2.8.7 Steam Generator Blowdown System

1.0 Description

The steam generator blowdown system (SGBS) is a non-safety-related system with safety-related portions. It assists in maintaining the chemical characteristics of the secondary water within permissible limits. The SGBS is safety related from its connections to the steam generators to the outer containment isolation valves. The remaining portion of the blowdown system downstream of the outer containment isolation valves is non-safety-related.

The SGBS provides the following safety-related functions:

- Containment isolation.
- SG blowdown isolation (emergency feedwater (EFW) actuation signal, or high main steam activity signal with a partial cooldown signal, or high SG level signal with a partial cooldown signal).

The SGBS provides the following non-safety-related functions:

- SG blowdown isolation (high SGBS blowdown activity signal with a partial cooldown).

2.0 Arrangement

2.1 The functional arrangement of the SGBS is as shown on Figure 2.8.7-1—SGBS Functional Arrangement.

2.2 The location of the SGBS equipment is as listed in Table 2.8.7-1—SGBS Equipment Mechanical Design.

3.0 Mechanical Design Features

3.1 Valves listed in Table 2.8.7-1 will be functionally designed and qualified such that each valve is capable of performing its intended function for a full range of system differential pressure and flow, ambient temperatures, and available voltage (as applicable) under conditions ranging from normal operating to design-basis accident conditions.

3.2 Deleted.

3.3 Components identified as Seismic Category I in Table 2.8.7-1 can withstand seismic design basis loads without a loss of the function listed in Table 2.8.7-1.

3.4 Components listed in Table 2.8.7-1 as ASME Code Section III are designed in accordance with ASME Code Section III requirements.

3.5 Components listed in Table 2.8.7-1 as ASME Code Section III are fabricated in accordance with ASME Code Section III requirements.

3.6 Pressure boundary welds on components listed in Table 2.8.7-1 as ASME Code Section III are in accordance with ASME Code Section III requirements.

3.7 Components listed in Table 2.8.7-1 as ASME Code Section III retain pressure boundary integrity at design pressure.

3.8 SGBS piping shown as ASME Code Section III on Figure 2.8.7-1 is designed in accordance with ASME Code Section III requirements.

3.9 SGBS piping shown as ASME Code Section III on Figure 2.8.7-1 is installed in accordance with an ASME Code Section III Design Report.

3.10 Pressure boundary welds in SGBS piping shown as ASME Code Section III on Figure 2.8.7-1 are in accordance with ASME Code Section III.

3.11 SGBS piping shown as ASME Code Section III on Figure 2.8.7-1 retains pressure boundary integrity at design pressure.

3.12 SGBS piping shown as ASME Code Section III on Figure 2.8.7-1 is installed and inspected in accordance with ASME Code Section III requirements.

3.13 Components listed in Table 2.8.7-1 as ASME Code Section III are installed in accordance with ASME Code Section III requirements.

4.0 Instrumentation and Controls (I&C) Design Features, Displays, and Controls

4.1 Displays listed in Table 2.8.7-2—SGBS Equipment I&C and Electrical Design are retrievable in the main control room (MCR) and the remote shutdown station (RSS) as listed in Table 2.8.7-2.

4.2 SGBS equipment controls are provided in the MCR and the RSS as listed in Table 2.8.7-2.

4.3 Equipment listed as being controlled by a priority and actuator control system (PACS) module in Table 2.8.7-2 responds to the state requested by a test signal.

4.4 SGBS blowdown isolation valves listed in Table 2.8.7-2 close for the affected SG under the following signals:

- EFW actuation signal, or
- High main steam activity signal with a partial cooldown signal, or,
- High SG level signal with a partial cooldown signal, or
- High SGBS blowdown activity signal with a partial cooldown signal.

5.0 Electrical Power Design Features

5.1 The components designated as Class 1E in Table 2.8.7-2 are powered from the Class 1E division as listed in Table 2.8.7-2 in a normal or alternate feed condition.

5.2 Valves listed in Table 2.8.7-2 fail as-is on loss of power.

6.0 Environmental Qualifications

6.1 Components in Table 2.8.7-2, that are designated as harsh environment, will perform the function listed in Table 2.8.7-1 in the environments that exist during and following design basis events.

7.0 Equipment and System Performance

7.1 Class 1E valves listed in Table 2.8.7-2 can perform the function listed in Table 2.8.7-1 under system operating conditions.

7.2 Containment isolation valves listed in Table 2.8.7-1 close within the containment isolation response time following initiation of a containment isolation signal.

8.0 Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.8.7-3 lists the SGBS ITAAC.

Table 2.8.7-1—SGBS Equipment Mechanical Design (2 Sheets)

Description	Tag Number (1)	Location	ASME Code Section III	Function	Seismic Category
SG 1 cold leg blowdown isolation valve	30LCQ10AA002	Reactor Building	yes	close	I
SG 2 cold leg blowdown isolation valve	30LCQ20AA002	Reactor Building	yes	close	I
SG 3 cold leg blowdown isolation valve	30LCQ30AA002	Reactor Building	yes	close	I
SG 4 cold leg blowdown isolation valve	30LCQ40AA002	Reactor Building	yes	close	I
SG 1 hot leg blowdown isolation valve	30LCQ10AA001	Reactor Building	yes	close	I
SG 2 hot leg blowdown isolation valve	30LCQ20AA001	Reactor Building	yes	close	I
SG 3 hot leg blowdown isolation valve	30LCQ30AA001	Reactor Building	yes	close	I
SG 4 hot leg blowdown isolation valve	30LCQ40AA001	Reactor Building	yes	close	I
SG 1 common blowdown isolation valve	30LCQ10AA003	Reactor Building	yes	close	I
SG 2 common blowdown isolation valve	30LCQ20AA003	Reactor Building	yes	close	I
SG 3 common blowdown isolation valve	30LCQ30AA003	Reactor Building	yes	close	I
SG 4 common blowdown isolation valve	30LCQ40AA003	Reactor Building	yes	close	I
SG 1 blowdown flow rate control valve	30LCQ10AA104	Reactor Building	yes	pressure retaining component	I

Table 2.8.7-1—SGBS Equipment Mechanical Design (2 Sheets)

Description	Tag Number (1)	Location	ASME Code Section III	Function	Seismic Category
SG 2 blowdown flow rate control valve	30LCQ20AA104	Reactor Building	yes	pressure retaining component	I
SG 3 blowdown flow rate control valve	30LCQ30AA104	Reactor Building	yes	pressure retaining component	I
SG 4 blowdown flow rate control valve	30LCQ40AA104	Reactor Building	yes	pressure retaining component	I
Blowdown flash tank	30LCQ50BB001	Reactor Building	yes	pressure retaining component	I
Blowdown flash tank pressure relief valve	30LCQ52AA191	Reactor Building	yes	pressure retaining component	I
SG Blowdown Cooler – First Stage	30LCQ51AC001	Reactor Building	yes	pressure retaining component	I
SG Blowdown Cooler – First Stage	30LCQ51AC002	Reactor Building	yes	pressure retaining component	I
Inner containment isolation valve	30LCQ52AA001	Reactor Building	yes	close (Containment Isolation)	I
Inner containment isolation valve	30LCQ51AA002	Reactor Building	yes	close (Containment Isolation)	I
Outer containment isolation valve	30LCQ52AA002	Safeguard Building 1	yes	close (Containment Isolation)	I
Outer containment isolation valve	30LCQ51AA003	Safeguard Building 4	yes	close (Containment Isolation)	I

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

Table 2.8.7-2—SGBS Equipment I&C and Electrical Design (2 Sheets)

Description	Tag Number (1)	Location	IEEE Class 1E (2)	EQ – Harsh Env.	PACS	MCR/RSS Controls
SG 1 hot leg blowdown isolation valve	30LCQ10AA001	Reactor Building	1^N 2^A	yes	yes	Close/Close
SG 1 cold leg blowdown isolation valve	30LCQ10AA002	Reactor Building	1^N 2^A	yes	yes	Close/Close
SG 1 common blowdown isolation valve	30LCQ10AA003	Reactor Building	3^N 4^A	yes	yes	Close/Close
SG 2 hot leg blowdown isolation valve	30LCQ20AA001	Reactor Building	2^N 1^A	yes	yes	Close/Close
SG 2 cold leg blowdown isolation valve	30LCQ20AA002	Reactor Building	2^N 1^A	yes	yes	Close/Close
SG 2 common blowdown isolation valve	30LCQ20AA003	Reactor Building	3^N 4^A	yes	yes	Close/Close
SG 3 hot leg blowdown isolation valve	30LCQ30AA001	Reactor Building	3^N 4^A	yes	yes	Close/Close
SG 3 cold leg blowdown isolation valve	30LCQ30AA002	Reactor Building	3^N 4^A	yes	yes	Close/Close
SG 3 common blowdown isolation valve	30LCQ30AA003	Reactor Building	2^N 1^A	yes	yes	Close/Close
SG 4 hot leg blowdown isolation valve	30LCQ40AA001	Reactor Building	4^N 3^A	yes	yes	Close/Close
SG 4 cold leg blowdown isolation valve	30LCQ40AA002	Reactor Building	4^N 3^A	yes	yes	Close/Close
SG 4 common blowdown isolation valve	30LCQ40AA003	Reactor Building	2^N 1^A	yes	yes	Close/Close

Table 2.8.7-2—SGBS Equipment I&C and Electrical Design (2 Sheets)

Description	Tag Number (1)	Location	IEEE Class 1E (2)	EQ – Harsh Env.	PACS	MCR/RSS Controls
Inner containment isolation valve	30LCQ52AA001	Reactor Building	1^{N} 2^{A}	yes	yes	Close/Close
Inner containment isolation valve	30LCQ51AA002	Reactor Building	4^{N} 3^{A}	yes	yes	Close/Close
Outer containment isolation valve	30LCQ52AA002	Safeguard Building 1	3^{N} 4^{A}	no	yes	Close/Close
Outer containment isolation valve	30LCQ51AA003	Safeguard Building 4	2^{N} 1^{A}	no	yes	Close/Close

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

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

Table 2.8.7-3—Steam Generator Blowdown System ITAAC (6 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
2.1	The functional arrangement of the SGBS is as shown on Figure 2.8.7-1.	Inspections of the as-built system as shown on Figure 2.8.7-1 will be conducted	The as-built SGBS conforms with the functional arrangement as shown on Figure 2.8.7-1.
2.2	The location of the SGBS equipment is as listed in Table 2.8.7-1.	An inspection will be performed of the location of the equipment listed in Table 2.8.7-1.	The equipment listed in Table 2.8.7-1 is located as listed in Table 2.8.7-1.
3.1	Valves listed in Table 2.8.7-1 will be functionally designed and qualified such that each valve is capable of performing its intended function for a full range of system differential pressure and flow, ambient temperatures, and available voltage (as applicable) under conditions ranging from normal operating to design-basis accident conditions.	Tests or type tests of the valves listed in Table 2.8.7-1 will be conducted to demonstrate that the pumps and valves function under conditions ranging from normal operating to design-basis accident conditions.	A test report exists and concludes that the valves listed in Table 2.8.7-1 function under conditions ranging from normal operating to design-basis accident conditions.
3.2	Deleted.	Deleted.	Deleted.

Table 2.8.7-3—Steam Generator Blowdown System ITAAC (6 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
3.3	Components identified as Seismic Category I in Table 2.8.7-1 can withstand seismic design basis loads without a loss of the function listed in Table 2.8.7-1.	a. Type tests, analyses, or a combination of type tests and analyses will be performed on the components identified as Seismic Category I in Table 2.8.7-1 using analytical assumptions, or under conditions, which bound the Seismic Category I design requirements.	a. Seismic qualification reports (SQDP, EQDP, or analyses) exist and conclude that the Seismic Category I components identified in Table 2.8.7-1 can withstand seismic design basis loads without a loss of the function listed in Table 2.8.7-1 including the time required to perform the listed function.
		b. Inspections will be performed of the Seismic Category I components identified in Table 2.8.7-1 to verify that the components, including anchorage, are installed as specified on the construction drawings and deviations have been reconciled to the seismic qualification reports (SQDP, EQDP, or analyses).	b. Inspection reports exist and conclude that the Seismic Category I components identified in Table 2.8.7-1, including anchorage, are installed as specified on the construction drawings and deviations have been reconciled to the seismic qualification reports (SQDP, EQDP, or analyses).
3.4	Components listed in Table 2.8.7-1 as ASME Code Section III are designed in accordance with ASME Code Section III requirements.	Inspections of ASME Code Section III Design Reports and associated reference documents will be performed.	ASME Code Section III Design Reports (NCA-3550) exist and conclude that components listed as ASME Code Section III in Table 2.8.7-1 comply with ASME Code Section III requirements.

Table 2.8.7-3—Steam Generator Blowdown System ITAAC (6 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
3.5	Components listed in Table 2.8.7-1 as ASME Code Section III are fabricated in accordance with ASME Code Section III requirements.	An analysis will be performed to verify that deviations to the component design reports (NCA-3550) have been reconciled.	ASME Code Section III Design Reports (NCA-3550) exist and conclude that components listed as ASME Code Section III in Table 2.8.7-1 comply with ASME Code Section III requirements and any deviations to the design report have been reconciled.
3.6	Pressure boundary welds on components listed in Table 2.8.7-1 as ASME Code Section III are in accordance with ASME Code Section III requirements.	Inspections of pressure boundary welds will be performed to verify that welding is performed in accordance with ASME Code Section III requirements.	For components listed as ASME Code Section III in Table 2.8.7-1, ASME Code Section III Data Reports (NCA-8000) exist and conclude that pressure boundary welding has been performed in accordance with ASME Code Section III.
3.7	Components listed in Table 2.8.7-1 as ASME Code Section III retain pressure boundary integrity at design pressure.	Hydrostatic tests will be performed on the components.	For components listed as ASME Code Section III in Table 2.8.7-1, ASME Code Section III Data Reports exist and conclude that hydrostatic test results comply with ASME Code Section III requirements.
3.8	SGBS piping shown as ASME Code Section III on Figure 2.8.7-1 is designed in accordance with ASME Code Section III requirements.	Inspections of the ASME Code Section III Design Reports (NCA-3550) and associated reference documents will be performed. **{{DAC}}**	ASME Code Section III Design Reports (NCA-3550) exist and conclude that SGBS piping shown as ASME Code Section III on Figure 2.8.7-1 complies with ASME Code Section III requirements. **{{DAC}}**

Table 2.8.7-3—Steam Generator Blowdown System ITAAC (6 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
3.9	SGBS piping shown as ASME Code Section III on Figure 2.8.7-1 is installed in accordance with an ASME Code Section III Design Report.	Analyses to reconcile as-built deviations to the ASME Code Design Reports (NCA-3550) will be performed.	For SGBS piping shown as ASME Code Section III on Figure 2.8.7-1, ASME Code Data Reports (N-5) exist and conclude that design reconciliation (NCA-3554) has been completed in accordance with the ASME Code Section III for the as-built system. The report(s) document the as-built condition.
3.10	Pressure boundary welds in SGBS piping shown as ASME Code Section III on Figure 2.8.7-1 are in accordance with ASME Code Section III.	Inspections of pressure boundary welds verify that welding is performed in accordance with ASME Code Section III requirements.	ASME Code Section III Data Reports exist and conclude that pressure boundary welding for SGBS piping shown as ASME Code Section III on Figure 2.8.7-1 has been performed in accordance with ASME Code Section III.
3.11	SGBS piping shown as ASME Code Section III on Figure 2.8.7-1 retains pressure boundary integrity at design pressure.	Hydrostatic tests will be performed on the system.	For SGBS piping shown as ASME Code Section III on Figure 2.8.7-1, ASME Code Section III Data Reports exist and conclude that hydrostatic test results comply with ASME Code Section III requirements.
3.12	SGBS piping shown as ASME Code Section III on Figure 2.8.7-1 is installed and inspected in accordance with ASME Code Section III requirements.	An inspection of the as-built piping will be performed.	For as-built SGBS piping shown as ASME Code Section III on Figure 2.8.7-1, N–5 Data Reports exist and conclude that installation and inspection are in accordance with ASME Code Section III requirements.

Table 2.8.7-3—Steam Generator Blowdown System ITAAC (6 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
3.13	Components listed in Table 2.8.7-1 as ASME Code Section III are installed in accordance with ASME Code Section III requirements.	An inspection of ASME Code Data Reports will be performed.	ASME Code Section III N-5 Data Reports exist and conclude that components listed as ASME Code Section III in Table 2.8.7-1 have been installed in accordance with ASME Code Section III requirements.
4.1	Displays exist or can be retrieved in the MCR and the RSS as identified in Table 2.8.7-2.	Tests will be performed for the retrieveability of the displays in the MCR or the RSS as listed in Table 2.8.7-2.	a. The displays listed in Table 2.8.7-2 as being retrieved in the MCR can be retrieved in the MCR. b. The displays listed in Table 2.8.7-2 as being retrieved in the RSS can be retrieved in the RSS.
4.2	Controls exist in the MCR and the RSS as identified in Table 2.8.7-2.	Tests will be performed for the existence of control signals from the MCR and the RSS to the equipment listed in Table 2.8.7-2.	a. The controls listed in Table 2.8.7-2 as being in the MCR exist in the MCR. b. The controls listed in Table 2.8.7-2 as being in the RSS exist in the RSS.
4.3	Equipment listed as being controlled by a PACS module in Table 2.8.7-2 responds to the state requested by a test signal.	A test will be performed using test signals.	Equipment listed as being controlled by a PACS module in Table 2.8.7-2 responds to the state requested by the test signal.

Table 2.8.7-3—Steam Generator Blowdown System ITAAC (6 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
4.4	SGBS blowdown isolation valves listed in Table 2.8.7-2 close for the affected SG under the following signals: • EFW actuation signal, or • High main steam activity signal with a partial cooldown signal, or, • High SG level signal with a partial cooldown signal, or • High SGBS blowdown activity signal with a partial cooldown signal.	Tests will be performed to verify SGBS blowdown isolation.	Test results confirm that SGBS blowdown isolation valves listed in Table 2.8.7-2 close for the affected SG under the following signals: • EFW actuation signal, or • High main steam activity signal (main steam activity sensors Table 2.8.2-2) with a partial cooldown signal, or, • High SG level signal with a partial cooldown signal, or • High SGBS blowdown activity signal (QUC11CR001, QUC12CR001, QUC13CR001, QUC14CR001) with a partial cooldown signal.
5.1	The components designated as Class 1E in Table 2.8.7-2 are powered from the Class 1E division as listed in Table 2.8.7-2 in a normal or alternate feed condition.	a. Testing will be performed for components designated as Class 1E in Table 2.8.7-2 by providing a test signal in each normally aligned division. b. Testing will be performed for components designated as Class 1E in Table 2.8.7-2 by providing a test signal in each division with the alternate feed aligned to the divisional pair.	a. The test signal provided in the normally aligned division is present at the respective Class 1E component identified in Table 2.8.7-2. b. The test signal provided in each division with the alternate feed aligned to the divisional pair is present at the respective Class 1E component identified in Table 2.8.7-2.
5.2	Valves listed in Table 2.8.7-2 fail as-is on loss of power.	Testing will be performed for the valves listed in Table 2.8.7-2 to fail as-is on loss of power.	Following loss of power, the valves listed in Table 2.8.7-2 fail as-is.

Table 2.8.7-3—Steam Generator Blowdown System ITAAC (6 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
6.1	Components in Table 2.8.7-2, that are designated as harsh environment, will perform the function listed in Table 2.8.7-1 in the environments that exist during and following design basis events.	a. Type tests or type tests and analysis will be performed to demonstrate the ability of the components listed as harsh environment in Table 2.8.7-2 to perform the function listed in Table 2.8.7-1 for the environmental conditions that could occur during and following design basis events.	a. Environmental Qualification Data Packages (EQDP) exist and conclude that the components listed as harsh environment in Table 2.8.7-2 can perform the function listed in Table 2.8.7-1 during and following design basis events including the time required to perform the listed function.
		b. Components listed as harsh environment in Table 2.8.7-2 will be inspected to verify installation in accordance with the construction drawings including the associated wiring, cables and terminations. Deviations to the construction drawings will be reconciled to the EQDP.	b. Inspection reports exists and conclude that the components listed in Table 2.8.7-2 as harsh environment has been installed per the construction drawings and any deviations have been reconciled to the EQDP.
7.1	Class 1E valves listed in Table 2.8.7-2 perform the function listed in Table 2.8.7-1 under system operating conditions.	Tests and analyses or a combination of tests and analyses will be performed to demonstrate the ability of the valves listed in Table 2.8.7-2 to change position as listed in Table 2.8.7-1 under system operating conditions.	The valve changes position as listed Table 2.8.7-1 under system operating conditions.
7.2	Containment isolation valves listed in Table 2.8.7-1 close within the containment isolation response time following initiation of a containment isolation signal.	Tests will be performed to demonstrate the ability of the containment isolation valves listed in Table 2.8.7-1 to close within the containment isolation response time following initiation of a containment isolation signal.	The containment isolation valves listed in Table 2.8.7-1 close within 60 seconds following initiation of a containment isolation signal.

Next File