2.2.3 Safety Injection System and Residual Heat Removal System

Design Description

1.0 System Description

The safety injection system and residual heat removal system (SIS/RHRS) is a safety-related system. The SIS/RHRS has four divisions. The SIS/RHRS provides the following safety-related functions:

- Emergency core cooling.
- Residual heat removal.
- Reactor coolant pressure boundary integrity.
- Containment isolation.

2.0 Arrangement

2.1 The functional arrangement of the SIS/RHRS is as described in the Design Description of Section 2.2.3, Tables 2.2.3-1—SIS/RHRS Equipment Mechanical Design and 2.2.3-2—SIS/RHRS Equipment I&C and Electrical Design, and as shown on Figure 2.2.3-1—Safety Injection System and Residual Heat Removal System Functional Arrangement.

2.2 Deleted.

2.3 Physical separation exists between divisions of the SIS/RHRS located in the Safeguard Buildings as listed in Table 2.2.3-1 and as shown on Figure 2.2.3-1.

3.0 Mechanical Design Features

3.1 Pumps and valves listed in Table 2.2.3-1 will be functionally designed and qualified such that each pump and valve is capable of performing its intended function under the full range of fluid flow, differential pressure, electrical conditions, and temperature conditions with debris-laden coolant fluids up to and including design basis accident conditions.

3.2 Check valves listed in Table 2.2.3-1 will function to change position as listed in Table 2.2.3-1 under normal operating conditions.

3.3 Deleted.

3.4 Equipment identified as Seismic Category I in Table 2.2.3-1 can withstand seismic design basis loads without a loss of safety function(s).

3.5 Deleted.

3.6 Deleted.

3.7 Deleted.

3.8 Deleted.

3.9 Deleted.

3.10 Deleted.

3.11 Deleted.

3.12 Deleted.

3.13 Deleted.

3.14 Deleted.

3.15 ASME Code Class1 and 2 piping systems are designed in accordance with ASME Code Section III requirements.

3.16 As-built ASME Code Class 1 and 2 components listed in Table 2.2.3-1 are reconciled with the design requirements.

3.17 Pressure-boundary welds in ASME Code Class 1 and 2 components listed in Table 2.2.3-1 meet ASME Code Section III non-destructive examination requirements.

3.18 ASME Code Class 1 and 2 components listed in Table 2.2.3-1 retain their pressure-boundary integrity at their design pressure.

3.19 ASME Code Class 1 and 2 components listed in Table 2.2.3-1 are fabricated, installed, and inspected in accordance with ASME Code Section III requirements.

4.0 I&C Design Features, Displays, and Controls

4.1 Displays listed in Table 2.2.3-2 are indicated on the PICS operator workstations in the main control room (MCR) and the remote shutdown station (RSS).

4.2 Controls on the PICS operator workstations in the MCR and the RSS perform the function listed in Table 2.2.3-2.

4.3 Equipment listed as being controlled by a priority and actuator control system (PACS) module in Table 2.2.3-2 responds to the state requested and provides drive monitoring signals back to the PACS module. The PACS module will protect the equipment by terminating the output command upon the equipment reaching the requested state.

4.4 Interlocks for the SIS/RHRS initiate the following:

- Opening of the accumulator injection path.
- Opening authorization of the residual heat removal system suction path from the reactor coolant system.

- Opening authorization of the hot-leg safety injection path.

5.0 Electrical Power Design Features

5.1 Equipment designated as Class 1E in Table 2.2.3-2 are powered from the Class 1E division as listed in Table 2.2.3-2 in a normal or alternate feed condition.

5.2 Deleted.

6.0 Environmental Qualifications

6.1 Equipment designated as harsh environment in Table 2.2.3-2 can perform the function listed in Table 2.2.3-1 under normal environmental conditions, containment test conditions, anticipated operational occurrences, and accident and post-accident environmental conditions.

7.0 Equipment and System Performance

7.1 Each SIS/RHRS heat exchangers listed in Table 2.2.3-1 has the capacity to transfer the design heat load to the component cooling water system (CCWS).

7.2 The accumulators listed in Table 2.2.3-1 provide a storage volume for emergency core cooling.

7.3 Each accumulator injection line to the RCS cold leg has a minimum head loss coefficient (fL/D + K).

7.4 The pumps listed in Table 2.2.3-1 have net positive suction head available (NPSHA) that is greater than net positive suction head required (NPSHR) at system run-out flow.

7.5 The SIS/RHRS delivers water to the reactor coolant system (RCS) for core cooling.

7.6 Deleted.

7.7 Class 1E valves listed in Table 2.2.3-2 will function to change position as listed in Table 2.2.3-1 under normal operating conditions.

7.8 The SIS/RHRS has provisions to allow flow testing of each SIS/RHRS pump during plant operation.

7.9 Safety injection pumped flow will be delivered to the RCS before the maximum elapsed time.

7.10 Each LHSI pump delivers water to its respective RCS hot leg.

7.11 Deleted.

7.12 LHSI heat exchanger cools the post-LOCA fluid for a minimum of 30 days.

7.13 LHSI and MHSI systems provide safety injection flow to the RCS during post-LOCA operation.

7.14 The SIS/RHRS includes high point vents to avoid gas accumulation in the SIS/RHRS.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.2.3-3 lists the SIS/RHRS ITAAC.

Table 2.2.3-1—SIS/RHRS Equipment Mechanical Design
Sheet 1 of 8

Description	Tag Number(1)	Location	ASME Code Section III	Function	Seismic Category
RHR 1st RCPB Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNA10AA001 (30JNA20AA001) (30JNA30AA001) (30JNA40AA001)	Reactor Building	Yes	Open / Close	I
RHR 2nd RCPB Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNA10AA002 (30JNA20AA002) (30JNA30AA002) (30JNA40AA002)	Reactor Building	Yes	Open / Close	I
RHR Outside Containment Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNA10AA003 (30JNA20AA003) (30JNA30AA003) (30JNA40AA003)	Safeguard Building 1 (Safeguard Building 2) (Safeguard Building 3) (Safeguard Building 4)	Yes	Open / Close	I
LHSI Heat Exchanger Bypass Control Valve Division 1 (Division 2, Division 3, Division 4)	30JNA10AA101 (30JNA20AA101) (30JNA30AA101) (30JNA40AA101)	Safeguard Building 1 (Safeguard Building 2) (Safeguard Building 3) (Safeguard Building 4)	Yes	Open / Close	I
LHSI Heat Exchanger Bypass Isolation Valve on Purification Line to CVCS Division 3 (Division 4)	30JNA30AA004 (30JNA40AA004)	Safeguard Building 3 (Safeguard Building 4)	Yes	Close	I
LHSI Heat Exchanger Bypass Throttle Valve on Purification Line to CVCS Division 3 (Division 4)	30JNA30AA103 (30JNA40AA103)	Safeguard Building 3 (Safeguard Building 4)	Yes	Close	I

Table 2.2.3-1—SIS/RHRS Equipment Mechanical Design
Sheet 2 of 8

Description	Tag Number(1)	Location	ASME Code Section III	Function	Seismic Category
MHSI Pump Division 1 (Division 2, Division 3, Division 4)	30JND10AP001 (30JND20AP001) (30JND30AP001) (30JND40AP001)	Safeguard Building 1 (Safeguard Building 2) (Safeguard Building 3) (Safeguard Building 4)	Yes	Run	I
MHSI Suction Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JND10AA001 (30JND20AA001) (30JND30AA001) (30JND40AA001)	Safeguard Building 1 (Safeguard Building 2) (Safeguard Building 3) (Safeguard Building 4)	Yes	Open / Close	I
MHSI Outside Containment Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JND10AA002 (30JND20AA002) (30JND30AA002) (30JND40AA002)	Safeguard Building 1 (Safeguard Building 2) (Safeguard Building 3) (Safeguard Building 4)	Yes	Open / Close	I
MHSI 2nd RCPB Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JND10AA003 (30JND20AA003) (30JND30AA003) (30JND40AA003)	Reactor Building	Yes	Open / Close	I
MHSI Small Miniflow Line Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JND10AA004 (30JND20AA004) (30JND30AA004) (30JND40AA004)	Reactor Building	Yes	Open	I
MHSI Large Miniflow Line Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JND10AA005 (30JND20AA005) (30JND30AA005) (30JND40AA005)	Reactor Building	Yes	Open / Close	I

Table 2.2.3-1—SIS/RHRS Equipment Mechanical Design
Sheet 3 of 8

Description	Tag Number(1)	Location	ASME Code Section III	Function	Seismic Category
MHSI Control Valve Division 1 (Division 2, Division 3, Division 4)	30JND10AA103 (30JND20AA103) (30JND30AA103) (30JND40AA103)	Reactor Building	Yes	Open / Close	I
MHSI Inside Containment Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JND10AA007 (30JND20AA007) (30JND30AA007) (30JND40AA007)	Reactor Building	Yes	Open / Close	I
Primary Coolant Injection Pump Suction Isolation Valve	30JND11AA008	Safeguard Building 1	Yes	Close	I
Primary Coolant Injection Pump Suction Isolation Valve	30JND11AA009	Safeguard Building 1	Yes	Close	I
Primary Coolant Injection Outside Containment Isolation Valve	30JND11AA012	Safeguard Building 1	Yes	Close	I
LHSI Pump Division 1 (Division 2, Division 3, Division 4)	30JNG10AP001 (30JNG20AP001) (30JNG30AP001) (30JNG40AP001)	Safeguard Building 1 (Safeguard Building 2) (Safeguard Building 3) (Safeguard Building 4)	Yes	Run	I
LHSI Heat Exchanger Division 1 (Division 2, Division 3, Division 4)	30JNG10AC001 (30JNG20AC001) (30JNG30AC001) (30JNG40AC001)	Safeguard Building 1 (Safeguard Building 2) (Safeguard Building 3) (Safeguard Building 4)	Yes	Heat Transfer Device	I

Table 2.2.3-1—SIS/RHRS Equipment Mechanical Design
Sheet 4 of 8

Description	Tag Number(1)	Location	ASME Code Section III	Function	Seismic Category
SIS Accumulator Division 1 (Division 2, Division 3, Division 4)	30JNG13BB001 (30JNG23BB001) (30JNG33BB001) (30JNG43BB001)	Reactor Building	Yes	Storage Volume	I
LHSI Suction Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNG10AA001 (30JNG20AA001) (30JNG30AA001) (30JNG40AA001)	Safeguard Building 1 (Safeguard Building 2) (Safeguard Building 3) (Safeguard Building 4)	Yes	Open / Close	I
LHSI Radial Miniflow Line Check Valve Division 1 (Division 2, Division 3, Division 4)	30JNG10AA003 (30JNG20AA003) (30JNG30AA003) (30JNG40AA003)	Reactor Building	Yes	Close	I
LHSI Tangential Miniflow Line Check Valve Division 1 (Division 2, Division 3, Division 4)	30JNG10AA004(30JNG20AA004)(30JNG30AA004)(30JNG40AA004)	Reactor Building	Yes	Open / Close	I
LHSI 2nd RCPB Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNG10AA006 (30JNG20AA006) (30JNG30AA006) (30JNG40AA006)	Reactor Building	Yes	Open / Close	I
LHSI Inside Containment Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNG10AA009 (30JNG20AA009) (30JNG30AA009) (30JNG40AA009)	Reactor Building	Yes	Open / Close	I

Table 2.2.3-1—SIS/RHRS Equipment Mechanical Design
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Description	Tag Number(1)	Location	ASME Code Section III	Function	Seismic Category
LHSI Cross-Connect Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNG10AA010 (30JNG20AA010) (30JNG30AA010) (30JNG40AA010)	Reactor Building	Yes	Open / Close	I
LHSI Cross-Connect Check Valve Division 1 (Division 2, Division 3, Division 4)	30JNG10AA011 (30JNG20AA011) (30JNG30AA011) (30JNG40AA011)	Reactor Building	Yes	Open / Close	I
LHSI Outside Containment Main Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNG10AA060 (30JNG20AA060) (30JNG30AA060) (30JNG40AA060)	Safeguard Building 1 (Safeguard Building 2) (Safeguard Building 3) (Safeguard Building 4)	Yes	Open / Close	I
LHSI Outside Containment Bypass Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNG10AA061 (30JNG20AA061) (30JNG30AA061) (30JNG40AA061)	Safeguard Building 1 (Safeguard Building 2) (Safeguard Building 3) (Safeguard Building 4)	Yes	Open / Close	I
LHSI Heat Exchanger Main Control Valve Division 1 (Division 2, Division 3, Division 4)	30JNG10AA102 (30JNG20AA102) (30JNG30AA102) (30JNG40AA102)	Safeguard Building 1 (Safeguard Building 2) (Safeguard Building 3) (Safeguard Building 4)	Yes	Open / Close	I
LHSI Control Valve Division 1 (Division 2, Division 3, Division 4)	30JNG10AA106 (30JNG20AA106) (30JNG30AA106) (30JNG40AA106)	Reactor Building	Yes	Open / Close	I

Table 2.2.3-1—SIS/RHRS Equipment Mechanical Design
Sheet 6 of 8

Description	Tag Number(1)	Location	ASME Code Section III	Function	Seismic Category
LHSI Hot Leg Injection Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNG12AA001 (30JNG22AA001) (30JNG32AA001) (30JNG42AA001)	Safeguard Building 1 (Safeguard Building 2) (Safeguard Building 3) (Safeguard Building 4)	Yes	Open / Close	I
LHSI Hot Leg Injection Check Valve Division 1 (Division 2, Division 3, Division 4)	30JNG12AA002 (30JNG22AA002) (30JNG32AA002) (30JNG42AA002)	Safeguard Building 1 (Safeguard Building 2) (Safeguard Building 3) (Safeguard Building 4)	Yes	Open / Close	I
Accumulator Filling Line Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNG13AA002 (30JNG23AA002) (30JNG33AA002) (30JNG43AA002)	Reactor Building	Yes	Close	I
SIS 1st RCPB Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNG13AA005 (30JNG23AA005) (30JNG33AA005) (30JNG43AA005)	Reactor Building	Yes	Open / Close	I
Accumulator-Nitrogen Distribution Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNG13AA006 (30JNG23AA006) (30JNG33AA006) (30JNG43AA006)	Reactor Building	Yes	Close	I
Accumulator Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNG13AA008 (30JNG23AA008) (30JNG33AA008) (30JNG43AA008)	Reactor Building	Yes	Open / Close	I

Table 2.2.3-1—SIS/RHRS Equipment Mechanical Design
Sheet 7 of 8

Description	Tag Number(1)	Location	ASME Code Section III	Function	Seismic Category
Accumulator Check Valve Division 1 (Division 2, Division 3, Division 4)	30JNG13AA009 (30JNG23AA009) (30JNG33AA009) (30JNG43AA009)	Reactor Building	Yes	Open / Close	I
Accumulator Depressurization Control Valve Division 1 (Division 2, Division 3, Division 4)	30JNG13AA101 (30JNG13AA101) (30JNG33AA101) (30JNG43AA101)	Reactor Building	Yes	Close	I
Accumulator Depressurization Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNG13AA502 (30JNG23AA502) (30JNG33AA502) (30JNG43AA502)	Reactor Building	Yes	Close	I
Dead Leg Pressurization Valve Division 1 (Division 2, Division 3, Division 4)	30JNG15AA001 (30JNG25AA001) (30JNG35AA001) (30JNG45AA001)	Reactor Building	Yes	Close	I
RCS Suction Line Pressurization Valve Division 1 (Division 2, Division 3, Division 4)	30JNG15AA002 (30JNG25AA002) (30JNG35AA002) (30JNG45AA002)	Reactor Building	Yes	Close	I
Dead Leg Pressure Bypass Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNG15AA003 (30JNG25AA003) (30JNG35AA003) (30JNG45AA003)	Reactor Building	Yes	Close	I

Table 2.2.3-1—SIS/RHRS Equipment Mechanical Design
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Description	Tag Number(1)	Location	ASME Code Section III	Function	Seismic Category
Dead Leg Pressure Control Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNG15AA004 (30JNG25AA004) (30JNG35AA004) (30JNG45AA004)	Reactor Building	Yes	Close	I
SAHRS-IRWSTS 1st Isolation Valve Division 4	30JNG40AA007	Safeguard Building 4	Yes	Close	I
SAHRS-IRWSTS 2nd Isolation Valve Division 4	30JNG40AA008	Safeguard Building 4	Yes	Close	I

1. Equipment tag numbers are provided for information only and are not part of the certified design.

Table 2.2.3-2—SIS/RHRS Equipment I&C and Electrical Design
Sheet 1 of 7

Description	Tag Number(1)	Location	IEEE Class 1E(2)	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
RHR 1st RCPB Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNA10AA001 (30JNA20AA001) (30JNA30AA001) (30JNA40AA001)	Reactor Building	$1^N / 2^A$ ($2^N / 1^A$) ($3^N / 4^A$) ($4^N / 3^A$)	Yes	Yes	Position / Position	Open-Close / Open-Close
RHR 2nd RCPB Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNA10AA002 (30JNA20AA002) (30JNA30AA002) (30JNA40AA002)	Reactor Building	$2^N / 1^A$ ($1^N / 2^A$) ($4^N / 3^A$) ($3^N / 4^{A)}$	Yes	Yes	Position / Position	Open-Close / Open-Close
RHR Outside Containment Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNA10AA003 (30JNA20AA003) (30JNA30AA003) (30JNA40AA003)	Safeguard Building 1 (Safeguard Building 2) (Safeguard Building 3) (Safeguard Building 4)	$1^N / 2^A$ ($2^N / 1^A$) ($3^N / 4^A$) ($4^N / 3^A$)	Yes	Yes	Position / Position	Open-Close / Open-Close
LHSI Heat Exchanger Bypass Control Valve Division 1 (Division 2, Division 3, Division 4)	30JNA10AA101 (30JNA20AA101) (30JNA30AA101) (30JNA40AA101)	Safeguard Building 1 (Safeguard Building 2) (Safeguard Building 3) (Safeguard Building 4)	$1^N / 2^A$ ($2^N / 1^A$) ($3^N / 4^A$) ($4^N / 3^A$)	Yes	Yes	Position / Position	Open-Close / Open-Close
LHSI Heat Exchanger Bypass Isolation Valve on Purification Line to CVCS Division 3 (Division 4)	30JNA30AA004 (30JNA40AA004)	Safeguard Building 3 (Safeguard Building 4)	$3^N / 4^A$ ($4^N / 3^A$)	Yes	Yes	Position / Position	Open-Close / Open-Close

Table 2.2.3-2—SIS/RHRS Equipment I&C and Electrical Design
Sheet 2 of 7

Description	Tag Number(1)	Location	IEEE Class 1E(2)	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
LHSI Heat Exchanger Bypass Throttle Valve on Purification Line to CVCS Division 3 (Division 4)	30JNA30AA103 (30JNA40AA103)	Safeguard Building 3 (Safeguard Building 4)	$3^N / 4^A$ ($4^N / 3^A$)	Yes	Yes	Position / Position	Open-Close / Open-Close
MHSI Pump Division 1 (Division 2, Division 3, Division 4)	30JND10AP001 (30JND20AP001) (30JND30AP001) (30JND40AP001)	Safeguard Building 1 (Safeguard Building 2) (Safeguard Building 3) (Safeguard Building 4)	1 (2) (3) (4)	Yes	Yes	On-Off / On-Off	Start-Stop / Start-Stop
MHSI Outside Containment Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JND10AA002 (30JND20AA002) (30JND30AA002) (30JND40AA002)	Safeguard Building 1 (Safeguard Building 2) (Safeguard Building 3) (Safeguard Building 4)	$1^N / 2^A$ ($2^N / 1^A$) ($3^N / 4^A$) ($4^N / 3^A$)	Yes	Yes	Position / Position	Open-Close / Open-Close
Primary Coolant Injection Outside Containment Isolation Valve	30JND11AA012	Safeguard Building 1	$1^N / 2^A$	Yes	Yes	Position / Position	Open-Close / Open-Close
MHSI Small Miniflow Line Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JND10AA004 (30JND20AA004) (30JND30AA004) (30JND40AA004)	Reactor Building	$1^N / 2^A$ ($2^N / 1^A$) ($3^N / 4^A$) ($4^N / 3^A$)	Yes	Yes	Position / Position	Open-Close / Open-Close
MHSI Large Miniflow Line Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JND10AA005 (30JND20AA005) (30JND30AA005) (30JND40AA005)	Reactor Building	$1^N / 2^A$ ($2^N / 1^A$) ($3^N / 4^A$) ($4^N / 3^A$)	Yes	Yes	Position / Position	Open-Close / Open-Close

Table 2.2.3-2—SIS/RHRS Equipment I&C and Electrical Design
Sheet 3 of 7

Description	Tag Number(1)	Location	IEEE Class 1E(2)	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
LHSI Control Valve Division 1 (Division 2, Division 3, Division 4)	30JND10AA106 (30JND20AA106) (30JND30AA106) (30JND40AA106)	Reactor Building	$1^N / 2^N$ ($2^N / 1^N$) ($3^N / 4^N$) ($4^N / 3^N$)	Yes	Yes	Position / Position	Open-Close / Open-Close
LHSI Pump Division 1 (Division 2, Division 3, Division 4)	30JNG10AP001 (30JNG20AP001) (30JNG30AP001) (30JNG40AP001)	Safeguard Building 1 (Safeguard Building 2) (Safeguard Building 3) (Safeguard Building 4)	1 (2) (3) (4)	Yes	Yes	On-Off / On-Off	Start-Stop / Start-Stop
LHSI Suction Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNG10AA001 (30JNG20AA001) (30JNG30AA001) (30JNG40AA001)	Safeguard Building 1 (Safeguard Building 2) (Safeguard Building 3) (Safeguard Building 4)	$1^N / 2^N$ ($2^N / 1^N$) ($3^N / 4^A$) ($4^N / 3^A$)	Yes	Yes	Position / Position	Open-Close / Open-Close
LHSI Radial Miniflow Line Check Valve Division 1 (Division 2, Division 3, Division 4)	30JNG10AA003 (30JNG20AA003) (30JNG30AA003) (30JNG40AA003)	Reactor Building	$1^N / 2^A$ ($2^N / 1^A$) ($3^N / 4^A$) ($4^N / 3^A$)	Yes	Yes	Position / Position	Open-Close / Open-Close
LHSI Tangential Miniflow Line Check Valve Division 1 (Division 2, Division 3, Division 4)	30JNG10AA004 (30JNG20AA004) (30JNG30AA004) (30JNG40AA004)	Reactor Building	$1^N / 2^A$ ($2^N / 1^A$) ($3^N / 4^A$) ($4^N / 3^A$)	Yes	Yes	Position / Position	Open-Close / Open-Close

Table 2.2.3-2—SIS/RHRS Equipment I&C and Electrical Design
Sheet 4 of 7

Description	Tag Number(1)	Location	IEEE Class 1E(2)	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
LHSI Cross-Connect Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNG10AA010 (30JNG20AA010) (30JNG30AA010) (30JNG40AA010)	Reactor Building	$1^N / 2^A$ $(2^N / 1^A)$ $(3^N / 4^A)$ $(4^N / 3^A)$	Yes	Yes	Position / Position	Open-Close / Open-Close
LHSI Outside Containment Main Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNG10AA060 (30JNG20AA060) (30JNG30AA060) (30JNG40AA060)	Safeguard Building 1 (Safeguard Building 2) (Safeguard Building 3) (Safeguard Building 4)	$1^N / 2^A$ $(2^N / 1^A)$ $(3^N / 4^A)$ $(4^N / 3^A)$	Yes	Yes	Position / Position	Open-Close / Open-Close
LHSI Outside Containment Bypass Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNG10AA061 (30JNG20AA061) (30JNG30AA061) (30JNG40AA061)	Safeguard Building 1 (Safeguard Building 2) (Safeguard Building 3) (Safeguard Building 4)	$1^N / 2^A$ $(2^N / 1^A)$ $(3^N / 4^A)$ $(4^N / 3^A)$	Yes	Yes	Position / Position	Open-Close / Open-Close
LHSI Heat Exchanger Main Control Valve Division 1 (Division 2, Division 3, Division 4)	30JNG10AA102 (30JNG20AA102) (30JNG30AA102) (30JNG40AA102)	Safeguard Building 1 (Safeguard Building 2) (Safeguard Building 3) (Safeguard Building 4)	$1^N / 2^A$ $(2^N / 1^A)$ $(3^N / 4^A)$ $(4^N / 3^A)$	Yes	Yes	Position / Position	Open-Close / Open-Close
LHSI Control Valve Division 1 (Division 2, Division 3, Division 4)	30JNG10AA106 (30JNG20AA106) (30JNG30AA106) (30JNG40AA106)	Reactor Building	$1^N / 2^A$ $(2^N / 1^A)$ $(3^N / 4^A)$ $(4^N / 3^A)$	Yes	Yes	Position / Position	Open-Close / Open-Close

Table 2.2.3-2—SIS/RHRS Equipment I&C and Electrical Design
Sheet 5 of 7

Description	Tag Number(1)	Location	IEEE Class 1E(2)	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
LHSI Hot Leg Injection Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNG12AA001 (30JNG22AA001) (30JNG32AA001) (30JNG42AA001)	Safeguard Building 1 (Safeguard Building 2) (Safeguard Building 3) (Safeguard Building 4)	$1^N / 2^A$ ($2^N / 1^A$) ($3^N / 4^A$) ($4^N / 3^A$)	Yes	Yes	Position / Position	Open-Close / Open-Close
Accumulator Filling Line Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNG13AA002 (30JNG23AA002) (30JNG33AA002) (30JNG43AA002)	Reactor Building	$1^N / 2^A$ ($2^N / 1^A$) ($3^N / 4^A$) ($4^N / 3^A$)	Yes	Yes	Position / Position	Open-Close / Open-Close
Accumulator-Nitrogen Distribution Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNG13AA006 (30JNG23AA006) (30JNG33AA006) (30JNG43AA006)	Reactor Building	N/A	Yes	N/A	Position / N/A	Open-Close / N/A
Accumulator Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNG13AA008 (30JNG23AA008) (30JNG33AA008) (30JNG43AA008)	Reactor Building	$1^N / 2^A$ ($2^N / 1^A$) ($3^N / 4^A$) ($4^N / 3^A$)	Yes	Yes	Position / Position	Open-Close / Open-Close
Accumulator Depressurization Control Valve Division 1 (Division 2, Division 3, Division 4)	30JNG13AA101 (30JNG13AA101) (30JNG33AA101) (30JNG43AA101)	Reactor Building	N/A	Yes	N/A	Position / N/A	Open-Close / N/A

Table 2.2.3-2—SIS/RHRS Equipment I&C and Electrical Design
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Description	Tag Number(1)	Location	IEEE Class 1E(2)	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
Accumulator Depressurization Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNG13AA502 (30JNG23AA502) (30JNG33AA502) (30JNG43AA502)	Reactor Building	N/A	Yes	N/A	Position / N/A	Open-Close / N/A
Dead Leg Pressurization Valve Division 1 (Division 2, Division 3, Division 4)	30JNG15AA001 (30JNG25AA001) (30JNG35AA001) (30JNG45AA001)	Reactor Building	$1^N / 2^A$ ($2^N / 1^A$) ($3^N / 4^A$) ($4^N / 3^A$)	Yes	Yes	Position / Position	Open-Close / Open-Close
RCS Suction Line Pressurization Valve Division 1 (Division 2, Division 3, Division 4)	30JNG15AA002 (30JNG25AA002) (30JNG35AA002) (30JNG45AA002)	Reactor Building	$1^N / 2^A$ ($2^N / 1^A$) ($3^N / 4^A$) ($4^N / 3^A$)	Yes	Yes	Position / Position	Open-Close / Open-Close
Dead Leg Pressure Bypass Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNG15AA003 (30JNG25AA003) (30JNG35AA003) (30JNG45AA003)	Reactor Building	$1^N / 2^A$ ($2^N / 1^A$) ($3^N / 4^A$) ($4^N / 3^A$)	Yes	Yes	Position / Position	Open-Close / Open-Close
Dead Leg Pressure Control Isolation Valve Division 1 (Division 2, Division 3, Division 4)	30JNG15AA004 (30JNG25AA004) (30JNG35AA004) (30JNG45AA004)	Reactor Building	$2^N / 1^A$ ($1^N / 2^A$) ($4^N / 3^A$) ($3^N / 4^A$)	Yes	Yes	Position / Position	Open-Close / Open-Close
SAHRS-IRWSTS 1st Isolation Valve Division 4	30JNG40AA007	Safeguard Building 4	$4^N / 3^A$	Yes	Yes	Position / Position	Open-Close / Open-Close

Table 2.2.3-2—SIS/RHRS Equipment I&C and Electrical Design
Sheet 7 of 7

Description	Tag Number(1)	Location	IEEE Class 1E(2)	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
SAHRS-IRWSTS 2nd Isolation Valve Division 4	30JNG40AA008	Safeguard Building 4	4^{N} / 3^{A}	Yes	Yes	Position / Position	Open-Close / Open-Close

1. Equipment tag numbers are provided for information only and are not part of the certified design.

2. ^{N} denotes the division equipment is normally powered from. ^{A} denotes the division equipment is powered from when alternate feed is implemented.

Table 2.2.3-3—Safety Injection System and Residual Heat Removal System ITAAC
Sheet 1 of 9

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
2.1	The functional arrangement of the SIS/RHRS is as described in the Design Description of Section 2.2.3, Tables 2.2.3-1 and 2.2.3-2, and as shown on Figure 2.2.3-1.	An inspection of the as-built SIS/RHRS functional arrangement will be performed.	The SIS/RHRS conforms to the functional arrangement as described in the Design Description of Section 2.2.3, Tables 2.2.3-1 and 2.2.3-2, and as shown on Figure 2.2.3-1.
2.2	Deleted.	Deleted.	Deleted.
2.3	Physical separation exists between divisions of the SIS/ RHRS located in the Safeguard Buildings as listed in Table 2.2.3-1 and as shown on Figure 2.2.3-1.	An inspection will be performed to verify that the as-built divisions of the SIS/ RHRS are located in separate Safeguard Buildings.	The divisions of the SIS/RHRS are located in separate Safeguard Buildings as listed in Table 2.2.3-1 and as shown on Figure 2.2.3-1.
3.1	Pumps and valves listed in Table 2.2.3-1 will be functionally designed and qualified such that each pump and valve is capable of performing its intended function under the full range of fluid flow, differential pressure, electrical conditions, and temperature conditions with debris-laden coolant fluids up to and including design basis accident conditions.	Tests or type tests of pumps and valves will be performed to demonstrate that the pumps and valves function under the full range of fluid flow, differential pressure, electrical conditions, and temperature conditions with debris-laden coolant fluids up to and including design basis accident conditions.	A report concludes that the pumps and valves listed in Table 2.2.3-1 are capable of performing their intended function under the full range of fluid flow, differential pressure, electrical conditions, and temperature conditions with debris-laden coolant fluids up to and including design basis accident conditions.
3.2	Check valves listed in Table 2.2.3-1 will function to change position as listed in Table 2.2.3-1 under normal operating conditions.	Tests will be performed to verify the ability of check valves to change position under normal operating conditions.	The check valves change position as listed in Table 2.2.3-1 under normal operating conditions.
3.3	Deleted.	Deleted.	Deleted.

Table 2.2.3-3—Safety Injection System and Residual Heat Removal System ITAAC
Sheet 2 of 9

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
3.4	Equipment identified as Seismic Category I in Table 2.2.3-1 can withstand seismic design basis loads without a loss of safety function(s).	a. Type tests, analyses, or a combination of type tests and analyses will be performed on the equipment identified as Seismic Category I in Table 2.2.3-1 using analytical assumptions, or under conditions, which bound the Seismic Category I design requirements. b. An inspection will be performed of the as-built equipment identified as Seismic Category I in Table 2.2.3-1 to verify that the equipment, including anchorage, are installed in a condition bounded by the tested or analyzed condition.	a. Test/analysis reports conclude that the equipment identified as Seismic Category I in Table 2.2.3-1 can withstand seismic design basis loads without a loss of safety function(s). b. Inspection reports conclude that the equipment identified as Seismic Category I in Table 2.2.3-1, including anchorage, are installed in a condition bounded by the tested or analyzed condition.
3.5	Deleted.	Deleted.	Deleted.
3.6	Deleted.	Deleted.	Deleted.
3.7	Deleted.	Deleted.	Deleted.
3.8	Deleted.	Deleted.	Deleted.
3.9	Deleted.	Deleted.	Deleted.
3.10	Deleted.	Deleted.	Deleted.
3.11	Deleted.	Deleted.	Deleted.
3.12	Deleted.	Deleted.	Deleted.
3.13	Deleted.	Deleted.	Deleted.
3.14	Deleted.	Deleted.	Deleted.

Table 2.2.3-3—Safety Injection System and Residual Heat Removal System ITAAC
Sheet 3 of 9

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
3.15	ASME Code Class 1 and 2 piping systems are designed in accordance with ASME Code Section III requirements.	An inspection of piping design and analysis documentation required by the ASME Code Section III will be performed. {{DAC}}	ASME Code Section III Design Report(s) exist(s) that meet the requirements of NCA-3550, and conclude that the design of ASME Code Class 1 and 2 piping systems complies with the requirements of the ASME Code Section III. {{DAC}}
3.16	As-built ASME Code Class 1 and 2 components listed in Table 2.2.3-1 are reconciled with the design requirements.	A reconciliation analysis of ASME Code Class 1 and 2 components will be performed.	ASME Code Design Report(s) exist that meet the requirements of NCA-3550, conclude that the design reconciliation has been completed for as-built ASME Code Class 1 and 2 components listed in Table 2.2.3-1, and document that the results of the reconciliation analysis comply with the requirements of ASME Code Section III.
3.17	Pressure-boundary welds in ASME Code Class 1 and 2 components listed in Table 2.2.3-1 meet ASME Code Section III non-destructive examination requirements.	An inspection of the as-built pressure-boundary welds in ASME Code Class 1 and 2 components will be performed.	ASME Code reports(s) exist that conclude that ASME Code Section III requirements are met for non-destructive examination of pressure-boundary welds in ASME Code Class 1 and 2 components listed in Table 2.2.3-1.
3.18	ASME Code Class 1 and 2 components listed in Table 2.2.3-1 retain their pressure-boundary integrity at their design pressure.	A hydrostatic test will be conducted on ASME Code Class 1 and 2 components that are required to be hydrostatically tested by ASME Code Section III.	ASME Code Data Report(s) exist and conclude that the results of the hydrostatic test of ASME Code Class 1 and 2 components listed in Table 2.2.3-1 comply with the requirements of ASME Code Section III.

Table 2.2.3-3—Safety Injection System and Residual Heat Removal System ITAAC
Sheet 4 of 9

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
3.19	ASME Code Class 1 and 2 components listed in Table 2.2.3-1 are fabricated, installed, and inspected in accordance with ASME Code Section III requirements.	An inspection of the as-built construction activities and documentation for ASME Code Class 1 and 2 components listed in Table 2.2.3-1 will be conducted.	ASME Code Data Report(s) exist that conclude that ASME Code Class 1 and 2 components listed in Table 2.2.3-1 are fabricated, installed, and inspected in accordance with ASME Code Section III requirements.
4.1	Displays listed in Table 2.2.3-2 are indicated on the PICS operator workstations in the MCR and the RSS.	a. Tests will be performed to verify that the displays listed in Table 2.2.3-2 are indicated on the PICS operator workstations in the MCR. b. Tests will be performed to verify that the displays listed in Table 2.2.3-2 are indicated on the PICS operator workstations in the RSS.	a. Displays listed in Table 2.2.3-2 are indicated on the PICS operator workstations in the MCR. b. Displays listed in Table 2.2.3-2 are indicated on the PICS operator workstations in the RSS.
4.2	Controls on the PICS operator workstations in the MCR and the RSS perform the function listed in Table 2.2.3-2.	a. Tests will be performed using controls on the PICS operator workstations in the MCR. b. Tests will be performed using controls on the PICS operator workstations in the RSS.	a. Controls on the PICS operator workstations in the MCR perform the function listed in Table 2.2.3-2. b. Controls on the PICS operator workstations in the RSS perform the function listed in Table 2.2.3-2.
4.3	Equipment listed as being controlled by a PACS module in Table 2.2.3-2 responds to the state requested and provides drive monitoring signals back to the PACS module. The PACS module will protect the equipment by terminating the output command upon the equipment reaching the requested state.	A test will be performed using test input signals to verify equipment controlled by a PACS module responds to the state requested and provides drive monitoring signals back to the PACS module.	Equipment listed as being controlled by a PACS module in Table 2.2.3-2 responds to the state requested and provides drive monitoring signals back to the PACS module. The PACS module will protect the equipment by terminating the output command upon the equipment reaching the requested state.

Table 2.2.3-3—Safety Injection System and Residual Heat Removal System ITAAC
Sheet 5 of 9

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
4.4	Interlocks for the SIS/RHRS initiate the following: ● Opening of the accumulator injection path. ● Opening authorization of the residual heat removal system suction path from the reactor coolant system. ● Opening authorization of the hot leg safety injection path.	Tests will be performed using test input signals to verify interlocks initiate the following: ● Opening of the accumulator isolation valve. ● Opening authorization of the RHR 1st RCPB isolation valve and the RHR 2nd RCPB isolation valve. ● Opening authorization of the LHSI hot leg injection isolation valve.	The following interlocks respond as specified below when activated by a test input signal: ● Opening of the accumulator isolation valve. ● Opening authorization of the RHR 1st RCPB isolation valve and the RHR 2nd RCPB isolation valve. ● Opening authorization of the LHSI hot leg injection isolation valve.
5.1	Equipment designated as Class 1E in Table 2.2.3-2 are powered from the Class 1E division as listed in Table 2.2.3-2 in a normal or alternate feed condition.	a. Testing will be performed by providing a test input signal in each normally aligned division. b. Testing will be performed by providing a test input signal in each division with the alternate feed aligned to the divisional pair.	a. The test input signal provided in the normally aligned division is present at the respective Class 1E equipment identified in Table 2.2.3-2. b. The test input signal provided in each division with the alternate feed aligned to the divisional pair is present at the respective Class 1E equipment identified in Table 2.2.3-2.
5.2	Deleted.	Deleted.	Deleted.

Table 2.2.3-3—Safety Injection System and Residual Heat Removal System ITAAC
Sheet 6 of 9

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
6.1	Equipment designated as harsh environment in Table 2.2.3-2 can perform the function listed in Table 2.2.3-1 under normal environmental conditions, containment test conditions, anticipated operational occurrences, and accident and post-accident environmental conditions.	a. Type tests or type tests and analysis will be performed to demonstrate the ability of the equipment designated as harsh environment in Table 2.2.3-2 to perform the function listed in Table 2.2.3-1 under normal environmental conditions, containment test conditions, anticipated operational occurrences, and accident and post-accident environmental conditions.	a. EQDPs conclude that the equipment designated as harsh environment in Table 2.2.3-2 can perform the function listed in Table 2.2.3-1 under normal environmental conditions, containment test conditions, anticipated operational occurrences, and accident and post-accident environmental conditions, including the time required to perform the listed function.
		b. An inspection will be performed of the as-built equipment designated as harsh environment in Table 2.2.3-2 to verify that the equipment, including the associated cables, wiring, and terminations located in a harsh environment, are bounded by the type test or combination of type tests and analyses.	b. A report exists and concludes that the equipment designated as harsh environment in Table 2.2.3-2, including the associated cables, wiring, and terminations located in a harsh environment, are bounded by the type test or combination of type tests and analyses.
7.1	Each SIS/RHRS heat exchanger listed in Table 2.2.3-1 has the capacity to transfer the design heat load to the CCWS.	Tests and analyses will be performed to verify the capability of the SIS/RHRS heat exchangers to transfer the design heat load to the CCWS.	Each SIS/RHRS heat exchanger listed in Table 2.2.3-1 has the capacity to transfer a heat load of greater than or equal to 2.35E+08 BTU/hr to the CCWS.
7.2	The accumulators listed in Table 2.2.3-1 provide a storage volume for emergency core cooling.	An inspection and analysis will be performed to verify the total volume of the as-built accumulators.	The accumulators listed in Table 2.2.3-1 provide a minimum total volume of 1942.3 ft^3 per accumulator.

Table 2.2.3-3—Safety Injection System and Residual Heat Removal System ITAAC
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Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
7.3	Each accumulator injection line to the RCS cold leg has a minimum head loss coefficient (fL/D + K).	An analysis will be performed to verify each as-built accumulator injection line to the RCS cold leg minimum head loss coefficient (fL/D + K).	Each accumulator injection line to the RCS cold leg has a minimum head loss coefficient (fL/D + K) of 3.71 for a flow area of 0.3941 ft^2 and f = 0.014.
7.4	The pumps listed in Table 2.2.3-1 have NPSHA that is greater than NPSHR at system run-out flow.	Tests and analyses will be performed to verify pump NPSHA that is greater than NPSHR at system run-out flow.	The pumps listed in Table 2.2.3-1 have NPSHA that is greater than NPSHR at system run-out flow.
7.5	The SIS/RHRS delivers water to the RCS for core cooling.	Tests will be performed to verify the SIS/RHRS delivers water to the RCS for core cooling.	The SIS/RHRS delivers the following flows to the RCS: a. Minimum MHSI pump capacity: ≥ 165 gpm @ 3200 TDH (ft) (shutoff head condition). b. Minimum LHSI pump capacity: ≥ 530 gpm @ 750 TDH (ft) (shutoff head condition). c. Maximum MHSI pump capacity: ≤ 1110 gpm @ 328 TDH (ft) (run-out condition). d. Maximum LHSI pump capacity: ≤ 3220 gpm @ 108 TDH (ft) (run-out condition).
7.6	Deleted.	Deleted.	Deleted.
7.7	Class 1E valves listed in Table 2.2.3-2 will function to change position as listed in Table 2.2.3-1 under normal operating conditions.	Tests will be performed to verify the ability of Class 1E valves to change position under normal operating conditions.	Class 1E valves listed in Table 2.2.3-2 change position as listed in Table 2.2.3-1 under normal operating conditions.

Table 2.2.3-3—Safety Injection System and Residual Heat Removal System ITAAC
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Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
7.8	The SIS/RHRS has provisions to allow flow testing of each SIS/RHRS pump during plant operation.	Tests will be performed to verify the SIS/RHRS has provisions to allow flow testing of each SIS/RHRS pump during plant operation.	The flow test line allows the each SIS/RHRS pump to deliver the following flow rates: a. MHSI pump: Flow rate per pump is greater than or equal to 480 gpm. b. LHSI pump: Flow rate per pump is greater than or equal to 1760 gpm.
7.9	Safety injection pumped flow will be delivered to the RCS before the maximum elapsed time.	Tests will be performed using test input signals to verify the safety injection pumped flow delivery time.	Time for safety injection flow to reach full flow does not exceed 15 seconds with offsite power available or 40 seconds with loss of offsite power after receipt of a safety injection test input signal from the PACS module.
7.10	Each LHSI pump delivers water to its respective RCS hot leg.	Tests will be performed to verify each LHSI pump delivers the flow to its respective RCS hot leg.	Each LHSI pump delivers a minimum flow of 1720 gpm to its respective RCS hot leg at an equivalent RCS pressure of greater than or equal to 69.27 psia.
7.11	Deleted.	Deleted.	Deleted.
7.12	LHSI heat exchanger cools the post-LOCA fluid for a minimum of 30 days.	Type tests, analyses, or a combination of type tests and analyses for heat exchanger performance will be performed to demonstrate that the LHSI heat exchanger cools the post-LOCA fluid for a minimum of 30 days.	A report concludes that debris plugging and settlement in the LHSI heat exchanger tubes will not occur, and/or affect the performance of the LHSI heat exchanger for the 30-day mission time. A report concludes that failure due to abrasive wear will not degrade the performance of the LHSI heat exchanger below the 30-day acceptance criteria.

Table 2.2.3-3—Safety Injection System and Residual Heat Removal System ITAAC
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Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
7.13	LHSI and MHSI systems provide safety injection flow to the RCS during post-LOCA operation.	a. An analysis of pressure drop/overall system resistance across ECCS will be performed.	a. A report concludes that pressure drop/overall system resistance across ECCS is consistent with safety analysis results for 30 days of post-LOCA operation.
		b. An analysis of wear rates of piping, valves, and orifices will be performed.	b. A report concludes that wear rates are acceptable for 30 days of post-LOCA operation based on provided equipment specification.
		c. An analysis of plugging of ECCS instrument lines will be performed	c. A report concludes that post-LOCA debris will not clog the ECCS instrument lines.
7.14	The SIS/RHRS includes high point vents to avoid gas accumulation in the SIS/ RHRS.	a. An analysis will be performed to determine the locations of high point vents to avoid gas accumulation in the SIS/ RHRS.	a. A report defines the locations of high point vents to avoid gas accumulation in the SIS/ RHRS.
		b. An inspection will be performed to verify high point vents are installed in the as-built SIS/RHRS.	b. High point vents are installed in the SIS/RHRS.

Next File