2.9.5 Nuclear Island Drain and Vent System

Design Description

1.0 System Description

The nuclear island drain and vent system (NIDVS) collects, temporarily stores, and transfers radioactive fluids from the nuclear island area to other plant systems in a controlled manner. Portions of the NIDVS are classified as safety-related. The NIDVS operates during normal power, start-up, and shutdown conditions.

The NIDVS provides the following safety-related functions:

- Provides alarms in the main control room (MCR) to indicate a flooding event.
- Trips the essential service water system (ESWS) pump and closes the ESWS pump discharge valve in a Safeguard Building (SB) flooding event.
- Supports reactor coolant pressure boundary (RCPB) leakage detection.

2.0 Arrangement

2.1 The location of the sump level sensors is as listed in Table 2.9.5-1—NIDVS Equipment I&C and Electrical Design.

3.0 I&C Design Features, Displays, and Controls

3.1 Displays listed in Table 2.9.5-1 are indicated on the PICS operator workstations in the MCR.

3.2 An interlock for the sump level sensors in the Safeguard Buildings as listed in Table 2.9.5-1 trips the ESWS pump and closes the pump discharge valve in response to a flooding signal in the respective Safeguard Building.

3.3 Containment sump level sensors support RCS leakage detection.

4.0 Electrical Power Design Features

4.1 The sump level sensors designated as Class 1E in Table 2.9.5-1 are powered from the Class 1E division as listed in Table 2.9.5-1 in a normal feed condition.

5.0 Environmental Qualifications

5.1 The sump level sensors listed in Table 2.9.5-1 designated as harsh environment can initiate an alarm in the MCR under normal environmental conditions, containment test conditions, anticipated operational occurrences, and accident and post-accident environmental conditions.

Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.9.5-2 lists the NIDVS ITAAC.

Table 2.9.5-1—NIDVS Equipment I&C and Electrical Design

Description	Tag Number(1)	Location	IEEE Class 1E	EQ – Harsh Env.	MCR Display
Level Sensors for Sump 30KTE20BB001	30KTE20CL001	Safeguard Building 1	Division 1	Yes	Yes
Level Sensors for Sump 30KTE20BB002	30KTE20CL003	Safeguard Building 2	Division 2	Yes	Yes
Level Sensors for Sump 30KTE20BB003	30KTE20CL005	Safeguard Building 3	Division 3	Yes	Yes
Level Sensors for Sump 30KTE20BB004	30KTE20CL007	Safeguard Building 4	Division 4	Yes	Yes
Level Sensors for Sump 30KTC30BB001	30KTC30CL001	Fuel Building	Division 1	Yes	Yes
Level Sensors for Sump 30KTC30BB002	30KTC30CL003	Fuel Building	Division 4	Yes	Yes
Level Sensors for Sump 30KTD10BB002	30KTD10CL002	Reactor Building Annulus	Division 4	No	Yes
Level Sensors for Sump 30KTC10BB001	30KTC10CL001	Reactor Building	Division 1	Yes	Yes
	30KTC10CL002	Reactor Building	Division 1	Yes	Yes
Level Sensors for Sump 30KTC10BB002	30KTC10CL005	Reactor Building	Division 4	Yes	Yes
Reactor Building Sump Pump	30KTC10AP001	Reactor Building	N/A	N/A	Start/Stop
Reactor Building Sump Pump	30KTC10AP002	Reactor Building	N/A	N/A	Start/Stop

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

Table 2.9.5-2—Nuclear Island Drain and Vent System ITAAC
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Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
2.1	The location of the sump level sensors is as listed in Table 2.9.5-1.	An inspection of the location of the as-built sump level sensors will be performed.	The sump level sensors listed in Table 2.9.5-1 are located as listed in Table 2.9.5-1.
3.1	Displays listed in Table 2.9.5-1 are indicated on the PICS operator workstations in the MCR.	Tests will be performed to verify that the displays listed in Table 2.9.5-1 are indicated on the PICS operator workstations in the MCR.	Displays listed in Table 2.9.5-1 are indicated on the PICS operator workstations in the MCR.
3.2	An interlock for the sump level sensors in the Safeguard Buildings as listed in Table 2.9.5-1 trips the ESWS pump and closes the pump discharge valve in response to a flooding signal in the respective Safeguard Building.	Tests will be performed using test input signals to verify the interlock for the sump level sensors automatically trips the ESWS pump and closes the pump discharge valve in response to a flooding signal in the respective Safeguard Building.	The following interlock responds as specified below when activated by a flooding signal: ● The sump level sensors in each of the Safeguard Buildings as listed in Table 2.9.5-1 trip the ESWS pump and close the pump discharge valve in response to a flooding signal in the respective Safeguard Building.
3.3	Containment sump level sensors support RCS leakage detection.	Tests will be performed to verify that Containment sump level sensors support RCS leakage detection.	Containment sump level sensors can detect a level increase of 0.5 gpm within one hour.
4.1	The sump level sensors designated as Class 1E in Table 2.9.5-1 are powered from the Class 1E division as listed in Table 2.9.5-1 in a normal feed condition.	Tests will be performed by providing a test input signal to the aligned Class 1E division.	The test input signal provided in the normally aligned division is present at the sump level sensors identified in Table 2.9.5-1.

Table 2.9.5-2—Nuclear Island Drain and Vent System ITAAC
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Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
5.1	The sump level sensors listed in Table 2.9.5-1 designated as harsh environment can initiate an alarm in the MCR 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 sump level sensors designated as harsh environment in Table 2.9.5-1 to initiate an alarm in the MCR under normal environmental conditions, containment test conditions, anticipated operational occurrences, and accident and post-accident environmental conditions.	a. EQDPs conclude that the sump level sensors designated as harsh environment in Table 2.9.5-1 can initiate an alarm in the MCR under normal environmental conditions, containment test conditions, anticipated operational occurrences, and accident and post-accident environmental conditions, including the time required to initiate an alarm in the MCR.
		b. An inspection will be performed of the as-built sump level sensors designated as harsh environment in Table 2.9.5-1 to verify that the equipment, including the associated cables, wiring, and terminations located in a harsh environment, are bounded by the type test or combination of type tests and analyses.	b. A report exists and concludes that the sump level sensors designated as harsh environment in Table 2.9.5-1, including the associated cables, wiring, and terminations located in a harsh environment, are bounded by the type test or combination of type tests and analyses.

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