

2.2.2 In-Containment Refueling Water Storage Tank System

Design Description

1.0 System Description

The in-containment refueling water storage tank system (IRWSTS) is a safety-related system. The IRWSTS provides the following safety-related function:

- Borated water supply for the emergency core cooling systems.

The IRWSTS provides the following non-safety-related function:

- Borated water supply to the severe accident heat removal system (SAHRS) during a severe accident.

2.0 Arrangement

2.1 The functional arrangement of the IRWSTS is as described in the Design Description of Section 2.2.2, Tables 2.2.2-1—IRWSTS Equipment Mechanical Design and 2.2.2-2—IRWSTS Equipment I&C and Electrical Design, and as shown on Figure 2.2.2-1—In-Containment Refueling Water Storage Tank System Functional Arrangement.

2.2 Deleted.

2.3 Physical separation exists between divisions of the IRWSTS as shown on Figure 2.2.2-1.

3.0 Mechanical Design Features

3.1 Valves listed in Table 2.2.2-1 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 design basis accident conditions.

3.2 Deleted.

3.3 Equipment identified as Seismic Category I in Table 2.2.2-1 can withstand seismic design basis loads without a loss of the function listed in Table 2.2.2-1.

3.4 Deleted.

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 ASME Code Class 1, 2 and 3 piping systems are designed in accordance with ASME Code Section III requirements.
- 3.14 As-built ASME Code Class 1, 2 and 3 components are reconciled with the design requirements.
- 3.15 Pressure-boundary welds in ASME Code Class 1, 2 and 3 components meet ASME Code Section III non-destructive examination requirements.
- 3.16 ASME Code Class 1, 2 and 3 components retain their pressure-boundary integrity at their design pressure.
- 3.17 ASME Code Class 1, 2 and 3 components 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 2.2.2-2 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 2.2.2-2.
- 4.3 Equipment listed as being controlled by a priority and actuator control system (PACS) module in Table 2.2.2-2 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 Deleted.

5.0 Electrical Power Design Features

- 5.1 Equipment designated as Class 1E in Table 2.2.2-2 are powered from the Class 1E division as listed in Table 2.2.2-2 in a normal or alternate feed condition.
- 5.2 Deleted.

6.0 Environmental Qualifications

- 6.1 Equipment designated as harsh environment in Table 2.2.2-2 will perform the function listed in Table 2.2.2-1 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 Class 1E valves listed in Table 2.2.2-2 will function to change position as listed in Table 2.2.2-1 under normal operating conditions.
- 7.2 Deleted.
- 7.3 The IRWST provides a water volume for emergency core cooling.
- 7.4 Post-LOCA pH control is provided for the IRWST with trisodium phosphate (TSP).
- 7.5 The IRWST suction inlet line for each safety injection system division has a debris screen.
- 7.6 Deleted.
- 7.7 The IRWST provides water to flood the core spreading area.
- 7.8 The IRWST has a retaining basket located directly below each heavy floor opening.
- 7.9 The IRWST has a trash rack located over each heavy floor opening.
- 7.10 The IRWST has a weir located around each trash rack at the heavy floor opening.
- 7.11 The IRWST has a weir located at the annular space wall openings.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.2.2-3 lists the IRWSTS ITAAC.

**Table 2.2.2-1—IRWSTS Equipment Mechanical Design
Sheet 1 of 3**

Description	Tag Number(1)	Location	ASME Code Section III	Function	Seismic Category
IRWST Three-way Isolation Valve for SIS Division 1	30JNK10AA001	Safeguard Building 1	Yes	open/close	I
IRWST Three-way Isolation Valve for SIS division 2	30JNK20AA001	Safeguard Building 2	Yes	open/close	I
IRWST Three-way Isolation valve for SIS Division 3	30JNK30AA001	Safeguard Building 3	Yes	open/close	I
IRWST Three-way Isolation Valve for SIS Division 4	30JNK40AA001	Safeguard Building 4	Yes	open/close	I
IRWST Isolation Valve for CVCS	30JNK10AA009	Safeguard Building 1	Yes	close	I
IRWST Isolation Valve for CVCS	30JNK10AA013	Safeguard Building 1	Yes	close	I
IRWST Isolation Valve for SAHRS	30JNK11AA009	Safeguard Building 4	Yes	open/close	I
SIS Division 1 Strainer Backflush Isolation Valve	30JNK10AA006	Reactor Building	N/A	close	II
SIS Division 1 Strainer Backflush Isolation Valve	30JNK10AA007	Reactor Building	N/A	close	II
SIS Division 2 Strainer Backflush Isolation Valve	30JNK10AA004	Reactor Building	N/A	close	II
SIS Division 2 Strainer Backflush Isolation Valve	30JNK10AA005	Reactor Building	N/A	close	II
SIS Division 3 Strainer Backflush Isolation Valve	30JNK11AA004	Reactor Building	N/A	close	II

Table 2.2.2-1—IRWSTS Equipment Mechanical Design
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Description	Tag Number(1)	Location	ASME Code Section III	Function	Seismic Category
SIS Division 3 Strainer Backflush Isolation Valve	30JNK11AA005	Reactor Building	N/A	close	II
SIS Division 4 Strainer Backflush Isolation Valve	30JNK11AA006	Reactor Building	N/A	close	II
SIS Division 4 Strainer Backflush Isolation Valve	30JNK11AA007	Reactor Building	N/A	close	II
Trash Rack (IRWST Heavy Floor Opening)	30JNK10AT014	Reactor Building	N/A	debris retaining device	I
Trash Rack (IRWST Heavy Floor Opening)	30JNK10AT015	Reactor Building	N/A	debris retaining device	I
Trash Rack (IRWST Heavy Floor Opening)	30JNK11AT014	Reactor Building	N/A	debris retaining device	I
Trash Rack (IRWST Heavy Floor Opening)	30JNK11AT015	Reactor Building	N/A	debris retaining device	I
IRWST Retaining Basket & Corresponding Gutters	30JNK10AT004	Reactor Building	N/A	debris retaining device	I
IRWST Retaining Basket & Corresponding Gutters	30JNK10AT005	Reactor Building	N/A	debris retaining device	I
IRWST Retaining Basket & Corresponding Gutters	30JNK11AT004	Reactor Building	N/A	debris retaining device	I
IRWST Retaining Basket & Corresponding Gutters	30JNK11AT005	Reactor Building	N/A	debris retaining device	I
SIS Sump Strainer Division 1	30JNK10AT001	Reactor Building	N/A	filtering device	I
SIS Sump Strainer Division 2	30JNK10AT002	Reactor Building	N/A	filtering device	I
SIS Sump Strainer Division 3	30JNK11AT002	Reactor Building	N/A	filtering device	I

Table 2.2.2-1—IRWSTS Equipment Mechanical Design
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Description	Tag Number(1)	Location	ASME Code Section III	Function	Seismic Category
SIS Sump Strainer Division 4	30JNK11AT001	Reactor Building	N/A	filtering device	I
CVCS Sump Strainer	30JNK10AT003	Reactor Building	N/A	filtering device	II
SAHRS Sump Strainer	30JNK11AT003	Reactor Building	N/A	filtering device	II
TSP Basket	30JNK10AT024	Reactor Building	N/A	TSP source	I
TSP Basket	30JNK10AT025	Reactor Building	N/A	TSP source	I
TSP Basket	30JNK11AT024	Reactor Building	N/A	TSP source	I
TSP Basket	30JNK11AT025	Reactor Building	N/A	TSP source	I
IRWST Tank	30JNK00BB001	Reactor Building	N/A	storage volume	I

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

Table 2.2.2-2—IRWSTS Equipment I&C and Electrical Design
Sheet 1 of 2

Description	Tag Number ⁽¹⁾	Location	IEEE Class 1E ⁽²⁾	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
IRWST Three-way Isolation Valve for SIS Division 1	30JNK10AA001	Safeguard Building 1	1 ^N 2 ^A	Yes	Yes	Position/Position	Open-Close/Open-Close
IRWST Three-way Isolation Valve for SIS Division 2	30JNK20AA001	Safeguard Building 2	2 ^N 1 ^A	Yes	Yes	Position/Position	Open-Close/Open-Close
IRWST Three-way Isolation valve for SIS Division 3	30JNK30AA001	Safeguard Building 3	3 ^N 4 ^A	Yes	Yes	Position/Position	Open-Close/Open-Close
IRWST Three-way Isolation Valve for SIS Division 4	30JNK40AA001	Safeguard Building 4	4 ^N 3 ^A	Yes	Yes	Position/Position	Open-Close/Open-Close
IRWST Isolation Valve for CVCS	30JNK10AA009	Safeguard Building 1	1 ^N 2 ^A	Yes	Yes	Position/Position	Open-Close/Open-Close
IRWST Isolation Valve for CVCS	30JNK10AA013	Safeguard Building 1	4 ^N 3 ^A	Yes	Yes	Position/Position	Open-Close/Open-Close
IRWST Isolation Valve for SAHRS	30JNK11AA009	Safeguard Building 4	4 ^N 3 ^A	Yes	Yes	Position/Position	Open-Close/Open-Close
IRWST Train 1 and 2	30JNK10CL050	Reactor Building Annulus	Yes	Yes	no	Level/Level	N/A
IRWST Train 1 and 2	30JNK10CL052	Reactor Building Annulus	Yes	Yes	no	Level/Level	N/A
IRWST Train 3 and 4	30JNK11CL050	Reactor Building Annulus	Yes	Yes	no	Level/Level	N/A

Table 2.2.2-2—IRWSTS Equipment I&C and Electrical Design
Sheet 2 of 2

Description	Tag Number ⁽¹⁾	Location	IEEE Class 1E ⁽²⁾	EQ – Harsh Env.	PACS	MCR/RSS Displays	MCR/RSS Controls
IRWST Train 3 and 4	30JNK11CL052	Reactor Building Annulus	Yes	Yes	no	Level/Level	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 equipment is normally powered from. ^A denotes the division the equipment is powered from when alternate feed is implemented.

**Table 2.2.2-3—In-Containment Refueling Water Storage
Tank System ITAAC
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Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
2.1	The functional arrangement of the IRWSTS is as described in the Design Description of Section 2.2.2, Tables 2.2.2-1 and 2.2.2-2, and as shown on Figure 2.2.2-1.	An inspection of the as-built IRWSTS functional arrangement will be performed.	The IRWSTS conforms to the functional arrangement as described in the Design Description of Section 2.2.2, Tables 2.2.2-1 and 2.2.2-2, and as shown on Figure 2.2.2-1.
2.2	Deleted.	Deleted.	Deleted.
2.3	Physical separation exists between divisions of the IRWSTS as shown on Figure 2.2.2-1.	An inspection will be performed to verify that the as-built divisions of the IRWSTS are physically separated.	The divisions of the IRWSTS are physically separated in the Reactor Building as shown on Figure 2.2.2-1. The IRWSTS equipment in the Safeguard Buildings is located in separate Safeguard Buildings as listed in Table 2.2.2-1.
3.1	Valves listed in Table 2.2.2-1 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 design basis accident conditions.	Tests or type tests of valves will be performed to demonstrate that the pumps and valves function under design basis accident conditions.	A report concludes that the valves listed in Table 2.2.2-1 are capable of performing their intended function for a full range of system differential pressure and flow, ambient temperatures, and available voltage (as applicable) under design basis accident conditions.
3.2	Deleted.	Deleted.	Deleted.
3.3	Equipment identified as Seismic Category I in Table 2.2.2-1 can withstand seismic design basis loads without a loss of the function listed in Table 2.2.2-1.	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 2.2.2-1 using analytical assumptions, or under conditions, which bound the Seismic Category I design requirements.	a. Test/analysis reports conclude that the equipment identified as Seismic Category I in Table 2.2.2-1 can withstand seismic design basis loads without a loss of the function listed in Table 2.2.2-1 including the time required to perform the listed function.

**Table 2.2.2-3—In-Containment Refueling Water Storage
Tank System ITAAC
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Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
		b. An inspection will be performed of the as-built equipment identified as Seismic Category I in Table 2.2.2-1 to verify that the equipment, including anchorage, are installed per the approved design requirements.	b. Inspection reports conclude that the equipment identified as Seismic Category I in Table 2.2.2-1, including anchorage, are installed per the approved design requirements.
3.4	Deleted.	Deleted.	Deleted.
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	ASME Code Class 1, 2, and 3 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 that meet the requirements of NCA-3550, and conclude that the design of the ASME Code Class 1, 2 and 3 piping system complies with the requirements of the ASME Code Section III. {{DAC}}
3.14	As-built ASME Code Class 1, 2 and 3 components are reconciled with the design requirements.	A reconciliation analysis of ASME Code Class 1, 2 and 3 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, 2 and 3 components, and document the results of the reconciliation analysis.

**Table 2.2.2-3—In-Containment Refueling Water Storage
Tank System ITAAC
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Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
3.15	Pressure-boundary welds in ASME Code Class 1, 2 and 3 components meet ASME Code Section III non-destructive examination requirements.	An inspection of the as-built pressure-boundary welds in ASME Code Class 1, 2 and 3 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, 2 and 3 components.
3.16	ASME Code Class 1, 2 and 3 components retain their pressure-boundary integrity at their design pressure.	A hydrostatic test will be conducted on ASME Code Class 1, 2 and 3 components that are required to be hydrostatically tested by the ASME Code Section III.	ASME Code Data Report(s) exist and conclude that the results of the hydrostatic test of ASME Code Class 1, 2 and 3 components comply with the requirements of ASME Code Section III.
3.17	ASME Code Class 1, 2 and 3 components 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, 2 and 3 components will be conducted.	ASME Code Data Report(s) exist that conclude that ASME Code Class 1, 2 and 3 components are fabricated, installed, and inspected in accordance with ASME Code Section III requirements.
4.1	Displays listed in Table 2.2.2-2 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 2.2.2-2 are indicated on the PICS operator workstations in the MCR by using test input signals to PICS. b. Tests will be performed to verify that the displays listed in Table 2.2.2-2 are indicated on the PICS operator workstations in the RSS by using test input signals inputs to PICS.	a. Displays listed in Table 2.2.2-2 are indicated on the PICS operator workstations in the MCR. b. Displays listed in Table 2.2.2-2 are indicated on the PICS operator workstations in the RSS.

**Table 2.2.2-3—In-Containment Refueling Water Storage
Tank System ITAAC
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Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
4.2	Controls on the PICS operator workstations in the MCR and the RSS perform the function listed in Table 2.2.2-2.	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 2.2.2-2. b. Controls on the PICS operator workstations in the RSS perform the function listed in Table 2.2.2-2.
4.3	Equipment listed as being controlled by a PACS module in Table 2.2.2-2 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 input 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 2.2.2-2 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	Deleted.	Deleted.	Deleted.
5.1	Equipment designated as Class 1E in Table 2.2.2-2 are powered from the Class 1E division as listed in Table 2.2.2-2 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 2.2.2-2. 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 2.2.2-2.
5.2	Deleted.	Deleted.	Deleted.

**Table 2.2.2-3—In-Containment Refueling Water Storage
Tank System ITAAC
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Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
6.1	Equipment designated as harsh environment in Table 2.2.2-2 will perform the function listed in Table 2.2.2-1 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 2.2.2-2 to perform the function listed in Table 2.2.2-1 under normal environmental conditions, containment test conditions, anticipated operational occurrences, and accident and post-accident environmental conditions. b. An inspection will be performed of the as-built equipment designated as harsh environment in Table 2.2.2-2 to verify that the equipment, including anchorage, are installed per the approved design requirements.	a. EQDPs conclude that the equipment designated as harsh environment in Table 2.2.2-2 can perform the function listed in Table 2.2.2-1 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. Inspection reports conclude that the equipment designated as harsh environment in Table 2.2.2-2, including anchorage, are installed per the approved design requirements.
7.1	Class 1E valves listed in Table 2.2.2-2 will function to change position as listed in Table 2.2.2-1 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 2.2.2-2 change position as listed in Table 2.2.2-1 under normal operating conditions.
7.2	Deleted.	Deleted.	Deleted.
7.3	The IRWST provides a water volume for emergency core cooling.	An inspection and analysis will be performed to verify the as-built IRWST water volume.	The IRWST provides a minimum water volume of 66,886 ft ³ .
7.4	Post-LOCA pH control is provided for the IRWST with TSP.	An inspection and analysis will be performed to verify the as-built capacity of the TSP baskets to provide post-LOCA pH control.	The TSP baskets listed in Table 2.2.2-1 hold a capacity of TSP of ≥ 12,200 lb _m .

**Table 2.2.2-3—In-Containment Refueling Water Storage
Tank System ITAAC
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Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
7.5	The IRWST suction inlet line for each safety injection system division has a debris screen.	a. An inspection will be performed to verify a debris screen is installed in the as-built IRWST suction inlet line for each safety injection system division. b. An inspection and analysis will be performed to verify the minimum surface area and maximum mesh grid opening of the as-built debris screen.	a. A debris screen is installed in the IRWST suction inlet line for each safety injection system division. b. The debris screen has a minimum surface area of 753 ft² and a maximum mesh grid opening of 0.08 x 0.08 inches.
7.6	Deleted.	Deleted.	Deleted.
7.7	The IRWST provides water to flood the core spreading area.	An inspection will be performed to verify the as-built IRWST and interfacing severe accident heat removal system piping configuration provides a flow path to the core spreading area.	The IRWST and interfacing severe accident heat removal system piping configuration provides a flow path to the core spreading area.
7.8	The IRWST has a retaining basket located directly below each heavy floor opening.	a. An inspection will be performed to verify a retaining basket is installed in the as-built IRWST directly under each heavy floor opening. b. An inspection and analysis will be performed to verify the minimum surface area and maximum mesh grid opening of the as-built retaining basket.	a. A retaining basket is installed in the IRWST directly below each heavy floor opening. b. The retaining basket has a minimum surface area of 721 ft² and a maximum mesh grid opening of 0.08 x 0.08 inches.

**Table 2.2.2-3—In-Containment Refueling Water Storage
Tank System ITAAC
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Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
7.9	The IRWST has a trash rack located over each heavy floor opening.	a. An inspection will be performed to verify a trash rack is installed over each as-built heavy floor opening. b. An inspection will be performed to verify the maximum mesh grid opening of the as-built trash rack.	a. A trash rack is installed over each heavy floor opening to the IRWST. b. The trash rack has a maximum mesh grid opening of 4 x 4 inches.
7.10	The IRWST has a weir located around each trash rack at the heavy floor opening.	An inspection will be performed to verify a weir is installed around each as-built trash rack at the heavy floor opening.	A weir is installed around each trash rack at the heavy floor opening.
7.11	The IRWST has a weir located at the annular space wall openings.	An inspection will be performed to verify a weir is installed at the as-built annular space wall openings.	A weir is installed at the annular space wall opening.