## 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, welded, and hydrostatically tested in accordance with ASME Code Section III.

3.2 Equipment identified as Seismic Category I in Table 2.7.5-1 can withstand seismic design basis loads 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 Equipment listed as being controlled by a priority and actuator control system (PACS) module in Table 2.7.5-2 responds to the state requested by a test signal.

4.4 The as-built fire water distribution system is consistent with the post-fire safe shutdown analysis.

## 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 The FWDS pumps consist of at least one electric motor-driven pump 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 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 standpipe and hose systems in areas containing systems and components required for safe plant shutdown in the event of a safe shutdown earthquake (SSE), including the water supply to these standpipes, are capable of remaining functional and supplying two hose stations following an SSE.

## 8.0 Interface Requirements

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

Table 2.7.5-3 lists the FWDS ITAAC.

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

| Equipment Description | Equipment Tag Number (1) | Equipment Location | ASME Code Section III | Function | Seismic Category |
|---|---|---|---|---|---|
| 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**

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

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 2.7.5-3—Fire Water Distribution System ITAAC**
**(5 Sheets)**

| Commitment Wording | | Inspections, Tests, Analyses | Acceptance Criteria |
|---|---|---|---|
| 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 | Equipment listed in Table 2.7.5-1 as ASME Code Section III is designed, welded, and hydrostatically tested in accordance with ASME Code Section III. | a. Analysis of the equipment identified in Table 2.7.5-1 as ASME Code Section III will be performed per ASME Code Section III design requirements. | a. ASME Code Section III Design Reports (NCA-3550) exist and conclude that the equipment identified in Table 2.7.5-1 as ASME Code Section III meets ASME Code Section III design requirements. |
| | | b. Inspections will be conducted on the equipment identified in Table 2.7.5-1 as ASME Code Section III to verify welding has been performed per ASME Code Section III welding requirements. | b. Equipment identified in Table 2.7.5-1 as ASME Code Section III has been welded per ASME Code Section III welding requirements. |
| | | c. Hydrostatic testing of the equipment identified in Table 2.7.5-1 as ASME Code Section III will be performed per ASME Code Section III hydrostatic testing requirements. | c. Equipment identified in Table 2.7.5-1 as ASME Code Section III has been hydrostatically tested per ASME Code Section III hydrostatic testing requirements. |
| 3.2 | Equipment identified as Seismic Category I in Table 2.7.5-1 can withstand seismic design basis loads without loss of safety function as listed in Table 2.7.5-1. | a. Type tests, analyses or a combination of type tests and analyses will be performed on the equipment designated as Seismic Category I in Table 2.7.5-1 using analytical assumptions, or under conditions, which bound the Seismic Category I design requirements | a. Tests/analysis reports exists and conclude that the Seismic Category I equipment listed in Table 2.7.5-1 can withstand seismic design basis loads without loss of safety function. |

**Table 2.7.5-3—Fire Water Distribution System ITAAC**
**(5 Sheets)**

| Commitment Wording | | Inspections, Tests, Analyses | Acceptance Criteria |
|---|---|---|---|
| | | b. Inspections will be performed of the as-installed Seismic Category I equipment listed in Table 2.7.5-1 to verify that the equipment including anchorage is installed as specified on the construction drawings. | b. Inspection reports exist and conclude that the as-installed Seismic Category I equipment listed in Table 2.7.5-1 including anchorage is installed as specified on the construction drawings. |
| 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 retrievability of the displays in the MCR or the RSS as listed in Table 2.7.5-2. | a. The displays listed in Table 2.7.5-2 as being retrieved in the MCR can be retrieved in the MCR.<br>b. The displays listed in Table 2.7.5-2 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 2.7.5-2. | 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. | a. The controls listed in Table 2.7.5-2 as being in the MCR exist in the MCR.<br>b. The controls listed in Table 2.7.5-2 as being in the RSS exist in the RSS. |
| 4.3 | Equipment listed as being controlled by a PACS module in Table 2.7.5-2 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 2.7.5-2 responds to the state requested by the test signal. |
| 4.4 | The as-built fire water distribution system is consistent with the post-fire safe shutdown analyses. | An inspection will be performed. | An inspection report documents that the as-built fire water distribution system is consistent with the post-fire safe shutdown analysis. |
| 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. | 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. | 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. |

**Table 2.7.5-3—Fire Water Distribution System ITAAC**
**(5 Sheets)**

| Commitment Wording | | Inspections, Tests, Analyses | Acceptance Criteria |
|---|---|---|---|
| | | 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. | 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. |
| 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. |
| 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. | a. Type tests, tests, analyses or a combination of tests and analyses will be performed. | 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. |
| | | 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. | 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. |
| 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 pump and one diesel engine-driven pump. | a. An inspection will be performed to verify that at least one electric motor-driven pump and one diesel engine-driven pump exists. | a. At least one electric motor-driven pump and one diesel engine-driven pump exists. |

**Table 2.7.5-3—Fire Water Distribution System ITAAC**
**(5 Sheets)**

| Commitment Wording | | Inspections, Tests, Analyses | Acceptance Criteria |
|---|---|---|---|
| | | b. An analysis will be performed. | b. Analysis reports exist and conclude a sufficient number of pumps to provide 100% capacity are available assuming failure of the largest pump or loss of offsite power. |
| 7.3 | FWDS pumps have sufficient NPSHA. | Testing and analyses will be performed to verify NPSHA for FWDS pumps. | The FWDS pumps have NPSHA that is greater than net positive suction head required (NPSHR) at system run-out flow. |
| 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. |
| 7.5 | The FWDS provides for flow testing of FWDS pumps during plant operation. | A test will be performed. | A flow test line allows testing of each FWDS pump 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. | 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. | Containment isolation valves listed in Table 2.7.5-1 close within 60 seconds following initiation of a containment isolation signal. |

**Table 2.7.5-3—Fire Water Distribution System ITAAC**
**(5 Sheets)**

| Commitment Wording | | Inspections, Tests, Analyses | Acceptance Criteria |
|---|---|---|---|
| 7.7 | The standpipe and hose systems in areas containing systems and components required for safe plant shutdown in the event of a safe shutdown earthquake (SSE), including the water supply to these standpipes, are capable of remaining functional and supplying two hose stations following an SSE. | An analysis will be performed to demonstrate the ability of the standpipe and hose systems in areas containing systems and components required for safe plant shutdown in the event of a SSE to remain functional and supply two hose stations following a SSE. | Analyses demonstrate the FWDS will remain functional following a SSE and is capable of supplying the two hydraulically most remote hose stations with at least 75 gpm per hose stream. |

Next File