## 2.4.5 Priority and Actuator Control System

### Design Description

### 1.0 System 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 The location of the PACS equipment is as listed in Table 2.4.5-1—Priority and Actuator Control System Equipment.

2.2 Physical separation exists between the divisions of the PACS as listed in Table 2.4.5-1.

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 a loss of safety function(s).

### 4.0 I&C Design Features, Displays, and Controls

4.1 The priority module prioritizes different system inputs in the following order from highest to lowest priority:

- PS/DAS
- SAS
- SICS
- PAS

4.2 Electrical isolation is provided on connections between Class 1E PACS equipment and non-Class 1E equipment to prevent the propagation of credible electrical faults.

4.3 Class 1E PACS equipment listed in Table 2.4.5-1 can perform its safety function when subjected to electromagnetic interference (EMI), radio-frequency interference (RFI), electrostatic discharges (ESD), and power surges.

4.4 Deleted.

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 on the PICS operator workstations in the MCR.

4.6 Locking mechanisms are provided on the PACS cabinet doors. PACS cabinet doors that are not closed are indicated on the PICS operator workstations in the MCR.

4.7 Equipment markings for each PACS division are distinctly identified and distinguishable from other identifying markings placed on the equipment.

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—Containment Isolation Valves.

4.9 Non-Class 1E PACS communication module associated with Class 1E PACS equipment will not cause a failure of a PACS priority module when subjected to electromagnetic interference (EMI), radio-frequency interference (RFI), electrostatic discharges (ESD) and power surges.

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

4.11 The PACS is designed so that safety-related functions required for an anticipated operational occurrence (AOO) or postulated accident (PA) are performed in the presence of the following:

- Single failure within the PACS.
- Failures caused by the single failure.
- Failures and spurious system actions that cause or are caused by the AOO or PA requiring the safety function.

## 5.0 Electrical Power Design Features

5.1 Equipment designated as Class 1E in Table 2.4.5-1 are powered from the Class 1E division as listed in Table 2.4.5-1 in a normal or alternate feed condition.

## 6.0 Environmental Qualification

6.1 Equipment designated as mild environment in Table 2.4.5-1 can perform their function under normal environmental conditions, anticipated operational occurrences, and accident and post-accident environmental conditions.

### Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.4.5-3 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) | Environment |
|---|---|---|---|---|---|
| PACS Cabinets, Division 1 | 30CLE6 | Safeguard Building 1 | I | $1^{N}$<br>$2^{A}$ | Mild |
| PACS Cabinets, Division 2 | 30CLF6 | Safeguard Building 2 | I | $2^{N}$<br>$1^{A}$ | Mild |
| PACS Cabinets, Division 3 | 30CLG6 | Safeguard Building 3 | I | $3^{N}$<br>$4^{A}$ | Mild |
| PACS Cabinets, Division 4 | 30CLH6 | Safeguard Building 4 | I | $4^{N}$<br>$3^{A}$ | Mild |

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

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.

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

**Table 2.4.5-2—Containment Isolation Valves**
**Sheet 1 of 6**

| 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 |

**Table 2.4.5-2—Containment Isolation Valves**
**Sheet 2 of 6**

| System Name | Valve Number |
|---|---|
| CWS | 30QNJ41AA027 |
| 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 |

**Table 2.4.5-2—Containment Isolation Valves**
**Sheet 3 of 6**

| System Name | Valve Number |
|---|---|
| HMS | 30JMU51AA085 |
| 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 |

**Table 2.4.5-2—Containment Isolation Valves**
**Sheet 4 of 6**

| System Name | Valve Number |
|---|---|
| LHSI/RHRS | 30JNG12AA001 |
| 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 |

**Table 2.4.5-2—Containment Isolation Valves**
**Sheet 5 of 6**

| System Name | Valve Number |
|---|---|
| MSS | 30LBA33AA101 |
| 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 |

**Table 2.4.5-2—Containment Isolation Valves**
**Sheet 6 of 6**

| System Name | Valve Number |
|---|---|
| NSS | 30QUC14AA001 |
| 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**
**Sheet 1 of 6**

| Commitment Wording | | Inspections, Tests, Analyses | Acceptance Criteria |
|---|---|---|---|
| 2.1 | The location of the PACS equipment is as listed in Table 2.4.5-1. | An inspection of the location of the as-built PACS equipment will be performed. | 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 divisions of the PACS as listed in Table 2.4.5-1. | An inspection will be performed to verify that the as-built divisions of the PACS are located in separate Safeguard Buildings. | The 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. An analysis will be performed to determine the required safety-related structures, separation distance, barriers, or any combination thereof to achieve physical separation between as-built Class 1E PACS equipment and as-built non-Class 1E equipment. | a. A report defines the required safety-related structures, separation distance, barriers, or any combination thereof to achieve physical separation between Class 1E PACS equipment and non-Class 1E equipment. |
| | | b. An inspection will be performed to verify that the required safety-related structures, separation distance, barriers, or any combination thereof exist between as-built Class 1E PACS equipment and as-built 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. |

**Table 2.4.5-3—Priority and Actuator Control System ITAAC**
**Sheet 2 of 6**

| 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 a loss of safety function(s). | 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 2.4.5-1 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 2.4.5-1 can withstand seismic design basis loads without a loss of safety function(s). |
| | | b. An inspection will be performed of the as-built equipment identified as Seismic Category I in Table 2.4.5-1 to verify that the equipment, including anchorage, are installed in a condition bounded by the tested or analyzed conditions. | b. Inspection reports conclude that the equipment identified as Seismic Category I in Table 2.4.5-1, including anchorage, are installed in a condition bounded by the tested or analyzed conditions. |
| 4.1 | The priority module prioritizes different system inputs in the following order from highest to lowest priority:<br>● PS/DAS<br>● SAS<br>● SICS<br>● PAS | A test will be performed using test input signals to verify the priority module prioritizes different system inputs in the following order from highest to lowest priority:<br>● PS/DAS<br>● SAS<br>● SICS<br>● PAS | The priority module prioritizes different system inputs in the following order from highest to lowest priority:<br>● PS/DAS<br>● SAS<br>● SICS<br>● PAS |

**Table 2.4.5-3—Priority and Actuator Control System ITAAC**
**Sheet 3 of 6**

| 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 to prevent the propagation of credible electrical faults. | a. 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.<br>b. An inspection will be performed on connections between as-built Class 1E PACS equipment and non-Class 1E equipment. | a. A report 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.<br>b. Class 1E electrical isolation devices exist on connections between Class 1E PACS equipment and non-Class 1E equipment. |
| 4.3 | Class 1E PACS equipment listed in Table 2.4.5-1 can perform its safety function when subjected to EMI, RFI, ESD, and power surges. | Type tests or type tests and analyses will be performed to demonstrate that the Class 1E PACS equipment listed in Table 2.4.5-1 can perform its safety function when subjected to EMI, RFI, ESD, and power surges. | 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 | Deleted. | Deleted. | Deleted. |
| 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 on the PICS operator workstations in the MCR. | a. A test will be performed using test input signals to verify the capability for testing of the PACS is provided while retaining the capability to accomplish its safety function.<br>b. A test will be performed to verify bypassed SAS equipment is indicated on the PICS operator workstations in the MCR. | a. The capability for testing of the PACS is provided while retaining the capability of the PACS to accomplish its safety functions.<br>b. PACS divisions in test are indicated on the PICS operator workstations in the MCR. |

**Table 2.4.5-3—Priority and Actuator Control System ITAAC**
**Sheet 4 of 6**

| | Commitment Wording | Inspections, Tests, Analyses | Acceptance Criteria |
|---|---|---|---|
| 4.6 | Locking mechanisms are provided on the PACS cabinet doors. PACS cabinet doors that are not closed are indicated on the PICS operator workstations in the MCR. | a. A test will be performed to verify that the locking mechanisms on the PACS cabinet doors operate properly.<br>b. A test will be performed to verify that PACS cabinet doors that are not closed are indicated on the PICS operator workstations in the MCR. | a. The locking mechanisms on the PACS cabinet doors operate properly.<br>b. PACS cabinet doors that are not closed are indicated on the PICS operator workstations in the MCR. |
| 4.7 | Equipment markings for each PACS division are distinctly identified and distinguishable from other identifying markings placed on the equipment. | An inspection will be performed on the as-built PACS equipment to verify that the equipment markings for each PACS division are distinctly identified and distinguishable from other markings placed on the equipment. | Equipment markings for each PACS division are distinctly identified and distinguishable from other identifying markings placed on the equipment. |
| 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 input signals to verify that the PACS provides position indication signals to the SICS for each containment isolation valve listed in Table 2.4.5-2. | 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 PACS equipment will not cause a failure of a PACS priority module when subjected to EMI, RFI, ESD, and power surges. | Type tests or type tests and analyses will be performed to demonstrate that the non-Class 1E PACS communication module associated with Class 1E PACS equipment will not cause a failure of a PACS priority module when subjected to EMI, RFI, ESD, and power surges. | Non-Class 1E PACS communication module associated with Class 1E PACS equipment will not cause a failure of a PACS 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 consideration of 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. | The capability of 100% combinatorial testing of the PACS priority module is provided to preclude consideration of a software common cause failure. |

**Table 2.4.5-3—Priority and Actuator Control System ITAAC**
**Sheet 5 of 6**

| Commitment Wording | | Inspections, Tests, Analyses | Acceptance Criteria |
|---|---|---|---|
| 4.11 | The PACS is designed so that safety-related functions required for an AOO or PA are performed in the presence of the following:<br>● Single failures within the PACS.<br>● Failures caused by the single failure.<br>● Failures and spurious system actions that cause or are caused by the AOO or PA requiring the safety function. | A failure modes and effects analysis will be performed on the PACS at the level of replaceable modules and components. | A report concludes that the PACS is designed so that safety-related functions required for an AOO or PA are performed in the presence of the following:<br>● Single failures within the PACS.<br>● Failures caused by the single failure.<br>● Failures and spurious system actions that cause or are caused by the AOO or PA requiring the safety function. |
| 5.1 | Equipment designated as Class 1E in Table 2.4.5-1 are powered from the Class 1E division as listed in Table 2.4.5-1 in a normal or alternate feed condition. | a. Testing will be performed by providing a test input signal in each normally aligned division.<br><br>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 2.4.5-1.<br><br>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 2.4.5-1. |

**Table 2.4.5-3—Priority and Actuator Control System ITAAC**
**Sheet 6 of 6**

| Commitment Wording | | Inspections, Tests, Analyses | Acceptance Criteria |
|---|---|---|---|
| 6.1 | Equipment designated as mild environment in Table 2.4.5-1 can perform their function under normal environmental 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 mild environment in Table 2.4.5-1 to perform their function under normal environmental conditions, containment test conditions, anticipated operational occurrences, and accident and post-accident environmental conditions. | a. EQDPs conclude that the equipment designated as mild environment in Table 2.4.5-1 can perform their function 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. An inspection will be performed of the as-built equipment designated as mild environment in Table 2.4.5-1 to verify that the equipment, including the associated cables, wiring, and terminations located in a mild environment, are bounded by the type test or combination of type tests and analyses. | b. A report exists and concludes that the equipment designated as mild environment in Table 2.4.5-1, including the associated cables, wiring, and terminations located in a mild environment, are bounded by the type test or combination of type tests and analyses. |

Next File