Southern Nuclear

Vogtle Electric Generating Plant Units 3 & 4
Code Alternatives re: Squib Valves

SNC Requesting Additional Code Alternatives for Squib Valve Inspections and Charge Firing

August 13, 2026

Southern Nuclear

Agenda

- Introductions & Meeting Purpose
- Background
- Description of Revisions
- Basis for Revisions
- Schedule
- Discussion / Feedback

INTRODUCTIONS & MEETING PURPOSE

- Introductions
  - Southern Nuclear Operating Company (SNC)
  - Nuclear Regulatory Commission (NRC)

- Meeting Purpose

  SNC is requesting ASME Code Relief and proposing Alternative requirements for Squib Valve Inspections and Charge Testing

  The purpose of this meeting is to discuss the proposed relief and alternative requirements

Squib Valve Code Alternatives

BACKGROUND –

Inservice Testing (IST) Program Plan for the First 10-year Interval

- Based on the American Society of Mechanical Engineers (ASME) Operation and Maintenance of Nuclear Power Plants (OM) Code, 2012 Edition
- Addresses Pumps, Valves, and Dynamic Restraints

Prior Squib Valve Relief and Alternative Requirements

- IST-ALT-03 No squib valve testing in 3R01 and 4R01
  - Request 20240215 ML24046A230
  - Request revision 20240507 ML24128A245 – identifies change of vendor
  - NRC Approval 20240729 ML24191A456

Squib Valve Code Alternatives

BACKGROUND (Prior Squib Valve Relief and Alternative Requirements)

- IST-ALT-04 Revised squib valve testing in 3R02 and 4R02
  - Request 20260212 ML26044A119
  - RCI response 20260310 ML26069A575
  - NRC Approval 20260319 ML26075A078
  - Clarified PXS safety function provided by single “Train”
  - Clarified ADS safety function provided by single “Train”
  - 3/4R02 – disassembled for inspection - 4 squib valves
  - 3/4R02 – replaced and fired charge for 6 squib valves
  - Post-3/4R02 - disassemble and inspect 2 squib valves per outage (one of each size)
  - Post-3/4R02 - replace and fire charge for 3 squib valves per outage (one of each function)

ASME Components Within Scope of Proposed Alternatives

System (Purpose) Component Numbers	Class	Category	Size
ADS (Depressurization)			
3/4-RCS-V004A,B,C,D	1	D	14"
PXS (Injection)			
3/4-PXS-V123A & B	1	D	8"
3/4-PXS-V125A & B	1	D	8"
PXS (Recirculation)			
3/4-PXS-V118A & B	3	D	8"
3/4-PXS-V120A & B	3	D	8"

Squib Valve Code Alternatives

PREVIOUS TESTING

- 3R01 & 4R01 – No squib valve testing per previous relief request
  - 3/4R02 – disassemble for inspection - 4 squib valves
  - 3/4R02 – replace and fire charge for 6 squib valves
- 3R02
  - 3R02 – disassembled for inspection – V123A, V125A, V004B, V004D
  - 3R02 – replaced and fired charge – V123A, V125A, V118A, V120A, V004B, V004D
- Future (later slide)

PREVIOUS TESTING RESULTS

- 3R02
  - 3R02 – “non-disassembly” visual inspections on all squib valves – no significant findings
    - Not subject of the relief request
  - 3R02 – removed for disassembly and inspection – V123A, V125A, V004B, V004D
    - V004B, V004D – Disassembly and inspection in situ – no findings
    - V123A, V125A – Disassembly and inspection in progress – results in August
  - 3R02 – replace and charge firing – V123A, V125A, V118A, V120A, V004B, V004D
    - Findings – charge tests completed within acceptable parameters
  - 3R02 – arm and fire test – all squib valves every outage
    - Findings – arm and fire test failure to be discussed with charge testing request
    - Not subject of the relief request

Applicable ASME OM Code Requirements - Disassembly

- ISTC-5260(e)(2) states:
  - **At least once every 2 yr., one valve of each size** shall be disassembled for internal examination of the valve and actuator.

    (-a) This examination will verify the operational readiness of the valve assembly by evaluating the internal components for their operational functionality, ensuring the integrity of individual components, and removing any foreign material, fluid, or corrosion in accordance with the Owner's examination procedures.

    (-b) **All valves shall be disassembled for internal examination at least once every 10 yr.**

Applicable ASME OM Code Requirements – Charge Firing

- The pertinent IST requirements in the ASME OM Code, Division 1, Section IST, Subsection ISTC, "Inservice Testing of Valves in Water-Cooled Reactor Nuclear Power Plants," as incorporated by reference in 10 CFR 50.55a, are:
- ISTC-5260(c), "Explosively Actuated Valves," states:
  - **At least 20% of the charges in explosively actuated valves shall be fired and replaced** at least once every 2 yr [years]. If a charge fails to fire, all charges with the same batch number shall be removed, discarded, and replaced with charges from a different batch.
- ISTC-5260(e) states:
  - (4) For the valves selected in the test sample for subparagraph ISTC-5260(c), the sampling must select at least **one explosively actuated valve from each redundant safety train** every 2 yr. Each sampled pyrotechnic charge shall be tested in the valve or a qualified test fixture to confirm the capability of the charge to provide the necessary motive force to operate the valve to perform its intended function without damage to the valve body or connected piping.

DESCRIPTION of CHANGES (Revised)

- Disassembly Inspection - ISTC-5260(e)(2)
  - Remove schedule requirement for one valve of each size every two years

- Proposed Alternative - ISTC-5260(e)(2)(b)
  - **Disassemble and inspect ALL valves at least once every 10 years**
  - **Disassemble and inspect no more than 50% of any function during any outage**
  - **Disassemble and inspect at least 50% of any function during any sequential four outage period**

DESCRIPTION of CHANGES (Revised)

- Charge Firing - ISTC-5260(c) & ISTC-5260(e)
  - Remove requirement for at least 20% every two years
  - Remove requirement for at least one valve from each safety train every two years

- Proposed Alternative - ISTC-5260(e)(2)
  - **Fire charges in ALL valves at least once every 10 years**, or within the qualified life, whichever is less (SNC plan is to extend current qualified life from 8 years to 10 or more)
  - **Fire charges in no more than 50% of any function during any outage**
  - **Fire charges in at least 50% of any function during any sequential four outage period**
  - **Charge testing may be concurrent with above valve disassembly**

Squib Valve Code Alternatives

EXAMPLE Disassembly Inspection Schedules

VOGTLE UNIT 3

Valve	Type	Functional purpose	R1 (1.5Y)	R2 (3Y) Actual	R3 (4.5Y)	R4 (6Y)	R5 (7.5Y)	R6 (9Y)
PXS-V118A	8" LP	Containment Recirculation	NONE					X
PXS-V118B	8" LP	Containment Recirculation	NONE		X			
PXS-V120A	8" HP-L	Containment Recirculation	NONE					X
PXS-V120B	8" HP-R	Containment Recirculation	NONE		X			
PXS-V123A	8" HP-R	IRWST Injection	NONE	X				X
PXS-V123B	8" HP-L	IRWST Injection	NONE		X			
PXS-V125A	8" HP-R	IRWST Injection	NONE	X				X
PXS-V125B	8" HP-L	IRWST Injection	NONE		X			
RCS-V004A	14"	ADS Stage 4 Depressurization	NONE				X	
RCS-V004B	14"	ADS Stage 4 Depressurization	NONE	X				
RCS-V004C	14"	ADS Stage 4 Depressurization	NONE				X	
RCS-V004D	14"	ADS Stage 4 Depressurization	NONE	X				

VOGTLE UNIT 4

Valve	Type	Functional purpose	R1 (1.5Y)	R2 (3Y)	R3 (4.5Y)	R4 (6Y)	R5 (7.5Y)	R6 (9Y)
PXS-V118A	8" LP	Containment Recirculation	NONE	X				
PXS-V118B	8" LP	Containment Recirculation	NONE				X	
PXS-V120A	8" HP-L	Containment Recirculation	NONE	X				
PXS-V120B	8" HP-R	Containment Recirculation	NONE				X	
PXS-V123A	8" HP-R	IRWST Injection	NONE	X				
PXS-V123B	8" HP-L	IRWST Injection	NONE				X	
PXS-V125A	8" HP-R	IRWST Injection	NONE	X				
PXS-V125B	8" HP-L	IRWST Injection	NONE				X	
RCS-V004A	14"	ADS Stage 4 Depressurization	NONE					X
RCS-V004B	14"	ADS Stage 4 Depressurization	NONE			X		
RCS-V004C	14"	ADS Stage 4 Depressurization	NONE					X
RCS-V004D	14"	ADS Stage 4 Depressurization	NONE			X		

BASIS FOR CHANGES (Revised)

- Disassembly Inspection – ADS – 4 valves
  - At least once every 2 yr., **one valve of each size** shall be disassembled for internal examination of the valve and actuator.
  - For VEGP 3/4, **one valve of each size** equates to 25% of the total ADS valves
  - 18 mo cycle leads to disassembly and inspection of ALL valves over four cycles **(6 years)**
    - **Excessive testing** (6 disassembled and inspected over 10 yrs if one required every outage)
  - Room congestion and interferences leads to **significant challenges** (next two slides)
  - **Plan** is to disassemble and inspect both valves in one SG compartment during an outage
  - **Plan** is two valves (in one SG compartment) during an outage (none for some outages)
  - **Require** - All four valves (two in each SG compartment) done once per 10 years
  - Scheduling as identified in previous slides
  - TS requirements must also be met

Squib Valve Code Alternatives

BASIS FOR CHANGES

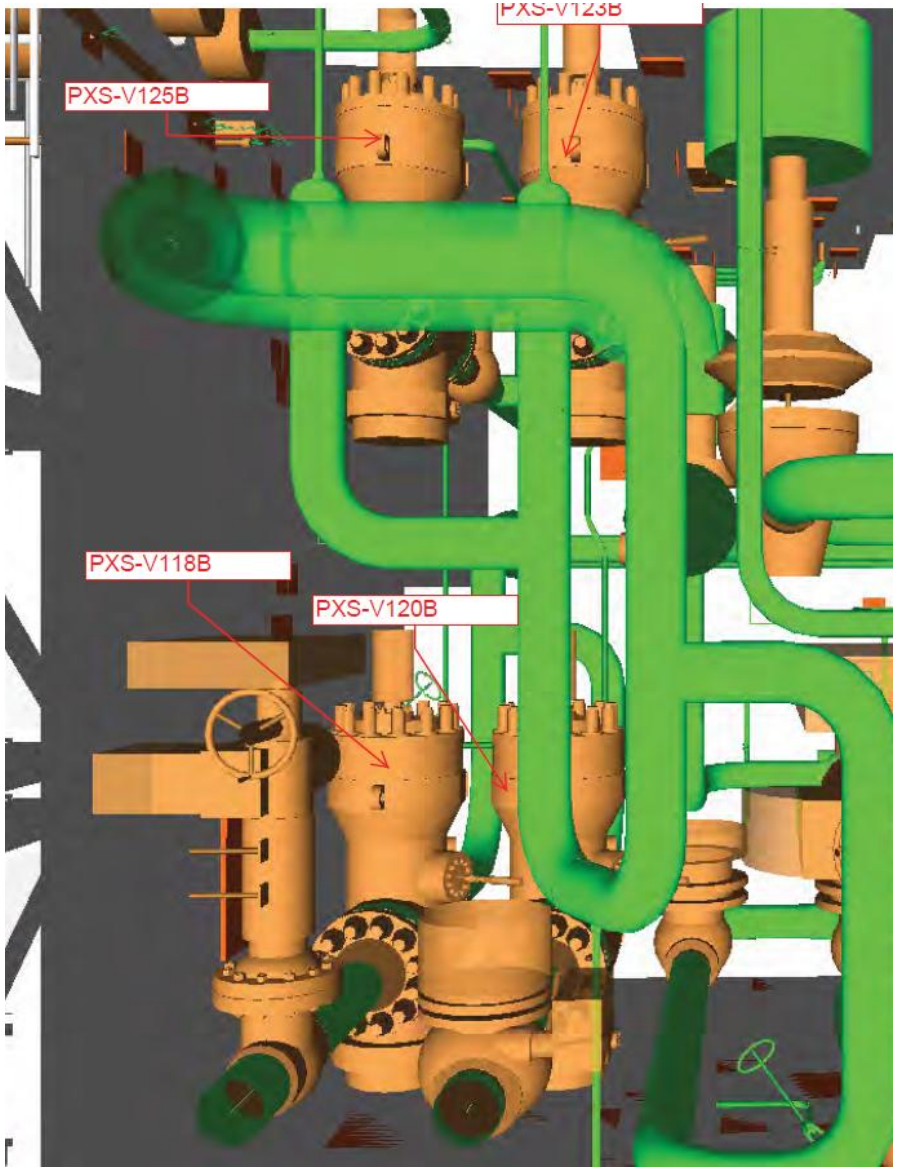
- Disassembly Inspection – ADS – 4 valves – "**significant challenges"**
  - Risk of inducing ADS line vibrations increased because work may upset pipe geometry
  - Simultaneous working of these valves with any other work in the SG compartments is very
    - Burdensome – essentially no secondary side SG work can be done during squib valve work
    - Physical layout of the rooms means that for a period, ingress and egress is significantly impeded
    - Requires building a large rigging scaffold which interferes with other work
  - Radiological challenges:
    - Inspections are near some of the highest dose components in the room
    - Access requires walking through the primary area to the secondary area, increasing potential to spread contamination from primary to secondary

Squib Valve Code Alternatives

BASIS FOR CHANGES (Revised)

- Disassembly Inspection – PXS – 8 valves
  - At least once every 2 yr., **one valve of each size** shall be disassembled for internal examination of the valve and actuator.
  - For VEGP 3/4, **one valve of each size** equates to 12.5% of the total PXS valves
  - 18 mo cycle leads to disassembly and inspection of ALL valves over eight cycles **(12 yrs)**
  - Room layout and other work in the room leads to **significant challenges**
    - **Piping layout** (shown next slide) leads to excessive work and requires additional resources
    - Valves removed just to access another squib leads to increased risk of damage
  - **Plan** is to disassemble and inspect all four valves in one room during an outage
  - **Plan** is four valves (in one PXS room) during an outage (none for some outages)
  - **Require** - All eight valves (four in each PXS room) done once per 10 years
  - Scheduling as identified in previous slides
  - TS requirements must also be met

Squib Valve Code Alternatives



PXS valves – B path

- Upper elevation
  - PXS-V125B and PXS-V123B
- Lower elevation
  - PXS-V118B and PXS-V120B

- **V123B** removal requires prior removal of V125B
- **V120B** removal requires prior removal of both V123B and V125B
- **V118B** removal requires prior removal of V120B, V123B, and V125B

A path PXS valves are similarly arranged.

Squib Valve Code Alternatives

BASIS FOR CHANGES (Revised)

- Squib Valve Charge Firing – ADS & PXS – 12 valves
  - At least once every 2 yr, a**t least 20% of the charges shall be fired and replaced**.
  - For VEGP 3/4, **at least 20%** equates to (three or) 25% of the total squib valves
  - Only two required to be disassembles and inspected
  - 18 mo cycle leads to charge firing of ALL valves every four cycles **(6 years)**
    - **Excessive testing** (if required every outage)
  - **Plan** is to test up to four valves during an outage (none for some outages)
  - **Plan** is to fire the charges concurrent with valve disassembly and inspection (however, could be separated)
  - **Require** - All twelve valves done once per 10 years, or within the qualified life, whichever is less
  - Scheduling as identified in previous slides
  - TS requirements must also be met

COMPONENT EVALUATION

- Scoping study addressing credible mechanical degradation mechanisms
- Evaluation concluded visual inspections of representative areas sufficient for detection
  - internal actuating mechanism contains few critical sliding or bearing surfaces
  - primary credible degradation mechanism is corrosion/oxidation of internal metallic surfaces
  - degradation would require moisture intrusion or seal degradation
  - such degradation would manifest as visible corrosion products, deposits, discoloration, or fluid accumulation before operability is challenged

COMPONENT EVALUATION

- Scoping study addressing credible electrical degradation mechanisms
  - Readiness of I&C components (CIMs and cabinets) are verified through:
    - arm and fire testing (each outage)
    - upstream logic testing (each outage)
  - Failure and degradation modes of components within other circuitry will be addressed in alternative
  - By associating handling and testing of charges to the disassembly, frequency for risk of maintenance induced failure or degradation in sensitive components is reduced

FAILURE MITIGATION

- Maintenance related failures can be mitigated
  - Replacement with pre-inspected spare valves, limiting work during the outage
  - Removed valves inspected post-outage in a more controlled environment
  - Removed valves inspected outside of the outage critical path activities
  - Inspections done with appropriate planning, tooling, training, and oversight
  - Reduced intrusive maintenance > reduced opportunities for maintenance induced failures

PRA Insights

- PRA sensitivity evaluation result:
  - all modeled hazards quantified (internal, flood, fire, seismic)
  - very small total absolute change (<1E-7 increase to CDF, <5E-10 increase to LERF)

- Relief request to include:
  - PRA sensitivity evaluation description and results
  - comparison to RG 1.174 risk guidelines
  - description of treatment of uncertainty
  - evaluation of impact on defense in depth and safety margin, consistent with RG 1.174

IMPACT to PRA BASED CHANGES

- Base PRA Impact
  - Will be assessed via normal PRA maintenance process
  - Proposed alternatives retain a measure of test staggering
- RICT, 50.69, and SFCP license amendment requests
  - LARs were developed using the PRA model of record
  - No impact to the applications identified

Squib Valve Code Alternatives

SCHEDULE (Revised)

- **Target submittal** — August 2026 IST-ALT-05 re: Inspections
  September 2026 IST-ALT-06 re: Charge Firing
- **Outage related** — Yes
- **Target approval** — December 2026 IST-ALT-05 re: Inspections
  January 2027 IST-ALT-06 re: Charge Firing

Discussion / Feedback

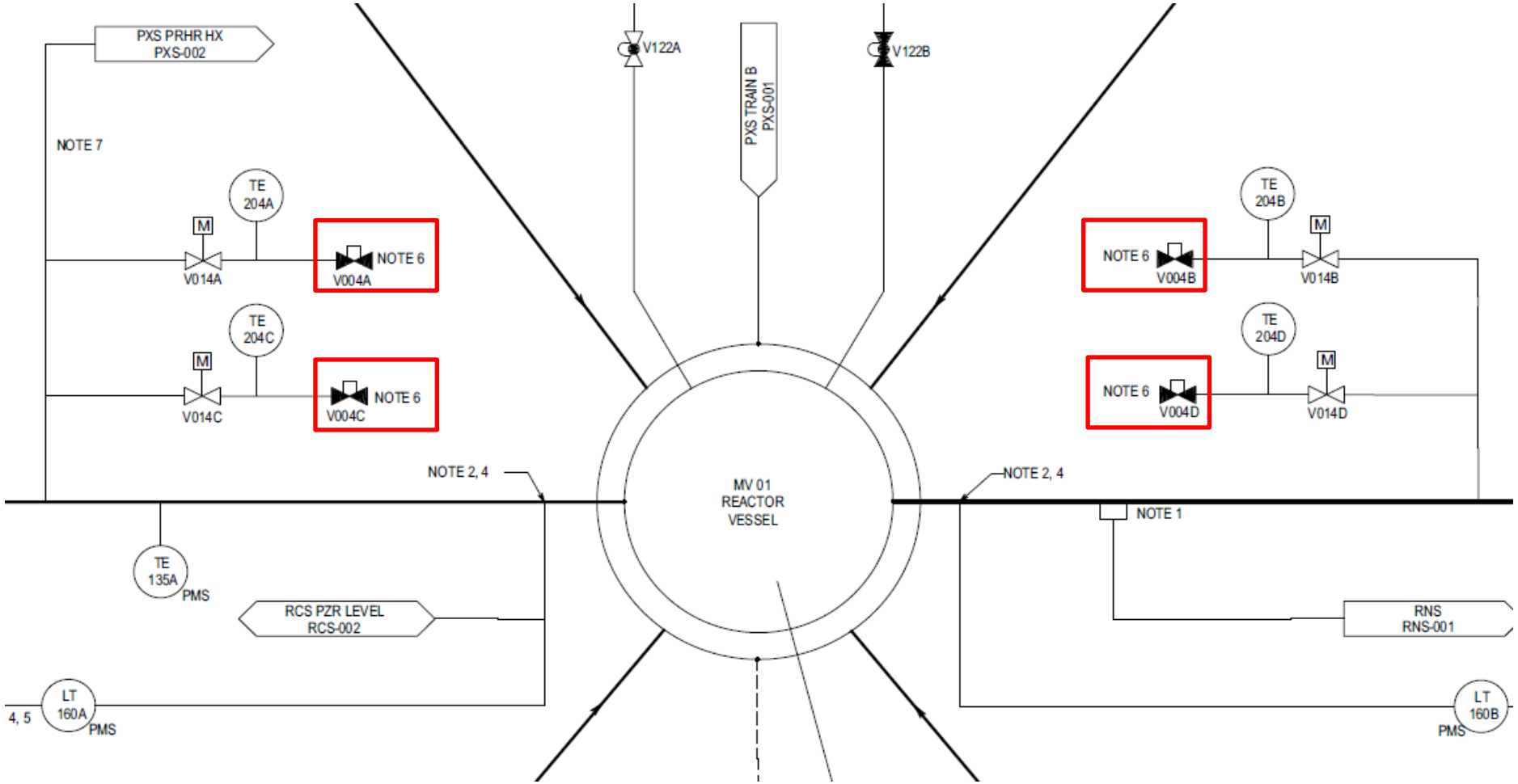
Squib Valves

Table 6.3-1 (excerpts)
Passive Core Cooling System - Remote Actuation Valves

- In-Containment Refueling Water Storage Tank
  - IRWST injection line MOV (V121A/B)
  - **IRWST injection line squib (V123A/B, V125A/B)**
- Containment Recirculation Sump Valves
  - Recirculation line MOVs (V117A/B)
  - **Recirculation line squib valves (V118A/B, V120A/B)**
- Automatic Depressurization System Valves
  - ADS Stage 1 MOVs (V001A/B, V011A/B)
  - ADS Stage 2 MOVs (V002A/B, V012A/B)
  - ADS Stage 3 MOVs (V003A/B, V013A/B)
  - ADS Stage 4 MOVs (V014A/B/C/D)
  - **ADS Stage 4 squib valves (V004A/B/C/D)**

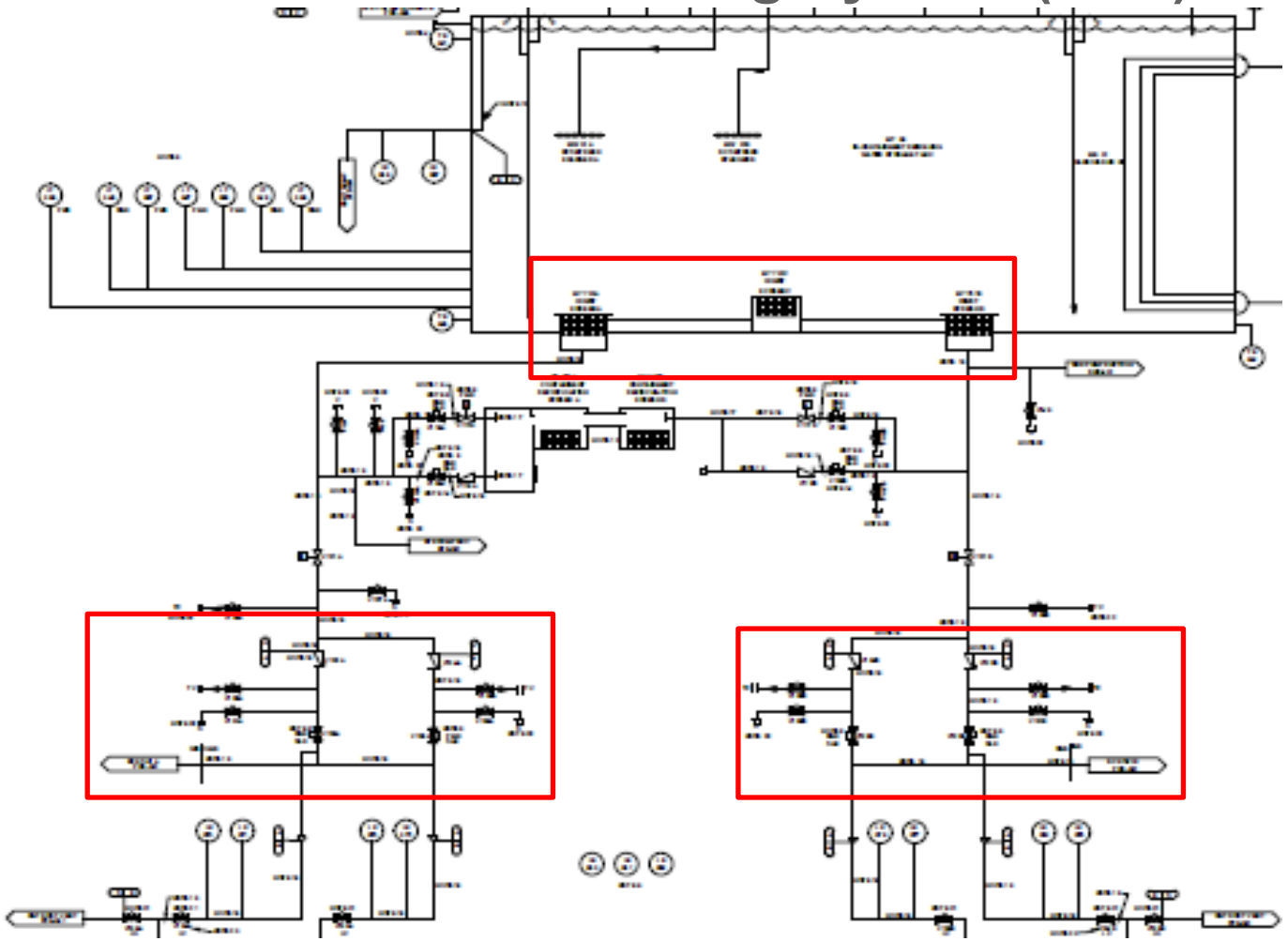
Squib Valves

[ADS Valves] on Figure 5.3-5 (Sheet 1 of 3) Simplified Reactor Coolant System (RCS) P&ID



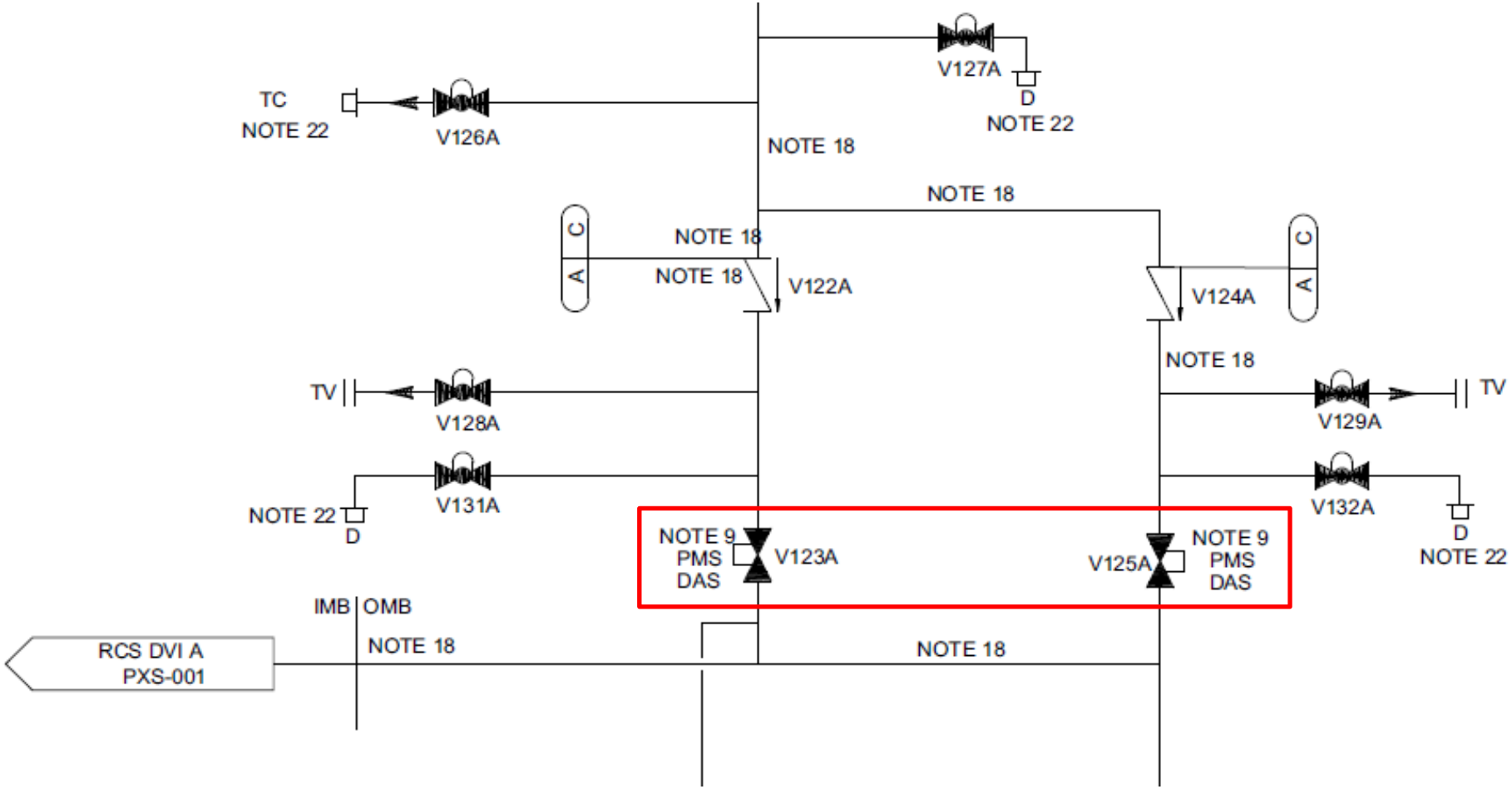
Squib Valves

[PXS Injection Paths] on Figure 6.3-1 (Sheet 2 of 3) Simplified Passive Core Cooling System (PXS) P&ID

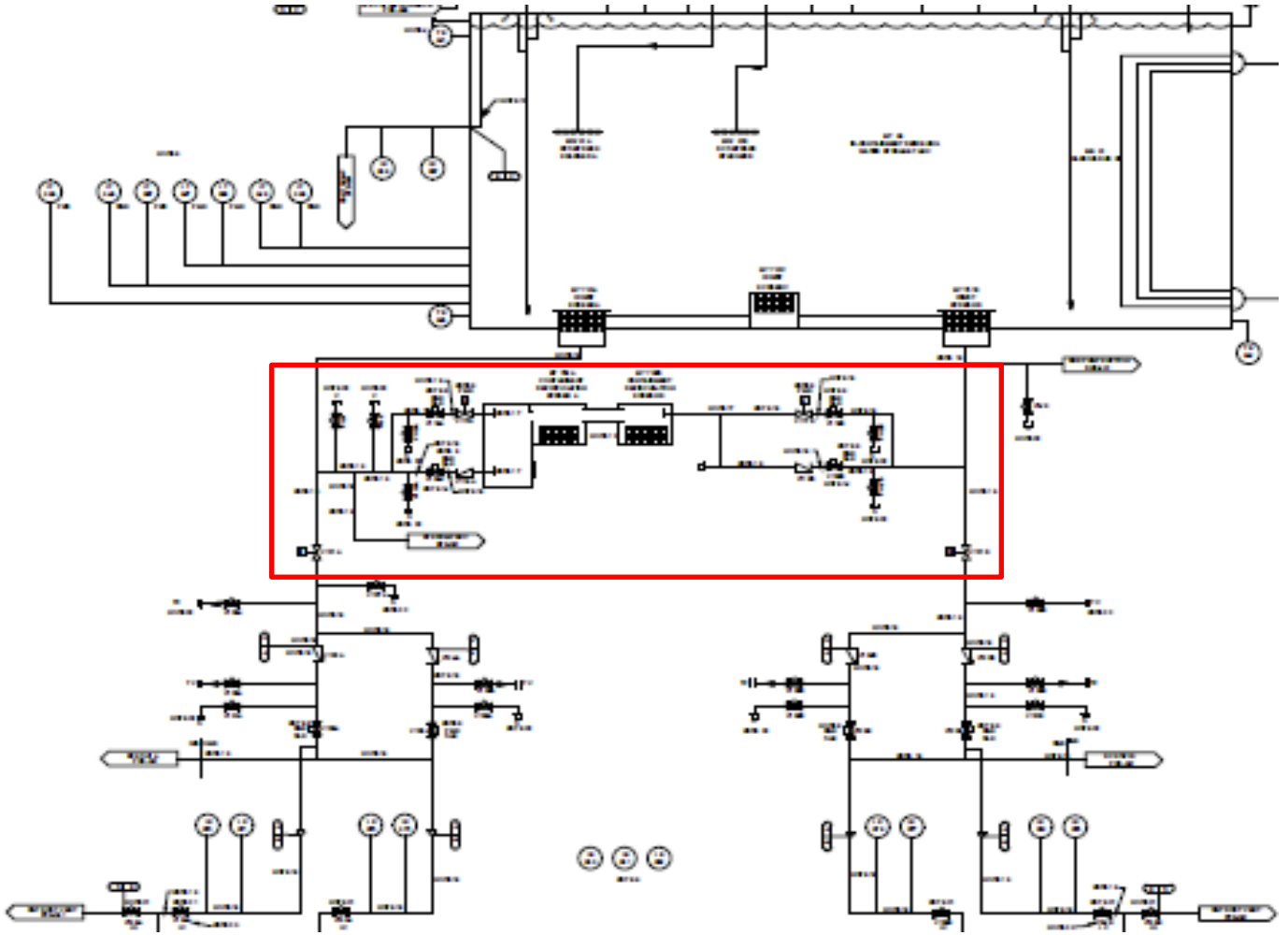


Squib Valves

[PXS Injection Valves] on Figure 6.3-1 (Sheet 2 of 3) Simplified Passive Core Cooling System (PXS) P&ID



[PXS Recirculation Paths] on Figure 6.3-1 (Sheet 2 of 3) Simplified Passive Core Cooling System (PXS) P&ID



Squib Valves

[PXS Recirculation Valves] on Figure 6.3-1 (Sheet 2 of 3) Simplified Passive Core Cooling System (PXS) P&ID