

2.4.24 Diverse Actuation System

1.0 Description

The diverse actuation system (DAS) is a non-safety related digital I&C system.

The DAS provides the following non-safety related functions:

- Automatic anticipated transient without scram (ATWS) mitigation functions.
- Automatic PS software common cause failure mitigation functions.
- Automatic station blackout (SBO) mitigation functions.

2.0 Arrangement

2.1 The DAS equipment is located as listed in Table 2.4.24-1—Diverse Actuation System Equipment.

2.2 Physical separation exists between the four divisions of the DAS.

3.0 I&C Design Features, Displays and Controls

3.1 The DAS system design is accomplished through a phased approach which includes the following (or equivalent) phases:

1. System Requirements Phase.
2. System Design Phase.
3. Software/Hardware Requirements Phase.
4. Software/Hardware Design Phase.
5. Software/Hardware Implementation Phase.
6. Software/Hardware Validation Phase.
7. System Integration Phase.
8. System Validation Phase.

3.2 The system hardware and system software in the DAS are diverse from the system hardware and system software in the protection system (PS).

3.3 The DAS generates signals for automatic actuation of the functions identified in Table 2.4.24-2—Functions Automatically Actuated by the DAS.

3.4 The DAS allows manual, system-level actuation of the functions listed in Table 2.4.24-3.

3.5 Functions of the DAS that are not tested by the self-test features are identified and included in the periodic testing procedures.

4.0 System Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.24-4 lists the DAS ITAAC.

Table 2.4.24-1—Diverse Actuation System Equipment

Description	Location
DAS Units Division 1	Safeguard Building 1
DAS Units Division 2	Safeguard Building 2
DAS Units Division 3	Safeguard Building 3
DAS Units Division 4	Safeguard Building 4

Table 2.4.24-2—Functions Automatically Actuated by the DAS

Reactor trip on low SG pressure
Reactor trip on low SG level
Reactor trip on high SG level
Reactor trip on low reactor coolant system (RCS) flow (two loops)
Reactor trip on low-low RCS flow (one loop)
Reactor trip on high neutron flux (power range)
Reactor trip on low hot leg pressure
Reactor trip on high pressurizer (PZR) pressure
Turbine trip on reactor trip
EFWS actuation on low SG level
SIS actuation on low PZR pressure
Main steam isolation on low SG pressure with signal to PAS to generate partial cooldown through TBS
Containment isolation on high containment activity (also includes functions that cascade from containment isolation: Annulus ventilation and Safeguard Building HVAC reconfiguration)
MFWS isolation on low SG pressure
MFWS isolation on high SG level
Opening of containment H ₂ mixing dampers on high containment pressure

Table 2.4.24-3—Functions Manually Actuated through the DAS

Safety Injection System Actuation
Containment Isolation (stage 1)
EFW Actuation

Table 2.4.24-4—Diverse Actuation System ITAAC (3 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
2.1	The DAS equipment is located as listed in Table 2.4.24-1.	Inspections will be performed of the location of the DAS equipment.	The equipment listed in Table 2.4.24-1 is located as listed in Table 2.4.24-1.
2.2	Physical separation exists between the four divisions of the DAS.	Inspections will be performed to verify that the divisions of the DAS are located in separate buildings.	The four divisions of the DAS are located in separate Safeguard Buildings as listed in Table 2.4.24-1.
3.1	<p>The DAS system design is accomplished through a phased approach which includes the following (or equivalent) phases:</p> <ol style="list-style-type: none"> 1. System Requirements Phase. 2. System Design Phase. 3. Software/Hardware Requirements Phase. 4. Software/Hardware Design Phase. 4. Software/Hardware Implementation Phase. 6. Software/Hardware Validation Phase. 7. System Integration Phase. 8. System Validation Phase. 	<ol style="list-style-type: none"> a. Analyses will be performed to verify that the outputs for the DAS system requirements phase conform to the requirements of that phase. {{DAC}} b. Analyses will be performed to verify that the outputs for the DAS system design phase conform to the requirements of that phase. {{DAC}} c. Analyses will be performed to verify that the outputs for the DAS software/hardware requirements phase conform to the requirements of that phase. {{DAC}} d. Analyses will be performed to verify that the outputs for the DAS software/hardware design phase conform to the requirements of that phase. {{DAC}} e. Analyses will be performed to verify that the outputs for the DAS software/hardware implementation phase conform to the requirements of that phase. 	<ol style="list-style-type: none"> a. A report exists and concludes that the outputs for the DAS system requirements phase conform to the requirements of that phase. {{DAC}} b. A report exists and concludes that the outputs for the DAS system design phase conform to the requirements of that phase. {{DAC}} c. A report exists and concludes that the outputs for the DAS software/hardware requirements phase conform to the requirements of that phase. {{DAC}} d. A report exists and concludes that the outputs for the DAS software/hardware design phase conform to the requirements of that phase. {{DAC}} e. A report exists and concludes that the outputs for the DAS software/hardware implementation phase conform to the requirements of that phase.

Table 2.4.24-4—Diverse Actuation System ITAAC (3 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
		<p>f. Analyses will be performed to verify that the outputs for the DAS software/hardware validation phase conform to the requirements of that phase.</p> <p>g. Analyses will be performed to verify that the outputs for the DAS system integration phase conform to the requirements of that phase.</p> <p>h. Analyses will be performed to verify that the outputs for the DAS system validation phase conform to the requirements of that phase.</p>	<p>f. A report exists and concludes that the outputs for the DAS software/hardware validation phase conform to the requirements of that phase.</p> <p>g. A report exists and concludes that the outputs for the DAS system integration phase conform to the requirements of that phase.</p> <p>h. A report exists and concludes that the outputs for the DAS system validation phase conform to the requirements of that phase.</p>
3.2	The system hardware and system software in the DAS are diverse from the system hardware and system software in the protection system (PS).	An analysis will be performed to demonstrate that the system hardware and system software in the DAS are diverse from the system hardware and system software in the PS.	A report exists and concludes that the system hardware and system software in the DAS are diverse from the system hardware and system software in the PS.
3.3	The DAS generates signals for automatic actuation of the functions identified in Table 2.4.24-2.	Tests will be performed on the as-built DAS using test signals.	The DAS generates signals for automatic actuation of the functions identified in Table 2.4.24-2.
3.4	The DAS allows manual, system-level actuation of the functions listed in Table 2.4.24-3.	Tests will be performed on the as-built DAS using test signals.	The DAS generates signals allowing manual actuation of the functions identified in Table 2.4.24-3.
3.5	Functions of the DAS that are not tested by the self-test features are identified and included in the periodic testing procedures.	a. An analysis is performed to identify functions of the DAS that are not tested by self-test features.	a. A report exists which identifies any functions of the DAS that are not tested by self-test features.

Table 2.4.24-4—Diverse Actuation System ITAAC (3 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
		b. An inspection is performed to verify that functions of the DAS that are not tested by self-test features are included in periodic testing procedures.	b. Functions of the DAS that are not tested by self-test features are included in periodic testing procedures.

[Next File](#)