter is a part of the SIS and is directly connected to the SIS logic processor, which processes the logic to generate the SS interlock. The signal is also passed from the SIS to the BPCS such that the BPCS can perform its non-SS control function.

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Figure 3-1 depicts the SWPF DCS Network Architecture. The System Architecture for the DCS is shown on drawing J-JQ-J-0001, Sheet 1, *SWPF Instrumentation DCS System Architecture [U]* [17] and J-JQ-J-0001, Sheet 2, *SWPF Instrumentation DCS System Architecture [U]* [18].

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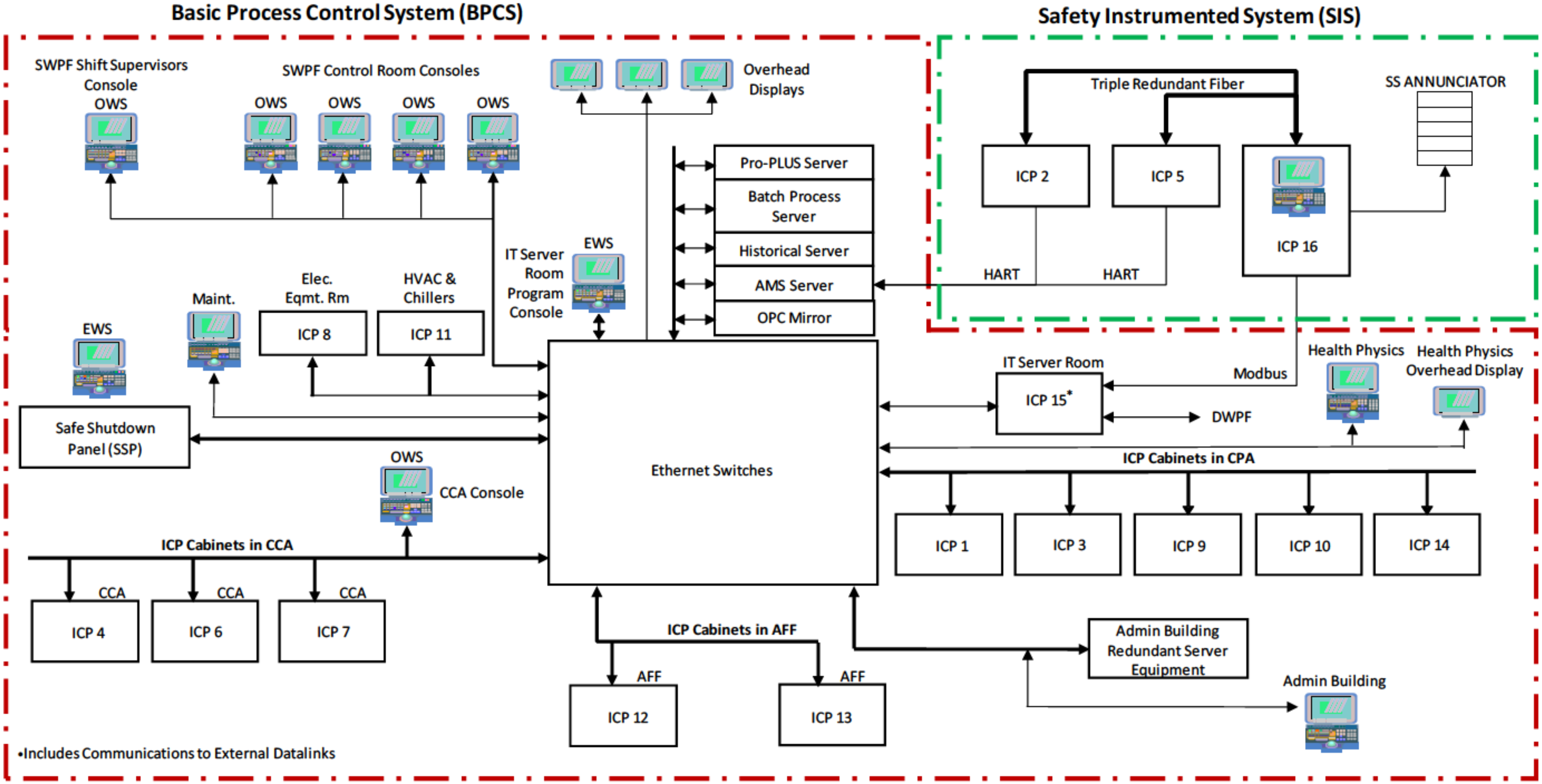
Figure 3-1. SWPF DCS Configuration



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3.2 System Functions

The DCS has two subsystems, the BPCS and the SIS. The function of the BPCS is to monitor and control the processes and provide the human interface to allow safe, effective, and efficient operation of the process. It is the largest component of the DCS.

The SIS executes Safety Instrumented Functions (SIFs), as described in S-SAR-J-00002[13]. The SIS monitors specific SIF parameters and/or events and initiates specific control functions required to prevent or mitigate the consequences of an abnormal condition.

Figure 3-2 depicts a simplified BPCS/SIS functional configuration. The diagram shows how the BPCS and SIS functions are integrated. Instrument Control Panels house the Controllers and I/O structure for both BPCS and SIS. SWPF uses separate enclosures and rack structures to provide a clean break between BPCS and SIS. Primary communications between field devices and the BPCS is via FF or DeviceNet to the controllers in the various Instrument Control Panels (ICPs). From the ICPs, Information is routed to the servers, and the CR consoles.

The Triconex system supports HART 4-20 mA and discrete I/O. This allows the use of HART Transmitters where available to provide increased reliability. These HART signals are sent to the BPCS for diagnostics and are not directly used by the SIS. The Triconex system executes all safety logic. The outputs are wired to a safety relay, to execute the SIF or safety alarm panel to execute the safety function. Auxiliary Triconex controller cabinets are controlled by the main Triconex Triple Modular Redundant (TMR) controller over a redundant fiber-optic network. Communications from the SIS to the BPCS are via HART Multiplexers for diagnostic HART signals and a read only link to the BPCS via Modbus for the retransmitted process variable, interlock, and alarm information. This allows the BPCS to utilize SIS output while ensuring that no BPCS action can affect the SIS function.

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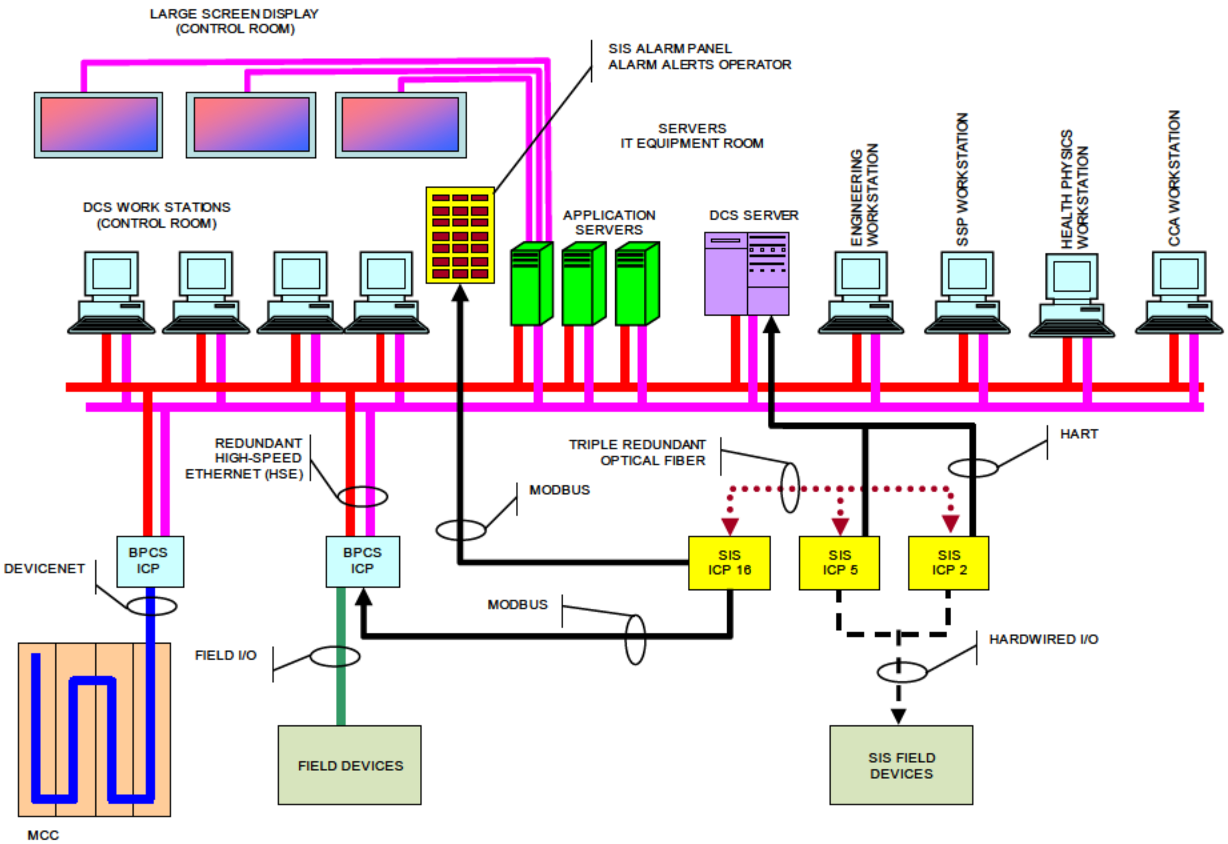
Figure 3-2. Simplified BPCS/SIS Configuration



3.2.1 Functional Classification

Component functional classifications are annotated on the Piping and Instrumentation Diagrams (P&IDs) and Data Sheets. All instruments that form a part of an SIS loop are SS. The SIS loops and associated instruments monitor process parameters, execute logic, and initiate control actions and alarms as required in S-SAR-J-00002[13]. The SIS portion of the DCS is classified SS and shall meet the standards set forth in the American National Standards Institute/ Instrumentation, Systems, and Automation Society (ANSI/ISA) 84.00.01-2004, *Functional Safety: Safety Instrumented Systems for the Process Industry Sector*[19]. The BPCS portion of the DCS is classified as General Service (GS)-1.

No DCS equipment is identified as GS-2.

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3.2.2 Configuration Management

Design of the instrument system is under configuration control in accordance with Project Procedure (PP)-EN-5025, *Automated System Configuration and Validation*[15].

The DCS software developed for the BPCS to control the process and simulate the process is controlled per Software Quality Assurance Plan (SQAP)-BPCS-01-00000, *Basic Process Control System (BPCS)*[20]. The SIS software configuration management is covered under SQAP-SIS-001, *Safety Instrumented System (SIS)*[21].

3.2.3 Functional Requirements and Basis

The DCS complies with the Instrument and Control Design Philosophy and the global functional design objectives and requirements described in P-DB-J-00004, *SWPF Balance of Plant Basis of Design*[22]. The primary criteria and requirements are established to automate control and support functions as much as possible to ensure safe and efficient operations. Appropriate interlocks are used to ensure the safety of the process, equipment, and facility under all operational modes and anticipated upset events.

The Safety Significant interlocks and alarms are described in Table 3-2. All safety and process interlocks and alarms are detailed in the Scale Sheet documents for each instrument.

The SWPF Software Requirement Specification Documents define the specific use cases used to develop the control logic.

3.3 Operational Overview

The alarm philosophy is established and category descriptions are provided in Section 17.1.3 of P-DB-J-00004[22]. Protocols ensure that all alarms are time-sequenced and recorded, along with actions taken by the operators in the CR.

3.3.1 Basic Process Control System

The BPCS provides process monitoring, control, historical data storage and the human-machine interface to direct the process, direct process support, and provide indirect support functions. Through the BPCS, normal process interlocks and control functions are executed. The operator interfaces with the process via the BPCS to monitor, control, and change process control parameters and limits within the established ranges and set points, as required.

Radiation monitoring instruments have been strategically located in accessible areas of the facility, after consideration of airflow dynamics, source term locations, and potential release points. These instruments provide real time information regarding the general area airborne concentrations and dose rates and provide continuous monitoring and warning, if established thresholds for airborne concentrations or area dose rates are exceeded.

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The BPCS functional components are distributed throughout the facility, with primary operator interface located in the CR, servers and Local Area Network (LAN) switches located in the Server

Room, and logic controllers and I/O structures in the ICPs. The CR is the central control point for all process and facility support functions. In the CR there are OWS for monitoring, controlling, and alarm display. There are additional OWS located in the Cold Chemicals Area (CCA) for use in monitoring and controlling the CCA processes and in the Health Physics office for use in viewing the radiation monitoring instruments.

The CCA OWS can only control the functions inside the CCA. The Health Physics office have two OWS, one desktop OWS for viewing information and creating reports, and one wall mounted display for viewing alarm information. The two Health Physics office OWS are for viewing information only and cannot be used to control any part of the facility. There is also an OWS located in the Administrative Building for use by Engineering staff for viewing information and creating reports. The Administrative Building OWS cannot be used to control any part of the facility. It is possible to place a workstation on the network at any BPCS Instrument Control Panel (ICP). Local control by maintenance personnel for testing at each ICP can be performed using a user supplied portable OWS.

Supporting these OWSs is the Safe Shutdown Panel (SSP), which is located adjacent to the CR and has a direct access/egress outside the facility. The SSP is an EWS, with full access to BPCS instruments and controls in the facility. It provides CR functions to shutdown the facility in the event that the CR becomes uninhabitable or personnel have been evacuated. It also provides monitoring and control for post-event re-entry preparations. The SSP room has limited space and the process is not intended to be normally or continuously operated from this location. The intent is to provide an independent shutdown location within the facility having comprehensive monitoring and control capability in the event of an emergency, which prevents entry/re-entry into the CR. The SSP is not intended for normal operational use.

The BPCS monitors, records, and controls all non-safety automated processes within the SWPF. Automated sequences are a series of steps executed by the BPCS without additional operator command or intervention. Typically, this can be a series of valve alignments to perform a specific transfer or process function. In some instances, operator action is required.

3.3.2 Safety Instrumented System

The SIS is an independent monitoring and control system that operates outside of BPCS control. It can alarm to alert the operator to an abnormal condition.

An SIF is an automated sequence that performs a safety function. Safety functions must be executed in the SIS, and there can be no intervention by either operators or other automated functions during normal operations. An example is the Salt Solution Feed line turbidity detector monitoring for cross-flow filter breakthrough, which initiates automatic shutdown of the associated salt solution feed pumps upon detection of turbidity above a set limit. Safety Integrity Level calculations for each SIF will be prepared to show compliance with ANSI/ISA 84.00.01 - 2004[19].

The SIS monitors the required parameters and executes required safety logic sequences, independent of any operator action or BPCS functions. Also, selected operating parameters that

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indicate abnormal operating conditions in certain safety systems generate system status alarms via the SIS. These SIS alarms are displayed on a separate annunciator panel independent of the BPCS alarms.

Table 3-1 lists the instruments connected to the SIS along with their associated Alarm Setpoint Document. Instruments connected to the SIS are classified as Safety Significant, but there are certain instruments that are not credited in the DSA, S-SAR-J-00002[11], that are used to alarm abnormal plant conditions to the control room operators so that appropriate action can be taken. These "non-credited" alarms include the leak-detection sump-level alarms (LIT-xxxx) and the strip-effluent gamma monitor alarms (RIT-xxxx).

Table 3-2 lists the SS interlocks and alarms as identified in S-SAR-J-00002[13].

Table 3-1. SIS Instruments and their Associated Alarm Setpoint Document

Device Tag	Alarm Setpoint Document Number	Alarm Setpoint Document Title
AIT-1459	J-JZ-J-00202	*AI-1459 CSSX Feed Turbidity*[23]
AIT-1460	J-JZ-J-00203	*AI-1460 CSSX Feed Turbidity*[24]
RIT-2163	J-JZ-J-00457	*RI-2163 BDT Cs Concentration P-206A*[25]
RIT-2164	J-JZ-J-00458	*RI-2164 BDT Cs Concentration P-206A*[26]
RIT-2169	J-JZ-J-00459	*RI-2169 BDT Cs Concentration P-206B*[27]
RIT-2170	J-JZ-J-00460	*RI-2170 BDT Cs Concentration P-206B*[28]
TIT-1111A	J-JZ-J-00113	*TIT-1111A FFT-A Tank Temperature*[29]
TIT-1111B	J-JZ-J-01094	*TIT-1111B FFT-A Tank Temperature*[30]
TIT-1273A	J-JZ-J-00160	*TIT-1273A SSRT Tank Temperature*[31]
TIT-1273B	J-JZ-J-01095	*TIT-1273B SSRT Tank Temperature*[32]
TIT-7098A	J-JZ-J-01137	*TI-7098A FLT-222C Loop Temperature*[33]
TIT-7098B	J-JZ-J-01138	*TI-7098B FLT-222C Loop Temperature*[34]
TIT-7099A	J-JZ-J-01004	*TI-7099A FLT-222B Loop Temperature*[35]
TIT-7099B	J-JZ-J-01005	*TI-7099B FLT-222B Loop Temperature*[36]
TIT-7100A	J-JZ-J-01002	*TI-7100A FLT-222A Loop Temperature*[37]
TIT-7100B	J-JZ-J-01003	*TI-7100B FLT-222A Loop Temperature*[38]
PDIT-4374	J-JZ-J-01074	*PDIT-4374 Hot Cell Vacuum*[39]
PDIT-4359	J-JZ-J-01058	*PDI-4359 Glovebox 8 Vacuum*[40]
PDIT-4360	J-JZ-J-01059	*PDI-4360 Glovebox 9 Vacuum*[41]
PDIT-4191	J-JZ-J-00829	*PDIC-4191 PVV Header Vacuum*[42]
PDIT-4169	J-JZ-J-00827	*PDI-4169 PVV FLT-401A HEPA dP*[43]
PDIT-4204	J-JZ-J-00884	*PDI-4204 PVV FLT-401B HEPA dP*[44]

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Device Tag	Alarm Setpoint Document Number	Alarm Setpoint Document Title
PDIT-4068	J-JZ-J-00999	*PDI-4068 PB FLT-001 HEPA dP*[45]
PDIT-4108	J-JZ-J-01001	*PDI-4108 PB FLT-002 HEPA dP*[46]
PDIT-4075	J-JZ-J-01000	*PDI-4075 PB FLT-003 HEPA dP*[47]
PDIT-4039	J-JZ-J-00998	*PDI-4039 PB FLT-004 HEPA dP*[48]
PDIT-4002	J-JZ-J-00972	*PDI-4002 SSFT Cell Inlet FLT-010 HEPA dP*[49]
PDIT-4010	J-JZ-J-00977	*PDI-4010 SEHT Cell Inlet FLT-011 HEPA dP*[50]
PDIT-4037	J-JZ-J-00967	*PDI-4037 SSRT/WWHT Cell Inlet FLT-012 HEPA dP*[51]
PDIT-4030	J-JZ-J-00956	*PDI-4030 AST-A Cell Inlet FLT-013 HEPA dP*[52]
PDIT-4040	J-JZ-J-00921	*PDI-4040 ASDT Cell Inlet FLT-014 HEPA dP*[53]
PDIT-4076	J-JZ-J-00982	*PDI-4076, CSSX Tk Cell FLT-015 HEPA dP*[54]
PDIT-4085	J-JZ-J-00962	*PDI-4085 FFT-A Cell Inlet FLT-016 HEPA dP*[55]
FIT-4003	J-JZ-J-00969	*FIC-4003 SSFT Cell Air Flow*[56]
FIT-4013	J-JZ-J-00974	*FIC-4013 SEHT Cell Air Flow*[57]
FIT-4053	J-JZ-J-00964	*FIC-4053 SSRT/WWHT Cell Air Flow*[58]
FIT-4033	J-JZ-J-00954	*FIC-4033 AST-A Cell Air Flow*[59]
FIT-4043	J-JZ-J-00919	*FIC-4043 ASDT Cell Air Flow*[60]
FIT-4057	J-JZ-J-00979	*FIC-4057 East CSSX Tank Cell Air Flow*[61]
FIT-4063	J-JZ-J-00986	*FIC-4063 West CSSX Tank Cell Air Flow*[62]
FIT-4020	J-JZ-J-00959	*FIC-4020 FFT-A Cell Air Flow*[63]
PDIT-4008	J-JZ-J-00970	*PDIC-4008 SSFT Cell Vacuum*[64]
PDIT-4012	J-JZ-J-00975	*PDIC-4012 SEHT Cell Vacuum*[65]
PDIT-4032	J-JZ-J-00955	*PDIC-4032 AST-A Cell Vacuum*[66]
PDIT-4042	J-JZ-J-00920	*PDIC-4042 ASDT Cell Vacuum*[67]
PDIT-4052	J-JZ-J-00965	*PDIC-4052 SSRT/WWHT Cell Vacuum*[68]
PDIT-4062A	J-JZ-J-00980	*PDIT-4062A West CSSX Cell Vacuum*[69]
PDIT-4062B	J-JZ-J-00987	*PDIT-4062B East CSSX Cell Vacuum*[70]
PDIT-4067	J-JZ-J-00960	*PDIC-4067 FFT-A Cell Vacuum*[71]
PDIT-4090	J-JZ-J-00950	*PDI-4090 CSSX and S ASP P&V Corr Vacuum*[72]
PDIT-4091	J-JZ-J-00948	*PDI-4091 Contactor Operating Deck Vacuum*[73]
PDIT-4241	J-JZ-J-00951	*PDI-4241 N ASP P&V Corr Vacuum*[74]
PDIT-4242	J-JZ-J-00952	*PDI-4242 Drum Off/Decon Area Vacuum*[75]
PDIT-4387	J-JZ-J-00916	*PDI-4387 Lab Hot Cell FLT-021 HEPA dP*[76]
PDIT-4388	J-JZ-J-00917	*PDI-4388 Lab Hot Cell FLT-022 HEPA dP*[77]
PDIT-4224	J-JZ-J-01024	*PDI-4224 AFF FLT-007 HEPA dP*[78]

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Device Tag	Alarm Setpoint Document Number	Alarm Setpoint Document Title
PDIT-4170	J-JZ-J-01027	*PDIC-4170 Process Area Vacuum*[79]
PIT-7311	J-JZ-J-00866	*PI-7311 HP Purge Air Pressure*[80]
PIT-7314	J-JZ-J-00867	*PI-7314 LP Purge Air Pressure*[81]
PIT-7323	J-JZ-J-00868	*PI-7323 Plant Air Pressure to Tank Purge*[82]
LIT-1391	J-JZ-J-00082	*LI-1391 SSFT Sump Level*[83]
LIT-1499	J-JZ-J-01080	*LI-1499 SEHT Sump Level*[84]
LIT-1105	J-JZ-J-00079	*LI-1105 AST-A Sump Level*[85]
LIT-1107	J-JZ-J-00080	*LI-1107 FFT-A Sump Level*[86]
LIT-1109	J-JZ-J-00083	*LI-1109 ASDT Sump Level*[87]
LIT-1315	J-JZ-J-00081	*LI-1315 SSRT/WWHT Sump Level*[88]
LIT-6010	J-JZ-J-00102	*LI-6010 WTE Sump Level*[89]
RIT-2215	J-JZ-J-00209	*RI-2215 Strip Effluent Cs Concentration*[90]
RIT-2216	J-JZ-J-00210	*RI-2216 Strip Effluent Cs Concentration*[91]

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Table 3-2. Safety Significant Interlocks and Alarms

Equipment Description	Component Identifier	ICP	Action/Location
	Safety Significant/PC-3 Interlocks		
Hi Turbidity Interlock *(for Protection of Initial Conditions)*	AE/AIT- 1459, 1460	05	Trip pumps P-109 A/B
BDT Hi Gamma Interlock *(for Protection of Initial Conditions)*	RE/RIT- 2163, 2164, 2169, 2170	05	Trip pumps P-109 A/B and P-206 A/B
FFT-A Tank Temperature Hi	TE/TIT- 1111 A/B	02/05	Trip pumps P-102-2A/2B/2C
SSRT Tank Temperature Hi	TE/TIT- 1273 A/B	02/05	Trip pump P-104-2
FFT-B CFF Recirc Loop Temperature Hi	TE/TIT- 7098 A/B, 7099 A/B, 7100 A/B	05	Trip pumps P-222-2A/2B/2C
	Safety Significant/PC-1 Interlocks		
Laboratory Ventilation System: Hot Cell Lo Vacuum Gloveboxes 8 and 9 Lo Vacuum	 PDIT- 4374 PDIT- 4359/4360	 02/05 02/05	 Trip sample pumps: SP-101, 102, 103, 104, 105, 109, 205, 235 Trip sample pumps: SP-207, 220, 221, 222, 223, 224
	Safety Significant/PC-1 Alarms – Indicated on Control Room Annunciator Panel ANN-001		
PVVS Lo Flow Exhaust HEPA dP Hi	 PDIT- 4191 PDIT- 4169, 4204	 02 02	 PVVS Vent Header Final filter element FLT-401 A/B
PBVS Exhaust HEPA dP Hi Cell Inlet HEPA dP Hi Cell Air Flow Lo Zone 1 and key Zone 2 Lo Vacuum	 PDIT- 4068, 4108, 4075, 4039 PDIT- 4002, 4010, 4037, 4030, 4040, 4076, 4085 FE/FIT- 4003, 4013, 4053, 4033, 4043, 4057, 4063, 4020 PDIT- 4008, 4012, 4032, 4042, 4052, 4062A/B, 4067, 4090, 4091, 4241, 4242,	 02 02 02 02/05	 Final filter elements FLT-001/2/3/4 Process Vessel Cell inlet filters Outlet of each Process Vessel Cell As defined
Laboratory Ventilation System Exhaust HEPA dP Hi	 PDIT- 4387, 4388	 02	 Final filter elements FLT-021/022
AFF Ventilation System Exhaust HEPA dP Hi alarm AFF Vessel Area Vacuum Lo	 PDIT- 4224 PDIT- 4170	 05 05	 Final filter element (FLT-007) As defined
Air Dilution System Lo B/U Tank Pressure Lo B/U Header Pressure Lo Plant Air Header Pressure	 PIT- 7311 PIT- 7314 PIT- 7323	 05 05 02	 Upstream of ADS Pressure Regulators Downstream of ADS Pressure Regulators Downstream of PA Pressure Regulators
Leak Detection[1] Hi Process Vessel Cell Sump Level Hi WTE Sump Level	 LIT- 1391, 1499, 1105, 1107, 1109, 1315 LIT- 6010	 02 05	 Wet Sump As defined
Strip Effluent Gamma Monitor Hi[1]	RE/RIT- 2215, 2216	05	Area Radiation Monitor in P-205 Labyrinth

[1] Non-credited alarms described in the Documented Safety Analysis, S-SAR-J-00002, used to alert the control room operators of abnormal conditions.

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3.4 Configuration Information

3.4.1 Description of System

The DCS architecture is shown on Drawing J-JQ-J-0001, Sheet 1[17] and J-JQ-J-0001, Sheet 2[18].

An Emerson DeltaV DCS has been selected to control the BPCS process and ancillary facilities, and to communicate with interfacing SRS facilities consistent with the inter-area product transfer requirements. The procurement to Emerson for the DeltaV BPCS additionally includes a stand-alone DeltaV system for use in development and an additional stand-alone DeltaV system for use as an Operator Training System (OTS). The BPCS is the primary control system for the process and ancillary services. In some cases, vendor furnished control systems are provided for equipment packages, such as the deionized water system. These are linked to the BPCS for monitoring and start/stop functions. Other vendor furnished control systems, such as the compressed air system, vibration monitoring system, and closed circuit television system, run independently of the BPCS, but have control software hosted on the BPCS workstations. These systems are switched through a single, separate network and brought into each workstation using an independent Network Interface Card (NIC).

The BPCS is based on the use of bus technology, with preference given to the FF for communications with transmitters and valves. DeviceNet is preferred for motor control and primarily discrete-type I/O. The different buses connect to controllers that are linked to displays and servers via redundant High-Speed Ethernet (HSE) paths. Application servers also reside on the redundant HSE. They are used to interface with and integrate control and information from other packaged control systems.

Bus technology affords great flexibility in modifications, troubleshooting, and maintenance, as well as providing a "small footprint" for I/O. The application servers provide greater flexibility in the ability to integrate vendor-furnished controls into a common control system.

A Laboratory Information Management System (LIMS) is used to track laboratory samples including their identification numbers, parameters, results, etc., in accordance with Specification Section 11622, *Laboratory Information Management System*[92]. This is a stand-alone system and does not connect to the DCS or any other system in the facility.

3.4.2 Control Room

The CR contains four (4) OWSs from which the primary processes are monitored and controlled. The CR supervisor has an OWS in his office. The CR has communication links to other facilities. The CCA can be monitored and controlled from the CR, but it is normally controlled from a dedicated CCA remote OWS.

The workstations are connected via a redundant Ethernet network to the BPCS LAN. Also residing on the LAN are the servers with the required system software for control such as human-machine interface (HMI), data collection, and other applications, which are captured, recorded, and stored on a dedicated historical data server. This historical data server can be accessed from all control consoles and is used for determining impending equipment failures, calibration trending, historical records review of component failures, process and equipment efficiency trending, and other maintenance, operational and historical event analyses.

Also located in the CR are three displays, one of which includes a dedicated alarm list; the others may be used for displaying a problem area allowing several people to observe the process simultaneously.

3.4.3 Local Instrument Control Panels

The Process Building and Alpha Finishing Facility (AFF) house ICPs, which connect into the DCS LAN via redundant fiber optic pathways. These ICPs contain the I/O structure for process interface and the logic processors used to execute the control and interlock functions. In the SWPF Project, there are thirteen (13) ICPs that are BPCS controllers and three ICPs that house SIS controllers. ICPs support a wide variety of I/O and serial communications cards. FF and DeviceNet protocols are the Project standard, when available; however, analog and discrete I/Os are required for some applications. Modbus and other serial communications cards may also be utilized for interfacing with package equipment, such as radiation monitoring instruments.

At the process level, individual transmitters and valves utilize FF protocol and communicate with the BPCS, using FF segments connected to FF communications modules on the ICP I/O Structure. A single FF field device may represent as many as five (5) variables, and each segment may have as many as sixteen (16) field devices connected. Where FF equipment is not available, other bus protocols, traditional analog and discrete I/O provide the field connectivity.

SIS controllers house an I/O carrier structure. Each main controller has slots for up to six (6) I/O modules which may be discrete, analog or communication protocol. Each remote controller allows for up to eight (8) I/O modules. The main SIS ICP contains a TMR controller and redundant power supplies while the auxiliary ICPs have redundant power supplies and are controlled by the main ICP.

3.4.4 Power Sources

In general, the DCS receives power from 120 volts alternating current (VAC) instrument power that is backed up with the UPS and the standby diesel generator (DG) that comes online when primary power is unavailable. Servers have on-board redundant power supplies fed from different power panel circuit breakers.

BPCS ICPs require a combination of 12 Volts Direct Current (VDC) and 24 VDC and SIS ICPs require 6.5 VDC for the back plane and module operations. To provide a high degree of reliability, each BPCS ICP is configured with redundant 12 VDC and 24 VDC bulk power supplies and each SIS ICP is configured with redundant 6.5 VDC power modules

The BPCS power supplies receive power from a 120 VAC instrument power panel that is backed up with the UPS and DG. SIS ICP-002 power is provided by two standard power circuits and one UPS circuit; SIS ICP-005 and ICP-016 each have power provided by one standard power circuit, one Stand-by Diesel Generator circuit and one UPS circuit. A separate calibration and test

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equipment power duplex receptacle is provided inside each BPCS ICP. This power is from a lighting panel and is for calibration and test equipment use.

3.4.5 System Flexibility

All DCS components are modular. Installed spare capability is distributed throughout the system. Replacement of cards, controllers, power conditioners, and power supplies can be easily accomplished with a like component from cabinet spare positions, facility spares, or vendor-supplied spares. All components are hot swappable, meaning that a component can be changed without powering down the system.

The DCS operations software provides a full complement of internal diagnostic programs to locate and identify problem components and software issues. In addition, routine maintenance and inspections are software prompt-initiated, performed to ensure maximum uptime for the system and discern trends that may need immediate or near-term attention.

3.4.6 Major Components

Major components of the DCS are:

- Servers,
- Control Software,
- Workstations (Operator, Engineering, Portable),
- Ethernet LAN,
- ICP housing:
  - Controllers (BPCS logic processors),
  - I/O Modules, and
  - SIS Logic Processor I/O modules,
- Field Devices:
  - Sensors and Elements,
  - Transmitters,
  - Automated Valves/Dampers and Controllers,
  - Motor Control and Monitoring Devices,
  - Gamma Detectors and Controller/Analyzer/Transmitters,
  - Turbidity Sensors and Analyzer/Transmitters, and
  - Local display gauges and devices.

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3.4.7 Instrument Loop Uncertainty and Setpoint Calculations

SIS instrument loop setpoints take into account loop uncertainty. The method for uncertainty calculations is described in ISA-RP67.04.02-2000, *Methodologies for the Determination of Setpoints for Nuclear Safety-Related Instrumentation*[93].

3.4.8 Alarm Management

The alarm philosophy is established and category descriptions are provided in P-DB-J-00004[22], the document that establishes an operational significance hierarchy. A prioritized alarm order is established and, when a higher-importance level alarm occurs, the higher priority alarm will be displayed above other active, lower priority alarms.

The most recent alarms are displayed on each operator's console. Additionally, one or more of the overhead screens is typically dedicated to displaying the current alarm list. All alarms are recorded, along with actions taken by the operators in the CR. Operations equipment and protocols ensure that all alarms are time-sequenced and recorded for future review and archiving.

Alarms from the SIS are displayed on a separate annunciator.

3.4.9 Data Management

The BPCS monitors, records, displays, and manages data related to the process and ancillary systems and stores the information in a historical server for near- and long-term retrieval, which supports status and analysis. Data is retrievable for process support, maintenance, and operational analysis and periodically downloaded to long-term archives.

3.4.10 Human Factors

The U.S. Department of Energy Guides and Standards, as well as nuclear materials processing industry practices, require consideration of the human factor elements in development of the detailed facility design. Human factors elements are heavily considered in CRs and at any HMI. Human factors evaluations focus on designing facilities, systems, equipment, and tools so they are sensitive to the capabilities, limitations, and needs of humans. Closely coupled is human reliability analysis, which quantifies the contribution of human error to the facility risk. These applicable requirements and standards are found in S-RCP-J-00001, *SWPF Standards/Requirements Identification Document*[94], NUREG-0700, *Human-System Interface Design Review Guidelines*[95], and Section 13 of S-SAR-J-00002[13].

3.4.11 System Control Features and Interlocks

3.4.11.1 System Monitoring

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The BPCS monitors and displays all process parameters and records the data in a data historian. In addition to providing process control monitoring, the BPCS is capable of running diagnostic software to monitor the health of the smart devices connected to its I/O structure and reporting the condition for corrective action. These diagnostic actions may be prompted, automatic, or a combination.

3.4.11.2 Control Functions

The BPCS performs all the non-safety automatic control functions. Its capabilities include single- and multi-variable control system algorithms, as well as batch routine software and simple interlock logic. These are used to execute the specific requirements of each part of the process, as described in the Scale Sheets and Software Requirement Specifications. The SIS performs all automatic safety functions.

3.4.11.3 Operator Access Security

The system is designed with access security so that operators may only access systems on which they are trained and authorized. Access may be granted to maintenance and technical personnel with systems training to support maintenance, operations analysis, testing, and modifications.

The BPCS logs access data and provides a secure historical log of operators and actions taken during operations and maintenance activities for reference and review. Operators have no access to alter the programming of the SIS.

3.5 Operations

3.5.1 Physical Location and Layout

The CR, which contains four (4) OWSs, the programming EWS, and the supervisor's console, is located in the northwest end of the Process Building inside the Performance Category (PC)-3/seismic containment structure. The servers and Ethernet LAN switches are located in the Information Technology (IT) equipment room adjacent to the CR. Redundant server equipment is located in the Administrative Building in Room 112B, Development/Simulator Network Room. The actual layout of the CR is depicted in drawing P-PG-J-0003, *SWPF Process Building General Arrangement Central Process Area Plan at Elevation 100'-0" (Unless otherwise noted) (U)*[96].

The CCA OWS is located in Room 156 of the CCA. Refer to the CCA General Arrangement drawing P-PG-J-0004, *SWPF Process Building General Arrangement Cold Chemicals Area Plan at Elevation 100'-0" (U)*[97] for the actual location.

The facility BPCS consoles are housed in an environmentally controlled CR within the Process Building. The servers are in an adjacent environmentally controlled server and support room, with connected cabling routed through embedded and overhead conduits for control and power cables in and out the CR and overhead in cable trays to the facility.

Sixteen (16) ICPs are located through the facility as follows:

- Three in the Cold Chemicals Electrical Room at Elevation (EL) 100',
- Two in the AFF Electrical Room at EL 100',

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- One in the Electrical Room at EL 100',
- One in the Mechanical Room at EL 100',
- Two in the Facility Support Area Control Entry Room at EL 100',
- One in the Contactor Variable Frequency Drive Room at EL 116',
- Four in the High-Efficiency Particulate Air (HEPA) Filter Staging Area at EL 139',
- Two in the IT Server room at EL 100'.

Three of these panels (ICP 2, ICP 5, and ICP 16) are for the SIS. The mounting of the SIS cabinets and the required post-seismic credited instruments (i.e., Turbidity Detectors, Barium-137 Decay Tank Gamma Monitor, and select process temperatures) are designed to PC-3 requirements, or analyzed to show that the fail-safe characteristics of the credited panel/instrument are preserved. The SIS panels are appropriately shielded from the effects of direct sprays and minor flooding events. Panels are NEMA 12 enclosures and bottom of panel will be elevated a minimum of six (6) inches above the finished floor elevation to eliminate the adverse effects of a flood. A loss of power to the SIS ICP unit would result in the safety equipment failing to its fail-safe position.

One panel (ICP-15) is identified for data communication to and from DWPF. Data required for product transfer will be handled by the DWPF DCS, which also communicates with Saltstone and the Tank Farm.

3.5.2 Initial Configuration

The BPCS and SIS configuration is based on final design documents. These include the P&IDs, Process and Engineering System Descriptions, Software Requirement Specifications, instrument database, and Scale Sheets. Configuration control is maintained in accordance with PP-EN-5025[15], as with any other SWPF equipment.

Configuration design will be reviewed in the same manner as other design documents produced, ensuring capture of process, engineering, and operational requirements in development of the HMI and logic configurations.

3.5.3 System Startup

The DCS is not a system that undergoes frequent startup and shutdown and the commissioning of the DCS is outside the scope of this document. Once commissioned, the DCS will normally remain operational.

3.5.4 Normal Operation

The DCS is expected to operate under all normal conditions. The system is redundant down to the I/O structure (instrument), which is not redundant. In all normal conditions, the DCS will be able to monitor and display the status of the process and any support systems availability

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3.5.5 Off-Normal and Recovery Operations

The DCS is highly redundant and modular; therefore, most individual equipment failures can be repaired by module replacement with minimal interruption.

Because of its high reliability, it is anticipated that the BPCS will be functional for all operations necessary to recover off-normal process upsets and interruptions short of the design seismic event.

3.5.6 System Shutdown

Once the DCS is operational, it will normally remain operational until the facility is decommissioned. System shutdown under normal conditions in the current design is not an expected scenario. Individual components, instruments, ICPs, and package systems control may be shut down as needed for maintenance, upgrade, or replacement. Should some incident cause a shutdown, the system is designed to fail-safe.

4.0 PUBLIC ADDRESS SYSTEM

4.1 System Functions

The PA system provides general paging and emergency notification functions for J-Area personnel.

4.1.1 Functional Classification

The PA system is functionally classified GS-1.

4.2 Operational Overview

The PA system supports local voice communications for operations, emergency event voice notification and instructions, and paging for personnel in J-Area. Notification from the SRSOC of emergency conditions or situations originating outside the area that may affect J-Area personnel are provided through the interface to SRSOC via the Selective Signal Telephone phone system, as described in V-ESR-J-00013, *SWPF Telecommunications and Controls Datalink System Interface Control Document (ICD-13)*[98].

4.3 Configuration Information

4.3.1 Description of System

The system central equipment is located in the Process Building IT Server Room with communication stations in the CR, SSP Room, and Administration Building. Sound reproduction equipment is located throughout J-Area outside and in the facility at designated locations. Voice activated light beacons are placed in areas classified as high noise. The system is designed to provide clear communications to all potentially occupied locations.

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The PA system receives a one volt (1V) peak-to-peak signal from the SRSOC remote paging system and other local paging inputs from telephone and/microphone sources. The paging signal is amplified in the master amplifier and distributed throughout the area to sound reproducing devices and other amplifiers via a 70.7 volt distribution system. Sound-reproducing devices are strategically placed in all buildings and the outside areas to provide coverage of the entire J-Area.

The power to the PA equipment is supplied by the Process Building UPS System.

The PA system is not designed to be operational after a natural phenomenon hazard event.

4.3.2 Major Components

The PA system major components are:

- Preamplifier and input controls,
- Amplifiers,
- Sound Reproduction Devices, and
- Voice Activated Beacon Lights.

4.3.3 Physical Location and Layout

Amplifiers are located throughout the facility as needed to support the sound reproduction devices need for full coverage. The master controls are located in the Process Building IT Server Room.

4.4 Operations

The PA system is part of the voice communications functions for normal and emergency operations. It is controlled for designated communications stations and the program software in the main controller station in the Process Building IT Server Room. Instructions for use are provided at the communications stations and in the facility phone instructions.

4.4.1 Normal Operations

The PA system is available for use through the CR, SSP Room, and Administration Building communication stations.

4.4.2 Off-Normal and Recovery Operations

The PA system is limited to CR, SSP Room, and Administration Building use during emergencies conditions and exercises.

4.4.3 System Shutdown

Should the system require a shutdown, an alternate system must be in place to provide essential J-Area and SRSOC communications.

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5.0 CLOSED CIRCUIT TELEVISION SYSTEM DESCRIPTION

5.1 System Functions

The CCTV system provides remote viewing in areas that are not directly accessible during operations. CCTV cameras are provided for the Process Cells, WTE, Drum Off/Decon Area, Operating Deck Crane, the filter removal cask, labyrinths, the Hot Cell Lab and the Hot Cell Lab Crane.

5.1.1 Functional Classification

The CCTV system is functionally classified GS-1.

5.2 Operational Overview

The CCTV system consists of cameras (wall-mounted, mechanized insertable, and crane mounted), local controller racks, an Ethernet network, local Ethernet switches, mobile camera control workstations, relay servers, a DCS interface and software.

The CCTV system provides visual support of all cameras. Remote monitoring and recording of video signals is available. Video can be displayed on the OWS in the CR or in the Simulator Room in the administrative building. Cameras with pan, tilt, and zoom (PTZ) can be remotely controlled from the OWS.

5.3 Configuration Information

5.3.1 Description of System

The CCTV system provides two cameras for the Operations Deck Crane, and two radiation-hardened Class 1, Division 2 portable cameras mounted in telescoping insertion units for Process Cells, East Caustic-side Solvent Extraction (CSSX) Tank Cell and WTE insertion through floor penetrations, should the need arise. All cameras are color with the exception of the camera mounted in the CSSX Labyrinth #2. In the Hot Cell Laboratory area, there are two through-the-wall radiation-hardened PTZ color cameras supporting the Hot Cell manipulators. The Hot Cell Crane has one radiation-hardened PTZ color camera. The CSSX has three color PTZ cameras. There are PTZ color cameras in the north and south Pump and Valve Gallery (P&VGs) for each of the pump rooms. There is one portable (pole mounted) and one fixed PTZ radiation-hardened color camera and holder for the one filter cask positioning assembly. The one portable (pole mounted) filter cask camera will also be utilized in the WTE with video feed back to the main CCTV cabinet located in the Process Building IT Server Room. There is one PTZ camera in the Drum Off Decon Room. All of these cameras have links to the CR and the Operations Deck crane's mounted cameras can be controlled from the mobile crane console. There are four mobile remote workstations to allow local monitoring and control of any of the cameras locally.

Crane cameras and interface electronics are provided to the crane vendor to incorporate into the crane superstructure. Other cameras are connected to a switcher system and server to allow the signals to be recorded and ported to the DCS for display on the OWS.

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5.3.2 Major Components

The major components of the system are:

- Cameras with PTZ,
- Interface racks,
- Ethernet network,
- Ethernet switches,
- Mobile workstations,
- Camera controllers, and
- DCS Interface.

5.3.3 Physical Location and Layout

The cameras are located in each labyrinth, on the Crane, in the Hot Cell, and in portable units on the Operating Deck. Cameras have cross site cables, which transmit to local controller racks. The video servers and other support equipment are located in the Process Building IT Server Room.

5.3.4 System Control Features and Interlocks

The system provides for remote control of all cameras from the CR. When required for maintenance, a camera may be controlled locally at the camera.

5.3.4.1 System Monitoring

The CCTV system is self-monitoring and has internal software diagnostics to evaluate the system status, which will be displayed in the CR.

5.3.4.2 Control Functions

The CCTV system provides visual support for the crane systems from the CR, and key facility area and room monitoring. During maintenance functions, it provides selective operational visual support.

5.4 Operations

5.4.1 Normal Operations

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The CCTV system is an indirect support system not essential to normal process operations. The Process Cell and East CSSX Tank Cell cameras are for event recovery inspection of equipment and piping. Items inserted in the Process Cells or East CSSX Tank Cells have an electrical Safety Classification of Class 1, Div. 2, and Group B. The cell penetration plug is removed and the mechanized insertion unit is positioned with the help of the overhead crane over the hole. The camera insertion unit is connected to the mobile camera control module and the wall box linking it to the CR. The insertion unit telescopes the radiation-hardened camera unit down into the cell and the controllers control the camera movements. The Process Cell unit is stored on the Operating Deck and the East CSSX Tank Cell unit is stored on the tank cell operating deck. Similar units with camera and mechanized insertion unit are provided for the East CSSX Tank Cell. This unit is stored in the CSSX Tank cell Operating Deck.

The filter cask positioning platform cameras provide visual operations support for the filter head unbolting and bolting, filter head removal/reinstallation, and removal and insertion of filter units. The filter cask positioning platform cameras are stored in the instrument calibration shop when not in use. They are easily insertable and removable from the service platform. When removed, the units must be bagged and decontaminated prior to storage.

The WTE camera is for event recovery inspection of equipment and piping. The WTE penetration plug is removed and the portable pole mounted camera is inserted into the penetration. Video feedback is sent to the CR with operations of the PTZ camera controlled locally only.

The Laboratory Hot Cell through-the-wall cameras provide visual support for Hot Cell operations and visual zoom for sampler and manipulator operations. The single crane-mounted camera in the Hot Cell provides the visual operations support to move sample bottles from/to sampler stations and in/out of the Hot Cell. The through-the-wall cameras must be physically moved from manipulator station to manipulator station.

The north and south P&VG labyrinth cameras are wall mounted PTZ camera units that visually monitor equipment and maintenance operations. The CSSX cameras are used to visually monitor the equipment and maintenance operations in the Contactor Room. These units are mounted on the side wall in the Contactor Room. A camera port is provided to support maintenance operations in the East CSSX Tank Cell; however, the camera is not permanently installed. A wall mounted PTZ camera is also provided for the Drum Off/Decon Area.

All of the cameras are designed for the hazardous and radiological environments in which they are used. The lenses are the most common degradation items that must be periodically replaced.

6.0 ACCESS CONTROL SYSTEM

6.1 System Functions

The Access Control System provides security for the Property Protection Area and personnel location accountability for operations and emergency events. The system also includes the electronically activated door locks, card readers, computers, and other such equipment used to monitor and control facility access to the J-Area and buildings.

6.1.1 Functional Classification

The Facility Access System is functionally classified as GS-2.

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6.2 Operational Overview

6.3 Configuration Information

A series of card readers are installed at strategic locations and at all electronically locked doors. The card readers are linked to an access control server that provides verification of the card and records the entry/exit activity.

6.3.1 Description of System

The Access Control System consists of the card readers, computer, and software used to control entry into J-Area and the Process Building. Personnel will pass their individual cards by the readers and gain access to J-Area and the Process Building. Scanning out is only required when exiting J-Area. The system monitors and logs any opening of Emergency Egress Only doors.

6.3.2 Major Components

The major system components are:

- Card readers,
- Computer,
- Access Control Software,
- Electronic Door Locks, and
- Cabling.

6.3.3 Physical Location and Layout

A series of card readers are installed at the entry turnstiles and at all electronically locked doors. Access points into and between different levels of control access areas of the Process Building provide location and accountability for persons in hazardous and radioactive areas. The access control server (computer) is located in the Process Building IT Server Room.

6.3.4 System Control Features and Interlocks

Only authorized badges will open electronically locked doors or allow the turnstiles to rotate. Badges may be coded to only allow access to specific areas for which a person is trained and cleared from the CR to access.

6.3.4.1 System Monitoring

The Access Control System is monitored by Operations.

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6.3.4.2 Control Functions

The Access Control System can disallow, allow, or limit access to specific areas of the facility by authorized individuals. The CR or Security Office can manually control personnel access.

6.4 Operations

The Access Control System is an integral part of the facility and area security, safety, personnel accountability, and the general administration of operations.

6.4.1 Initial Configuration

The Access Control System will be set for the startup and Commissioning organizational functions and then be revised to stricter requirements when radioactive material is introduced into the facility. The system is flexible to add additional functions and provide historical log data and reports.

6.4.2 Normal Operations

In normal operations, the Access Control System provides access control to J-Area and the Process Building and monitors Emergency Exit Only doors for activity. It maintains a list of personnel located within the J-Area perimeter. The Access Control System is always in operation, beginning with Construction and continuing throughout the life of the facility.

6.4.3 Off-Normal and Recovery Operations

Loss of the Access Control System will necessitate administrative action to execute its functions until it is operational. The system is provided with self-contained battery backup.

This is a property protection area only and doors will fail unlocked.

7.0 RADIO COMMUNICATIONS SYSTEM

7.1 System Functions

The Radio Communications System provides mobile voice communications for the daily activities of SWPF operations and maintenance. The radio system also provides a required backup connection to SRSOC if other communications are down.

7.1.1 Functional Classification

The Radio Communication System has been identified as a GS-2 function.

7.2 Operational Overview

Hand-held radios provide two-way radio communications between J-Area operations and maintenance personnel. The system also supports the Site emergency response teams' radio

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communications when required to enter the Process Building, as well as facility maintenance and alternate communications.

7.3 Configuration Information

7.3.1 Description of System

The Radio Communication System is an extension of the existing SRS trunking radio system. For SWPF, a new call group will be created. Fixed and hand-held radios, with accessories as required, are provided for operations use. Where required, the system will include an in-building repeater system to ensure 2-way communications throughout the Process Building which would normally act as a shield preventing radio communications.

7.3.2 Major Components

The major components are:

- Handheld Radios,
- Fixed Radios (Base Station), and
- Repeaters (where required in the Process Building).

7.3.3 Physical Location and Layout

Any required in-building repeaters will be installed in the Process Building. Two fixed radios are currently planned, one located in the CR and the other in the SSP Room. Hand-held radios will be issued as required to support operations and maintenance.

8.0 COMMUNICATIONS PATHWAYS AND CABLE

8.1 System Functions

The Communications pathways and cable comprise the CP which supports the telephone and data system. These systems provide the normal and emergency voice and data communication for facility communications. The telephone portion of the system is designed around Plain Old Telephone Service (POTS), per V-ESR-J-00013[98], with copper backbone and copper laterals. The data portion of the system is designed for Category 6 communications with copper laterals and fiber optic backbone. Interfaces are described in V-ESR-J-00013[98].

8.1.1 Functional Classification

The CP is designated GS-2.

8.2 Operational Overview

The CP provides the wire, cable, and fiber for facilities telephone and data systems.

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8.3 Configuration Information

8.3.1 Description of System

The initial CP will emanate from the temporary telecommunications trailer to outlying construction facilities and the Administration Building, as necessary, to support construction activities. Copper and fiber backbones are provided by the Site Management & Operating (M&O) at this location for use in the Construction phase of the Project. During the second stage, the Site M&O will provide copper and fiber backbones to the Process Building IT Server Room adjacent to the CR. Copper and fiber will then be expanded from this location to all permanent facilities, including the Administration Building, where the construction connections will be dismantled and removed and the final system tied in.

There are plans for two separate Ethernet networks in the facility/area providing data communications with separation and control to prevent cross-connection. One Ethernet link is for Parsons on- and off-site communications and the second is dedicated to the SRS and ShRINE networks outside of SWPF J-Area.

A POTS will be installed by the Engineering, Procurement, and Construction (Contractor) and maintained by the Site M&O, per V-ESR-J-00013[98]. There will be two services installed, the first for Construction and the second for Operations. There will be an overlap of these services. In the end, all telephones will be connected via the Process Building IT Server Room and the construction service will be removed.

8.3.2 Major Components

The CP major components are:

- Distribution Frames,
- Termination Patch Panels,
- Copper Data Cable, and
- Fiber Optic Cable.

8.4 Physical Location and Layout

The temporary IT room is in the telecommunication trailer, which will be operational for the duration of construction activity.

The permanent IT room is adjacent to the CR and will be operational sometime late in the Construction phase.

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