

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.

2.0 Arrangement

2.1 The functional arrangement of the SGBS is as shown in 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 Equipment listed in Table 2.8.7-1 as ASME Code Section III is designed and tested in accordance with ASME Code Section III.

3.2 Piping indicated in Figure 2.8.7-1 as ASME Code Section III is designed and tested in accordance with ASME Code Section III.

3.3 Equipment identified as Seismic Category I in Table 2.8.7-1 can withstand a design basis seismic load without loss of safety function as listed in Table 2.8.7-1.

3.4 Supports for piping shown as ASME Section III on Figure 2.2.4-1 will be designed per ASME Section III.

3.5 Specifications exist for components listed as ASME Section III in Table 2.2.4-1.

3.6 Specifications exist for piping shown as ASME Section III on Figure 2.2.4-1.

3.7 Specifications exist for supports for piping shown as ASME Section III on Figure 2.2.4-1.

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 Actuators listed as being controlled by a priority actuation and control system (PACS) module in Table 2.8.7-2 are controlled by a PACS module.
- 4.4 The SGBS has interlocks to close the containment isolation valves on a containment isolation signal as well as interlocks to close the blowdown isolation valves if there is an EFW actuation 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 Electrical drivers for equipment listed in Table 2.8.7-2 for harsh environment can perform the safety function in Table 2.8.7-1 following exposure to the design basis environments for the time required.

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 design 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—SGBS Inspections, Tests, Analyses, and Acceptance Criteria specifies the inspections, tests, analyses, and acceptance criteria for the SGBS.

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

Equipment Description	Equipment Tag Number ⁽¹⁾	Equipment Location	ASME Code Section III	Function	Seismic Category
SG 1 cold leg blowdown isolation valve	30LCQ10 AA002	Reactor Building	yes	close	I
SG 2 cold leg blowdown isolation valve	30LCQ20 AA002	Reactor Building	yes	close	I
SG 3 cold leg blowdown isolation valve	30LCQ30 AA002	Reactor Building	yes	close	I
SG 4 cold leg blowdown isolation valve	30LCQ40 AA002	Reactor Building	yes	close	I
SG 1 hot leg blowdown isolation valve	30LCQ10 AA001	Reactor Building	yes	close	I
SG 2 hot leg blowdown isolation valve	30LCQ20 AA001	Reactor Building	yes	close	I
SG 3 hot leg blowdown isolation valve	30LCQ30 AA001	Reactor Building	yes	close	I
SG 4 hot leg blowdown isolation valve	30LCQ40 AA001	Reactor Building	yes	close	I
SG 1 common blowdown isolation valve	30LCQ10 AA003	Reactor Building	yes	close	I
SG 2 common blowdown isolation valve	30LCQ20 AA003	Reactor Building	yes	close	I
SG 3 common blowdown isolation valve	30LCQ30 AA003	Reactor Building	yes	close	I
SG 4 common blowdown isolation valve	30LCQ40 AA003	Reactor Building	yes	close	I
SG 1 blowdown flow rate control valve	30LCQ10 AA104	Reactor Building	yes	pressure retaining component	I

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

Equipment Description	Equipment Tag Number ⁽¹⁾	Equipment Location	ASME Code Section III	Function	Seismic Category
SG 2 blowdown flow rate control valve	30LCQ20 AA104	Reactor Building	yes	pressure retaining component	I
SG 3 blowdown flow rate control valve	30LCQ30 AA104	Reactor Building	yes	pressure retaining component	I
SG 4 blowdown flow rate control valve	30LCQ40 AA104	Reactor Building	yes	pressure retaining component	I
Blowdown flash tank	30LCQ50 BB001	Reactor Building	yes	pressure retaining component	I
Blowdown flash tank pressure relief valve	30LCQ52 AA191	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	30LCQ52 AA001	Reactor Building	yes	close (Containment Isolation)	I
Inner containment isolation valve	30LCQ51 AA002	Reactor Building	yes	close (Containment Isolation)	I
Outer containment isolation valve	30LCQ52 AA002	Safeguard Building 1	yes	close (Containment Isolation)	I
Outer containment isolation valve	30LCQ51 AA003	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)

Equipment Description	Equipment Tag Number ⁽¹⁾	Equipment Location	IEEE Class 1E ⁽²⁾	EQ – Harsh Env.	PACS	MCR/RSS Controls
SG 1 hot leg blowdown isolation valve	30LCQ10 AA001	Reactor Building	1 ^N 2 ^A	yes	yes	Close/Close
SG 1 cold leg blowdown isolation valve	30LCQ10 AA002	Reactor Building	1 ^N 2 ^A	yes	yes	Close/Close
SG 1 common blowdown isolation valve	30LCQ10 AA003	Reactor Building	3 ^N 4 ^A	yes	yes	Close/Close
SG 2 hot leg blowdown isolation valve	30LCQ20 AA001	Reactor Building	2 ^N 1 ^A	yes	yes	Close/Close
SG 2 cold leg blowdown isolation valve	30LCQ20 AA002	Reactor Building	2 ^N 1 ^A	yes	yes	Close/Close
SG 2 common blowdown isolation valve	30LCQ20 AA003	Reactor Building	3 ^N 4 ^A	yes	yes	Close/Close
SG 3 hot leg blowdown isolation valve	30LCQ30 AA001	Reactor Building	3 ^N 4 ^A	yes	yes	Close/Close
SG 3 cold leg blowdown isolation valve	30LCQ30 AA002	Reactor Building	3 ^N 4 ^A	yes	yes	Close/Close
SG 3 common blowdown isolation valve	30LCQ30 AA003	Reactor Building	2 ^N 1 ^A	yes	yes	Close/Close
SG 4 hot leg blowdown isolation valve	30LCQ40 AA001	Reactor Building	4 ^N 3 ^A	yes	yes	Close/Close
SG 4 cold leg blowdown isolation valve	30LCQ40 AA002	Reactor Building	4 ^N 3 ^A	yes	yes	Close/Close
SG 4 common blowdown isolation valve	30LCQ40 AA003	Reactor Building	2 ^N 1 ^A	yes	yes	Close/Close

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

Equipment Description	Equipment Tag Number ⁽¹⁾	Equipment Location	IEEE Class 1E ⁽²⁾	EQ – Harsh Env.	PACS	MCR/RSS Controls
Inner containment isolation valve	30LCQ52 AA001	Reactor Building	1 ^N 2 ^A	yes	yes	Close/Close
Inner containment isolation valve	30LCQ51 AA002	Reactor Building	4 ^N 3 ^A	yes	yes	Close/Close
Outer containment isolation valve	30LCQ52 AA002	Safeguard Building 1	3 ^N 4 ^A	no	yes	Close/Close
Outer containment isolation valve	30LCQ51 AA003	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—SGBS Inspections, Tests, Analyses, and Acceptance Criteria (4 Sheets)

	Commitment Wording	Inspection, Test, or Analysis	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 in 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	The components designated as ASME Code Section III in Table 2.8.7-1 are designed to ASME Code Section III requirements.	Inspections will be conducted of ASME design, NDE, and hydrostatic test reports for the components listed as ASME Code Section III in Table 2.8.7-1.	A report exists and concludes that the components listed as ASME Code Section III in Table 2.8.7-1 have been designed and hydrostatically tested in accordance ASME Code Section III requirements.
3.2a	The piping identified as being within the ASME Code Section III boundary as indicated in Figure 2.8.7-1 has been designed in accordance with ASME Code Section III requirements including seismic loads.	Analysis of the as-designed piping will be performed in accordance with ASME Code Section III requirements for the piping indicated in Figure 2.8.7-1.	ASME Code Section III stress reports exist and conclude that the as-designed piping identified as ASME Code Section III in Figure 2.8.7-1 meets ASME Code Section III design requirements.
3.2b	The piping identified as being within the ASME Code Section III boundary as indicated in Figure 2.8.7-1 has been inspected and hydrostatically tested in accordance with ASME Code Section III.	Inspections will be conducted of the as-built piping as indicated in Figure 2.8.7-1 for the following: Welding has been performed per ASME Code Section III. Hydrostatic testing per ASME Code Section III was performed.	A report exists and concludes that the piping as indicated in Figure 2.8.7-1 as ASME Code Section III has been welded in accordance with ASME Code Section III welding requirements. A report exists and concludes that the piping as indicated in Figure 2.8.7-1 as ASME Code Section III has been hydrostatically tested in accordance with ASME Code Section III requirements.

Table 2.8.7-3—SGBS Inspections, Tests, Analyses, and Acceptance Criteria (4 Sheets)

	Commitment Wording	Inspection, Test, or Analysis	Acceptance Criteria
3.3	Equipment identified as Seismic Category I in Table 2.8.7-1 can withstand a design basis seismic load without loss of safety function as listed in Table 2.8.7-1.	Type tests, tests, analyses or a combination of tests and analyses will be performed on the equipment designated as Seismic Category I in Table 2.8.7-1.	The equipment designated as Seismic Category I in Table 2.8.7-1 can withstand a design basis seismic load without loss of safety function.
3.4	Supports for piping shown as ASME Section III on Figure 2.8.7-1 will be designed per ASME Section III.	An analysis will be performed.	<ul style="list-style-type: none"> a. Supports for piping shown as ASME Section III on Figure 2.8.7-1 are designed in accordance with ASME Section III. b. Snubbers have been identified, including those analyzed for fatigue for piping shown as ASME Section III on Figure 2.8.7-1. c. Support mass is less than ten percent of the adjacent pipe span for piping shown as ASME Section III on Figure 2.8.7-1.
3.5	Specifications exist for components listed as ASME Section III in Table 2.8.7-1.	An inspection will be performed.	Specifications exist for components listed as ASME Section III in Table 2.8.7-1.
3.6	Specifications exist for piping shown as ASME Section III on Figure 2.8.7-1.	An inspection will be performed.	Specifications exist for piping identified as ASME Section III on Figure 2.8.7-1.
3.7	Specifications exist for supports for piping shown as ASME Section III on Figure 2.8.7-1	An inspection will be performed.	Specifications exist for supports for piping shown as ASME Section III on Figure 2.8.7-1
4.1	Displays exist or can be retrieved in the MCR and the RSS as identified in Table 2.8.7-2.	Inspections will be performed for the existence or retrieveability of the displays in the MCR or the RSS as listed in Table 2.8.7-2.	<p>The displays listed in Table 2.8.7-2 as being retrieved in the MCR can be retrieved in the MCR.</p> <p>The displays listed in Table 2.8.7-2 as being retrieved in the RSS can be retrieved in the RSS.</p>

Table 2.8.7-3—SGBS Inspections, Tests, Analyses, and Acceptance Criteria (4 Sheets)

	Commitment Wording	Inspection, Test, or Analysis	Acceptance Criteria
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.	The controls listed in Table 2.8.7-2 as being in the MCR exist in the MCR. The controls listed in Table 2.8.7-2 as being in the RSS exist in the RSS.
4.3	Actuators listed as being controlled by a PACS module in Table 2.8.7-2 are controlled by a PACS module.	An operational test will be performed using test signals for the actuators being controlled by a PACS module as listed in Table 2.8.7-2. An inspection will be performed on the actuation of the actuator.	The actuators listed as being controlled by a PACS module in Table 2.8.7-2 actuate to the state requested by the signal.
4.4	The SGBS has the following interlocks: Containment isolation valves isolate on containment isolation signal. Blowdown isolation valves isolate on EFW actuation signal.	Tests will be performed using simulated signals to verify the interlock.	The interlocks function in response to a simulated 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.	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. 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.	The test signal provided in the normally aligned division is present at the respective Class 1E component identified in Table 2.8.7-2. 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—SGBS Inspections, Tests, Analyses, and Acceptance Criteria (4 Sheets)

	Commitment Wording	Inspection, Test, or Analysis	Acceptance Criteria
6.1	Components listed as Class 1E 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 before and during the time required to perform their safety function.	<p>6.1a. Type tests, tests, analyses, or a combination of tests and analyses will be performed to demonstrate the ability of the equipment listed for 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 before and during a design basis accident.</p> <p>6.1b. For equipment listed for harsh environment in Table 2.8.7-2, an inspection will be performed of the as-installed Class 1E equipment and the associated wiring, cables, and terminations.</p>	<p>6.1a. The Class 1E equipment listed for harsh environment in Table 2.8.7-2 can perform the function listed in Table 2.8.7-1 before and during design basis accidents for the time required to perform the listed function.</p> <p>6.1b. Inspection concludes the as-installed Class 1E equipment and associated wiring, cables, and terminations as listed in Table 2.8.7-2 for harsh environment conform with the design.</p>
7.1	Class 1E valves listed in Table 2.8.7-2 perform the function listed in Table 2.8.7-1 under system 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 design conditions.	The as-installed valve changes position as listed Table 2.8.7-1 under system design 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.	A report exists and concludes that the containment isolation valves listed in Table 2.8.7-1 close within the required times following initiation of a containment isolation signal.