2.4.5 Priority and Actuator Control System

1.0 Description

The priority and actuator control system (PACS) is a safety-related system.

The PACS provides the following safety-related functions:

- Prioritizes actuation requests from I&C systems.
- Performs essential equipment protection.
- Performs drive actuation.
- Performs drive monitoring.

2.0 Arrangement

2.1 PACS equipment is located as listed in Table 2.4.5-1—Priority and Actuator Control System Equipment.

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

2.3 Physical separation exists between Class 1E PACS equipment and non-Class 1E equipment.

3.0 Mechanical Design Features

3.1 Equipment identified as Seismic Category I in Table 2.4.5-1 can withstand seismic design basis loads without loss of safety function.

4.0 I&C Design Features, Displays and Controls

4.1 Protection system (PS) signals received by each priority module override other signals received by the priority module.

4.2 Electrical isolation is provided on connections between Class 1E PACS equipment and non-Class 1E equipment.

4.3 Class 1E PACS equipment can perform its safety function when subjected to electromagnetic interference (EMI), radio-frequency interference (RFI), electrostatic discharges (ESD), and power surges.

4.4 The input wiring from other I&C systems to the PACS is properly connected.

4.5 The capability for testing of the PACS is provided while retaining the capability of the PACS to accomplish its safety function. PACS divisions in test are indicated in the MCR.

4.6 Locking mechanisms are provided on the PACS cabinet doors. Opened PACS cabinet doors are indicated in the MCR.

4.7 The equipment for each PACS division is distinctly identified and distinguishable from other identifying markings placed on the equipment, and the identifications do not require frequent use of reference material.

4.8 The PACS provides a position indication signal to the safety information and control system (SICS) for each containment isolation valve (Type B post-accident monitoring (PAM) variable) listed in Table 2.4.5-2.

4.9 Non-Class 1E PACS communication module associated with Class 1E equipment will not cause a failure of a priority module when subjected to EMI, RFI, ESD and power surges.

4.10 The capability of 100% combinatorial testing of the PACS priority module is provided to preclude a software common cause failure.

5.0 Electrical Power Design Features

5.1 Class 1E PACS components are powered from a Class 1E division in a normal or alternate feed condition.

6.0 System Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.5-2 lists the PACS ITAAC.

Table 2.4.5-1—Priority and Actuator Control System Equipment

Description	Tag Number (1)	Location	Seismic Category	IEEE Class 1E(2)(3)
PACS Cabinets, Division 1	30CLE6	Safeguard Building 1	I	1^N 2^A
PACS Cabinets, Division 2	30CLF6	Safeguard Building 2	I	2^N 1^A
PACS Cabinets, Division 3	30CLG6	Safeguard Building 3	I	3^N 4^A
PACS Cabinets, Division 4	30CLH6	Safeguard Building 4	I	4^N 3^A

1) Equipment Tag numbers are provided for information and are not part of the design certification.

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.

3) The PACS communication module is classified as an associated circuit.

Table 2.4.5-2—Containment Isolation Valves
(6 Sheets)

System Name	Valve Number
CADS	30SCB01AA001
CADS	30SCB01AA002
CCWS	30KAB30AA049
CCWS	30KAB30AA051
CCWS	30KAB30AA052
CCWS	30KAB30AA053
CCWS	30KAB30AA055
CCWS	30KAB30AA056
CCWS	30KAB40AA001
CCWS	30KAB40AA006
CCWS	30KAB40AA012
CCWS	30KAB60AA013
CCWS	30KAB60AA018
CCWS	30KAB60AA019
CCWS	30KAB70AA013
CCWS	30KAB70AA018
CCWS	30KAB70AA019
CVCS	30JEW01AA005
CVCS	30JEW50AA001
CVCS	30JEW50AA002
CVCS	30KBA14AA002
CVCS	30KBA14AA003
CVCS	30KBA34AA002
CVS	30KLA10AA001
CVS	30KLA10AA003
CVS	30KLA20AA001
CVS	30KLA20AA003
CVS	30KLA30AA002
CVS	30KLA30AA003
CVS	30KLA40AA001
CVS	30KLA40AA002
CWS	30QNJ41AA002
CWS	30QNJ41AA027

Table 2.4.5-2—Containment Isolation Valves
(6 Sheets)

System Name	Valve Number
CWS	30QNJ41AA028
DWDS	30GHC74AA001
DWDS	30GHC74AA002
EBS	30JDH10AA006
EBS	30JDH40AA006
EFWS	30LAR11AA006
EFWS	30LAR21AA006
EFWS	30LAR31AA006
EFWS	30LAR41AA006
FPCPS	30FAL12AA001
FPCPS	30FAL12AA002
FPCPS	30FAL15AA002
FWS	30LAB60AA002
FWS	30LAB70AA002
FWS	30LAB80AA002
FWS	30LAB90AA002
FWDS	30SGB30AA031
FWDS	30SGB30AA032
GWPS	30KPL84AA002
GWPS	30KPL84AA003
GWPS	30KPL85AA003
GWPS	30KPL85AA004
HMS	30JMU50AA075
HMS	30JMU50AA076
HMS	30JMU50AA077
HMS	30JMU50AA078
HMS	30JMU50AA079
HMS	30JMU50AA080
HMS	30JMU50AA081
HMS	30JMU50AA082
HMS	30JMU50AA083
HMS	30JMU50AA084
HMS	30JMU51AA085

Table 2.4.5-2—Containment Isolation Valves
(6 Sheets)

System Name	Valve Number
HMS	30JMU51AA086
HMS	30JMU51AA087
HMS	30JMU51AA088
HMS	30JMU51AA089
HMS	30JMU51AA090
HMS	30JMU51AA091
HMS	30JMU51AA092
HMS	30JMU51AA093
HMS	30JMU51AA094
IRWST	30JMQ40AA001
IRWST	30JNK10AA001
IRWST	30JNK10AA009
IRWST	30JNK10AA013
IRWST	30JNK11AA009
IRWST	30JNK20AA001
IRWST	30JNK30AA001
IRWST	30JNK40AA001
Leak-Off	30JMM10AA006
Leak-Off	30JMM10AA007
Leak-Off	30JMM23AA001
Leak-Off	30JMM23AA002
LHSI/RHRS	30JNA10AA002
LHSI/RHRS	30JNA10AA003
LHSI/RHRS	30JNA20AA002
LHSI/RHRS	30JNA20AA003
LHSI/RHRS	30JNA30AA002
LHSI/RHRS	30JNA30AA003
LHSI/RHRS	30JNA32AA001
LHSI/RHRS	30JNA40AA002
LHSI/RHRS	30JNA40AA003
LHSI/RHRS	30JNG10AA060
LHSI/RHRS	30JNG10AA061
LHSI/RHRS	30JNG12AA001

Table 2.4.5-2—Containment Isolation Valves
(6 Sheets)

System Name	Valve Number
LHSI/RHRS	30JNG15AA004
LHSI/RHRS	30JNG20AA060
LHSI/RHRS	30JNG20AA061
LHSI/RHRS	30JNG22AA001
LHSI/RHRS	30JNG25AA004
LHSI/RHRS	30JNG30AA060
LHSI/RHRS	30JNG30AA061
LHSI/RHRS	30JNG35AA004
LHSI/RHRS	30JNG40AA060
LHSI/RHRS	30JNG40AA061
LHSI/RHRS	30JNG42AA001
LHSI/RHRS	30JNG45AA004
MCS	30LCA90AA003
MCS	30LCA90AA005
MC	30LCA90AA006
MHSI	30JND10AA002
MHSI	30JND20AA002
MHSI	30JND30AA002
MHSI	30JND40AA002
MSS	30LBA10AA002
MSS	30LBA10AA441
MSS	30LBA13AA001
MSS	30LBA13AA101
MSS	30LBA14AA001
MSS	30LBA20AA002
MSS	30LBA20AA441
MSS	30LBA23AA001
MSS	30LBA23AA101
MSS	30LBA24AA001
MSS	30LBA30AA002
MSS	30LBA30AA441
MSS	30LBA33AA001
MSS	30LBA33AA101

Table 2.4.5-2—Containment Isolation Valves
(6 Sheets)

System Name	Valve Number
MSS	30LBA34AA001
MSS	30LBA40AA002
MSS	30LBA40AA441
MSS	30LBA43AA001
MSS	30LBA43AA101
MSS	30LBA44AA001
NGDS	30QJB40AA001
NGDS	30QJB40AA002
NGDS	30QJB40AA003
NGDS	30QJB40AA004
NIDVS	30KTA10AA017
NIDVS	30KTA10AA018
NIDVS	30KTC10AA005
NIDVS	30KTC10AA006
NIDVS	30KTC10AA010
NIDVS	30KTD10AA015
NIDVS	30KTD10AA024
NIDVS	30KTD10AA025
NSS	30KUA10AA003
NSS	30KUA10AA004
NSS	30KUA20AA002
NSS	30KUA20AA003
NSS	30KUA30AA003
NSS	30KUA30AA004
NSS	30KUB10AA001
NSS	30KUB10AA002
NSS	30QUC11AA001
NSS	30QUC11AA011
NSS	30QUC12AA001
NSS	30QUC12AA011
NSS	30QUC13AA001
NSS	30QUC13AA011
NSS	30QUC14AA001

Table 2.4.5-2—Containment Isolation Valves
(6 Sheets)

System Name	Valve Number
NSS	30QUC14AA011
SAHRS	30JMQ41AA001
SAHRS	30JMQ42AA001
SAHRS	30JMQ43AA001
SASS	30KUL51AA002
SASS	30KUL51AA003
SASS	30KUL52AA002
SASS	30KUL52AA003
SGBDS	30LCQ51AA002
SGBDS	30LCQ51AA003
SGBDS	30LCQ52AA001
SGBDS	30LCQ52AA002

Table 2.4.5-3—Priority and Actuator Control System ITAAC
(5 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
2.1	PACS equipment is located as listed in Table 2.4.5-1.	Inspections will be performed of the location of the PACS equipment.	The PACS equipment listed in Table 2.4.5-1 is located as listed in Table 2.4.5-1.
2.2	Physical separation exists between the four divisions of the PACS.	Inspections will be performed to verify that the divisions of the PACS are located in separate Safeguard Buildings.	The four divisions of the PACS are located in separate Safeguard Buildings as listed in Table 2.4.5-1.
2.3	Physical separation exists between Class 1E PACS equipment and non-Class 1E equipment.	a. Design analyses will be performed to determine the required safety-related structures, separation distance, barriers, or any combination thereof to achieve adequate physical separation between Class 1E PACS equipment and non-Class 1E equipment. b. Inspections will be performed to verify that the required safety-related structures, separation distance, barriers, or any combination thereof exist between the Class 1E PACS equipment and non- Class 1E equipment.	a. A report exists and defines the required safety-related structures, separation distance, barriers, or any combination thereof to achieve adequate physical separation between Class 1E PACS equipment and non-Class 1E equipment. b. The required safety-related structures, separation distance, barriers, or any combination thereof exist between Class 1E PACS equipment and non-Class 1E equipment. Reconciliation is performed of any deviations to the design.

Table 2.4.5-3—Priority and Actuator Control System ITAAC
(5 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
3.1	Equipment identified as Seismic Category I in Table 2.4.5-1 can withstand seismic design basis loads without loss of safety function.	a. Type tests, analyses or a combination of type tests and analyses will be performed on the equipment listed as Seismic Category I in Table 2.4.5-1 using analytical assumptions, or under conditions, which bound the Seismic Category I design requirements.	a. Tests/analysis reports exist and conclude that the equipment listed as Seismic Category I in Table 2.4.5-1 can withstand seismic design basis loads without loss of safety function.
		b. Inspections will be performed of the Seismic Category I equipment listed in Table 2.4.5-1 to verify that the equipment including anchorage is installed as specified on the construction drawings.	b. Inspection reports exist and conclude that the Seismic Category I equipment listed in Table 2.4.5-1 including anchorage is installed as specified on the construction drawings.
4.1	PS signals received by each priority module override other signals received by the priority module	Tests will be performed using test signals that verify PS signals received by each priority modules override other signals received by the priority module.	Test results exist and conclude that the PS signals received by each priority module override other signals received by the priority modules.

Table 2.4.5-3—Priority and Actuator Control System ITAAC
(5 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
4.2	Electrical isolation is provided on connections between Class 1E PACS equipment and non-Class 1E equipment.	a. Analyses will be performed to determine the test specification for electrical isolation devices on connections between Class 1E PACS equipment and non-Class 1E equipment.	a. A test plan exists that provides the test specification for determining whether a device is capable of preventing the propagation of credible electrical faults on connections between Class 1E PACS equipment and non-Class 1E equipment.
		b. Type tests, analyses, or a combination of type tests and analyses will be performed on the electrical isolation devices between Class 1E PACS equipment and non-Class 1E equipment.	b. A report exists and concludes that the Class 1E isolation devices used between Class 1E PACS equipment and non-Class 1E equipment prevent the propagation of credible electrical faults.
		c. Inspections will be performed on connections between Class 1E PACS equipment and non-Class 1E equipment.	c. Class 1E electrical isolation devices exist on connections between Class 1E PACS and non-Class 1E equipment.
4.3	Class 1E PACS equipment can perform its safety function when subjected to EMI, RFI, ESD, and power surges.	Type tests or type tests and analysis of these will be performed for the Class 1E equipment listed in Table 2.4.5-1.	A report exists and concludes that the equipment identified as Class 1E in Table 2.4.5-1 can perform its safety function when subjected to EMI, RFI, ESD, and power surges.
4.4	The input wiring from other I&C systems to the PACS is properly connected.	Inspections will be performed to verify that the input wiring from other I&C systems to the PACS is properly connected.	The input wiring from the other I&C systems to the PACS is properly connected.

Table 2.4.5-3—Priority and Actuator Control System ITAAC
(5 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
4.5	The capability for testing of the PACS is provided while retaining the capability of the PACS to accomplish its safety function. PACS divisions in test are indicated in the MCR.	a. Testing will be performed to verify the capability for testing of the PACs is provided while retaining the capability to accomplish its safety function. b. Inspections will be performed to verify the existence of indication in the MCR when a division of the PACS is placed in test.	a. The capability for testing of the PACS is provided while retaining the capability of the PACS to accomplish its safety functions. b. PACS divisions in test are indicated in the MCR.
4.6	Locking mechanisms are provided on the PACS cabinet doors. Opened PACS cabinet doors are indicated in the MCR.	a. Inspections will be performed to verify the existence of locking mechanisms on the PACS cabinet doors. b. Tests will be performed to verify the proper operation of the locking mechanisms on the PACS cabinet doors. c. Tests and inspections will be performed to verify an indication exists in the MCR when a PACS cabinet door is in the open position.	a. Locking mechanisms exist on the PACS cabinet doors. b. The locking mechanisms on the PACS cabinet doors operate properly. c. Opened PACS cabinet doors are indicated in the MCR.
4.7	The equipment for each PACS division is distinctly identified and distinguishable from other identifying markings placed on the equipment, and the identifications do not require frequent use of reference material.	Inspections will be performed on the PACS equipment to verify that the equipment for each PACS division is distinctly identified and distinguishable from other markings placed on the equipment and that the identifications do not require frequent use of reference material.	The equipment for each PACS division is distinctly identified and distinguishable from other identifying markings placed on the equipment, and the identifications do not require frequent use of reference material.

Table 2.4.5-3—Priority and Actuator Control System ITAAC
(5 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
4.8	The PACS provides a position indication signal to the SICS for each containment isolation valve (Type B PAM variable) listed in Table 2.4.5-2.	Tests will be performed using test signals to verify that the PACS provides position indication signals to the SICS for each containment isolation valve.	The PACS provides a position indication signal to the SICS for each containment isolation valve listed in Table 2.4.5-2.
4.9	Non-Class 1E PACS communication module associated with Class 1E equipment will not cause a failure of a priority module when subjected to EMI, RFI, ESD and power surges	Tests, analyses, or a combination of tests and analyses will be performed on the communication module.	A report exists and concludes that the communication module will not cause a failure of priority module when subjected to EMI, RFI, ESD, and power surges.
4.10	The capability of 100% combinatorial testing of the PACS priority module is provided to preclude a software common cause failure.	A type test will be performed on the PACS priority module to preclude consideration of a software common cause failure.	A report exists and concludes that 100% combinatorial type testing on the PACS priority module has been successfully completed.
5.1	Class 1E PACS components are powered from a Class 1E division in a normal or alternate feed condition.	a. Testing will be performed for components identified as Class 1E in Table 2.4.5-1 by providing a test signal in each normally aligned division. b. Testing will be performed for components identified as Class 1E in Table 2.4.5-1 by providing a test signal in each division with the alternate feed aligned to the divisional pair.	a. The test signal provided in the normally aligned division is present at the respective Class 1E components identified in Table 2.4.5-1. b. The test signal provided in each division with the alternate feed aligned to the divisional pair is present at the respective Class 1E components identified in Table 2.4.5-1.

Next File