

## **2.7.5 Fire Water Distribution System**

### **1.0 Description**

The fire water distribution system (FWDS) is non-safety related, except for the FWDS containment isolation valves and associated piping which are safety-related. The FWDS is comprised of the following fire water distribution subsystems:

- The FWDS conventional area, which consists of the fire water storage tanks, fire pumps, pump structure, and underground fire main loop.
- The FWDS inside Nuclear Island consists of supply headers and the standpipe and hose system.

The FWDS provides the following safety-related functions:

- The FWDS provides the safety-related function of providing containment isolation of the Reactor Building (RB).

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

- The FWDS inside Nuclear Island is an alternate source of makeup water for the spent fuel spray system during a severe accident event.
- The FWDS inside Nuclear Island is an alternate source of makeup water for component cooling water system (CCWS) post seismic event.

### **2.0 Arrangement**

**2.1** The location of safety-related FWDS equipment is as listed in Table 2.7.5-1—Fire Water Distribution System Equipment Mechanical Design.

### **3.0 Mechanical Design Features**

**3.1** Equipment listed in Table 2.7.5-1 as ASME Code Section III is designed and tested to ASME Code Section III.

**3.2** Equipment identified as Seismic Category I in Table 2.7.5-1 can withstand a design basis seismic load without loss of safety function as listed in Table 2.7.5-1.

### **4.0 I&C Design Features, Displays and Controls**

**4.1** Displays listed in Table 2.7.5-2—Fire Water Distribution System Equipment I&C and Electrical Design are retrievable in the main control room (MCR) and the remote shutdown station (RSS) as listed in Table 2.7.5-2.

**4.2** The FWDS equipment controls are provided in the MCR and the RSS as listed in Table 2.7.5-2.

- 4.3 Actuators listed as being controlled by a Priority Actuation and Control System (PACS) module in Table 2.7.5-2 are controlled by a PACS module.
- 5.0 Electrical Power Design Features**
- 5.1 The components designated as Class 1E in Table 2.7.5-2 are powered from the Class 1E division as listed in Table 2.7.5-2 in a normal or alternate feed condition.
- 5.2 Valves listed in Table 2.7.5-2 fail as-is on loss of power.
- 6.0 Environmental Qualifications**
- 6.1 Electrical drivers for equipment listed in Table 2.7.5-2 for harsh environment can perform the safety function in Table 2.7.5-1 following exposure to the design basis environments for the time required.
- 7.0 Equipment and System Performance**
- 7.1 The FWDS includes two separate fresh water storage tanks.
- 7.2 Site FWDS pumps consist of at least one electric motor-driven and one diesel engine-driven pump.
- 7.3 FWDS pumps have sufficient net positive suction head absolute.
- 7.4 Class 1E valves listed in Table 2.7.5-2 can perform the function listed in Table 2.7.5-1 under system design conditions.
- 7.5 The FWDS provides for flow testing of the FWDS pumps during plant operation.
- 7.6 Containment isolation valves listed in Table 2.7.5-1 close within the containment isolation response time following initiation of a containment isolation signal.
- 7.7 The FWDS standpipe and hose systems are capable of supplying two hose stations.
- 8.0 Interface Information**
- 8.1 The raw water supply system (RWSS) delivers makeup water to the FWDS fire water storage tanks.
- 9.0 Inspections, Tests, Analyses, and Acceptance Criteria**
- 9.1 Table 2.7.5-3 specifies the inspections, tests, analyses, and acceptance criteria for the FWDS.

**Table 2.7.5-1—Fire Water Distribution System Equipment Mechanical Design**

<b>Equipment Description</b>	<b>Equipment Tag Number (1)</b>	<b>Equipment Location</b>	<b>ASME Code Section III</b>	<b>Function</b>	<b>Seismic Category</b>
Fire Water Distribution System CI Valve	30SGB30AA031	FB	Yes	Close	I
Fire Water Distribution System CI Valve	30SGB30AA032	RB	Yes	Close	I

**Table 2.7.5-2—Fire Water Distribution System Equipment I&C and Electrical Design**

<b>Equipment Description</b>	<b>Equipment Tag Number (1)</b>	<b>Equipment Location</b>	<b>IEEE Class 1E (2)</b>	<b>EQ – Harsh Env.</b>	<b>PACS</b>	<b>MCR/RSS Displays</b>	<b>MCR/RSS Controls</b>
Fire Water Distribution System CI Valve	30SGB30AA031	FB	Division 4N Division 3A	No	Yes	Pos/N/A	Open-Close/ N/A
Fire Water Distribution System CI Valve	30SGB30AA032	RB	Division 1N Division 2A	Yes	Yes	Pos/N/A	Open-Close/ N/A

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

(2) <sup>N</sup> denotes the division the component is normally powered from.

<sup>A</sup> denotes the division the component is powered from when alternate feed is implemented.

**Table 2.7.5-3—Fire Water Distribution System Inspections, Tests, Analyses, and Acceptance Criteria (4 Sheets)**

	<b>Commitment Wording</b>	<b>Inspection, Analysis or Test</b>	<b>Acceptance Criteria</b>
2.1	The location of the safety-related fire water distribution system equipment is as listed in Table 2.7.5-1.	An inspection will be performed of the location of the equipment listed in Table 2.7.5-1.	The equipment listed in Table 2.7.5-1 is located as listed in Table 2.7.5-1.
3.1	The components designated as ASME Code Section III in Table 2.7.5-1 are designed and tested 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 2.7.5-1.	A report exists and concludes that the components listed as ASME Code Section III in Table 2.7.5-1 have been designed and hydrostatically tested in accordance ASME Code Section III requirements.
3.2	Equipment identified as Seismic Category I in Table 2.7.5-1 can withstand a design basis seismic load without loss of safety function as listed in Table 2.7.5-1.	<ul style="list-style-type: none"> <li>a. Inspection will be performed of the equipment identified as Seismic Category I in Table 2.7.5-1.</li> <li>b. Type tests, tests, analyses or a combination of tests and analyses will be performed on the equipment designated as Seismic Category I in Table 2.7.5-1.</li> </ul>	<ul style="list-style-type: none"> <li>a. the equipment designated as Seismic Category I in Table 2.7.5-1 is installed as designed.</li> <li>b. the equipment designated as Seismic Category I in Table 2.7.5-1 can with stand a design basis seismic load without loss of safety function.</li> </ul>
4.1	Displays exist or can be retrieved in the MCR and the RSS as identified in Table 2.7.5-2.	Inspections will be performed for the existence or retrieveability of the displays in the MCR or the RSS as listed in Table 2.7.5-2.	<ul style="list-style-type: none"> <li>a. The displays listed in Table 2.7.5-2 as being retrieved in the MCR can be retrieved in the MCR.</li> <li>b. The displays listed in Table 2.7.5-2 as being retrieved in the RSS can be retrieved in the RSS.</li> </ul>

**Table 2.7.5-3—Fire Water Distribution System Inspections, Tests, Analyses, and Acceptance Criteria (4 Sheets)**

	<b>Commitment Wording</b>	<b>Inspection, Analysis or Test</b>	<b>Acceptance Criteria</b>
4.2	Controls exist in the MCR and the RSS as identified in Table 2.7.5-2.	Tests will be performed for the existence of control signals from the MCR and the RSS to the equipment listed in Table 2.7.5-2.	<ul style="list-style-type: none"> <li>a. The controls listed in Table 2.7.5-2 as being in the MCR exist in the MCR.</li> <li>b. The controls listed in Table 2.7.5-2 as being in the RSS exist in the RSS.</li> </ul>
4.3	Actuators listed as being controlled by a PACS module in Table 2.7.5-2 are controlled by a PACS module.	A test will be performed using test signals for the actuators being controlled by a PACS module as listed in Table 2.7.5-2.	The actuators listed as being controlled by a PACS module in Table 2.7.5-2 actuate to the state requested by the signal.
5.1	The components designated as Class 1E in Table 2.7.5-2 are powered from the Class 1E division as listed in Table 2.7.5-2 in a normal or alternate feed condition.	<ul style="list-style-type: none"> <li>a. Testing will be performed for components designated as Class 1E in Table 2.7.5-2 by providing a test signal in each normally aligned division.</li> <li>b. Testing will be performed for components designated as Class 1E in Table 2.7.5-2 by providing a test signal in each division with the alternate feed aligned to the divisional pair.</li> </ul>	<ul style="list-style-type: none"> <li>a. The test signal provided in the normally aligned division is present at the respective Class 1E component identified in Table 2.7.5-2.</li> <li>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 2.7.5-2.</li> </ul>
5.2	Valves listed in Table 2.7.5-2 fail as-is on loss of power.	Testing will be performed for the valves listed in Table 2.7.5-2 to fail as-is on loss of power.	Following loss of power, the valves listed in Table 2.7.5-2 fail as-is.

**Table 2.7.5-3—Fire Water Distribution System Inspections, Tests, Analyses, and Acceptance Criteria (4 Sheets)**

	<b>Commitment Wording</b>	<b>Inspection, Analysis or Test</b>	<b>Acceptance Criteria</b>
6.1	Components listed as Class 1E in Table 2.7.5-2 that are designated as harsh environment will perform the function listed in Table 2.7.5-1 in the environments that exist before and during the time required to perform their safety function.	<p>a. Type tests, tests, analyses or a combination of tests and analyses will be performed.</p> <p>b. For equipment listed for harsh environment in Table 2.7.5-2, an inspection will be performed of the as-installed Class 1E equipment and the associated wiring, cables and terminations.</p>	<p>a. A report exists and concludes that the Class 1E equipment listed for harsh environment in Table 2.7.5-2 can perform the function listed in Table 2.7.5-1 before and during design basis accidents for the time required to perform the listed function.</p> <p>b. Inspection concludes the as-installed Class 1E equipment and associated wiring, cables, and terminations as listed in Table 2.7.5-2 for harsh environment conform to the design.</p>
7.1	The FWDS includes two separate fresh water storage tanks.	An inspection of the as-built capacity of the fire water storage tanks will be performed.	Each fire water storage tank is of greater than or equal to 300,000 gallons capacity.
7.2	The FWDS pumps consist of at least one electric motor-driven and one diesel engine-driven pump.	An inspection will be performed to verify that at least one electric motor-driven and one diesel engine-driven pump exists.	At least one electric motor-driven and one diesel engine-driven pump exists.
7.3	FWDS pumps have sufficient NPSHA.	Testing and analyses will be performed to verify adequate NPSHA for FWDS pumps.	The FWDS pumps have sufficient NPSHA.
7.4	Class 1E valves listed in Table 2.7.5-2 perform the function listed in Table 2.7.5-1 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 2.7.5-2 to change position as listed in Table 2.7.5-1 under system design conditions.	The as-installed valve changes position as listed Table 2.7.5-1 under system design conditions.

**Table 2.7.5-3—Fire Water Distribution System Inspections, Tests, Analyses, and Acceptance Criteria (4 Sheets)**

	<b>Commitment Wording</b>	<b>Inspection, Analysis or Test</b>	<b>Acceptance Criteria</b>
7.5	The fire water distribution system has provisions to allow flow testing of the fire water distribution system pumps during plant operation.	Testing for flow of the fire water distribution system pumps back to the fire water storage tank will be performed.	The flow test line allows fire water distribution system pump flow back to the fire water storage tank.
7.6	Containment isolation valves listed in Table 2.7.5-1 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 2.7.5-1 to close within the containment isolation response time following initiation of a containment isolation signal.	See Table 3.3.1-1, item 3.0.
7.7	The FWDS standpipe and hose systems are capable of supplying two hose stations.	Tests will be performed on the FWDS standpipe and hose.	The FWDS is capable of supplying two hose stations with approximately 75 gpm per hose stream for any two hose stations.
8.1	The RWSS delivers makeup water to the FWDS fire water storage tanks.	Testing of the flow delivery of the raw water supply system to the fire water distribution system fire water storage tanks will be performed.	The raw water supply system delivers the required flow to the fire water distribution system fire water storage tanks.