ENCLOSURE 3

TENNESSEE VALLEY AUTHORITY
SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2

SQN ITS Conversion RAI Database

ITS NRC Questions

Id	**188**
NRC Question Number	**CET001**
Category	**Technical**
ITS Section	**3.6**
ITS Number	**3.6.10**
DOC Number	
JFD Number	
JFD Bases Number	
Page Number (s)	**441**
NRC Reviewer Supervisor	**Rob Elliott**
Technical Branch POC	**Ahsan Sallman**
Conf Call Requested	**N**
NRC Question	**The proposed ITS SR 3.6.10.4 in page 441 states: "Verify each EGTS filter cooling bypass valve can be operated."** **This statement differs from NUREG 1431 Volume 1 SR 3.6.13.4 by changing the term "opened" to "operated."** **"Operated" could be interpreted as simply verifying the "open" and "closed" position of the valve by injecting a fictitious signal to the operator, i.e. without actually opening of the valve.** **Please ensure consistency with STS by retaining the word "opened" in order to make sure both operator and valve are tested.** **If you choose to retain the word "operated," please provide an explanation of "operated" in the ITS SR to provide clear expectation that the intent of the surveillance requirement is to test the operator and the valve for opening.**
Attach File 1	
Attach File 2	
Issue Date	**9/4/2014**
Added By	**Caroline Tilton**
Date Modified	
Modified By	
Date Added	**9/4/2014 8:49 AM**
Notification	**Scott Bowman**

Michelle Conner
Khadijah Hemphill
Andrew Hon
Lynn Mynatt
Ray Schiele
Roger Scott
Caroline Tilton

Licensee Response/NRC Response/NRC Question Closure

Id	**348**
NRC Question Number	**CET001**
Select Application	**Licensee Response**
Attachment 1	
Attachment 2	
Response Statement	**In response to CET001, the following information is provided to justify that ITS SR 3.6.10.4, "Verify each EGTS filter train cooling bypass valve can be operated," is equivalent to the STS language that requires verifying the EGTS cooling bypass valves can be opened. The SQN Surveillance Instructions used to demonstrate the operability of each EGTS filter cooling bypass valve require each valve go to the open position when the associated handswitch is placed in P-AUTO and return to the closed position when the handswitch is placed in the CLOSE position. The acceptance criteria requires verification that each valve opens and closes. Therefore, ITS SR 3.6.10.4, as proposed, will require verification that the valves can open when operated from the associated handswitch.**
Response Date/Time	**9/25/2014 11:15 AM**
Closure Statement	
Question Closure Date	
Notification	**Scott Bowman** **Michelle Conner** **Khadijah Hemphill** **Andrew Hon** **Ray Schiele** **Caroline Tilton**
Added By	**Scott Bowman**
Date Added	**9/25/2014 10:10 AM**
Date Modified	
Modified By	

Licensee Response/NRC Response/NRC Question Closure

Id	**360**
NRC Question Number	**CET001**
Select Application	**NRC Question Closure**
Attachment 1	
Attachment 2	
Response Statement	
Response Date/Time	
Closure Statement	**This question is closed and no further information is required at this time to draft the Safety Evaluation.**
Question Closure Date	**9/26/2014**
Notification	**Scott Bowman** **Michelle Conner** **Khadijah Hemphill** **Andrew Hon** **Lynn Mynatt** **Ray Schiele** **Roger Scott**
Added By	**Caroline Tilton**
Date Added	**9/26/2014 10:26 AM**
Date Modified	
Modified By	

ITS NRC Questions

Id	**189**
NRC Question Number	**CET002**
Category	**Technical**
ITS Section	**3.6**
ITS Number	**3.6.13**
DOC Number	
JFD Number	
JFD Bases Number	
Page Number (s)	**564**
NRC Reviewer Supervisor	**Rob Elliott**
Technical Branch POC	**Ahsan Sallman**
Conf Call Requested	**N**
NRC Question	**On page 564, the proposed Note 2 under ACTIONS in ITS 3.6.13 states:** **"When an ice condenser intermediate deck or top deck door is inoperable for a short duration solely due to personnel standing on or opening the door to perform required Surveillances, minor preventative maintenance, or system walkdowns, entry into associated Conditions and Required Actions is not required."** **Please define "short duration" and provide the bases for that definition. Include in the discussion any impact these allowed activities would have on the operability of the isolation condenser and how ice sublimation would be prevented.**
Attach File 1	
Attach File 2	
Issue Date	**9/8/2014**
Added By	**Caroline Tilton**
Date Modified	
Modified By	
Date Added	**9/8/2014 1:20 PM**
Notification	**Scott Bowman** **Michelle Conner** **Khadijah Hemphill** **Andrew Hon** **Lynn Mynatt** **Ray Schiele** **Roger Scott** **Caroline Tilton**

Licensee Response/NRC Response/NRC Question Closure

Id	**336**
NRC Question Number	**CET002**
Select Application	**NRC Question Closure**
Attachment 1	
Attachment 2	
Response Statement	
Response Date/Time	
Closure Statement	**This question has been withdrawn. No further information is required at this time to draft the Safety Evaluation.**
Question Closure Date	**9/17/2014**
Notification	**Scott Bowman Michelle Conner Khadijah Hemphill Andrew Hon Lynn Mynatt Ray Schiele Roger Scott**
Added By	**Caroline Tilton**
Date Added	**9/17/2014 12:51 PM**
Date Modified	
Modified By	

ITS NRC Questions

Id	**204**
NRC Question Number	**CET003**
Category	**Technical**
ITS Section	**3.6**
ITS Number	**3.6.7**
DOC Number	
JFD Number	
JFD Bases Number	
Page Number(s)	
NRC Reviewer Supervisor	**Rob Elliott**
Technical Branch POC	**Mark Blumberg**
Conf Call Requested	**N**

NRC Question

Enclosure 2, Volume 11, Rev. 0, Page 344 of 724, contains Sequoyah's proposed ITS LCO 3.6.7, "Shield Building." In converting to NUREG-1431, "Standard Technical Specifications (STS) for Westinghouse Plants," the licensee documented L01, the less restrictive change, but did not fully address the design differences. Sequoyah's shield building design is unique and differs from the design in the STS 3.6.8. STS 3.6.8 Condition A's completion time is 24 hours. Sequoyah must establish a proper technical basis to adopt STS 3.6.8. L01 did not provide a technical basis to support incorporation of the 24 completion time.

Please respond with one of the following options:
Please provide analyses that show that with the proposed change that the applicable regulatory limits (Title 10 of the Code of Federal Regulations (10 CFR), Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants," General Design Criterion (GDC) 19, 41, 60, 61, 64, 10 CFR, Part 100, "Reactor Site Criteria," and 10 CFR, Section 50.67, "Accident source term" (10 CFR 50.67)) continue to be met for all accidents and anticipated operational occurrences in the design bases. Provide the methods, acceptance criterion, inputs and assumptions used to make this determination and a justification for each change from the current licensing basis.

If the boundary restoration is credited using human actions, please justify how these actions can be assured to be completed with the potential for harsh environments (radiation, temperature, pressure, humidity, or failure of high energy pipes) which could impede or prevent human actions. Please specify and justify the methods used to make these determinations (e.g. RGs, Standard Review Plan Section 18.0, "Human Factors Engineering" (Adams Accession No. ML070670253 etc.)). Consistent with the requirements of NUREG-0737, "Clarification of TMI Action Plan Requirements," Task Action II.B.2, justify how these actions can be completed without exceeding the acceptance criteria (typically contained in GDC 19) for mission doses. In addition, describe the actions taken to compensate for the inability of closing the boundary using

engineered controls and justify the reliability of these methods (e.g. during maintenance on a boundary door).

Alternatively, restore to the current licensing basis for the Shield Building and the Emergency Gas Treatment System.

Attach File 1	
Attach File 2	
Issue Date	**12/8/2014**
Added By	**Khadijah Hemphill**
Date Modified	
Modified By	
Date Added	**12/8/2014 2:43 PM**
Notification	**Mark Blumberg** **Scott Bowman** **Michelle Conner** **Khadijah Hemphill** **Andrew Hon** **Lynn Mynatt** **Ray Schiele** **Roger Scott** **Caroline Tilton**

Licensee Response/NRC Response/NRC Question Closure

Id	**415**
NRC Question Number	**CET003**
Select Application	**Licensee Response**
Attachment 1	**CET003 Attachment 1 - Pages from SQN UFSAR.pdf** (325KB)
Attachment 2	**CET003 Attachment 2 - Restore CLB to ITS 3.6.7 and 3.6.10 12-23-14.pdf** (5MB)

Response Statement

In response to request for additional information (RAI) CET-003, the Tennessee Valley Authority (TVA) has elected to restore the Sequoyah Nuclear Plant (SQN), Units 1 and 2, current licensing basis for the shield building and the Emergency Gas Treatment System (EGTS) except for the relocation of the technical details of the current Technical Specification (CTS) definition of SHIELD BUILDING INTEGRITY and the change to the frequency of CTS 4.6.1.8.d.4.

As described in the SQN Updated Final Safety Analysis Report (UFSAR), the containment for each of the reactors consists of a freestanding steel vessel with an ice condenser and separate reinforced concrete shield building. The Shield Building annulus serves as a redundant second containment barrier for control of radioactivity leakage. As described in UFSAR Subsection 3.8.4.1.1, "Auxiliary Control Building," and shown on UFSAR Figure 1.2.3-5, access to the annulus is via the reactor building access room door and a water tight annulus access door at plant elevation 690.0 ft. During normal operation, these doors provide personnel and equipment access to the shield building annulus area and are equipped with electrical interlocks to ensure that one door is always closed (UFSAR pg. 3.8−77). Attachment 1 to this RAI provides UFSAR Figure 1.2.3-5 that shows the shield building annulus area personnel access location for SQN, Units 1 and 2 and UFSAR pages 3.8-76 and 3.8−77 that provide the description of the access doors to the annulus area; Doors A64 and A65; and Doors A77 and A78.

Attachment 2 to this RAI provides markup pages of Enclosure 2, Volumes 3 and 11 of the Improved Technical Specifications (ITS) license amendment request (LAR) dated November 11, 2013 (ADAMS Accession Nos. ML13329A790 and ML13330A931) and restores the SQN, Units 1 and 2 current licensing basis for the shield building and EGTS except for the following:

- **Relocate technical details of the CTS definition of SHIELD BUILDING INTEGRITY to the Bases of ITS 3.6.7, "Shield Building" (ITS 3.6.7 Discussion of Changes (DOC) LA04) that results in the deletion of this definition (ITS 1.0 DOC A06) from the CTS.**
- **Change in frequency of CTS 4.6.1.8.d.4 from "at least once per 18 months" to "18 months on a STAGGERED TEST BASIS (ITS 3.6.7 DOC L02 moved to ITS 3.6.10 DOC L05).**
- **Moving the specified frequency of CTS 4.6.1.8.d.4 to the Surveillance Frequency Control Program (ITS 3.6.7 DOC LA03 deleted and details incorporated into ITS 3.6.10 DOC LA02)**

As a result of the relocation of the technical details and deletion of the CTS definition of SHIELD BUILDING INTEGRITY, the following changes are being made to ITS 1.0, Use and Application, of Enclosure 2 of the ITS LAR:

- **CTS 1.0 markups are revised to delete the SHIELD BUILDING INTEGRITY and DOC A06 indicator is added (Enclosure 2, Volume 3, Rev. 0, Pages 14 and 32 of 117).**
- **SHIELD BUILDING INTEGRITY is added to the list of deleted definitions in ITS 1.0 DOC A06 (Enclosure 2, Volume 3, Rev. 0, Page 45 of 117).**

The following changes are being made to ITS 3.6.7, Shield Building of Enclosure 2 of the ITS LAR:

- **CTS 3.6.1.7 and 4.6.1.7 markups are revised to delete DOC L01, delete proposed SR 3.6.7.1 and SR 3.6.7.2. These revisions include changes to applicable DOC and ITS indicators (Enclosure 2, Volume 11, Rev. 0, Pages 330 and 334 of 724).**
- **CTS markups are revised to move CTS 4.6.1.8.d.4 to ITS 3.6.10 and delete Insert 1. This revision includes changes to applicable DOC and ITS indicators (Enclosure 2, Volume 11, Rev. 0, Pages 331, 332, 335, and 336 of 724).**
- **CTS markups are revised to delete CTS 1.30.a. Applicable DOC and ITS indicators are revised to reflect the relocation of this information to the Bases of ITS 3.6.7 (Enclosure 2, Volume 11, Rev. 0, Pages 333 and 337 of 724).**
- **ITS 3.6.7 DOCs A02, LA02, and LA04 are revised; ITS 3.6.7 DOCs M01, LA03, L01, and L02 are deleted (Enclosure 2, Volume 11, Rev. 0, Pages 338 through 342 of 724).**
- **Improved Standard Technical Specifications (ISTS) 3.6.8 (ITS 3.6.7) markups are revised to delete Insert 1 and revise the Completion Time of Required Action A.1 from 24 hours to 1 hour. In addition, ISTS SRs 3.6.8.1, 3.6.8.2, and 3.6.8.4 are deleted and ISTS SR 3.6.8.3 is re-numbered. These revisions include changes to applicable Justification for Deviations (JFD) and CTS indicators (Enclosure 2, Volume 11, Rev. 0, Pages 344 through 349 of 724).**
- **ITS 3.6.7 JFDs 3, 5, 6, and 7 are deleted and replaced with the justification for changing the Completion Time of Required Action A.1 from 24 hours to 1 hour (JFD 3), justification for deleting ISTS SRs 3.6.8.1 and 3.6.8.2 (JFD 5), and justification for moving ISTS SR 3.6.8.4 to ITS 3.6.10 (ISTS 3.6.13) (JFD 6) (Enclosure 2, Volume 11, Rev. 0, Page 350 of 724).**
- **The ISTS 3.6.8 (ITS 3.6.7) Bases markups are revised to align with changes made to the Specification and includes the relocation of technical details of the SHIELD BUILDING INTEGRITY definition stated in CTS 1.30.a. These revisions include changes to applicable Bases JFDs (Enclosure 2, Volume 11, Rev. 0, Pages 352 through 361 of 724).**
- **ITS 3.6.7 Bases JFDs are revised to delete JFDs 5 and 7 because they are no longer applicable and Bases JFD 8 is renumbered (Enclosure 2, Volume 11, Rev. 0, Page 362 of 724).**

The following changes are being made to ITS 3.6.10, Emergency Gas Treatment System (EGTS) of Enclosure 2 of the ITS LAR:

- **Attachment 10 is retitled, “ITS 3.6.10, Emergency Gas Treatment System (EGTS) Air Cleanup Subsystem,” consistent with the TVA response to RAI CSS-041 (Enclosure 2, Volume 11, Rev. 0, Page 424 of 724).**

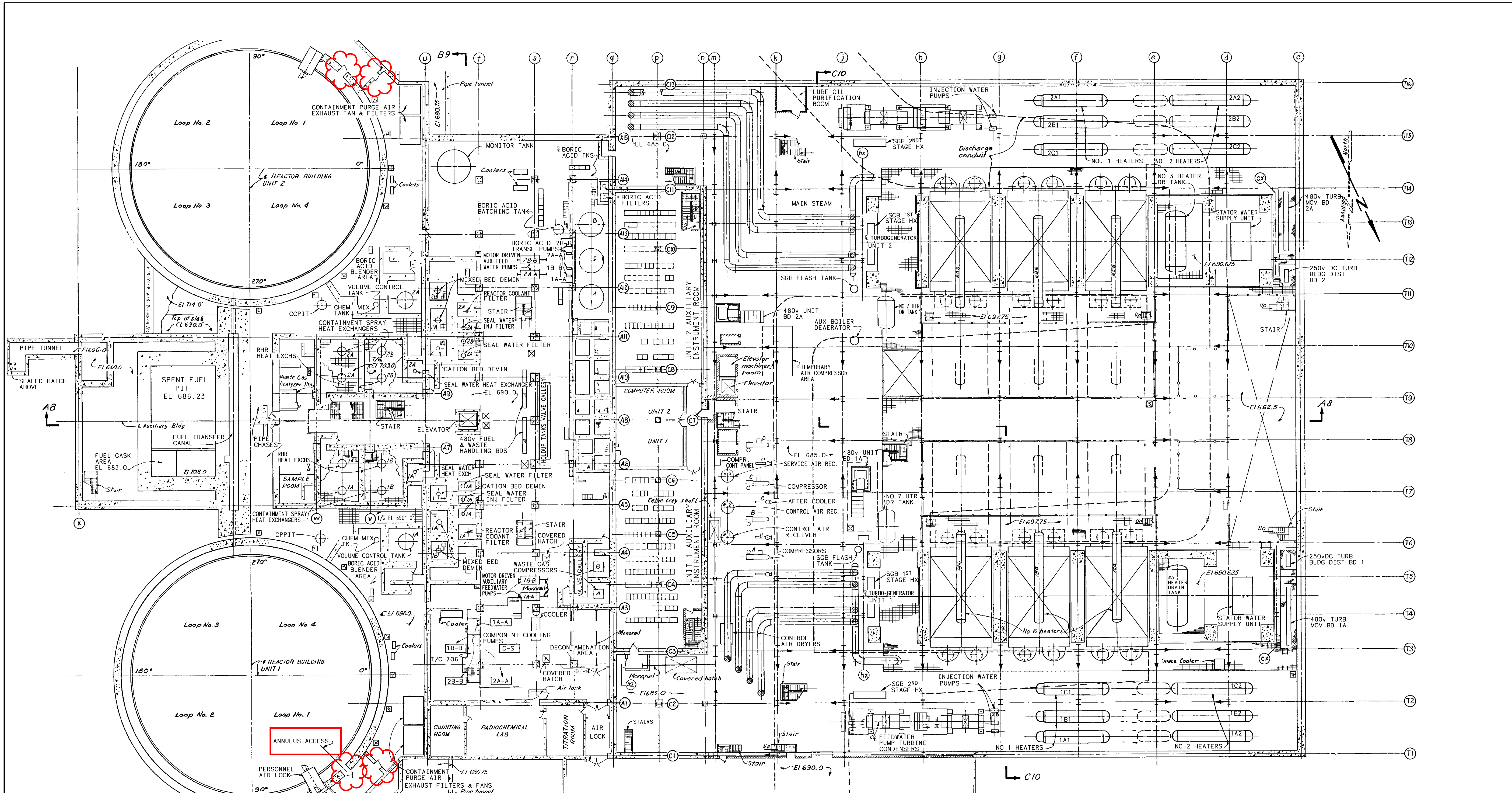
- CTS markups are revised to incorporate CTS 4.6.1.8.d.4 into ITS 3.6.10 as SR 3.6.10.6 and add Insert 1 (Insert Page 3/4 6-14). This revision includes changes to applicable DOC and ITS indicators (Enclosure 2, Volume 11, Rev. 0, Pages 427 and 431 of 724).
- Unit 2 CTS page 1-6 markup is revised to indicate that CTS 1.30.a is addressed in ITS 3.6.7 (Enclosure 2, Volume 11, Rev. 0, Page 433 of 724). The Unit 1 CTS page was correctly marked in Revision 0 of the ITS LAR.
- ITS 3.6.10 DOC LA02 is revised to include Insert 2 (Insert Page 2 of 5); and ITS 3.6.10 DOC L05 is added as Insert 3 (Insert Page 5 of 5) (Enclosure 2, Volume 11, Rev. 0, Pages 435 and 438 of 724).
- ISTS 3.6.13 (ITS 3.6.10) markups are revised to include SR 3.6.10.6 as Insert 1 (Insert Page 3.6.10-2). These revisions include changes to applicable JFD and CTS indicators. Additionally, "Air Cleanup Subsystem," is added to EGTS consistent with TVA response to RAI CSS-041 (Enclosure 2, Volume 11, Rev. 0, Pages 441 and 443 of 724).
- ITS 3.6.10 JFD 5 is added with the justification for the addition of ITS SR 3.6.10.6 to ITS 3.6.10 (ISTS 3.6.13) (Enclosure 2, Volume 11, Rev. 0, Page 444 of 724).
- The ISTS 3.6.13 (ITS 3.6.10) Bases markups are revised to align with changes made to the Specification and include, "Air Cleanup Subsystem," to EGTS consistent with TVA response to RAI CSS-041. These revisions include a Bases discussion regarding SR 3.6.10.6 (Insert 4 – Insert B 3.6.10.6) and the applicable Bases JFD (Enclosure 2, Volume 11, Rev. 0, Pages 446, 447, 454, 455, 456, and 463 of 724).

The NRC provided two RAIs, TVA responded, and the NRC staff subsequently closed:

- RAI CSS-021 addressed the change to the Frequency of CTS 4.6.1.8.d.4 (RAI CSS-021). TVA responded to RAI CSS-021 on August 4, 2014 and the NRC staff closed the RAI on September 4, 2014, stating that no further information is required.
- RAI CSS-041 addressed the EGTS design consisting of two subsystems; the annulus vacuum control subsystem and the air cleanup subsystem. Per TVA response to RAI CSS-041, ITS 3.6.10 is being revised to rename the Emergency Gas Treatment System as the Emergency Gas Treatment System (EGTS) Air Cleanup Subsystem. All references to the Emergency Gas Treatment System and EGTS are being revised to reflect this nomenclature. This change affects ITS 3.6.7 and ITS 3.6.10 and is reflected in the attachments to TVA response to RAI CSS-041, dated August 20, 2014. The NRC staff closed the RAI on August 26, 2014, stating that no further information is required.

Response Date/Time	**1/2/2015 11:55 PM**
Closure Statement	
Question Closure Date	
Notification	**Mark Blumberg** **Scott Bowman** **Kristy Bucholtz** **Margaret Chernoff**

	Michelle Conner **Robert Elliott** **Ravinder Grover** **Matthew Hardgrove** **Khadijah Hemphill** **Andrew Hon** **Lynn Mynatt** **Amrit Patel** **Ray Schiele** **Caroline Tilton**
Added By	**Michelle Conner**
Date Added	**1/2/2015 10:57 PM**
Date Modified	
Modified By	



SEQUOYAH NUCLEAR PLANT
FINAL SAFETY
ANALYSIS REPORT

FIGURE 1.2.3-5
EQUIPMENT-PLAN EL 690.0 AND
EL 685.0
(REVISED BY AMENDMENT 13)

DRAWING SERVICES UNIT
PROCAD MAINTAINED DRAWING
THIS CONFIGURATION CONTROL DRAWING IS MAINTAINED BY THE SQN CAD UNIT AND IS PART OF THE TVA PROCADAM DATABASE.
COMPUTER GRAPHICS

The door and door track are constructed of welded steel. The door, rectangular in cross section, is constructed of horizontal and vertical members with diagonal bracing as required for strength and rigidity. The exterior side of the door is covered with a steel skin plate. The embedded frame for the door is constructed of welded steel and is anchored to the concrete.

The door seals in the closed position with the side and top seals compressed against sealing surfaces on the embedded frame and the bottom seal compressed against an embedded sill plate. A sloped track guides the door rollers and positions the door so that the top and side seals contact the sealing surfaces only when the door is in or near the closed position.

An electric hoist unit opens and closes the door by lifting and lowering it vertically through a slot in the Elevation 734.0 floor. The hoist unit is mounted on the inside wall above the door slot. The door passes through this slot, and extensions of the frame act as guides for the door in the raised position.

The area above the floor at Elevation 734.0, occupied by the hoist and the door in its raised position, is enclosed with an airtight structural steel enclosure with gaskets provided on the access covers necessary for servicing the hoist unit and door.

Pressure Confining Personnel Doors

This section covers the following pressure confining personnel access control doors located in the Auxiliary Control Building. Door numbers listed for the doors are the designations used in in the plant.

1. The doors for stairs 7 and 8 penthouses at Elevation 749.0, doors A184 and A191.

2. The double doors to the personnel and equipment access rooms, elevation 734.0 (one for each unit), doors A152 and A159.

3. The double doors at the Ice Condenser Equipment Room, Elevation 734.0, door A155.

4. The double doors to the Emergency Gas Treatment Filter Room, Elevation 734.0, door A158.

5. The doors to the Reactor Building Access Room at Elevation 734.0 (one for each unit), doors A156 and A157.

6. The doors for stairs 3 and 4 penthouses at Elevation 734.0, doors A154 and A173.

7. The double doors to the elevator shaft at Elevation 734.0, door A153.

8. The N-line control bay doors at Elevation 732.0 (two double doors with bidirectional pressure requirements, doors C36 and C54) and elevation 706.0 (two double doors with bidirectional pressure requirements, doors C29 and C34).

9. The double doors to the heating and ventilating spaces at Elevation 714.0 (one for each unit), doors A123 and A132.

10. The door separating the Additional Equipment Building and the airlock at Elevation 714.0 (one for each unit, bidirectional pressure requirements), doors A214 and A215.

11. The door to the Cask Decontamination Room, Elevation 705.0, door A115.

12. The doors in the X-line wall of the cask loading area at Elevation 706.0 (one single door A113 and one double door A114).

13. The water tight doors leading to the instrument room at Elevation 685.0; one in N-line wall, C27, and one in C3-line wall, C14.

14. The doors to the Main Steam and Feedwater Valve Rooms at Elevation 706.0 (one for each unit), doors A101 and A105.

15. The water tight double doors at the main entrance from the Service Building, Elevation 690.0, door A57.

16. The water tight annulus access doors (one per unit, doors A65 and A78) and doors to the Reactor Building Access Rooms (one per unit, doors A64 and A77) at Elevation 690.0.

17. The water tight airlock door to the Radiochemical Laboratory at Elevation 690.0, door A55.

The doors are hinged, manually operated type metal doors, complete with frames and closers. The frames are either welded to plates, bolted to the concrete walls, embedded in concrete walls, or welded to embedded plates. Both single and double doors are involved. Double doors consist of an active and inactive leaf, with the active leaf being used for normal traffic. Doors C27, A55, A57, A65 and A78 have a single skin plate with horizontal stiffeners. All other doors are the flush type. Securing for tornado, annulus pressure drop, or flood is done by a normal latching mechanism except for doors C27, A55, A57, A65 and A78 which are secured by the use of hand-operated dogs. All doors affected by tornadoes are secured during tornado warning and doors A65 and A78 are secured during external flood warnings. Doors A55, A57, C27, and C14 will protect essential safety equipment in the auxiliary and control buildings to elevation 706.0 from internal floodwaters in the turbine building caused by a rupture in the Condenser Circulating Water system (CCWS).

During normal operation the doors provide personnel and equipment access. Doors A55, A57, A64, A65, A77, A78, A101, A105, A113, A114, A123, A132, A214, and 215 are also components of the building airlocks which serve to maintain a slight negative pressure in the Auxiliary and Reactor Buildings. These doors are equipped with electrical interlocks to assure that one of each pair of interlocked doors is always closed.

<u>Spent Fuel Pool Gates</u>

The fuel transfer canal gate as shown in Figure 3.8.4-11, when in the installed position, forms the boundary between the fuel transfer canal and the spent fuel pool. This gate is used for

ATTACHMENT 1

ITS 1.0, USE AND APPLICATION

Current Technical Specification (CTS) Markup and Discussion of Changes (DOCs)

~~SHIELD BUILDING INTEGRITY~~

A06

See ITS 3.6.3 3.6.13 3.6.1

~~1.30 SHIELD BUILDING INTEGRITY shall exist when:~~

~~a. The door in each access opening is closed except when the access opening is being used for normal transit entry and exit.~~ See ITS 3.6.3

~~b. The emergency gas treatment system is OPERABLE.~~ See ITS 3.6.13

~~c. The sealing mechanism associated with each penetration (e.g., welds, bellows or 0-rings) is OPERABLE.~~ See ITS 3.6.1

SHUTDOWN MARGIN (SDM)

SHUTDOWN MARGIN (SDM) — A01, A12

~~1.31~~ ~~SHUTDOWN MARGIN~~ SDM shall be the instantaneous amount of reactivity : a. by which the reactor is subcritical or would be subcritical from its present condition assuming all ~~full length~~ rod cluster control assemblies (~~shutdown and control~~ RCCAs) are fully inserted except for the single ~~rod cluster assembly~~ RCCA of highest reactivity worth , which is assumed to be fully withdrawn. INSERT 7

~~SITE BOUNDARY~~ — A06

~~1.32 The SITE BOUNDARY shall be that line beyond which the land is not owned, leased, or otherwise controlled by the licensee.~~

~~SOLIDIFICATION~~ — A07

~~1.33 Deleted~~

~~SOURCE CHECK~~ — A07

~~1.34 Deleted~~

INSERT 8 — A02

STAGGERED TEST BASIS

STAGGERED TEST BASIS

~~1.35~~ A STAGGERED TEST BASIS shall consist of~~:~~ INSERT 9 — A13

~~a. A test schedule for n systems, subsystems, trains or other designated components obtained by dividing the specified test interval into n equal subintervals,~~

~~b. The testing of one system, subsystem, train or other designated component at the beginning of each subinterval.~~

THERMAL POWER

THERMAL POWER

~~1.36~~ THERMAL POWER shall be the total reactor core heat transfer rate to the reactor coolant. A01

Enclosure 2, Volume 3, Rev. 0, Page 14 of 117

DEFINITIONS

RATED THERMAL POWER (RTP)

RATED THERMAL POWER (RTP)

~~1.27~~ ~~RATED THERMAL POWER~~ ~~(~~RTP~~)~~ shall be a total reactor core heat transfer rate to the reactor coolant of 3455 MWt. A01

REACTOR TRIP SYSTEM (RTS) RESPONSE TIME

REACTOR TRIP SYSTEM (RTS) RESPONSE TIME RTS that

~~1.28~~ The ~~REACTOR TRIP SYSTEM~~ RESPONSE TIME shall be ~~the~~ time interval from when the monitored parameter exceeds its ~~(~~RTS~~)~~ trip setpoint at the channel sensor until loss of stationary gripper coil voltage. The response time may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured. In lieu of measurement, response time may be verified for selected components provided that the components and ~~the~~ methodology for verification have been previously reviewed and approved by NRC. A01

the

~~REPORTABLE EVENT~~

~~1.29 DELETED~~ A07

~~SHIELD BUILDING INTEGRITY~~

~~1.30 SHIELD BUILDING INTEGRITY shall exist when:~~ A06 ~~See ITS 3.6.3 3.6.13 3.6.1~~

~~a. The door in each access opening is closed except when the access opening is being used for normal transit entry and exit.~~ ~~See ITS 3.6.3~~

~~b. The emergency gas treatment system is OPERABLE.~~ ~~See ITS 3.6.13~~

~~c. The sealing mechanism associated with each penetration (e.g., welds, bellows or O-rings) is OPERABLE.~~ ~~See ITS 3.6.1~~

SHUTDOWN MARGIN (SDM)

SHUTDOWN MARGIN (SDM)

SDM control

: a.

~~1.31~~ ~~SHUTDOWN MARGIN~~ shall be the instantaneous amount of reactivity by which the reactor is subcritical or would be subcritical from its present condition assuming all ~~full length~~ rod cluster assemblies (~~shutdown and control~~) are fully inserted except for the single ~~rod cluster assembly~~ of highest reactivity worth which is assumed to be fully withdrawn. A01 A12

RCCAs

, INSERT 7 RCCA

~~SITE BOUNDARY~~

~~1.32 The SITE BOUNDARY shall be that line beyond which the land is not owned, leased, or otherwise controlled by the licensee.~~ A06

DISCUSSION OF CHANGES
ITS 1.0, USE AND APPLICATIONS

to the CHANNEL FUNCTIONAL TEST for digital channels was consistent with the existing channel functional test definition and therefore acceptable.

These changes are designated as administrative because they do not result in a technical change to the Technical Specifications.

A05 CTS Section 1.0 includes a CHANNEL FUNCTIONAL TEST definition for bistable channels. The definition of CHANNEL FUNCTIONAL TEST for bistable channels requires "the injection of a simulated signal into the channel sensor to verify OPERABILITY including alarm and/or trip functions." However, this CTS definition is essentially duplicative of the TRIP ACTUATING DEVICE OPERATIONAL TEST (TADOT) definition. ITS Section 1.1 does not include this definition, since the requirements for bistable channels are covered by the TADOT definition.

This change is acceptable because the TADOT definition adequately covers bistable channels, and does not impose any new requirements or alter any existing requirements. This change is categorized as administrative because the bistable portion of the definition is duplicative of the TADOT definition.

A06 CTS Section 1.0 includes the following definitions:

- CONTAINMENT INTEGRITY
- GASEOUS RADWASTE TREATMENT SYSTEM
- PURGE – PURGING
- SHIELD BUILDING INTEGRITY
- SITE BOUNDARY
- UNRESTRICTED AREA
- VENTILATION EXHAUST TREATMENT SYSTEM
- VENTING
- $\bar{E}$ - AVERAGE DISINTEGRATION ENERGY
- CORE ALTERATION

The ITS does not use this terminology and ITS Section 1.1 does not contain these definitions.

These changes are acceptable because the terms are not used as defined terms in the ITS. Discussions of any technical changes related to the deletion of these terms are included in the DOCs for the CTS sections in which the terms are used. These changes are designated as administrative because they eliminate defined terms that are no longer used.

A07 CTS Section 1.0 shows the following definitions as being deleted:

- CONTROLLED LEAKAGE
- MEMBER(S) OF THE PUBLIC
- PROCESS CONTROL PROGRAM (PCP)
- REPORTABLE EVENT
- SOLIDIFICATION
- SOURCE CHECK

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ATTACHMENT 7

ITS 3.6.7, SHIELD BUILDING

Current Technical Specification (CTS) Markup and Discussion of Changes (DOCs)

ITS 3.6.7

A01

CONTAINMENT SYSTEMS

SHIELD BUILDING ~~STRUCTURAL INTEGRITY~~

LIMITING CONDITION FOR OPERATION

OPERABLE

LCO 3.6.7 3.6.1.7 The ~~structural integrity of the~~ shield building shall be ~~maintained at a level consistent with the acceptance criteria in Specification 4.6.1.7~~. LA01

Applicability APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

ACTION A Add proposed ACTION A

~~With the structural integrity of the shield building not conforming to the above requirements, restore the structural integrity to within the limits prior to increasing the Reactor Coolant System temperature above 200°F.~~ ~~L01~~ A02

ACTION B Add proposed ACTION B

SURVEILLANCE REQUIREMENTS

1

SR 3.6.1.1

SR 3.6.7.~~3~~ 4.6.1.7 The structural integrity of the shield building shall be determined during the shutdown for each Type A containment leakage rate test (~~Specification 4.6.1.1.c~~) by a visual inspection of the exposed accessible interior and exterior surfaces of the shield building ~~and verifying no apparent changes in appearance of the concrete surfaces or other abnormal degradation~~. LA02

~~Add proposed SR 3.6.7.1 at a Frequency of 12 hours~~ ~~M01~~

~~Add proposed SR 3.6.7.2 at a Frequency of 31 days~~

~~In accordance with the Surveillance Frequency Control Program~~ ~~LA03~~

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SURVEILLANCE REQUIREMENTS (Continued)

c. After every 720 hours of charcoal adsorber operation by verifying within 31 days after removal that a laboratory analysis of representative carbon sample obtained in accordance with Regulatory Position C.6.b of Regulatory Guide 1.52, Revision 2, March 1978, shows the methyl iodide penetration less than 2.5% when tested in accordance with ASTM D3803-1989 at a temperature of 30°C (86°F) and a relative humidity of 70%. See ITS 5.5.9

~~SR 3.6.7.4~~ d. ~~At least once per 18 months~~ by: ~~INSERT 1~~ See ITS 3.6.10 ~~L02~~

1. Verifying that the pressure drop across the combined HEPA filters and charcoal adsorber banks is less than 5 inches Water Gauge while operating the filter train at a flow rate of 4000 cfm ± 10%.

2. Verifying that the filter train starts on a Phase A containment isolation Test Signal.

3. Verify the operation of the filter cooling bypass valves. See ITS 3.6.10

~~SR 3.6.7.4~~ 4. Verifying that each system produces a negative pressure of greater than or equal to 0.5 inches W. G. in the annulus within 1 minute after a start signal. See ITS 3.6.10

e. After each complete or partial replacement of a HEPA filter bank by verifying that the HEPA filter banks remove greater than or equal to 99.95% of the DOP when they are tested in-place in accordance with ANSI N510-1975 while operating the system at a flow rate of 4000 cfm ± 10%.

f. After each complete or partial replacement of a charcoal adsorber bank by verifying that the charcoal adsorbers remove greater than or equal to 99.95% of a halogenated hydrocarbon refrigerant test gas when they are tested in-place in accordance with ANSI N510-1975 while operating the system at a flow rate of 4000 cfm ± 10%. See ITS 5.5.9

3.6.7

INSERT 1

L02

~~on a STAGGERED TEST BASIS for each Emergency Gas Treatment System train~~

In accordance with the Surveillance Frequency Control Program

LA03

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ITS A01 3.6.7

SHIELD BUILDING INTEGRITY

1.30 SHIELD BUILDING INTEGRITY shall exist when: See ITS Chapter 1.0

~~LCO 3.6.7 Note~~ ~~a. The door in each access opening is closed except when the access opening is being used for normal transit entry and exit.~~ LA04

b. The emergency gas treatment system is OPERABLE. See ITS 3.6.10

NA ~~c. The sealing mechanism associated with each penetration (e.g., welds, bellows or 0-rings) is OPERABLE.~~ LA04

SHUTDOWN MARGIN

1.31 SHUTDOWN MARGIN shall be the instantaneous amount of reactivity by which the reactor is subcritical or would be subcritical from its present condition assuming all full length rod cluster assemblies (shutdown and control) are fully inserted except for the single rod cluster assembly of highest reactivity worth which is assumed to be fully withdrawn.

SITE BOUNDARY

1.32 The SITE BOUNDARY shall be that line beyond which the land is not owned, leased, or otherwise controlled by the licensee.

SOLIDIFICATION

1.33 Deleted

See ITS Chapter 1.0

SOURCE CHECK

1.34 Deleted

STAGGERED TEST BASIS

1.35 A STAGGERED TEST BASIS shall consist of:

a. A test schedule for n systems, subsystems, trains or other designated components obtained by dividing the specified test interval into n equal subintervals,

b. The testing of one system, subsystem, train or other designated component at the beginning of each subinterval.

THERMAL POWER

1.36 THERMAL POWER shall be the total reactor core heat transfer rate to the reactor coolant.

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ITS 3.6.7

A01

CONTAINMENT SYSTEMS

SHIELD BUILDING ~~STRUCTURAL INTEGRITY~~

LIMITING CONDITION FOR OPERATION

OPERABLE

LA01

LCO 3.6.7 3.6.1.7 The ~~structural integrity of the~~ shield building shall be ~~maintained at a level consistent with the acceptance criteria in Specification 4.6.1.7~~.

Applicability APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION.

Add proposed ACTION A

ACTION A

~~LA01~~

A02

~~With the structural integrity of the shield building not conforming to the above requirements, restore the structural integrity to within the limits prior to increasing the Reactor Coolant System temperature above 200°F.~~

ACTION B Add proposed ACTION B

1

SURVEILLANCE REQUIREMENTS

SR 3.6.1.1

SR 3.6.7.~~3~~ 4.6.1.7 The structural integrity of the shield building shall be determined during the shutdown for each Type A containment leakage rate test (~~Specification 4.6.1.1.c~~) by a visual inspection of the exposed accessible interior and exterior surfaces of the shield building ~~and verifying no apparent changes in appearance of the concrete surfaces or other abnormal degradation~~.

LA02

~~Add proposed SR 3.6.7.1 at a Frequency of 12 hours~~

~~Add proposed SR 3.6.7.2 at a Frequency of 31 days~~

~~M01~~

~~In accordance with the Surveillance Frequency Control Program~~

~~LA03~~

ITS

A01

3.6.7

CONTAINMENT SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

c. After every 720 hours of charcoal adsorber operation by verifying within 31 days after removal that a laboratory analysis of representative carbon sample obtained in accordance with Regulatory Position C.6.b of Regulatory Guide 1.52, Revision 2, March 1978, shows the methyl iodide penetration less than 2.5% when tested in accordance with ASTM D3803-1989 at a temperature of 30°C (86° F) and a relative humidity of 70%. See ITS 5.5.9

~~LA03~~ See ITS 3.6.10 ~~L02~~

~~SR 3.6.7.4~~ d. ~~At least once per 18 months~~ by: ~~INSERT 1~~

1. Verifying that the pressure drop across the combined HEPA filters and charcoal adsorber banks is less than 5 inches Water Gauge while operating the filter train at a flow rate of 4000 cfm + 10%.

2. Verifying that the filter train starts on a Phase A containment isolation Test Signal.

3. Verify the operation of the filter cooling bypass valves.

See ITS 3.6.10

~~SR 3.6.7.4~~ 4. Verifying that each system produces a negative pressure of greater than or equal to 0.5 inches W.G. in the annulus within 1 minute after a start signal. See ITS 3.6.10

e. After each complete or partial replacement of a HEPA filter bank by verifying that the HEPA filter banks remove greater than or equal to 99.95% of the DOP when they are tested in-place in accordance with ANSI N510-1975 while operating the system at a flow rate of 4000 cfm + 10%.

f. After each complete or partial replacement of a charcoal adsorber bank by verifying that the charcoal adsorbers remove greater than or equal to 99.95% of a halogenated hydrocarbon refrigerant test gas when they are tested in-place in accordance with ANSI N510-1975 while operating the system at a flow rate of 4000 cfm + 10%.

See ITS 5.5.9

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3.6.7

INSERT 1 L02

~~on a STAGGERED TEST BASIS for each Emergency Gas Treatment System train~~

In accordance with the Surveillance Frequency Control Program LA03

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ITS

3.6.7

A01

DEFINITIONS

RATED THERMAL POWER (RTP)

1.27 RATED THERMAL POWER (RTP) shall be a total reactor core heat transfer rate to the reactor coolant of 3455 MWt.

REACTOR TRIP SYSTEM (RTS) RESPONSE TIME

1.28 The REACTOR TRIP SYSTEM RESPONSE TIME shall be the time interval from when the monitored parameter exceeds its (RTS) trip setpoint at the channel sensor until loss of stationary gripper coil voltage. The response time may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured. In lieu of measurement, response time may be verified for selected components provided that the components and the methodology for verification have been previously reviewed and approved by NRC.

See ITS Chapter 1.0

REPORTABLE EVENT

1.29 DELETED

SHIELD BUILDING INTEGRITY

1.30 SHIELD BUILDING INTEGRITY shall exist when:

See ITS Chapter 1.0

LCO 3.6.7 Note

a. ~~The door in each access opening is closed except when the access opening is being used for normal transit entry and exit.~~

LA04

b. The emergency gas treatment system is OPERABLE.

See ITS 3.6.10

NA

c. ~~The sealing mechanism associated with each penetration (e.g., welds, bellows or O-rings) is OPERABLE.~~

LA04

SHUTDOWN MARGIN

1.31 SHUTDOWN MARGIN shall be the instantaneous amount of reactivity by which the reactor is subcritical or would be subcritical from its present condition assuming all full length rod cluster assemblies (shutdown and control) are fully inserted except for the single rod cluster assembly of highest reactivity worth which is assumed to be fully withdrawn.

See ITS Chapter 1.0

SITE BOUNDARY

1.32 The SITE BOUNDARY shall be that line beyond which the land is not owned, leased, or otherwise controlled by the licensee.

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DISCUSSION OF CHANGES
ITS 3.6.7, SHIELD BUILDING

ADMINISTRATIVE CHANGES

A01 In the conversion of the Sequoyah Nuclear Plant (SQN) Current Technical Specifications (CTS) to the plant specific Improved Technical Specifications (ITS), certain changes (wording preferences, editorial changes, reformatting, revised numbering, etc.) are made to obtain consistency with NUREG-1431, Rev. 4.0, "Standard Technical Specifications- Westinghouse Plants" (ISTS) and additional Technical Specification Task Force (TSTF) travelers included in this submittal.

These changes are designated as administrative changes and are acceptable because they do not result in technical changes to the CTS.

A02 CTS 3.6.1.7 does not provide an ACTION to take if the shield building is inoperable while in MODE 1, 2, 3, or 4; it only includes a requirement that the shield building be restored to OPERABLE status prior to increasing Reactor Coolant System temperature above 200°F (i.e., MODE 4). Therefore, entry into CTS 3.0.3 is required if CTS 3.6.1.7 is not met while in MODE 1, 2, 3, or 4. CTS 3.0.3 requires action to be initiated within 1 hour to prepare for a shutdown and requires the unit to be in MODE 3 within 7 hours and MODE 5 within 37 hours. ITS 3.6.7 ACTION A requires restoring the shield building to OPERABLE status within 1 hour. When the shield building is ~~inoperable and~~ not restored to an OPERABLE status within the ~~specified Completion Time (see DOC L01)~~ 1 hour, ITS 3.6.7 ACTION B requires the unit be in MODE 3 within 6 hours and MODE 5 within 36 hours. This changes the CTS by stating the ACTIONS within the Specification rather than deferring to CTS 3.0.3. In addition, it deletes the Action to restore the LCO prior to entering MODE 4.

The purpose of CTS 3.0.3 is to place the unit outside the MODE of Applicability within a reasonable amount of time in a controlled manner. CTS 3.6.1.7 is silent on these actions, deferring to CTS 3.0.3 for the actions. This change is acceptable because the ACTIONS specified in ITS 3.6.7 adopt ISTS structure for placing the unit outside the MODE of Applicability without changing the time specified to enter MODE 3 and MODE 5. In addition, deletion of the current Action of CTS 3.6.1.7 is acceptable because CTS 3.0.4 (ITS LCO 3.0.4) already precludes entering the MODE of Applicability when the LCO is not met. Therefore, it is not necessary to include these requirements as specific actions in ITS 3.6.7. This change is designated as administrative, because it does not result in technical changes to the CTS.

MORE RESTRICTIVE CHANGES

None

~~M01~~ ~~ITS SR 3.6.7.1 requires verification that annulus negative pressure is greater than 5 inches water gauge every 12 hours. ITS SR 3.6.7.2 requires verification that the shield building access door in each access opening is closed every 31 days. CTS 3.6.1.7 does not contain these Surveillance Requirements. This changes the CTS by adding new Surveillance Requirements to verify annulus negative pressure is within limits and to verify the shield building access door in each access opening is closed. (See DOC LA03 for moving the "12 hour" and "31 day" Frequencies for these Surveillance Requirements to the Surveillance Frequency Control Program.)~~

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DISCUSSION OF CHANGES
ITS 3.6.7, SHIELD BUILDING

~~The shield building surrounds the containment vessel and forms an annulus between the containment vessel and the inner wall of the shield building. This annular space collects containment leakage that may occur following a loss of coolant accident. A negative pressure is maintained in the annulus between the shield building and the steel containment vessel by the Emergency Gas Treatment System (EGTS). The release of radioactive contaminants to the environment is controlled via filters in the EGTS trains. The purpose of CTS 3.6.1.7 is to ensure the shield building is OPERABLE in MODES 1, 2, 3, and 4 to ensure the release of radioactive material from the containment atmosphere is restricted to the leakage paths assumed in the accident analysis. Since shield building access door position and annulus pressure are integral to shield building OPERABILITY, ITS 3.6.7 adds a specific Surveillance Requirement (ITS SR 3.6.7.1) to verify every 12 hours that annulus negative pressure is within the limit assumed in the containment analysis. Additionally, a specific Surveillance Requirement (ITS SR 3.6.7.2) is added to verify every 31 days that the door in each access opening is closed, so that the shield building boundary is not breached at any time when the shield building boundary is required. This change is designated as more restrictive because new Surveillance Requirements have been added to ensure the shield building OPERABILITY is maintained.~~

RELOCATED SPECIFICATIONS

None

REMOVED DETAIL CHANGES

LA01 *(Type 1 – Removing Details of System Design and System Description, Including Design Limits)* CTS 3.6.1.7 requires that the structural integrity of the shield building be maintained at a level consistent with the acceptance criteria in CTS 4.6.1.7. CTS 4.6.1.7 requires the structural integrity of the shield building to be determined by a visual inspection of the exposed shield building interior and exterior surfaces and verifying no apparent changes in concrete surface appearance or other abnormal degradation. ITS LCO 3.6.7 requires the shield building to be OPERABLE. This changes the CTS by moving the detail of what constitutes shield building OPERABILITY to the Bases.

The removal of these details, related to system design, from the Technical Specifications, is acceptable because this type of information is not necessary to be included in the Technical Specifications to provide adequate protection of public health and safety. The ITS retains the requirements that the shield building be OPERABLE. Also, this changes is acceptable because the removed information will be adequately controlled in the ITS Bases. Changes to the Bases are controlled by the Technical Specifications Bases Control Program in Chapter 5. This program provides for the evaluation of changes to the Bases to ensure the Bases are properly controlled. This change is designated as a less restrictive removal of detail change because information relating to system design is being removed from the Technical Specifications.

DISCUSSION OF CHANGES
ITS 3.6.7, SHIELD BUILDING

LA02 *(Type 4 – Removal of LCO, SR, or other TS Requirements to the TRM, UFSAR, ODCM, NQAP, CLRT Program, IST Program, or ISI Program)* CTS 4.6.1.7 requires the structural integrity of the shield building to be determined by a visual inspection of the exposed shield building interior and exterior surfaces and verifying no apparent changes in concrete surface appearance or other abnormal degradation. ITS SR 3.6.7.3 includes the shield building structural integrity visual inspection verification of exposed interior and exterior surfaces, but does not include the details of what the inspection entails. This changes the CTS by moving the details of the shield building inspection to the TS Bases.

1

The removal of these details, which are related to methods of surveillance test performance, from the Technical Specifications, is acceptable because this type of information is not necessary to be included in the Technical Specifications to provide adequate protection of public health and safety. The ITS retains the requirements for verifying integrity of the shield building. Also, this changes is acceptable because the removed information will be adequately controlled in the ITS Bases. Changes to the Bases are controlled by the Technical Specifications Bases Control Program in Chapter 5. This program provides for the evaluation of changes to the Bases to ensure the Bases are properly controlled. This change is designated as a less restrictive removal of detail change because information relating to methods of surveillance test performance is being removed from the Technical Specifications.

LA03 ~~*(Type 5 – Removal of SR Frequency to the Surveillance Frequency Control Program)* CTS 4.6.1.8.d.4 requires verification that each Emergency Gas Treatment System produces a negative pressure within limits in the annulus within 1 minute after a start signal. ITS SR 3.6.7.4 requires a similar Surveillance and specifies the periodic Frequency as, "In accordance with the Surveillance Frequency Control Program." This changes the CTS by moving the specified Frequency for this SR and associated Bases to the Surveillance Frequency Control Program. (The change of the requirement to perform the Surveillances ON A STAGGERED TEST BASIS is discussed in DOC L02). Additionally, ITS SR 3.6.7.1 has been added to verify the annulus negative pressure is within limits every 12 hours, and ITS SR 3.6.7.2 has been added to verify the shield building access door in each access opening is closed every 31 days. (See DOC M01 for the discussion on adding these SRs.) The "12 hour" and "31 day" Frequencies for these Surveillances have been relocated to the Surveillance Frequency Control Program.~~

Not used.

~~The removal of these details related to Surveillance Requirement Frequencies from the Technical Specifications is acceptable, because this type of information is not necessary to be included in the Technical Specifications to provide adequate protection of public health and safety. The existing Surveillance Frequencies are removed from Technical Specifications and placed under licensee control pursuant to the methodology described in NEI 04-10. A new program (Surveillance Frequency Control Program) is being added to the Administrative Controls section of the Technical Specifications describing the control of Surveillance Frequencies. The surveillance test requirements remain in the Technical Specifications. The control of changes to the Surveillance Frequencies will be in accordance with the Surveillance Frequency Control Program. The Program shall ensure that Surveillance Requirements specified in~~

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DISCUSSION OF CHANGES
ITS 3.6.7, SHIELD BUILDING

~~the Technical Specifications are performed at intervals sufficient to assure the~~
~~met. This change is designated~~
~~because the Surveillance~~
~~ical Specifications.~~

a. The door in each access opening is closed except when the access opening is being used for normal transit entry and exit; and

LA04 *(Type 2 – Removing Descriptions of System Operation)* CTS 1.30 states, in part, "SHIELD BUILDING INTEGRITY shall exist when: c. The sealing mechanism associated with each penetration (e.g., welds, bellows, or 0-rings) is OPERABLE. ITS 3.6.7 states "The shield building shall be OPERABLE." This changes the CTS by moving the reference to penetration sealing mechanism requirements to the Bases.

the shield building access door requirements and

The removal of these details, which are related to system operation, from the Technical Specifications is acceptable, because this type of information is not necessary to be included in the Technical Specifications to provide adequate protection of public health and safety. The ITS retains the requirement for the shield building to be OPERABLE and the relocated material describes aspects of OPERABILITY. In addition, the ITS retains the requirement to perform a shield building annulus drawdown test, which would provide verification that the penetration sealing mechanisms are OPERABLE. Also, this change is acceptable, because the removed information will be adequately controlled in the ITS Bases. Changes to the Bases are controlled by the Technical Specification Bases Control Program in Chapter 5. This program provides for the evaluation of changes to ensure the Bases are properly controlled. This change is designated as a less restrictive removal of detail change because information relating to system operation is being removed from the Technical Specifications.

the shield building access openings and

LESS RESTRICTIVE CHANGES

None

~~L01~~ ~~*(Category 4 – Relaxation of Required Action)* CTS 3.6.1.7 does not state what action to take if the shield building is inoperable while in MODE 1, 2, 3, or 4; it only includes a requirement that the shield building be restored to OPERABLE status prior to increasing Reactor Coolant System temperature above 200°F (i.e., MODE 4). Therefore, entry into CTS 3.0.3 is required, if CTS 3.6.1.7 is not met in MODE 1, 2, 3, or 4. CTS 3.0.3 allows 1 hour to prepare for a shutdown and requires the unit to be in MODE 3 within 7 hours and MODE 5 within 37 hours. ITS 3.6.7 ACTION A provides 24 hours to restore the shield building to OPERABLE status prior to requiring a unit shutdown. This changes the CTS by providing an explicit ACTION to allow time to restore an inoperable shield building to OPERABLE status prior to requiring a unit shutdown and changes the time from 1 hour (as provided in CTS 3.0.3) to 24 hours. See DOC A02 for including the ACTIONS within the Specification to shut down the unit upon failure to restore shield building OPERABILITY, rather than deferring to CTS 3.0.3.~~

~~The purpose of CTS 3.6.1.7 is to maintain the shield building OPERABLE. Therefore, when the shield building is not OPERABLE, CTS 3.0.3 results in placing the unit in a condition in which the shield building is not required. This change is acceptable because the Required Actions are used to establish remedial measures that must be taken in response to the degraded conditions in order to minimize risk associated with continued operation while providing time to~~

DISCUSSION OF CHANGES
ITS 3.6.7, SHIELD BUILDING

~~repair inoperable features. This change provides an ACTION that allows 24 hours to restore the shield building to OPERABLE status. The Required Actions and associated 24 hour Completion Time are reasonable considering the limited leakage design of containment and the low probability of DBA occurring during this period. This change is designated as less restrictive because less stringent Required Actions are being applied in the ITS than were applied in the CTS.~~

~~L02~~ ~~*(Category 7 – Relaxation Of Surveillance Frequency)* CTS 4.6.1.8.d.4 requires a drawdown of the shield building annulus by each Emergency Gas Treatment System (EGTS) train to within limits at least once per 18 months. ITS SR 3.6.7.4 requires a drawdown of the shield building annulus to within limits "In accordance with the Surveillance Frequency Control Program." The specified Surveillance Frequency that is being moved to the Surveillance Frequency Control Program is "18 months on a STAGGERED TEST BASIS for each Emergency Gas Treatment System train." This changes the CTS by allowing the drawdown test for each EGTS train to be performed less frequently. Moving the specified Surveillance Frequency to the Surveillance Frequency Control Program is discussed in DOC LA03.~~

~~The purpose of CTS 4.6.1.8.d.4 is to verify the integrity of the shield building boundary by ensuring the shield building annulus can be rapidly drawn to a negative pressure of at least 0.5 inches water gauge. Therefore, this is a test of shield building integrity and does not need to be performed every 18 months using each EGTS train. Staggering use of the EGTS trains every 18 months will ensure both trains are capable of performing the test. This change is acceptable because performing the drawdown test using one train of EGTS every 18 months will adequately verify shield building integrity. OPERABILITY of EGTS will be maintained through the application of the requirements of ITS 3.6.10. This change is designated as less restrictive, because the shield building annulus drawdown Surveillance will be performed less frequently with each EGTS train under the ITS than under the CTS.~~

Improved Standard Technical Specifications (ISTS) Markup and Justification for Deviations (JFDs)

CTS

Shield Building ~~(Dual and Ice Condenser)~~
3.6.~~8~~ 7 1

3.6 CONTAINMENT SYSTEMS

3.6.~~8~~ 7 Shield Building ~~(Dual and Ice Condenser)~~ 1 ~~2~~

3.6.1.7 LCO 3.6.~~8~~ 7 The shield building shall be OPERABLE.

~~INSERT 1~~

Applicability APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

A02

CONDITION	REQUIRED ACTION	COMPLETION TIME
DOC ~~L01~~ A. Shield building inoperable.	A.1 Restore shield building to OPERABLE status.	~~24 hours~~ 1 hour 3
DOC A02 B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
~~DOC M01~~ ~~SR 3.6.8.1~~ 7 ~~[Verify annulus negative pressure is > [5] inches water gauge.~~ ≥	~~[12 hours~~ ~~OR~~ ~~In accordance with the Surveillance Frequency Control Program]~~ ~~1~~ ~~4~~ ~~5~~ 5 ~~5~~

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~~CTS~~

3.6.7

3

INSERT 1

---NOTE---

~~1.30.a~~ The access doors may be opened for normal transit entry and exit.

CTS

Shield Building ~~(Dual and Ice Condenser)~~
3.6.~~8~~ 7

1

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE		FREQUENCY	
~~DOC M01~~	~~SR 3.6.8.2~~ ~~7~~	~~Verify one shield building access door in each access opening is closed.~~ ~~the~~	~~[31 days~~ ~~OR~~ ~~In accordance with the Surveillance Frequency Control Program]~~	~~1~~ ~~6~~ ~~5~~ 5 ~~5~~
4.6.1.7	SR 3.6.~~8~~.3 7 1	~~[~~ Verify shield building structural integrity by performing a visual inspection of the accessible exposed interior and exterior surfaces of the shield building.	During shutdown for SR 3.6.1.1 Type A tests ~~]~~	1 4
~~4.6.1.8.d.4~~	~~SR 3.6.8.4~~ ~~7~~ ~~Emergency Gas Treatment System~~	~~Verify the shield building can be maintained at a pressure equal to or more negative than [-0.5] inch water gauge in the annulus by one Shield Building Air Cleanup System train with final flow ≤ [ ] cfm within [22] seconds after a start signal.~~ ~~60~~	~~[[18] months on a STAGGERED TEST BASIS for each Shield Building Air Cleanup System train~~ ~~OR~~ ~~In accordance with the Surveillance Frequency Control Program]~~	~~1~~ ~~4~~ ~~2~~ ~~7~~ ~~4~~ ~~5~~ 6 ~~5~~

CTS

Shield Building ~~(Dual and Ice Condenser)~~
3.6.~~8~~ 7 1

3.6 CONTAINMENT SYSTEMS

3.6.~~8~~ 7 Shield Building ~~(Dual and Ice Condenser)~~ 1

3.6.1.7 LCO 3.6.~~8~~ 7 The shield building shall be OPERABLE. ~~INSERT 1~~ 2

Applicability APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

A02

CONDITION	REQUIRED ACTION	COMPLETION TIME
DOC ~~L01~~ A. Shield building inoperable.	A.1 Restore shield building to OPERABLE status.	~~24 hours~~ 1 hour 3
DOC A02 B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
~~DOC M01~~ ~~SR 3.6.8.1~~ ~~7~~ ~~[Verify annulus negative pressure is > [5] inches water gauge.~~ ≥	~~[12 hours~~ ~~OR~~ ~~In accordance with the Surveillance Frequency Control Program]~~

1 4 5

5

5

~~CTS~~ 3.6.7

3 **INSERT 1**

---NOTE---

~~1.30.a~~ The access doors may be opened for normal transit entry and exit.

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SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE		FREQUENCY	
~~DOC M01~~	~~SR 3.6.8.2~~ 7	~~Verify one shield building access door in each access opening is closed.~~ the	~~[31 days~~ ~~OR~~ ~~In accordance with the Surveillance Frequency Control Program]~~	~~1~~ ~~6~~ ~~5~~ 5 ~~5~~
4.6.1.7	SR 3.6.~~8~~.3 7 1	~~[~~ Verify shield building structural integrity by performing a visual inspection of the accessible exposed interior and exterior surfaces of the shield building.	During shutdown for SR 3.6.1.1 Type A tests ~~]~~	1 4
~~4.6.1.8.d.4~~	~~SR 3.6.8.4~~ ~~7~~	~~Verify the shield building can be maintained at a pressure equal to or more negative than [-0.5] inch water gauge in the annulus by one Shield Building Air Cleanup System train with final flow ≤ [ ] cfm within [22] seconds after a start signal.~~ ~~Emergency Gas Treatment System~~ ~~60~~	~~[[18] months on a STAGGERED TEST BASIS for each Shield Building Air Cleanup System train~~ ~~OR~~ ~~In accordance with the Surveillance Frequency Control Program]~~	~~1~~ ~~4~~ ~~2~~ ~~7~~ ~~4~~ ~~5~~ 6 ~~5~~

JUSTIFICATION FOR DEVIATIONS
ITS 3.6.7, SHIELD BUILDING

1. The heading and title for ISTS 3.6.8 include the parenthetical expression (Dual and Ice Condenser). This identifying information is not included in the Sequoyah Nuclear (SQN) ITS. This information is provided in the NUREG to assist in identifying the appropriate Specifications to be used as a model for a plant-specific ITS conversion, but serves no purpose in a plant-specific implementation. Therefore, necessary editorial changes were made. In addition, SQN design does not include the Spray Additive System (ISTS 3.6.7). Therefore, ISTS 3.6.7 is not included in the SQN ITS and ISTS 3.6.8 is renumbered as ITS 3.6.7.

2. Changes are made (additions, deletions, and/or changes) to the ISTS which reflect the plant-specific nomenclature, number, reference, system description, analysis, or licensing basis description.

3. ~~There is no allowance in ISTS 3.6.8 for when a shield building access door is open~~ ~~for norr~~ ~~an exce~~ ~~allow fo~~ ~~that the~~ ~~Completion Time for Condition A). This change is consistent with the current licensing basis as defined in CTS 1.30, definition of SHIELD BUILDING INTEGRITY, which provides this exception to the requirement for the door in each access opening to be closed.~~

   The Completion Time associated with ISTS 3.6.8, Required Action A.1 is modified from 24 hours to 1 hour to reflect the SQN current licensing basis as described in Discussion of Change A02.

4. The ISTS contains bracketed information and/or values that are generic to Westinghouse vintage plants. The brackets are removed and the proper plant specific information/value is inserted to reflect the current licensing basis.

5. ~~ISTS SR 3.6.8.1, SR 3.6.8.2, and SR 3.6.8.4 provide two options for controlling the Frequencies of Surveillance Requirements. SQN is proposing to control the Surveillance Frequencies for ITS SR 3.6.7.1, SR 3.6.7.2, and SR 3.6.7.4 under the Surveillance Frequency Control Program.~~

   ISTS SR 3.6.8.1 and SR 3.6.8.2 are not included in SQN ITS 3.6.7 because theses Surveillances are not included in the SQN current Technical Specifications. As a result, ISTS SR 3.6.8.3 is renumbered to ITS SR 3.6.7.1.

6. ~~ISTS SR 3.6.8.2 requires verification that "one" access door in each shield building~~ ~~access~~ ~~shield b~~ ~~"the" sh~~ ~~the plai~~

   ISTS SR 3.6.8.4 verifies that the Shield Building Air Cleanup System can maintain a negative pressure within the shield building following a start signal. In the SQN ITS, this Surveillance is moved to ITS 3.6.10, "Emergency Gas Treatment System (EGTS) Air Cleanup Subsystem," (ISTS 3.6.13) consistent with the SQN current Technical Specifications.

7. ~~ISTS S~~ ~~negative pressure relative to the annulus by one train within a specified time and flow rate after a start signal. ITS SR 3.6.7.4 will require a similar test, but will not specify a flow rate for the EGTS train. The current licensing basis for this acceptance criteria is derived from the license amendment requested by TVA and approved by the NRC on December 23, 1982.~~

Improved Standard Technical Specifications (ISTS) Bases Markup and Bases Justification for Deviations (JFDs)

B 3.6 CONTAINMENT SYSTEMS

B 3.6.~~8~~ 7 Shield Building ~~(Dual and Ice Condenser)~~ 1

BASES

BACKGROUND

The shield building is a concrete structure that surrounds the steel containment vessel. Between the containment vessel and the shield building inner wall is an annular space that collects containment leakage that may occur following a loss of coolant accident (LOCA). This space also allows for periodic inspection of the outer surface of the steel containment vessel.

Insert 1

The Emergency Gas Treatment System (EGTS) ~~Shield Building Air Cleanup System (SBACS)~~ establishes a negative pressure in the annulus between the shield building and the steel containment vessel. Filters in the system then control the release of radioactive contaminants to the environment. The shield building is required to be OPERABLE to ensure retention of containment leakage and proper operation of the EGTS Air Cleanup Subsystem ~~SBACS~~. 2

INSERT ~~1~~ 2

APPLICABLE SAFETY ANALYSES

The design basis for shield building OPERABILITY is a LOCA. Maintaining shield building OPERABILITY ensures that the release of radioactive material from the containment atmosphere is restricted to those leakage paths and associated leakage rates assumed in the accident analyses.

The shield building satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

Shield building OPERABILITY must be maintained to ensure proper operation of the EGTS Air Cleanup Subsystem ~~SBACS~~ and to limit radioactive leakage from the containment to those paths and leakage rates assumed in the accident analyses. INSERT ~~2~~ 3 2 2

APPLICABILITY

Maintaining shield building OPERABILITY prevents leakage of radioactive material from the shield building. Radioactive material may enter the shield building from the containment following a LOCA. Therefore, shield building OPERABILITY is required in MODES 1, 2, 3, and 4 when a steam line break, LOCA, or rod ejection accident could release radioactive material to the containment atmosphere.

In MODES 5 and 6, the probability and consequences of these events are low due to the Reactor Coolant System temperature and pressure limitations in these MODES. Therefore, shield building OPERABILITY is not required in MODE 5 or 6.

2 **INSERT 1**

is a system common to Units 1 and 2 consisting of two subsystems:

a. annulus vacuum control subsystem, and

b. air cleanup subsystem.

The annulus vacuum control subsystem is used during normal operation to establish and maintain a negative pressure in the annulus space. The annulus vacuum control subsystem does not perform any safety function.

The air cleanup subsystem operates during a LOCA to establish and maintain a negative annulus pressure of at least 0.5 inches water gauge. Filters in the subsystem then control the release of radioactive contaminates to the environment. The EGTS air cleanup subsystem OPERABILITY requirements are specified in LCO 3.6.10, “Emergency Gas Treatment System (EGTS) Air Cleanup Subsystem.”

2 **INSERT ~~1~~2**

The isolation devices for the penetrations in the shield building boundary are a part of the shield building leak tight barrier. To maintain the shield building boundary leak tight, the sealing mechanism associated with each penetration (e.g., welds, bellows, or O-rings) are required to be OPERABLE. Access to the annulus area of the shield building is provided via the reactor building access room door and the water tight annulus access door located on 690 ft. elevation. During normal operation, these doors provide personnel and equipment access to the shield building annulus area and are equipped with electrical interlocks to assure that one door is always closed. Access to the annulus area is also provided via equipment hatches, which are typically not used during plant operation.

7 **INSERT ~~2~~3**

To maintain a leak tight barrier in the shield building: the door in each access opening must be closed except when the access opening is being used for normal transit entry and exit; and the sealing mechanisms associated with each penetration (e.g., welds, bellows, or O-rings) are OPERABLE.~~The LCO is modified by a Note to allow the shield building access doors to be opened to allow normal transit entry and exit. The basis of this exception is the assumption that, for normal transit, the time during which a door is open will be short (i.e., shorter than the Completion Time for Condition A).~~

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BASES

ACTIONS

A.1

In the event shield building OPERABILITY is not maintained, shield building OPERABILITY must be restored within ~~24 hours~~. ~~Twenty-four hours~~ 1 hour. One hour is a reasonable Completion Time considering the limited leakage design of containment and the low probability of a Design Basis Accident occurring during this time period. This specified time period is also consistent with the ACTIONS of LCO 3.6.1, "Containment," which requires the containment be restored to OPERABLE status within 1 hour.

3

B.1 and B.2

If the shield building cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

~~[SR 3.6.8.1~~

~~7~~

~~4~~ ~~1~~

~~Verifying that shield building annulus negative pressure is within limit ensures that operation remains within the limit assumed in the containment analysis. [The 12 hour Frequency of this SR was developed considering operating experience related to shield building annulus pressure variations and pressure instrument drift during the applicable MODES.~~

~~5~~

~~OR~~

~~The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.~~

3

~~-----------------------------------REVIEWER'S NOTE-----------------------------------~~
~~Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.~~
~~--]]~~

6

BASES

SURVEILLANCE REQUIREMENTS (continued)

~~SR 3.6.8.2~~ 7

3 ~~Maintaining shield building OPERABILITY requires verifying one door in the access opening closed. [An access opening may contain one inner and one outer door, or in some cases, shield building access openings are shared such that a shield building barrier may have multiple inner or multiple outer doors. The intent is to not breach the shield building boundary at any time when the shield building boundary is required. This is achieved by maintaining the inner or outer portion of the barrier closed at all times.] However, all shield building access doors are normally kept closed, except when the access opening is being used for entry and exit or when maintenance is being performed on an access opening. [The 31 day Frequency of this SR is based on engineering judgment and is considered adequate in view of the other indications of door status that are available to the operator.~~

~~OR~~

~~The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.~~

~~-----REVIEWER'S NOTE-----~~
~~Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.~~
~~-----]~~

1

~~[~~ SR 3.6.~~8~~.3 7

A visual inspection of the accessible shield building interior and exterior surfaces and verification that no apparent changes in the concrete surface appearance or other abnormal degradation will

~~This SR would~~ give advance indication of gross deterioration of the concrete structural integrity of the shield building. The Frequency of this SR is the same as that of SR 3.6.1.1. The verification is done during shutdown. ~~]~~

Shield Building ~~(Dual and Ice Condenser)~~
B 3.6.~~8~~ 7

1

BASES

SURVEILLANCE REQUIREMENTS (continued)

3

~~7~~

~~SR 3.6.8.4~~

~~EGTS~~

~~The Shield Building Air Cleanup System produces a negative pressure to prevent leakage from the building. SR 3.6.8.4 verifies that the shield building can be rapidly drawn down to [-0.5] inch water gauge in the annulus. This test is used to ensure shield building boundary integrity. Establishment of this pressure is confirmed by SR 3.6.8.4, which demonstrates that the shield building can be drawn down to ≤ [-0.5] inches of vacuum water gauge in the annulus ≤ [22] seconds using one Shield Building Air Cleanup System train. The time limit ensures that no significant quantity of radioactive material leaks from the shield building prior to developing the negative pressure. Since this SR is a shield building boundary integrity test, it does not need to be performed with each Shield Building Air Cleanup System train. [The Shield Building Air Cleanup System train used for this Surveillance is staggered to ensure that in addition to the requirements of LCO 3.6.8.4, either train will perform this test.] The primary purpose of this SR is to ensure shield building integrity. The secondary purpose of this SR is to ensure that the Shield Building Air Cleanup System being tested functions as designed. The inoperability of the Shield Building Air Cleanup System train does not necessarily constitute a failure of this Surveillance relative to the shield building OPERABILITY. [The 18 month Frequency is based on the need to perform this Surveillance under conditions that apply during a plant outage.~~

~~7~~ ~~7~~ ~~60~~ ~~EGTS~~ ~~EGTS~~ ~~EGTS train~~ ~~EGTS~~

~~1~~ ~~2~~ ~~1~~ ~~4~~ ~~1~~ ~~4~~ ~~2~~ ~~2~~ ~~5~~ ~~2~~ ~~5~~

~~OR~~

~~The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.~~

~~-----------------------------------REVIEWER'S NOTE-----------------------------------
Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.
---]~~

6

REFERENCES None.

1

B 3.6 CONTAINMENT SYSTEMS

B 3.6.~~8~~ 7 Shield Building ~~(Dual and Ice Condenser)~~

1

BASES

BACKGROUND

The shield building is a concrete structure that surrounds the steel containment vessel. Between the containment vessel and the shield building inner wall is an annular space that collects containment leakage that may occur following a loss of coolant accident (LOCA). This space also allows for periodic inspection of the outer surface of the steel containment vessel.

Insert 1

The Emergency Gas Treatment System (EGTS) ~~Shield Building Air Cleanup System (SBACS)~~ Air Cleanup Subsystem establishes a negative pressure in the annulus between the shield building and the steel containment vessel. Filters in the system then control the release of radioactive contaminants to the environment. The shield building is required to be OPERABLE to ensure retention of containment leakage and proper operation of the EGTS ~~SBACS~~ Air Cleanup Subsystem. INSERT ~~1~~ 2

2

APPLICABLE SAFETY ANALYSES

The design basis for shield building OPERABILITY is a LOCA. Maintaining shield building OPERABILITY ensures that the release of radioactive material from the containment atmosphere is restricted to those leakage paths and associated leakage rates assumed in the accident analyses.

The shield building satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

Shield building OPERABILITY must be maintained to ensure proper operation of the EGTS ~~SBACS~~ Air Cleanup Subsystem and to limit radioactive leakage from the containment to those paths and leakage rates assumed in the accident analyses. INSERT ~~2~~ 3

2

2

APPLICABILITY

Maintaining shield building OPERABILITY prevents leakage of radioactive material from the shield building. Radioactive material may enter the shield building from the containment following a LOCA. Therefore, shield building OPERABILITY is required in MODES 1, 2, 3, and 4 when a steam line break, LOCA, or rod ejection accident could release radioactive material to the containment atmosphere.

In MODES 5 and 6, the probability and consequences of these events are low due to the Reactor Coolant System temperature and pressure limitations in these MODES. Therefore, shield building OPERABILITY is not required in MODE 5 or 6.

2 **INSERT 1**

is a system common to Units 1 and 2 consisting of two subsystems:

a. annulus vacuum control subsystem, and

b. air cleanup subsystem.

The annulus vacuum control subsystem is used during normal operation to establish and maintain a negative pressure in the annulus space. The annulus vacuum control subsystem does not perform any safety function.

The air cleanup subsystem operates during a LOCA to establish and maintain a negative annulus pressure of at least 0.5 inches water gauge. Filters in the subsystem then control the release of radioactive contaminates to the environment. The EGTS air cleanup subsystem OPERABILITY requirements are specified in LCO 3.6.10, "Emergency Gas Treatment System (EGTS) Air Cleanup Subsystem."

2 **INSERT ~~1~~2**

The isolation devices for the penetrations in the shield building boundary are a part of the shield building leak tight barrier. To maintain the shield building boundary leak tight, the sealing mechanism associated with each penetration (e.g., welds, bellows, or O-rings) are required to be OPERABLE. Access to the annulus area of the shield building is provided via the reactor building access room door and the water tight annulus access door located on 690 ft. elevation. During normal operation, these doors provide personnel and equipment access to the shield building annulus area and are equipped with electrical interlocks to assure that one door is always closed. Access to the annulus area is also provided via equipment hatches, which are typically not used during plant operation.

7 **INSERT ~~2~~3**

To maintain a leak tight barrier in the shield building: the door in each access opening must be closed except when the access opening is being used for normal transit entry and exit; and the sealing mechanisms associated with each penetration (e.g., welds, bellows, or O-rings) are OPERABLE.~~The LCO is modified by a Note to allow the shield building access doors to be opened to allow normal transit entry and exit. The basis of this exception is the assumption that, for normal transit, the time during which a door is open will be short (i.e., shorter than the Completion Time for Condition A).~~

1

BASES

ACTIONS

A.1

In the event shield building OPERABILITY is not maintained, shield building OPERABILITY must be restored within ~~24 hours~~ 1 hour. One hour ~~Twenty-four hours~~ is a reasonable Completion Time considering the limited leakage design of containment and the low probability of a Design Basis Accident occurring during this time period. This specified time period is also consistent with the ACTIONS of LCO 3.6.1, "Containment," which requires the containment be restored to OPERABLE status within 1 hour.

3

B.1 and B.2

If the shield building cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

3

~~[SR 3.6.8.1~~ ~~7~~

~~Verifying that shield building annulus negative pressure is within limit ensures that operation remains within the limit assumed in the containment analysis. [The 12 hour Frequency of this SR was developed considering operating experience related to shield building annulus pressure variations and pressure instrument drift during the applicable MODES.~~

~~OR~~

~~The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.~~

~~-----REVIEWER'S NOTE-----~~
~~Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.~~
~~-----]]~~

6

1

BASES

SURVEILLANCE REQUIREMENTS (continued)

~~SR 3.6.8.2~~ ~~7~~

3

~~Maintaining shield building OPERABILITY requires verifying one door in the access opening closed. [An access opening may contain one inner and one outer door, or in some cases, shield building access openings are shared such that a shield building barrier may have multiple inner or multiple outer doors. The intent is to not breach the shield building boundary at any time when the shield building boundary is required. This is achieved by maintaining the inner or outer portion of the barrier closed at all times.] However, all shield building access doors are normally kept closed, except when the access opening is being used for entry and exit or when maintenance is being performed on an access opening. [The 31 day Frequency of this SR is based on engineering judgment and is considered adequate in view of the other indications of door status that are available to the operator.~~ ~~the~~ ~~s~~

~~OR~~

~~The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.~~

~~1~~ ~~3~~ ~~4~~ ~~7~~ ~~5~~

~~-----REVIEWER'S NOTE-----~~
~~Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.~~
~~----------]~~

6

1

~~[~~ SR 3.6.~~8~~.3 7

A visual inspection of the accessible shield building interior and exterior surfaces and verification that no apparent changes in the concrete surface appearance or other abnormal degradation will

~~This SR would~~ give advance indication of gross deterioration of the concrete structural integrity of the shield building. The Frequency of this SR is the same as that of SR 3.6.1.1. The verification is done during shutdown. ~~]~~

4 1 ~~8~~ 7 4

Shield Building ~~(Dual and Ice Condenser)~~
B 3.6.~~8~~7 1

BASES

SURVEILLANCE REQUIREMENTS (continued)

3

~~SR 3.6.8.4~~ ~~7~~ 1

~~The Shield Building Air Cleanup System~~ ~~EGTS~~ ~~produces a negative pressure to prevent leakage from the building. SR 3.6.8.4~~ ~~7~~ ~~verifies that the shield building can be rapidly drawn down to [-0.5] inch water gauge in the annulus. This test is used to ensure shield building boundary integrity. Establishment of this pressure is confirmed by SR 3.6.8.4~~ ~~7~~~~, which demonstrates that the shield building can be drawn down to ≤ [-0.5] inches of vacuum water gauge in the annulus ≤ [22]~~ ~~60~~ ~~seconds using one Shield Building Air Cleanup System~~ ~~EGTS~~ ~~train. The time limit ensures that no significant quantity of radioactive material leaks from the shield building prior to developing the negative pressure. Since this SR is a shield building boundary integrity test, it does not need to be performed with each Shield Building Air Cleanup System~~ ~~EGTS~~ ~~train. [The Shield Building Air Cleanup System train used for this Surveillance is staggered to ensure that in addition to the requirements of LCO 3.6.8.4, either train will perform this test.] The primary purpose of this SR is to ensure shield building integrity. The secondary purpose of this SR is to ensure that the Shield Building Air Cleanup System~~ ~~EGTS train~~ ~~being tested functions as designed. The inoperability of the Shield Building Air Cleanup System~~ ~~EGTS~~ ~~train does not necessarily constitute a failure of this Surveillance relative to the shield building OPERABILITY. [The 18 month Frequency is based on the need to perform this Surveillance under conditions that apply during a plant outage.~~

~~OR~~

~~The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.~~

~~-----------------------------------REVIEWER'S NOTE-----------------------------------~~
~~Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.~~
~~--]~~ 6

REFERENCES None.

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JUSTIFICATION FOR DEVIATIONS
ITS 3.6.7 BASES, SHIELD BUILDING

1. The heading and title for ISTS 3.6.8 include the parenthetical expression (Ice Condenser). This identifying information is not included in the Sequoyah Nuclear (SQN) ITS. This information is provided in the NUREG to assist in identifying the appropriate Specifications to be used as a model for a plant-specific ITS conversion, but serves no purpose in a plant-specific implementation. Therefore, necessary editorial changes were made. In addition, SQN design does not include the Spray Additive System (ISTS 3.6.7). Therefore, ISTS 3.6.7 is not included in the SQN ITS and ISTS 3.6.8 is renumbered as ITS 3.6.7.

2. Changes are made (additions, deletions, and/or changes) to the ISTS Bases which reflect the plant-specific nomenclature, number, reference, system description, analysis, or licensing basis description.

3. Changes have been made to be consistent with changes made to the Specification.

4. The ISTS contains bracketed information and/or values that are generic to all Westinghouse vintage plants. The brackets are removed and the proper plant specific information/value is changed to reflect the current licensing basis.

5. Not used. ~~ISTS SR 3.6.8.1, SR 3.6.8.2, and SR 3.6.8.4 provide two options for controlling the Frequencies of Surveillance Requirements. SQN is proposing to control the Surveillance Frequencies for ITS SR 3.6.7.1, SR 3.6.7.2, and SR 3.6.7.4 under the Surveillance Frequency Control Program.~~

6. The Reviewer's Note has been deleted. This information is for the NRC reviewer to be keyed into what is needed to meet this requirement. This Note is not meant to be retained in the final version of the plant specific submittal.

~~7. There are no allowances in the LCO for a shield building access opening door to be open when maintenance is being performed on an access opening.~~

7 ~~8.~~ Changes are made to include details moved from the Current Technical Specifications to the Bases.

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ATTACHMENT 10

ITS 3.6.10, EMERGENCY GAS TREATMENT SYSTEM (EGTS)

Air Cleanup Subsystem

Current Technical Specification (CTS) Markup and Discussion of Changes (DOCs)

CONTAINMENT SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

c. After every 720 hours of charcoal adsorber operation by verifying within 31 days after removal that a laboratory analysis of representative carbon sample obtained in accordance with Regulatory Position C.6.b of Regulatory Guide 1.52, Revision 2, March 1978, shows the methyl iodide penetration less than 2.5% when tested in accordance with ASTM D3803-1989 at a temperature of 30°C (86°F) and a relative humidity of 70%. See ITS 5.5.9

LA02

SR 3.6.10.3
SR 3.6.10.4

d. ~~At least once per 18 months by~~: In accordance with the Surveillance Frequency Control Program

L05

1. Verifying that the pressure drop across the combined HEPA filters and charcoal adsorber banks is less than 5 inches Water Gauge while operating the filter train at a flow rate of 4000 cfm ± 10%. See ITS 5.5.9

INSERT 1

SR 3.6.10.3 2. Verifying that the filter train starts on ~~a Phase A containment isolation Test~~ an actual or simulated Signal. L02 LA01

SR 3.6.10.6 3. Verify the operation of the filter cooling bypass valves.

4. Verifying that each system produces a negative pressure of greater than or equal to 0.5 inches W. G. in the annulus within 1 minute after a start signal. ~~See ITS 3.6.7~~

e. After each complete or partial replacement of a HEPA filter bank by verifying that the HEPA filter banks remove greater than or equal to 99.95% of the DOP when they are tested in-place in accordance with ANSI N510-1975 while operating the system at a flow rate of 4000 cfm ± 10%.

f. After each complete or partial replacement of a charcoal adsorber bank by verifying that the charcoal adsorbers remove greater than or equal to 99.95% of a halogenated hydrocarbon refrigerant test gas when they are tested in-place in accordance with ANSI N510-1975 while operating the system at a flow rate of 4000 cfm ± 10%.

See ITS 5.5.9

INSERT 1 L05

~~on a STAGGERED TEST BASIS for each EGTS Air Cleanup Subsystem train~~

In accordance with the Surveillance Frequency Control Program LA02

ITS

A01

ITS 3.6.10

CONTAINMENT SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

c. After every 720 hours of charcoal adsorber operation by verifying within 31 days after removal that a laboratory analysis of representative carbon sample obtained in accordance with Regulatory Position C.6.b of Regulatory Guide 1.52, Revision 2, March 1978, shows the methyl iodide penetration less than 2.5% when tested in accordance with ASTM D3803-1989 at a temperature of 30°C (86° F) and a relative humidity of 70%. See ITS 5.5.9

SR 3.6.10.3
SR 3.6.10.4

d. ~~At least once per 18 months by~~: In accordance with the Surveillance Frequency Control Program LA02

L05

INSERT 1

1. Verifying that the pressure drop across the combined HEPA filters and charcoal adsorber banks is less than 5 inches Water Gauge while operating the filter train at a flow rate of 4000 cfm + 10%. See ITS 5.5.9

SR 3.6.10.3 2. Verifying that the filter train starts on an actual or simulated ~~a Phase A containment isolation Test~~ Signal. L02 LA01

SR 3.6.10.4 3. Verify the operation of the filter cooling bypass valves.

SR 3.6.10.6 4. Verifying that each system produces a negative pressure of greater than or equal to 0.5 inches W.G. in the annulus within 1 minute after a start signal. ~~See ITS 3.6.7~~

e. After each complete or partial replacement of a HEPA filter bank by verifying that the HEPA filter banks remove greater than or equal to 99.95% of the DOP when they are tested in-place in accordance with ANSI N510-1975 while operating the system at a flow rate of 4000 cfm + 10%.

f. After each complete or partial replacement of a charcoal adsorber bank by verifying that the charcoal adsorbers remove greater than or equal to 99.95% of a halogenated hydrocarbon refrigerant test gas when they are tested in-place in accordance with ANSI N510-1975 while operating the system at a flow rate of 4000 cfm + 10%.

See ITS 5.5.9

INSERT 1 L05

~~on a STAGGERED TEST BASIS for each EGTS Air Cleanup Subsystem train~~

In accordance with the Surveillance Frequency Control Program LA02

ITS

A01

ITS 3.6.10

DEFINITIONS

RATED THERMAL POWER (RTP)

1.27 RATED THERMAL POWER (RTP) shall be a total reactor core heat transfer rate to the reactor coolant of 3455 MWt.

REACTOR TRIP SYSTEM (RTS) RESPONSE TIME

1.28 The REACTOR TRIP SYSTEM RESPONSE TIME shall be the time interval from when the monitored parameter exceeds its (RTS) trip setpoint at the channel sensor until loss of stationary gripper coil voltage. The response time may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured. In lieu of measurement, response time may be verified for selected components provided that the components and the methodology for verification have been previously reviewed and approved by NRC.

See ITS Chapter 1.0

REPORTABLE EVENT

1.29 DELETED

SHIELD BUILDING INTEGRITY

1.30 SHIELD BUILDING INTEGRITY shall exist when:

See ITS Chapter 1.0

a. The door in each access opening is closed except when the access opening is being used for normal transit entry and exit.

See ITS 3.6.7

LCO 3.6.10

b. The emergency gas treatment system is OPERABLE.

c. The sealing mechanism associated with each penetration (e.g., welds, bellows or O-rings) is OPERABLE.

See ITS 3.6.7

SHUTDOWN MARGIN

1.31 SHUTDOWN MARGIN shall be the instantaneous amount of reactivity by which the reactor is subcritical or would be subcritical from its present condition assuming all full length rod cluster assemblies (shutdown and control) are fully inserted except for the single rod cluster assembly of highest reactivity worth which is assumed to be fully withdrawn.

See ITS Chapter 1.0

SITE BOUNDARY

1.32 The SITE BOUNDARY shall be that line beyond which the land is not owned, leased, or otherwise controlled by the licensee.

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DISCUSSION OF CHANGES
ITS 3.6.10, EMERGENCY GAS TREATMENT SYSTEM (EGTS)

the Bases. The additional allowance to test EGTS train actuation on an actual or simulated actuation signal is discussed in DOC L02.

The removal of these details, which are related to system design, from the Technical Specifications is acceptable, because this type of information is not necessary to be included in the Technical Specifications to provide adequate protection of public health and safety. The ITS retains the requirement that two emergency gas treatment system trains shall be OPERABLE, and verifies that each train starts on a valid signal. This change is acceptable, because the removed information will be adequately controlled in the ITS Bases. Changes to the Bases are controlled by the Technical Specification Bases Control Program in Chapter 5. This program provides for the evaluation of changes to the Bases to ensure the Bases are properly controlled. This change is designated as a less restrictive removal of detail change, because information relating to system design is being removed from the Technical Specifications.

LA02 *(Type 5 – Removal of SR Frequency to the Surveillance Frequency Control Program)* CTS 4.6.1.8 requires each EGTS cleanup subsystem to be operated for at least 10 hours with the heaters on at least once per 31 days. ITS SR 3.6.10.1 requires a similar Surveillance and specifies the periodic Frequency as, "In accordance with the Surveillance Frequency Control Program." CTS 4.6.1.8.b.3 requires, in part, verification of each EGTS cleanup subsystem flow rate every 18 months. ITS SR 3.6.10.5 requires the same verification and specifies the periodic Frequency as, "In accordance with the Surveillance Frequency Control Program." CTS 4.6.1.8.d.2 requires verification that each EGTS cleanup subsystem filter train starts on a Phase A containment isolation Test signal at least once per 18 months. ITS SR 3.6.10.3 requires a similar verification and specifies the periodic Frequency as, "In accordance with the Surveillance Frequency Control Program." CTS 4.6.1.8.d.3 requires verification that the EGTS cleanup subsystem filter cooling bypass valves operate at least one per 18 months. ITS SR 3.6.10.4 requires a similar verification and specifies the periodic Frequency as, "In accordance with the Surveillance Frequency Control Program." This changes the CTS by moving the specified Frequencies for these SRs and associated Bases to the Surveillance Frequency Control Program.

INSERT 2

The removal of these details related to Surveillance Requirement Frequencies from the Technical Specifications is acceptable, because this type of information is not necessary to be included in the Technical Specifications to provide adequate protection of public health and safety. The existing Surveillance Frequencies are removed from Technical Specifications and placed under licensee control pursuant to the methodology described in NEI 04-10. A new program (Surveillance Frequency Control Program) is being added to the Administrative Controls section of the Technical Specifications describing the control of Surveillance Frequencies. The surveillance test requirements remain in the Technical Specifications. The control of changes to the Surveillance Frequencies will be in accordance with the Surveillance Frequency Control Program. The Program shall ensure that Surveillance Requirements specified in the Technical Specifications are performed at intervals sufficient to assure the associated Limiting Conditions for Operation are met. This change is designated

INSERT 2

CTS 4.6.1.8.d.4 requires verification that each EGTS Air Cleanup Subsystem train produces a negative pressure within limits in the annulus within 1 minute after a start signal. ITS SR 3.6.10.6 requires a similar verification and specifies the periodic Frequency as, "In accordance with the Surveillance Frequency Control Program." The change to CTS 4.6.1.8.d.4 to perform the Surveillance on a STAGGERED TEST BASIS is discussed in DOC L05.

DISCUSSION OF CHANGES
ITS 3.6.10, EMERGENCY GAS TREATMENT SYSTEM (EGTS)

the Surveillances for the two fans can be larger or smaller under the ITS than under the CTS.

L04 *(Category 6 – Relaxation of Surveillance Requirement Acceptance Criteria)* CTS 4.6.1.8.a requires the periodic operation of each EGTS train for at least 10 hours with the heaters on. ITS SR 3.6.10.1 requires the periodic operation of each EGTS train for at least 15 continuous minutes with the heaters on. This changes the CTS by reducing the amount of time each EGTS train is required to be operated.

The purpose of CTS 4.6.1.8.a is to periodically verify that each train of EGTS can operate properly. The requirement to operate each train for at least 10 hours per month with the heaters on in order to reduce the buildup of moisture on the adsorbers and HEPA filters was derived from the guidance provided in Regulatory Guide (RG) 1.52, "Design, Testing, and Maintenance Criteria for Post Accident Engineered-Safety-Feature Atmosphere Cleanup System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants," Revision 2, Regulatory Position 4.d. However, this was changed in RG 1.52, Revision 3. RG 1.52, Revision 3, Regulatory Position 6.1 states, "Each ESF atmosphere cleanup train should be operated continuously for at least 15 minutes each month, with the heaters on (if so equipped), to justify the operability of the system and all its components." The Ventilation Filter Testing Program (VFTP) also requires that a laboratory test of a sample of the charcoal adsorber used in each of the Engineered Safety Features (ESF) systems be tested in accordance with ASTM D3803-1989. Generic Letter 99-02, "Laboratory Testing of Nuclear-Grade Activated Charcoal," dated June 3, 1999, informed licensees that the use of any standard other than ASTM D3803-1989 to test the charcoal sample may result in an overestimation of the capability of the charcoal to adsorb radioiodine. As a result, TVA requested license amendments to the Sequoyah Nuclear Plant (SQN) Unit 1 and Unit 2 Technical Specifications to revise the required filter testing to be in accordance with ASTM D3803-1989. The NRC approved the SQN Unit 1 and Unit 2 license amendments on November 2, 2000 (ADAMS Accession Number ML003766942). This change is acceptable because the ASTM D3803-1989 Standard no longer requires operation for 10 hours utilizing the heaters. This change is designated as less restrictive because less stringent Surveillance Requirements are being applied in the ITS than were applied in the CTS.

INSERT 3

INSERT 3

L05 *(Category 7 – Relaxation Of Surveillance Frequency)* CTS 4.6.1.8.d.4 requires a drawdown of the shield building annulus by each EGTS Air Cleanup Subsystem train to within limits at least once per 18 months. ITS SR 3.6.10.6 requires a drawdown of the shield building annulus to within limits "In accordance with the Surveillance Frequency Control Program." The specified Surveillance Frequency that is being moved to the Surveillance Frequency Control Program is "18 months on a STAGGERED TEST BASIS for each EGTS Air Cleanup Subsystem train." This changes the CTS by allowing the drawdown test for each EGTS Air Cleanup Subsystem train to be performed less frequently. Moving the specified Surveillance Frequency to the Surveillance Frequency Control Program is discussed in DOC LA02.

The purpose of CTS 4.6.1.8.d.4 is to verify the integrity of the shield building boundary by ensuring the shield building annulus can be rapidly drawn to a negative pressure of at least 0.5 inches water gauge. Therefore, this is a test of shield building integrity and does not need to be performed every 18 months using each EGTS Air Cleanup Subsystem train. Staggering use of the EGTS Air Cleanup Subsystem trains every 18 months will ensure both trains are capable of performing the test. This change is acceptable because performing the drawdown test using one train of EGTS Air Cleanup Subsystem every 18 months will adequately verify shield building integrity. OPERABILITY of the EGTS Air Cleanup Subsystem will be maintained through the application of the other Surveillances of ITS 3.6.10. This change is designated as less restrictive, because the shield building annulus drawdown Surveillance will be performed less frequently with each EGTS Air Cleanup Subsystem train under the ITS than under the CTS.

Improved Standard Technical Specifications (ISTS) Markup and Justification for Deviations (JFDs)

CTS

~~SBACS (Dual and Ice Condenser)~~ EGTS Air Cleanup Subsystem

3.6.~~13~~ 10 1

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE		FREQUENCY	
4.6.1.8.d.2	SR 3.6.~~13~~.3 10	Verify each ~~SBACS~~ EGTS Air Cleanup Subsystem train actuates on an actual or simulated actuation signal.	~~[[18] months~~ ~~OR~~ In accordance with the Surveillance Frequency Control Program ~~]~~	1 4 4
4.6.1.8.d.3	SR 3.6.~~13~~.4 10	~~[~~ Verify each ~~SBACS~~ EGTS Air Cleanup Subsystem filter cooling bypass ~~damper~~ valve can be ~~opened~~ operated.	~~[[18] months~~ ~~OR~~ In accordance with the Surveillance Frequency Control Program ~~]]~~	1 3 4 4
4.6.1.8.b.3	SR 3.6.~~13~~.5 10	Verify each ~~SBACS~~ EGTS Air Cleanup Subsystem train flow rate is ~~≥ [ ]~~ ≥ 3600 and ≤ 4400 cfm.	~~[[18] months on a STAGGERED TEST BASIS~~ ~~OR~~ In accordance with the Surveillance Frequency Control Program ~~]~~	3 1 4 4

INSERT 1

5 **INSERT 1**

4.6.1.8.d.4	SR 3.6.10.6	Verify the shield building can be maintained at a negative pressure ≥ 0.5 inch water gauge in the annulus by one EGTS Air Cleanup Subsystem train within 60 seconds after a start signal.	In accordance with the Surveillance Frequency Control Program

CTS

~~SBACS (Dual and Ice Condenser)~~ EGTS Air Cleanup Subsystem

3.6.~~13~~ 10 1

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE		FREQUENCY	
4.6.1.8.d.2	SR 3.6.~~13~~10.3	Verify each ~~SBACS~~ EGTS Air Cleanup Subsystem train actuates on an actual or simulated actuation signal.	~~[[18] months~~ ~~OR~~ In accordance with the Surveillance Frequency Control Program ~~]~~	1 4 4
4.6.1.8.d.3	SR 3.6.~~13~~10.4	~~[~~ Verify each ~~SBACS~~ EGTS Air Cleanup Subsystem filter cooling bypass ~~damper~~ valve can be ~~opened~~ operated.	~~[[18] months~~ ~~OR~~ In accordance with the Surveillance Frequency Control Program ~~]]~~	1 3 4 4
4.6.1.8.b.3	SR 3.6.~~13~~10.5	Verify each ~~SBACS~~ EGTS Air Cleanup Subsystem train flow rate is ~~≥ [ ]~~ ≥ 3600 and ≤ 4400 cfm.	~~[[18] months on a STAGGERED TEST BASIS~~ ~~OR~~ In accordance with the Surveillance Frequency Control Program ~~]~~	3 1 4 4

INSERT 1

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5 **INSERT 1**

4.6.1.8.d.4	SR 3.6.10.6	Verify the shield building can be maintained at a negative pressure ≥ 0.5 inch water gauge in the annulus by one EGTS Air Cleanup Subsystem train within 60 seconds after a start signal.	In accordance with the Surveillance Frequency Control Program

JUSTIFICATION FOR DEVIATIONS
ITS 3.6.10, EMERGENCY GAS TREATMENT SYSTEM (EGTS)

1. The ISTS 3.6.13 title "Shield Building Air Cleanup System (SBACS)" has been changed to "Emergency Gas Treatment System (EGTS)" consistent with the Sequoyah Nuclear Plant (SQN) site specific terminology. The heading for ISTS 3.6.13 includes the parenthetical expression (Dual and Ice Condenser). This identifying information is not included in the SQN ITS. This information is provided in the NUREG-1431, Rev. 4.0 to assist in identifying the appropriate Specifications to be used as a model for a plant-specific ITS conversion, but serves no purpose in a plant-specific implementation. In addition, SQN design does not include the Spray Additive System (ISTS 3.6.7) or the Hydrogen Mixing System (ISTS 3.6.9). Therefore, ISTS 3.6.7 and ISTS 3.6.9 are not included in the SQN ITS and ISTS 3.6.13 is renumbered as ITS 3.6.10.

2. Changes are made (additions, deletions, and/or changes) to the ISTS which reflect the plant-specific nomenclature, number, reference, system description, analysis, or licensing basis description.

3. The ISTS contains bracketed information and/or values that are generic to Westinghouse vintage plants. The brackets are removed and the proper plant specific information/value is inserted to reflect the current licensing basis.

4. ISTS SR 3.6.13.1, SR 3.6.13.3, SR 3.6.13.4, and SR 3.6.13.5 (ITS SR 3.6.10.1, SR 3.6.10.3, SR 3.6.10.4, and SR 3.6.10.5, respectively) provide two options for controlling the Frequencies of Surveillance Requirements. SQN is proposing to control the Surveillance Frequencies for ITS SR 3.6.10.1, SR 3.6.10.3, SR 3.6.10.4, and SR 3.6.10.5 under the Surveillance Frequency Control Program.

5. ITS SR 3.6.10.6 is added to reflect the requirements of CTS 4.6.1.8.d.4. Changes associated with CTS 4.6.1.8.d.4 are described in Discussion of Changes LA02 and L05. ITS SR 3.6.10.6 is also similar to the requirements of ISTS SR 3.6.8.4 but will not specify a flow rate for the EGTS Cleanup Subsystem train. The current licensing basis for this acceptance criteria is derived from the license amendment requested by TVA and approved by the NRC on December 23, 1982.

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Improved Standard Technical Specifications (ISTS) Bases Markup and Bases Justification for Deviations (JFDs)

B 3.6 CONTAINMENT SYSTEMS

B 3.6.~~13~~ 10 ~~Shield Building Air Cleanup System (SBACS) (Dual and Ice Condenser)~~ Emergency Gas Treatment System (EGTS) Air Cleanup Subsystem 1

BASES

BACKGROUND

The ~~SBACS~~ EGTS is required by 10 CFR 50, Appendix A, GDC 41, "Containment Atmosphere Cleanup" (Ref. 1), to ensure that radioactive materials that leak from the primary containment into the shield building (secondary containment) following a Design Basis Accident (DBA) are filtered and adsorbed prior to exhausting to the environment. 1

The containment has a secondary containment called the shield building, which is a concrete structure that surrounds the steel primary containment vessel. Between the containment vessel and the shield building inner wall is an annular space that collects any containment leakage that may occur following a loss of coolant accident (LOCA). This space also allows for periodic inspection of the outer surface of the steel containment vessel.

INSERT 1 ~~The SBACS establishes a negative pressure in the annulus between the shield building and the steel containment vessel. Filters in the system then control the release of radioactive contaminants to the environment.~~ 2 Shield building OPERABILITY is required to ensure retention of primary containment leakage and proper operation of the ~~SBACS~~ EGTS Air Cleanup Subsystem. 1

The ~~SBACS~~ EGTS Air Cleanup Subsystem consists of two separate and redundant trains. Each train includes a heater, ~~[cooling coils,]~~ a prefilter, moisture separators, a high efficiency particulate air (HEPA) filter, an activated charcoal adsorber section for removal of radioiodines, and a fan. Ductwork, valves and/or dampers, and instrumentation also form part of the system. The moisture separators function to reduce the moisture content of the airstream. A second bank of HEPA filters follows the adsorber section to collect carbon fines and provide backup in case of failure of the main HEPA filter bank. Only the upstream HEPA filter and the charcoal adsorber section are credited in the analysis. The system initiates and maintains a negative air pressure in the shield building by means of filtered exhaust ventilation of the shield building following receipt of a ~~safety injection (SI)~~ Phase A containment isolation signal. The system is described in Reference 2. 3 4

The prefilters remove large particles in the air, and the moisture separators remove entrained water droplets present, to prevent excessive loading of the HEPA filters and charcoal absorbers. Heaters may be included to reduce the relative humidity of the airstream on systems that operate in high humidity. ~~Continuous operation of each train, for at least 10 hours per month, with heaters on, reduces moisture buildup on their HEPA filters and adsorbers.~~ ~~[The cooling coils cool the air to keep the charcoal beds from becoming too hot due to absorption of fission product.]~~ TSTF-522 3

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2 **INSERT 1**

The EGTS design consists of two subsystems common to both units. The annulus vacuum control subsystem is used to establish and maintain a negative pressure within the secondary containment annulus during normal plant operation ~~(non safety-related)~~. The annulus vacuum control subsystem does not perform any safety function. The air cleanup subsystem is actuated following a LOCA to maintain a negative pressure in the annulus area between the shield building and the steel containment. Filters in the air cleanup subsystem then control the release of radioactive contaminants to the environment. The air cleanup subsystem is the portion of EGTS that performs a safety function and is required to be OPERABLE. OPERABILITY requirements associated with the shield building are specified in LCO 3.6.7, "Shield Building."

BASES

SURVEILLANCE REQUIREMENTS (continued)

Insert 4

~~-------------------------------REVIEWER'S NOTE-------------------------------~~
~~Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.~~
~~---]~~

7

REFERENCES

1. 10 CFR 50, Appendix A, GDC 41.
2. U FSAR, Section ~~[6.5]~~ 6.2.
3. U FSAR, Chapter ~~[~~15~~]~~.
4. Regulatory Guide 1.52, Revision ~~[~~2~~]~~.

1 3

5 **INSERT 4**

SR 3.6.10.6

The EGTS Air Cleanup Subsystem produces a negative pressure to prevent leakage from the shield building. This Surveillance verifies that the shield building can be rapidly drawn down to - 0.5 inch water gauge in the annulus. This test is used to ensure shield building boundary integrity. Establishment of this pressure is confirmed by this SR, which demonstrates that the shield building can be drawn down to a negative pressure of ≥ 0.5 inches of water gauge in the annulus in ≤ 60 seconds using one EGTS Air Cleanup Subsystem train. The time limit ensures that no significant quantity of radioactive material leaks from the shield building prior to developing the negative pressure. Since this Surveillance is a shield building boundary integrity test, it does not need to be performed with each EGTS Air Cleanup Subsystem train; thus, this Surveillance is performed on a STAGGERED TEST BASIS. The primary purpose of this SR is to ensure shield building integrity. The secondary purpose of this SR is to ensure that the EGTS Air Cleanup Subsystem train being tested functions as designed. Upon failure to meet this SR, the leak tightness of the shield building must be immediately assessed to determine the impact on the OPERABILITY of the shield building. If a negative pressure of ≥ 0.5 inch water gauge cannot be maintained in the annulus by either EGTS Air Cleanup Subsystem train (i.e., loss of shield building safety function), the shield building must be declared inoperable and ACTIONS of LCO 3.6.7 performed in accordance with LCO 3.0.6 and Specification 5.5.13, “Safety Function Determination Program (SFDP).”

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

1

B 3.6 CONTAINMENT SYSTEMS

B 3.6.~~13~~ 10 ~~Shield Building Air Cleanup System (SBACS) (Dual and Ice Condenser)~~ Emergency Gas Treatment System (EGTS) Air Cleanup Subsystem

1

BASES

BACKGROUND

The ~~SBACS~~ EGTS Air Cleanup Subsystem is required by 10 CFR 50, Appendix A, GDC 41, "Containment Atmosphere Cleanup" (Ref. 1), to ensure that radioactive materials that leak from the primary containment into the shield building (secondary containment) following a Design Basis Accident (DBA) are filtered and adsorbed prior to exhausting to the environment. 1

The containment has a secondary containment called the shield building, which is a concrete structure that surrounds the steel primary containment vessel. Between the containment vessel and the shield building inner wall is an annular space that collects any containment leakage that may occur following a loss of coolant accident (LOCA). This space also allows for periodic inspection of the outer surface of the steel containment vessel.

INSERT 1 ~~The SBACS establishes a negative pressure in the annulus between the shield building and the steel containment vessel. Filters in the system then control the release of radioactive contaminants to the environment.~~ 2
Shield building OPERABILITY is required to ensure retention of primary containment leakage and proper operation of the ~~SBACS~~ EGTS Air Cleanup Subsystem. 1

The ~~SBACS~~ EGTS Air Cleanup Subsystem consists of two separate and redundant trains. Each train includes a heater, ~~[cooling coils,]~~ a prefilter, moisture separators, a high efficiency particulate air (HEPA) filter, an activated charcoal adsorber section for removal of radioiodines, and a fan. Ductwork, valves and/or dampers, and instrumentation also form part of the system. The moisture separators function to reduce the moisture content of the airstream. A second bank of HEPA filters follows the adsorber section to collect carbon fines and provide backup in case of failure of the main HEPA filter bank. Only the upstream HEPA filter and the charcoal adsorber section are credited in the analysis. The system initiates and maintains a negative air pressure in the shield building by means of filtered exhaust ventilation of the shield building following receipt of a ~~safety injection (SI)~~ Phase A containment isolation signal. The system is described in Reference 2. 3 4

The prefilters remove large particles in the air, and the moisture separators remove entrained water droplets present, to prevent excessive loading of the HEPA filters and charcoal absorbers. Heaters may be included to reduce the relative humidity of the airstream on systems that operate in high humidity. ~~Continuous operation of each train, for at least 10 hours per month, with heaters on, reduces moisture buildup on their HEPA filters and adsorbers. [The cooling coils cool the air to keep the charcoal beds from becoming too hot due to absorption of fission product.]~~ TSTF-522 3

2 **INSERT 1**

The EGTS design consists of two subsystems common to both units. The annulus vacuum control subsystem is used to establish and maintain a negative pressure within the secondary containment annulus during normal plant operation ~~(non safety-related)~~. The annulus vacuum control subsystem does not perform any safety function. The air cleanup subsystem is actuated following a LOCA to maintain a negative pressure in the annulus area between the shield building and the steel containment. Filters in the air cleanup subsystem then control the release of radioactive contaminants to the environment. The air cleanup subsystem is the portion of EGTS that performs a safety function and is required to be OPERABLE. OPERABILITY requirements associated with the shield building are specified in LCO 3.6.7, "Shield Building."

1

BASES

SURVEILLANCE REQUIREMENTS (continued)

Insert 4

~~-----------------------------------REVIEWER'S NOTE-----------------------------------~~
~~Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.~~
~~---~~ ~~]~~

7

REFERENCES

1. 10 CFR 50, Appendix A, GDC 41.
2. U FSAR, Section ~~[6.5]~~ 6.2.
3. U FSAR, Chapter ~~[~~15~~]~~.
4. Regulatory Guide 1.52, Revision ~~[~~2~~]~~.

1 3

5 **INSERT 4**

SR 3.6.10.6

The EGTS Air Cleanup Subsystem produces a negative pressure to prevent leakage from the shield building. This Surveillance verifies that the shield building can be rapidly drawn down to - 0.5 inch water gauge in the annulus. This test is used to ensure shield building boundary integrity. Establishment of this pressure is confirmed by this SR, which demonstrates that the shield building can be drawn down to a negative pressure of ≥ 0.5 inches of water gauge in the annulus in ≤ 60 seconds using one EGTS Air Cleanup Subsystem train. The time limit ensures that no significant quantity of radioactive material leaks from the shield building prior to developing the negative pressure. Since this Surveillance is a shield building boundary integrity test, it does not need to be performed with each EGTS Air Cleanup Subsystem train; thus, this Surveillance is performed on a STAGGERED TEST BASIS. The primary purpose of this SR is to ensure shield building integrity. The secondary purpose of this SR is to ensure that the EGTS Air Cleanup Subsystem train being tested functions as designed. Upon failure to meet this SR, the leak tightness of the shield building must be immediately assessed to determine the impact on the OPERABILITY of the shield building. If a negative pressure of ≥ 0.5 inch water gauge cannot be maintained in the annulus by either EGTS Air Cleanup Subsystem train (i.e., loss of shield building safety function), the shield building must be declared inoperable and ACTIONS of LCO 3.6.7 performed in accordance with LCO 3.0.6 and Specification 5.5.13, “Safety Function Determination Program (SFDP).”

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

Licensee Response/NRC Response/NRC Question Closure

Id	**426**
NRC Question Number	**CET003**
Select Application	**Licensee Response**
Attachment 1	**CET003 Second Response Attachment 1.pdf** (3MB)
Attachment 2	
Response Statement	**This response supersedes the previous response to RAI CET003.**

In response to CET003, the ITS submittal will be revised to restore the current licensing basis as it pertains to ITS 3.6.7, Shield Building. Specifically, ITS 3.6.7, Condition A will be revised so that the Required Action and Completion Time allows 1 hour for the restoration of an inoperable shield building. ISTS SR 3.6.8.1 will be deleted. ISTS SR 3.6.8.4 will be relocated to ITS 3.6.10, Emergency Gas Treatment System (EGTS) Air Cleanup Subsystem. Additionally, based on discussion with NRC Staff during a public meeting on January 15, 2015, ITS 3.6.7 will be revised to include ISTS SR 3.6.8.2 and retain the originally proposed note to allow the door verified closed in ISTS SR 3.6.8.2 to be opened for normal transit entry and exit.

Based on the discussion above, the following changes to the ITS submittal will be necessary:

1. **The CTS markups for the definition of CTS 1.30, SHIELD BUILDING INTEGRITY, will be revised to indicate the proper cross references in ITS. (Pages 14 and 32 of Enclosure 2, Volume 3)**

2. **The CTS markups (Pages 330 - 332 and 334 - 336 of Enclosure 2, Volume 11) for ITS 3.6.7 will be revised to:**
   a. **reflect the ITS cross reference for CTS 4.6.1.7 is**

ITS 3.6.7.2,
b. delete Discussion of Change (DOC) L01 indicators,
c. extend the brackets associated with DOC A02 to address the addition of proposed ACTION A,
d. delete the insert associated with proposed ITS SR 3.6.7.2,
e. reflect DOCs M01 and LA03 are associated with the addition of ITS SR 3.6.7.1 at a proposed Frequency of 31 days,
f. delete DOC LA03 and L02 indicators associated with CTS 4.6.1.8.d and Insert 1 because Insert 1 is deleted, and
g. reflect that CTS 4.6.1.8.d.4 is relocated to ITS 3.6.10 and delete ITS cross references to ITS 3.6.7.4.

3. ITS 3.6.7, DOC A02 will be revised to address changes made to ITS 3.6.7 Condition A. (Page 338 of Enclosure 2, Volume 11)

4. ITS 3.6.7, DOC M01 will be revised to reflect the changes made to ITS SR 3.6.7.1. (Pages 338 and 339 of Enclosure 2, Volume 11)

5. ITS 3.6.7, DOC LA02 will be revised to address ITS SR 3.6.7.2. (Page 340 of Enclosure 2, Volume 11)

6. ITS 3.6.7, DOC LA03 will be revised to address ITS SR 3.6.7.1. (Pages 340 and 341 of Enclosure 2, Volume 11)

7. ITS 3.6.7, DOCs L01 and L02 will be deleted. (Pages 341 and 342 of Enclosure 2, Volume 11)

8. The ISTS markups (Pages 344 - 349 of Enclosure 2, Volume 11) for ITS 3.6.7 will be revised to:
a. reflect the CTS cross reference for ITS 3.6.7 Condition A is DOC A02,
b. add Justification for Deviation (JFD) 7 indicators to address the change to the Completion Time for

ITS 3.6.7 Condition A,

c. **delete ISTS SR 3.6.8.1, delete CTS cross reference to DOC M01, delete JFD indicators 1, 4, and 5, and add indicators for JFD 8,**
d. **revise Insert 1 to read, "The annulus access door may be opened for normal transit entry and exit,"**
e. **renumber ISTS SR 3.6.8.2 as ITS SR 3.6.7.1, revise the SR to state, "Verify the annulus access door is closed," and add JFD 8 indicators,**
f. **renumber ISTS SR 3.6.8.3 as ITS SR 3.6.7.2 and add JFD 8 indicators, and**
g. **delete ISTS SR 3.6.8.4 (the SR is relocated to ITS 3.6.10), delete JFD 1, 2, 4, 5, and 7 indicators, and add JFD 9 indicators.**

9. **ITS 3.6.7, JFDs 3, 5, and 6, will be revised to reflect changes made to ITS 3.6.7. (Page 350 of Enclosure 2, Volume 11)**

10. **ITS 3.6.7, JFD 7 will be revised to address the change made to ISTS 3.6.8 Required Action A.1. (Page 350 of Enclosure 2, Volume 11)**

11. **ITS 3.6.7, JFDs 8 and 9 will be added to the Justification for Deviations ITS 3.6.7, Shield Building. (Page 350 of Enclosure 2, Volume 11)**

12. **The ISTS 3.6.8 (ITS 3.6.7) Bases markups will be revised to indicate that the name of the Emergency Gas Treatment System (EGTS) has been revised to EGTS Air Cleanup Subsystem based on the response and subsequent closure of RAI CSS-041. (Pages 444, 446, 454, 455, and 463 of Enclosure 2, Volume 11)**

13. **The ISTS 3.6.8 (ITS 3.6.7) Bases markups for the Background Section will be revised to add additional information to Insert 1, add Insert 3, and delete repeated ISTS information captured in Insert 3. (Pages 352, 353, 357, and 358 of Enclosure 2,**

Volume 11)

14. Insert 2 for the ISTS 3.6.8 (ITS 3.6.7) Bases markups in the LCO Section will be revised to align with changes made to the LCO note in ITS 3.6.7. (Pages 353 and 358 of Enclosure 2, Volume 11)

15. The ISTS 3.6.8 (ITS 3.6.7) Bases markups for the Actions Section will be revised to align with changes made to ITS 3.6.7 Condition A. JFD 3 indicators will be added to address the change made to the Bases. (Pages 354 and 359 of Enclosure 2, Volume 11)

16. The ISTS 3.6.8 (ITS 3.6.7) Bases markups (Pages 354 - 356 and 359 - 361 of Enclosure 2, Volume 11) for the Surveillance Requirements Section will be revised to:

a. delete ISTS SR 3.6.8.1 and replace JFD indicators 4, 1, and 5 with JFD 3,

b. renumber ITS SRs 3.6.7.2 and 3.6.7.3 as ITS SRs 3.6.7.1 and 3.6.7.2. The discussion for ITS SR 3.6.7.1 will be revised to reflect changes made to the Specification, and

c. delete ISTS SR 3.6.8.4 and associated JFD indicators because ISTS SR 3.6.8.4 will be relocated to ITS 3.6.10, EGTS Air Cleanup Subsystem.

17. Bases JFD 5 will be revised to reflect the deletion of references to ISTS SRs 3.6.8.1 and 3.6.8.4. (Page 362 of Enclosure 2, Volume 11)

18. The CTS markups (Pages 427, 431, 433, and Insert 1 of Enclosure 2, Volume 11) for ITS 3.6.10 will be revised to:

a. reflect the ITS cross reference for CTS 4.6.1.8.d.4 is ITS SR 3.6.10.6,

b. add Insert 1 associated with CTS 4.6.1.8.d.4 and DOC L05 indicators (The change to a STAGGERED TEST BASIS for CTS 4.6.1.8.d.4 (ITS SR 3.6.10.6)

was previously addressed in the response and closure of RAI CSS-021), and

c. correct a pointer to ITS 3.6.7 associated with the Unit 2 CTS markups for CTS 1.30.a.

19. ITS 3.6.10, DOC LA02 will be revised to address the addition of ITS SR 3.6.10.6. (Pages 435 and Insert 2 of Enclosure 2, Volume 11)

20. ITS 3.6.10, DOC L05 will be added as Insert 3 to address the change in Frequency for CTS 4.6.1.8.d.4. (Pages 438 and Insert 3 of Enclosure 2, Volume 11)

21. The ISTS markups for ITS 3.6.10 will be revised to add Insert 1 associated with the addition of ITS SR 3.6.10.6 and add JFD 5 indicators. Additionally, the markups are revised to indicate that the name of the Emergency Gas Treatment System (EGTS) has been revised to EGTS Air Cleanup Subsystem based on the response and subsequent closure of RAI CSS-041. (Pages 441, 443, and Insert 1 of Enclosure 2, Volume 11)

22. ITS 3.6.10, JFD 5 is added to justify the addition of ITS SR 3.6.10.6. (Page 444 of Enclosure 2, Volume 11)

23. Insert 1 for the ISTS 3.6.13 (ITS 3.6.10) Bases markups in the Background Section will be revised to align with changes made to the Specification. Additionally, the markups are revised to indicate that the name of the Emergency Gas Treatment System (EGTS) has been revised to EGTS Air Cleanup Subsystem based on the response and subsequent closure of RAI CSS-041. (Pages 447 and 456 of Enclosure 2, Volume 11)

24. The ISTS 3.6.13 (ITS 3.6.10) Bases markups for the Surveillance Requirements Section will be revised to

add Insert 4 associated with the addition of ITS SR 3.6.10 and add JFD 5 indicators. (Pages 454, 463, and Insert 4 of Enclosure 2, Volume 11)

See Attachment 1 for the draft revised changes associated with the discussion above.

Response Date/Time	**2/18/2015 1:45 PM**
Closure Statement	
Question Closure Date	
Notification	**Mark Blumberg** **Scott Bowman** **Michelle Conner** **Khadijah Hemphill** **Andrew Hon** **Lynn Mynatt** **Ray Schiele** **Caroline Tilton**
Added By	**Scott Bowman**
Date Added	**2/18/2015 12:44 PM**
Date Modified	
Modified By	

See ITS ~~3.6.3~~ ~~3.6.13~~ ~~3.6.1~~

3.6.7
3.6.10
3.6.7

SHIELD BUILDING INTEGRITY

1.30 SHIELD BUILDING INTEGRITY shall exist when:

a. The door in each access opening is closed except when the access opening is being used for normal transit entry and exit.

See ITS ~~3.6.3~~ 3.6.7

b. The emergency gas treatment system is OPERABLE.

See ITS ~~3.6.13~~ 3.6.10

c. The sealing mechanism associated with each penetration (e.g., welds, bellows or 0-rings) is OPERABLE.

See ITS ~~3.6.1~~ 3.6.7

SHUTDOWN MARGIN (SDM)

SHUTDOWN MARGIN (SDM)

~~1.31~~ ~~SHUTDOWN MARGIN~~ SDM shall be the instantaneous amount of reactivity : a. by which the reactor is subcritical or would be subcritical from its present condition assuming all ~~full length~~ rod cluster control assemblies (~~shutdown and control~~) RCCAs are fully inserted except for the single ~~rod cluster assembly~~ RCCA of highest reactivity worth , which is assumed to be fully withdrawn. INSERT 7

A01 A12

~~SITE BOUNDARY~~

~~1.32~~ ~~The SITE BOUNDARY shall be that line beyond which the land is not owned, leased, or otherwise controlled by the licensee.~~

A06

~~SOLIDIFICATION~~

~~1.33~~ ~~Deleted~~

A07

~~SOURCE CHECK~~

~~1.34~~ ~~Deleted~~

A07

INSERT 8

A02

STAGGERED TEST BASIS

STAGGERED TEST BASIS

~~1.35~~ A STAGGERED TEST BASIS shall consist of~~:~~ INSERT 9

~~a.~~ ~~A test schedule for n systems, subsystems, trains or other designated components obtained by dividing the specified test interval into n equal subintervals,~~

~~b.~~ ~~The testing of one system, subsystem, train or other designated component at the beginning of each subinterval.~~

A13

THERMAL POWER

THERMAL POWER

~~1.36~~ THERMAL POWER shall be the total reactor core heat transfer rate to the reactor coolant.

A01

ITS

Chapter 1.0

DEFINITIONS

RATED THERMAL POWER (RTP)

RATED THERMAL POWER (RTP)

~~1.27 RATED THERMAL POWER (~~RTP~~)~~ shall be a total reactor core heat transfer rate to the reactor coolant of 3455 MWt. A01

REACTOR TRIP SYSTEM (RTS) RESPONSE TIME

REACTOR TRIP SYSTEM (RTS) RESPONSE TIME

RTS that

~~1.28~~ The ~~REACTOR TRIP SYSTEM~~ RESPONSE TIME shall be ~~the~~ time interval from when the monitored parameter exceeds its ~~(~~RTS~~)~~ trip setpoint at the channel sensor until loss of stationary gripper coil voltage. The response time may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured. In lieu of measurement, response time may be verified for selected components provided that the components and ~~the~~ methodology for verification have been previously reviewed and approved by NRC. A01

the

~~REPORTABLE EVENT~~

~~1.29 DELETED~~ A07

SHIELD BUILDING INTEGRITY

1.30 SHIELD BUILDING INTEGRITY shall exist when:

3.6.7 3.6.10 3.6.7 See ITS ~~3.6.3~~ ~~3.6.13~~ ~~3.6.1~~

a. The door in each access opening is closed except when the access opening is being used for normal transit entry and exit. See ITS ~~3.6.3~~ 3.6.7

b. The emergency gas treatment system is OPERABLE. See ITS ~~3.6.13~~ 3.6.10

c. The sealing mechanism associated with each penetration (e.g., welds, bellows or O-rings) is OPERABLE. See ITS ~~3.6.1~~ 3.6.7

SHUTDOWN MARGIN (SDM)

SHUTDOWN MARGIN (SDM)

SDM control

: a.

~~1.31 SHUTDOWN MARGIN~~ shall be the instantaneous amount of reactivity by which the reactor is subcritical or would be subcritical from its present condition assuming all ~~full length~~ rod cluster assemblies (~~shutdown and control~~) are fully inserted except for the single ~~rod cluster assembly~~ of highest reactivity worth which is assumed to be fully withdrawn. A01 A12

RCCAs , INSERT 7 RCCA

~~SITE BOUNDARY~~

~~1.32 The SITE BOUNDARY shall be that line beyond which the land is not owned, leased, or otherwise controlled by the licensee.~~ A06

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ITS 3.6.7

A01

CONTAINMENT SYSTEMS

SHIELD BUILDING ~~STRUCTURAL INTEGRITY~~

LIMITING CONDITION FOR OPERATION

OPERABLE

LCO 3.6.7 3.6.1.7 The ~~structural integrity of the~~ shield building shall be ~~maintained at a level consistent with the acceptance criteria in Specification 4.6.1.7~~. LA01

Applicability APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

ACTION A Add proposed ACTION A

~~With the structural integrity of the shield building not conforming to the above requirements, restore the structural integrity to within the limits prior to increasing the Reactor Coolant System temperature above 200°F.~~ ~~L01~~ A02

ACTION B Add proposed ACTION B

SURVEILLANCE REQUIREMENTS

2

SR 3.6.1.1

SR 3.6.7.~~3~~ 4.6.1.7 The structural integrity of the shield building shall be determined during the shutdown for each Type A containment leakage rate test (~~Specification 4.6.1.1.c~~) by a visual inspection of the exposed accessible interior and exterior surfaces of the shield building ~~and verifying no apparent changes in appearance of the concrete surfaces or other abnormal degradation~~. LA02

~~31 days~~

Add proposed SR 3.6.7.1 ~~at a Frequency of 12 hours~~ M01

~~Add proposed SR 3.6.7.2 at a Frequency of 31 days~~

In accordance with the Surveillance Frequency Control Program LA03

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SURVEILLANCE REQUIREMENTS (Continued)

c. After every 720 hours of charcoal adsorber operation by verifying within 31 days after removal that a laboratory analysis of representative carbon sample obtained in accordance with Regulatory Position C.6.b of Regulatory Guide 1.52, Revision 2, March 1978, shows the methyl iodide penetration less than 2.5% when tested in accordance with ASTM D3803-1989 at a temperature of 30°C (86°F) and a relative humidity of 70%. See ITS 5.5.9

~~SR 3.6.7.4~~ d. ~~At least once per 18 months~~ by: ~~INSERT 1~~ See ITS 3.6.10 ~~L02~~

1. Verifying that the pressure drop across the combined HEPA filters and charcoal adsorber banks is less than 5 inches Water Gauge while operating the filter train at a flow rate of 4000 cfm ± 10%.

2. Verifying that the filter train starts on a Phase A containment isolation Test Signal.

3. Verify the operation of the filter cooling bypass valves.

See ITS 3.6.10

~~SR 3.6.7.4~~ 4. Verifying that each system produces a negative pressure of greater than or equal to 0.5 inches W. G. in the annulus within 1 minute after a start signal. See ITS 3.6.10

e. After each complete or partial replacement of a HEPA filter bank by verifying that the HEPA filter banks remove greater than or equal to 99.95% of the DOP when they are tested in-place in accordance with ANSI N510-1975 while operating the system at a flow rate of 4000 cfm ± 10%.

f. After each complete or partial replacement of a charcoal adsorber bank by verifying that the charcoal adsorbers remove greater than or equal to 99.95% of a halogenated hydrocarbon refrigerant test gas when they are tested in-place in accordance with ANSI N510-1975 while operating the system at a flow rate of 4000 cfm ± 10%.

See ITS 5.5.9

INSERT 1 L02

~~on a STAGGERED TEST BASIS for each Emergency Gas Treatment System train~~

In accordance with the Surveillance Frequency Control Program LA03

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ITS 3.6.7

A01

CONTAINMENT SYSTEMS

SHIELD BUILDING ~~STRUCTURAL INTEGRITY~~

LIMITING CONDITION FOR OPERATION

OPERABLE

LA01

LCO 3.6.7 3.6.1.7 The ~~structural integrity of the~~ shield building shall be ~~maintained at a level consistent with the acceptance criteria in Specification 4.6.1.7~~.

Applicability APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION.

Add proposed ACTION A

~~L01~~

ACTION A

~~With the structural integrity of the shield building not conforming to the above requirements, restore the structural integrity to within the limits prior to increasing the Reactor Coolant System temperature above 200°F.~~

A02

ACTION B

Add proposed ACTION B

2

SURVEILLANCE REQUIREMENTS

SR 3.6.1.1

SR 3.6.7.~~3~~ 4.6.1.7 The structural integrity of the shield building shall be determined during the shutdown for each Type A containment leakage rate test (~~Specification 4.6.1.1.c~~) by a visual inspection of the exposed accessible interior and exterior surfaces of the shield building ~~and verifying no apparent changes in appearance of the concrete surfaces or other abnormal degradation~~.

LA02

~~31 days~~

Add proposed SR 3.6.7.1 ~~at a Frequency of 12 hours~~

~~Add proposed SR 3.6.7.2 at a Frequency of 31 days~~

M01

In accordance with the Surveillance Frequency Control Program

LA03

A01

CONTAINMENT SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

c. After every 720 hours of charcoal adsorber operation by verifying within 31 days after removal that a laboratory analysis of representative carbon sample obtained in accordance with Regulatory Position C.6.b of Regulatory Guide 1.52, Revision 2, March 1978, shows the methyl iodide penetration less than 2.5% when tested in accordance with ASTM D3803-1989 at a temperature of 30°C (86° F) and a relative humidity of 70%. See ITS 5.5.9

~~LA03~~ See ITS 3.6.10 ~~L02~~

~~SR 3.6.7.4~~ d. ~~At least once per 18 months~~ by: ~~INSERT 1~~

1. Verifying that the pressure drop across the combined HEPA filters and charcoal adsorber banks is less than 5 inches Water Gauge while operating the filter train at a flow rate of 4000 cfm + 10%.

2. Verifying that the filter train starts on a Phase A containment isolation Test Signal.

3. Verify the operation of the filter cooling bypass valves.

See ITS 3.6.10

~~SR 3.6.7.4~~ 4. Verifying that each system produces a negative pressure of greater than or equal to 0.5 inches W.G. in the annulus within 1 minute after a start signal. See ITS 3.6.10

e. After each complete or partial replacement of a HEPA filter bank by verifying that the HEPA filter banks remove greater than or equal to 99.95% of the DOP when they are tested in-place in accordance with ANSI N510-1975 while operating the system at a flow rate of 4000 cfm + 10%.

f. After each complete or partial replacement of a charcoal adsorber bank by verifying that the charcoal adsorbers remove greater than or equal to 99.95% of a halogenated hydrocarbon refrigerant test gas when they are tested in-place in accordance with ANSI N510-1975 while operating the system at a flow rate of 4000 cfm + 10%.

See ITS 5.5.9

3.6.7

INSERT 1

L02

~~on a STAGGERED TEST BASIS for each Emergency Gas Treatment System train~~

In accordance with the Surveillance Frequency Control Program

LA03

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DISCUSSION OF CHANGES
ITS 3.6.7, SHIELD BUILDING

ADMINISTRATIVE CHANGES

A01 In the conversion of the Sequoyah Nuclear Plant (SQN) Current Technical Specifications (CTS) to the plant specific Improved Technical Specifications (ITS), certain changes (wording preferences, editorial changes, reformatting, revised numbering, etc.) are made to obtain consistency with NUREG-1431, Rev. 4.0, "Standard Technical Specifications- Westinghouse Plants" (ISTS) and additional Technical Specification Task Force (TSTF) travelers included in this submittal.

These changes are designated as administrative changes and are acceptable because they do not result in technical changes to the CTS.

ITS 3.6.7 ACTION A requires restoring the shield building to OPERABLE status within 1 hour.

1 hour

A02 CTS 3.6.1.7 does not provide an ACTION to take if the shield building is inoperable while in MODE 1, 2, 3, or 4; it only includes a requirement that the shield building be restored to OPERABLE status prior to increasing Reactor Coolant System temperature above 200°F (i.e., MODE 4). Therefore, entry into CTS 3.0.3 is required if CTS 3.6.1.7 is not met while in MODE 1, 2, 3, or 4. CTS 3.0.3 requires action to be initiated within 1 hour to prepare for a shutdown and requires the unit to be in MODE 3 within 7 hours and MODE 5 within 37 hours. When the shield building is ~~inoperable and~~ not restored to an OPERABLE status within ~~the specified Completion Time (see DOC L01)~~, ITS 3.6.7 ACTION B requires the unit be in MODE 3 within 6 hours and MODE 5 within 36 hours. This changes the CTS by stating the ACTIONS within the Specification rather than deferring to CTS 3.0.3. In addition, it deletes the Action to restore the LCO prior to entering MODE 4.

The purpose of CTS 3.0.3 is to place the unit outside the MODE of Applicability within a reasonable amount of time in a controlled manner. CTS 3.6.1.7 is silent on these actions, deferring to CTS 3.0.3 for the actions. This change is acceptable because the ACTIONS specified in ITS 3.6.7 adopt ISTS structure for placing the unit outside the MODE of Applicability without changing the time specified to enter MODE 3 and MODE 5. In addition, deletion of the current Action of CTS 3.6.1.7 is acceptable because CTS 3.0.4 (ITS LCO 3.0.4) already precludes entering the MODE of Applicability when the LCO is not met. Therefore, it is not necessary to include these requirements as specific actions in ITS 3.6.7. This change is designated as administrative, because it does not result in technical changes to the CTS.

MORE RESTRICTIVE CHANGES

annulus

this

a

Frequency for this Surveillance Requirement

annulus

M01 ITS SR 3.6.7.1 requires verification that ~~annulus negative pressure is greater than 5 inches water gauge every 12 hours. ITS SR 3.6.7.2 requires verification that~~ the ~~shield building~~ access door ~~in each access opening~~ is closed every 31 days. CTS 3.6.1.7 does not contain ~~these~~ Surveillance Requirements. This changes the CTS by adding new Surveillance Requirements ~~to verify annulus negative pressure is within limits and~~ to verify the ~~shield building~~ access door ~~in each access opening~~ is closed. (See DOC LA03 for moving the ~~"12 hour" and~~ "31 day" ~~Frequencies for these Surveillance Requirements~~ to the Surveillance Frequency Control Program.)

DISCUSSION OF CHANGES
ITS 3.6.7, SHIELD BUILDING

The shield building surrounds the containment vessel and forms an annulus between the containment vessel and the inner wall of the shield building. This annular space collects containment leakage that may occur following a loss of coolant accident. A negative pressure is maintained in the annulus between the shield building and the steel containment vessel by the Emergency Gas Treatment System (EGTS). The release of radioactive contaminants to the environment is controlled via filters in the EGTS trains. The purpose of CTS 3.6.1.7 is to ensure the shield building is OPERABLE in MODES 1, 2, 3, and 4 to ensure the release of radioactive material from the containment atmosphere is restricted to the leakage paths assumed in the accident analysis. Since the annulus ~~shield building~~ access door position ~~and annulus pressure are~~ is integral to shield building OPERABILITY, ITS 3.6.7 adds a specific Surveillance Requirement (ITS SR 3.6.7.1) ~~to verify every 12 hours that annulus negative pressure is within the limit assumed in the containment analysis. Additionally, a specific Surveillance Requirement (ITS SR 3.6.7.2) is added~~ to verify every 31 days that the annulus access door ~~in each access opening~~ is closed, so that the shield building boundary is not breached at any time when the shield building boundary is required. This change is designated as more restrictive because a new Surveillance Requirement~~s have~~ has been added to ensure the shield building OPERABILITY is maintained.

RELOCATED SPECIFICATIONS

None

REMOVED DETAIL CHANGES

LA01 *(Type 1 – Removing Details of System Design and System Description, Including Design Limits)* CTS 3.6.1.7 requires that the structural integrity of the shield building be maintained at a level consistent with the acceptance criteria in CTS 4.6.1.7. CTS 4.6.1.7 requires the structural integrity of the shield building to be determined by a visual inspection of the exposed shield building interior and exterior surfaces and verifying no apparent changes in concrete surface appearance or other abnormal degradation. ITS LCO 3.6.7 requires the shield building to be OPERABLE. This changes the CTS by moving the detail of what constitutes shield building OPERABILITY to the Bases.

The removal of these details, related to system design, from the Technical Specifications, is acceptable because this type of information is not necessary to be included in the Technical Specifications to provide adequate protection of public health and safety. The ITS retains the requirements that the shield building be OPERABLE. Also, this changes is acceptable because the removed information will be adequately controlled in the ITS Bases. Changes to the Bases are controlled by the Technical Specifications Bases Control Program in Chapter 5. This program provides for the evaluation of changes to the Bases to ensure the Bases are properly controlled. This change is designated as a less restrictive removal of detail change because information relating to system design is being removed from the Technical Specifications.

DISCUSSION OF CHANGES
ITS 3.6.7, SHIELD BUILDING

LA02 *(Type 4 – Removal of LCO, SR, or other TS Requirements to the TRM, UFSAR, ODCM, NQAP, CLRT Program, IST Program, or ISI Program)* CTS 4.6.1.7 requires the structural integrity of the shield building to be determined by a visual inspection of the exposed shield building interior and exterior surfaces and verifying no apparent changes in concrete surface appearance or other abnormal degradation. ITS SR 3.6.7.3 includes the shield building structural integrity visual inspection verification of exposed interior and exterior surfaces, but does not include the details of what the inspection entails. This changes the CTS by moving the details of the shield building inspection to the TS Bases.

2

The removal of these details, which are related to methods of surveillance test performance, from the Technical Specifications, is acceptable because this type of information is not necessary to be included in the Technical Specifications to provide adequate protection of public health and safety. The ITS retains the requirements for verifying integrity of the shield building. Also, this changes is acceptable because the removed information will be adequately controlled in the ITS Bases. Changes to the Bases are controlled by the Technical Specifications Bases Control Program in Chapter 5. This program provides for the evaluation of changes to the Bases to ensure the Bases are properly controlled. This change is designated as a less restrictive removal of detail change because information relating to methods of surveillance test performance is being removed from the Technical Specifications.

LA03 *(Type 5 – Removal of SR Frequency to the Surveillance Frequency Control Program)* ~~CTS 4.6.1.8.d.4 requires verification that each Emergency Gas Treatment System produces a negative pressure within limits in the annulus within 1 minute after a start signal. ITS SR 3.6.7.4 requires a similar Surveillance and specifies the periodic Frequency as, "In accordance with the Surveillance Frequency Control Program." This changes the CTS by moving the specified Frequency for this SR and associated Bases to the Surveillance Frequency Control Program. (The change of the requirement to perform the Surveillances ON A STAGGERED TEST BASIS is discussed in DOC L02). Additionally,~~ ITS SR 3.6.7.1 has been added to verify the ~~annulus negative pressure is within limits every 12 hours, and ITS SR 3.6.7.2 has been added to verify the shield building~~ annulus access door ~~in each access opening~~ is closed every 31 days. (See DOC M01 for the discussion on adding ~~these~~ this SR~~s~~.) The ~~"12 hour" and~~ "31 day" ~~Frequencies for these Surveillances have~~ Frequency for this Surveillance Requirement has been relocated to the Surveillance Frequency Control Program.

The removal of these details related to Surveillance Requirement Frequencies from the Technical Specifications is acceptable, because this type of information is not necessary to be included in the Technical Specifications to provide adequate protection of public health and safety. The existing Surveillance Frequencies are removed from Technical Specifications and placed under licensee control pursuant to the methodology described in NEI 04-10. A new program (Surveillance Frequency Control Program) is being added to the Administrative Controls section of the Technical Specifications describing the control of Surveillance Frequencies. The surveillance test requirements remain in the Technical Specifications. The control of changes to the Surveillance Frequencies will be in accordance with the Surveillance Frequency Control Program. The Program shall ensure that Surveillance Requirements specified in

DISCUSSION OF CHANGES
ITS 3.6.7, SHIELD BUILDING

the Technical Specifications are performed at intervals sufficient to assure the associated Limiting Conditions for Operation are met. This change is designated as a less restrictive removal of detail change, because the Surveillance Frequency is ~~Frequencies are~~ being removed from the Technical Specifications.

LA04 *(Type 2 – Removing Descriptions of System Operation)* CTS 1.30 states, in part, "SHIELD BUILDING INTEGRITY shall exist when: c. The sealing mechanism associated with each penetration (e.g., welds, bellows, or 0-rings) is OPERABLE. ITS 3.6.7 states "The shield building shall be OPERABLE." This changes the CTS by moving the reference to penetration sealing mechanism requirements to the Bases.

The removal of these details, which are related to system operation, from the Technical Specifications is acceptable, because this type of information is not necessary to be included in the Technical Specifications to provide adequate protection of public health and safety. The ITS retains the requirement for the shield building to be OPERABLE and the relocated material describes aspects of OPERABILITY. In addition, the ITS retains the requirement to perform a shield building annulus drawdown test, which would provide verification that the penetration sealing mechanisms are OPERABLE. Also, this change is acceptable, because the removed information will be adequately controlled in the ITS Bases. Changes to the Bases are controlled by the Technical Specification Bases Control Program in Chapter 5. This program provides for the evaluation of changes to ensure the Bases are properly controlled. This change is designated as a less restrictive removal of detail change because information relating to system operation is being removed from the Technical Specifications.

LESS RESTRICTIVE CHANGES

L01 Not used ~~*(Category 4 – Relaxation of Required Action)* CTS 3.6.1.7 does not state what action to take if the shield building is inoperable while in MODE 1, 2, 3, or 4; it only includes a requirement that the shield building be restored to OPERABLE status prior to increasing Reactor Coolant System temperature above 200°F (i.e., MODE 4). Therefore, entry into CTS 3.0.3 is required, if CTS 3.6.1.7 is not met in MODE 1, 2, 3, or 4. CTS 3.0.3 allows 1 hour to prepare for a shutdown and requires the unit to be in MODE 3 within 7 hours and MODE 5 within 37 hours. ITS 3.6.7 ACTION A provides 24 hours to restore the shield building to OPERABLE status prior to requiring a unit shutdown. This changes the CTS by providing an explicit ACTION to allow time to restore an inoperable shield building to OPERABLE status prior to requiring a unit shutdown and changes the time from 1 hour (as provided in CTS 3.0.3) to 24 hours. See DOC A02 for including the ACTIONS within the Specification to shut down the unit upon failure to restore shield building OPERABILITY, rather than deferring to CTS 3.0.3.~~

~~The purpose of CTS 3.6.1.7 is to maintain the shield building OPERABLE. Therefore, when the shield building is not OPERABLE, CTS 3.0.3 results in placing the unit in a condition in which the shield building is not required. This change is acceptable because the Required Actions are used to establish remedial measures that must be taken in response to the degraded conditions in order to minimize risk associated with continued operation while providing time to~~

DISCUSSION OF CHANGES
ITS 3.6.7, SHIELD BUILDING

~~repair inoperable features. This change provides an ACTION that allows 24 hours to restore the shield building to OPERABLE status. The Required Actions and associated 24 hour Completion Time are reasonable considering the limited leakage design of containment and the low probability of DBA occurring during this period. This change is designated as less restrictive because less stringent Required Actions are being applied in the ITS than were applied in the CTS.~~

Not used

L02 ~~*(Category 7 – Relaxation Of Surveillance Frequency)* CTS 4.6.1.8.d.4 requires a drawdown of the shield building annulus by each Emergency Gas Treatment System (EGTS) train to within limits at least once per 18 months. ITS SR 3.6.7.4 requires a drawdown of the shield building annulus to within limits "In accordance with the Surveillance Frequency Control Program." The specified Surveillance Frequency that is being moved to the Surveillance Frequency Control Program is "18 months on a STAGGERED TEST BASIS for each Emergency Gas Treatment System train." This changes the CTS by allowing the drawdown test for each EGTS train to be performed less frequently. Moving the specified Surveillance Frequency to the Surveillance Frequency Control Program is discussed in DOC LA03.~~

~~The purpose of CTS 4.6.1.8.d.4 is to verify the integrity of the shield building boundary by ensuring the shield building annulus can be rapidly drawn to a negative pressure of at least 0.5 inches water gauge. Therefore, this is a test of shield building integrity and does not need to be performed every 18 months using each EGTS train. Staggering use of the EGTS trains every 18 months will ensure both trains are capable of performing the test. This change is acceptable because performing the drawdown test using one train of EGTS every 18 months will adequately verify shield building integrity. OPERABILITY of EGTS will be maintained through the application of the requirements of ITS 3.6.10. This change is designated as less restrictive, because the shield building annulus drawdown Surveillance will be performed less frequently with each EGTS train under the ITS than under the CTS.~~

CTS

Shield Building ~~(Dual and Ice Condenser)~~
3.6.~~8~~ 7 1

3.6 CONTAINMENT SYSTEMS

3.6.~~8~~ 7 Shield Building ~~(Dual and Ice Condenser)~~ 1

3.6.1.7 LCO 3.6.~~8~~ 7 The shield building shall be OPERABLE. INSERT 1 3

Applicability APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

A02

CONDITION	REQUIRED ACTION	COMPLETION TIME
DOC ~~L01~~ A. Shield building inoperable.	A.1 Restore shield building to OPERABLE status.	~~24 hours~~ 1 hour 7
DOC A02 B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
~~DOC M01~~ ~~SR 3.6.8.1~~ 7 ~~[Verify annulus negative pressure is > [5] inches water gauge.~~ ≥	~~[12 hours~~ ~~OR~~ ~~In accordance with the Surveillance Frequency Control Program]~~ 1 4 5 8 5

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3

INSERT 1

annulus

--NOTE---
1.30.a The access door~~s~~ may be opened for normal transit entry and exit.

CTS

Shield Building ~~(Dual and Ice Condenser)~~
3.6.~~8~~ 7 1

SURVEILLANCE REQUIREMENTS (continued)

		SURVEILLANCE	FREQUENCY	
DOC M01	SR 3.6.~~8~~.2 7 1	Verify ~~one~~ the ~~shield building~~ annulus access door ~~in each access opening~~ is closed.	~~[31 days~~ ~~OR~~ In accordance with the Surveillance Frequency Control Program ~~]~~	8 1 6 5 5
4.6.1.7	SR 3.6.~~8~~.3 7 2	~~[~~ Verify shield building structural integrity by performing a visual inspection of the accessible exposed interior and exterior surfaces of the shield building.	During shutdown for SR 3.6.1.1 Type A tests ~~]~~	1 8 4
~~4.6.1.8.d.4~~	~~SR 3.6.8.4~~ ~~7~~	~~Verify the shield building can be maintained at a pressure equal to or more negative than [-0.5] inch water gauge in the annulus by one Shield Building Air Cleanup System train with final flow ≤ [ ] cfm within [22] seconds after a start signal.~~ ~~Emergency Gas Treatment System~~ ~~60~~	~~[[18] months on a STAGGERED TEST BASIS for each Shield Building Air Cleanup System train~~ ~~OR~~ ~~In accordance with the Surveillance Frequency Control Program]~~	~~1~~ ~~4~~ ~~2~~ ~~7~~ ~~4~~ ~~5~~ 9 ~~5~~

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CTS

1

3.6 CONTAINMENT SYSTEMS

3.6.~~8~~ 7 Shield Building ~~(Dual and Ice Condenser)~~

1 3

3.6.1.7 LCO 3.6.~~8~~ 7 The shield building shall be OPERABLE.

INSERT 1

Applicability APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

A02

	CONDITION	REQUIRED ACTION	COMPLETION TIME	
DOC ~~L01~~	A. Shield building inoperable.	A.1 Restore shield building to OPERABLE status.	~~24 hours~~ 1 hour	7
DOC A02	B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 5.	6 hours 36 hours	

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY	
~~DOC M01~~	~~SR 3.6.8.1~~ ~~7~~ ~~[Verify annulus negative pressure is ≥ [5] inches water gauge.~~ ≥	~~[12 hours~~ ~~OR~~ ~~In accordance with the Surveillance Frequency Control Program]~~	~~1~~ ~~4~~ ~~5~~ 8 ~~5~~

2 1

3

INSERT 1

annulus

---NOTE---

1.30.a The access door~~s~~ may be opened for normal transit entry and exit.

CTS

Shield Building ~~(Dual and Ice Condenser)~~
3.6.~~8~~ 7 1

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE		FREQUENCY	
DOC M01	SR 3.6.~~8~~.2 7 1	Verify ~~one~~ the ~~shield building~~ annulus access door ~~in each access opening~~ is closed.	~~[31 days~~ ~~OR~~ In accordance with the Surveillance Frequency Control Program ~~]~~	8 1 6 5 5
4.6.1.7	SR 3.6.~~8~~.3 7 2	~~[~~ Verify shield building structural integrity by performing a visual inspection of the accessible exposed interior and exterior surfaces of the shield building.	During shutdown for SR 3.6.1.1 Type A tests ~~]~~	1 8 4
~~4.6.1.8.d.4~~	~~SR 3.6.8.4~~ ~~7~~	~~Verify the shield building can be maintained at a pressure equal to or more negative than [-0.5] inch water gauge in the annulus by one Shield Building Air Cleanup System train with final flow ≤ [ ] cfm within [22] seconds after a start signal.~~ ~~Emergency Gas Treatment System~~ ~~60~~	~~[[18] months on a STAGGERED TEST BASIS for each Shield Building Air Cleanup System train~~ ~~OR~~ ~~In accordance with the Surveillance Frequency Control Program]~~	~~1~~ ~~4~~ ~~2~~ ~~7~~ ~~4~~ ~~5~~ 9 ~~5~~

JUSTIFICATION FOR DEVIATIONS
ITS 3.6.7, SHIELD BUILDING

1. The heading and title for ISTS 3.6.8 include the parenthetical expression (Dual and Ice Condenser). This identifying information is not included in the Sequoyah Nuclear (SQN) ITS. This information is provided in the NUREG to assist in identifying the appropriate Specifications to be used as a model for a plant-specific ITS conversion, but serves no purpose in a plant-specific implementation. Therefore, necessary editorial changes were made. In addition, SQN design does not include the Spray Additive System (ISTS 3.6.7). Therefore, ISTS 3.6.7 is not included in the SQN ITS and ISTS 3.6.8 is renumbered as ITS 3.6.7.

2. Changes are made (additions, deletions, and/or changes) to the ISTS which reflect the plant-specific nomenclature, number, reference, system description, analysis, or licensing basis description.

3. There is no allowance in ISTS 3.6.8 for when ~~a shield building~~ the annulus access door is open for normal transit entry and exit, thereby requiring entry into Condition A. Therefore, an exception to the requirement that the annulus access opening door~~s~~ be closed is made to allow for normal transit entry and exit. The basis of this exception is the assumption that the transit time during which ~~a~~ the door is open will be short (i.e., shorter than the Completion Time for Condition A). This change is consistent with the current licensing basis as defined in CTS 1.30, definition of SHIELD BUILDING INTEGRITY, which provides this exception to the requirement for the door in each access opening to be closed.

4. The ISTS contains bracketed information and/or values that are generic to Westinghouse vintage plants. The brackets are removed and the proper plant specific information/value is inserted to reflect the current licensing basis.

5. ISTS ~~SR 3.6.8.1,~~ SR 3.6.8.2~~, and SR 3.6.8.4~~ provides two options for controlling the Frequencies of Surveillance Requirements. SQN is proposing to control the Surveillance ~~Frequencies~~ Frequency for ITS SR 3.6.7.1~~, SR 3.6.7.2, and SR 3.6.7.4~~ under the Surveillance Frequency Control Program.

6. ISTS SR 3.6.8.2 requires verification that ~~"~~one~~"~~ access door in each shield building access opening is closed. ~~However,~~ SQN design consists of one door for ~~each~~ one shield building access opening. Therefore, the Surveillance is changed to verify ~~"~~the~~"~~ ~~shield building~~ annulus access door ~~in each access opening~~ closed, thereby reflecting the plant-specific design.

7. The Completion Time associated with ISTS 3.6.8, Required Action A.1 is modified from 24 hours to 1 hour to reflect the SQN current licensing basis as described in Discussion of Change A02.
~~ISTS SR 3.6.8.4 requires verification that the Shield Building can be maintained at a negative pressure relative to the annulus by one train within a specified time and flow rate after a start signal. ITS SR 3.6.7.4 will require a similar test, but will not specify a flow rate for the EGTS train. The current licensing basis for this acceptance criteria is derived from the license amendment requested by TVA and approved by the NRC on December 23, 1982.~~

8. ISTS SR 3.6.8.1 is not included in SQN ITS 3.6.7 because this Surveillance is not included in the SQN current Technical Specifications. As a result, ISTS SRs 3.6.8.2 and 3.6.8.3 are renumbered to ITS SRs 3.6.7.1 and 3.6.7.2.

9. ISTS SR 3.6.8.4 verifies that the Shield Building Air Cleanup System can maintain a negative pressure within the shield building following a start signal. In the SQN ITS, this Surveillance is moved to ITS 3.6.10, "Emergency Gas Treatment System (EGTS) Air Cleanup Subsystem," (ISTS 3.6.13) consistent with the SQN current Technical Specifications.

B 3.6 CONTAINMENT SYSTEMS

B 3.6.~~8~~ Shield Building ~~(Dual and Ice Condenser)~~

7

1

BASES

BACKGROUND

The shield building is a concrete structure that surrounds the steel containment vessel. Between the containment vessel and the shield building inner wall is an annular space that collects containment leakage that may occur following a loss of coolant accident (LOCA). This space also allows for periodic inspection of the outer surface of the steel containment vessel.

Insert 3

Emergency Gas Treatment System (EGTS)

The ~~Shield Building Air Cleanup System (SBACS) establishes a negative pressure in the annulus between the shield building and the steel containment vessel. Filters in the system then control the release of radioactive contaminants to the environment.~~ The shield building is required to be OPERABLE to ensure retention of containment leakage and proper operation of the ~~SBACS~~. EGTS Air Cleanup Subsystem

INSERT 1

2

APPLICABLE SAFETY ANALYSES

The design basis for shield building OPERABILITY is a LOCA. Maintaining shield building OPERABILITY ensures that the release of radioactive material from the containment atmosphere is restricted to those leakage paths and associated leakage rates assumed in the accident analyses.

The shield building satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

Shield building OPERABILITY must be maintained to ensure proper operation of the ~~SBACS~~ EGTS Air Cleanup Subsystem and to limit radioactive leakage from the containment to those paths and leakage rates assumed in the accident analyses. INSERT 2

2

2

APPLICABILITY

Maintaining shield building OPERABILITY prevents leakage of radioactive material from the shield building. Radioactive material may enter the shield building from the containment following a LOCA. Therefore, shield building OPERABILITY is required in MODES 1, 2, 3, and 4 when a steam line break, LOCA, or rod ejection accident could release radioactive material to the containment atmosphere.

In MODES 5 and 6, the probability and consequences of these events are low due to the Reactor Coolant System temperature and pressure limitations in these MODES. Therefore, shield building OPERABILITY is not required in MODE 5 or 6.

2 **INSERT 1**

The isolation devices for the penetrations in the shield building boundary are a part of the shield building leak tight barrier. To maintain the shield building boundary leak tight, the sealing mechanism associated with each penetration (e.g., welds, bellows, or O-rings) are required to be OPERABLE.

Access to the annulus area of the shield building is provided via the reactor building access room door and the water tight annulus access door located on 690 ft. elevation. During normal operation, these doors provide personnel and equipment access to the shield building annulus area and are equipped with electrical interlocks to assure that one door is always closed.

3 **INSERT 2**

The LCO is modified by a Note to allow the ~~shield building~~ annulus access door~~s~~ to be opened to allow normal transit entry and exit. The basis of this exception is the assumption that, for normal transit, the time during which ~~a~~ the door is open will be short (i.e., shorter than the Completion Time for Condition A).

INSERT 3

is a system consisting of two subsystems:

a. annulus vacuum control subsystem, and

b. air cleanup subsystem.

The annulus vacuum control subsystem is used during normal operation to establish and maintain a negative pressure in the annulus space. The annulus vacuum control subsystem does not perform any safety function.

The air cleanup subsystem operates during a LOCA to establish and maintain a negative annulus pressure of at least 0.5 inches water gauge. Filters in the subsystem then control the release of radioactive contaminates to the environment. The EGTS air cleanup subsystem OPERABILITY requirements are specified in LCO 3.6.10, “Emergency Gas Treatment System (EGTS) Air Cleanup Subsystem.”

BASES

ACTIONS

A.1

In the event shield building OPERABILITY is not maintained, shield building OPERABILITY must be restored within ~~24 hours. Twenty-four hours~~ 1 hour. One hour is a reasonable Completion Time considering the limited leakage design of containment and the low probability of a Design Basis Accident occurring during this time period. This specified time period is also consistent with the ACTIONS of LCO 3.6.1, "Containment," which requires the containment be restored to OPERABLE status within 1 hour. 3

B.1 and B.2

If the shield building cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

~~[SR 3.6.8.1~~ ~~7~~ ~~4~~ ~~1~~

~~Verifying that shield building annulus negative pressure is within limit ensures that operation remains within the limit assumed in the containment analysis. [The 12 hour Frequency of this SR was developed considering operating experience related to shield building annulus pressure variations and pressure instrument drift during the applicable MODES.~~ ~~5~~

~~OR~~

~~The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.~~ 3

~~-----------------------------------REVIEWER'S NOTE-----------------------------------~~
~~Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.~~
~~--]]~~ 6

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.6.~~8~~.2 1 7

1 3

Maintaining shield building OPERABILITY requires verifying ~~one~~ the door in the access opening closed. ~~[An~~ The access opening ~~may~~ contains one ~~inner and one outer~~ door~~, or in some cases, shield building access openings are shared such that a shield building barrier may have multiple inner or multiple outer doors~~. ~~The intent is to not breach the shield building boundary at any time when the shield building boundary is required. This is achieved by maintaining the inner or outer portion of the barrier closed at all times.]~~ ~~However, all shield building~~ The annulus access doors ~~are~~ is normally kept closed, except when the access opening is being used for entry and exit ~~or when maintenance is being performed on an access opening~~. ~~[The 31 day Frequency of this SR is based on engineering judgment and is considered adequate in view of the other indications of door status that are available to the operator.~~ 4 7 5

~~OR~~

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

~~REVIEWER'S NOTE~~
~~Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.~~
~~]~~ 6

2

~~[~~ SR 3.6.~~8~~.3 7 4 1

A visual inspection of the accessible shield building interior and exterior surfaces and verification that no apparent changes in the concrete surface appearance or other abnormal degradation will 8

~~This SR would~~ give advance indication of gross deterioration of the concrete structural integrity of the shield building. The Frequency of this SR is the same as that of SR 3.6.1.1. The verification is done during shutdown. ~~]~~ 4

BASES

SURVEILLANCE REQUIREMENTS (continued)

3

~~SR 3.6.8.4~~ ~~7~~ ~~1~~

~~The Shield Building Air Cleanup System~~ ~~EGTS~~ ~~produces a negative pressure to prevent leakage from the building. SR 3.6.8.4~~ ~~7~~ ~~verifies that the shield building can be rapidly drawn down to [-0.5] inch water gauge in the annulus. This test is used to ensure shield building boundary integrity. Establishment of this pressure is confirmed by SR 3.6.8.4,~~ ~~7~~ ~~which demonstrates that the shield building can be drawn down to ≤ [-0.5] inches of vacuum water gauge in the annulus ≤ [22]~~ ~~60~~ ~~seconds using one Shield Building Air Cleanup System~~ ~~EGTS~~ ~~train. The time limit ensures that no significant quantity of radioactive material leaks from the shield building prior to developing the negative pressure. Since this SR is a shield building boundary integrity test, it does not need to be performed with each Shield Building Air Cleanup System~~ ~~EGTS~~ ~~train. [The Shield Building Air Cleanup System train used for this Surveillance is staggered to ensure that in addition to the requirements of LCO 3.6.8.4, either train will perform this test.] The primary purpose of this SR is to ensure shield building integrity. The secondary purpose of this SR is to ensure that the Shield Building Air Cleanup System~~ ~~EGTS train~~ ~~being tested functions as designed. The inoperability of the Shield Building Air Cleanup System~~ ~~EGTS~~ ~~train does not necessarily constitute a failure of this Surveillance relative to the shield building OPERABILITY. [The 18 month Frequency is based on the need to perform this Surveillance under conditions that apply during a plant outage.~~

~~OR~~

~~The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.~~

~~-----------------------------------REVIEWER'S NOTE-----------------------------------~~
~~Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.~~
~~--]~~ 6

REFERENCES None.

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B 3.6 CONTAINMENT SYSTEMS

B 3.6.~~8~~ 7 Shield Building ~~(Dual and Ice Condenser)~~ 1

BASES

BACKGROUND

The shield building is a concrete structure that surrounds the steel containment vessel. Between the containment vessel and the shield building inner wall is an annular space that collects containment leakage that may occur following a loss of coolant accident (LOCA). This space also allows for periodic inspection of the outer surface of the steel containment vessel.

Insert 3

Emergency Gas Treatment System (EGTS)

The ~~Shield Building Air Cleanup System (SBACS)~~ ~~establishes a negative pressure in the annulus between the shield building and the steel containment vessel. Filters in the system then control the release of radioactive contaminants to the environment.~~ The shield building is required to be OPERABLE to ensure retention of containment leakage and proper operation of the ~~SBACS~~ EGTS Air Cleanup Subsystem. 2

INSERT 1

APPLICABLE SAFETY ANALYSES

The design basis for shield building OPERABILITY is a LOCA. Maintaining shield building OPERABILITY ensures that the release of radioactive material from the containment atmosphere is restricted to those leakage paths and associated leakage rates assumed in the accident analyses.

The shield building satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

LCO

Shield building OPERABILITY must be maintained to ensure proper operation of the ~~SBACS~~ EGTS Air Cleanup Subsystem and to limit radioactive leakage from the containment to those paths and leakage rates assumed in the accident analyses. INSERT 2 2 2

APPLICABILITY

Maintaining shield building OPERABILITY prevents leakage of radioactive material from the shield building. Radioactive material may enter the shield building from the containment following a LOCA. Therefore, shield building OPERABILITY is required in MODES 1, 2, 3, and 4 when a steam line break, LOCA, or rod ejection accident could release radioactive material to the containment atmosphere.

In MODES 5 and 6, the probability and consequences of these events are low due to the Reactor Coolant System temperature and pressure limitations in these MODES. Therefore, shield building OPERABILITY is not required in MODE 5 or 6.

2 **INSERT 1**

The isolation devices for the penetrations in the shield building boundary are a part of the shield building leak tight barrier. To maintain the shield building boundary leak tight, the sealing mechanism associated with each penetration (e.g., welds, bellows, or O-rings) are required to be OPERABLE.

Access to the annulus area of the shield building is provided via the reactor building access room door and the water tight annulus access door located on 690 ft. elevation. During normal operation, these doors provide personnel and equipment access to the shield building annulus area and are equipped with electrical interlocks to assure that one door is always closed.

3 **INSERT 2**

The LCO is modified by a Note to allow the ~~shield building~~ annulus access door~~s~~ to be opened to allow normal transit entry and exit. The basis of this exception is the assumption that, for normal transit, the time during which ~~a~~ the door is open will be short (i.e., shorter than the Completion Time for Condition A).

INSERT 3

is a system consisting of two subsystems:

a. annulus vacuum control subsystem, and

b. air cleanup subsystem.

The annulus vacuum control subsystem is used during normal operation to establish and maintain a negative pressure in the annulus space. The annulus vacuum control subsystem does not perform any safety function.

The air cleanup subsystem operates during a LOCA to establish and maintain a negative annulus pressure of at least 0.5 inches water gauge. Filters in the subsystem then control the release of radioactive contaminates to the environment. The EGTS air cleanup subsystem OPERABILITY requirements are specified in LCO 3.6.10, “Emergency Gas Treatment System (EGTS) Air Cleanup Subsystem.”

BASES

ACTIONS

A.1

In the event shield building OPERABILITY is not maintained, shield building OPERABILITY must be restored within ~~24 hours~~. ~~Twenty-four hours~~ 1 hour. One hour is a reasonable Completion Time considering the limited leakage design of containment and the low probability of a Design Basis Accident occurring during this time period. This specified time period is also consistent with the ACTIONS of LCO 3.6.1, "Containment," which requires the containment be restored to OPERABLE status within 1 hour. 3

B.1 and B.2

If the shield building cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

3

~~[SR 3.6.8.1~~ 7

~~Verifying that shield building annulus negative pressure is within limit ensures that operation remains within the limit assumed in the containment analysis. [The 12 hour Frequency of this SR was developed considering operating experience related to shield building annulus pressure variations and pressure instrument drift during the applicable MODES.~~

~~OR~~

~~The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.~~

~~-----REVIEWER'S NOTE-----~~
~~Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.~~
~~-----]]~~ 6

BASES

SURVEILLANCE REQUIREMENTS (continued)

~~SR 3.6.8.2~~ 1 7

The the 1 3

Maintaining shield building OPERABILITY requires verifying ~~one~~ door in the access opening closed. ~~[An~~ access opening ~~may~~ contain s one ~~inner and one outer~~ ~~door, or in some cases, shield building access openings are shared such that a shield building barrier may have multiple inner or multiple outer doors~~. ~~The intent is to not breach the shield building boundary at any time when the shield building boundary is required. This is achieved by maintaining the inner or outer portion of the barrier closed at all times.]~~ ~~However, all~~ ~~shield building~~ access doors ~~are~~ normally kept closed, except when the access ~~opening~~ is being used for entry and exit ~~or when maintenance is being performed on an access opening~~. ~~[The 31 day Frequency of this SR is based on engineering judgment and is considered adequate in view of the other indications of door status that are available to the operator.~~ 4

The annulus
is

7 5

~~OR~~

~~The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.~~

~~-----REVIEWER'S NOTE-----~~
~~Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.~~
~~---------------------------------]~~ 6

2 7

~~[~~ SR 3.6.~~8~~.3 4 1

A visual inspection of the accessible shield building interior and exterior surfaces and verification that no apparent changes in the concrete surface appearance or other abnormal degradation will 8

~~This SR would~~ give advance indication of gross deterioration of the concrete structural integrity of the shield building. The Frequency of this SR is the same as that of SR 3.6.1.1. The verification is done during shutdown. ~~]~~ 4

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BASES

SURVEILLANCE REQUIREMENTS (continued)

3

~~SR 3.6.8.4~~ ~~7~~ 1

~~The Shield Building Air Cleanup System produces a negative pressure to prevent leakage from the building. SR 3.6.8.4 verifies that the shield building can be rapidly drawn down to [-0.5] inch water gauge in the annulus. This test is used to ensure shield building boundary integrity. Establishment of this pressure is confirmed by SR 3.6.8.4, which demonstrates that the shield building can be drawn down to ≤ [-0.5] inches of vacuum water gauge in the annulus ≤ [22] seconds using one Shield Building Air Cleanup System train. The time limit ensures that no significant quantity of radioactive material leaks from the shield building prior to developing the negative pressure. Since this SR is a shield building boundary integrity test, it does not need to be performed with each Shield Building Air Cleanup System train. [The Shield Building Air Cleanup System train used for this Surveillance is staggered to ensure that in addition to the requirements of LCO 3.6.8.4, either train will perform this test.] The primary purpose of this SR is to ensure shield building integrity. The secondary purpose of this SR is to ensure that the Shield Building Air Cleanup System being tested functions as designed. The inoperability of the Shield Building Air Cleanup System train does not necessarily constitute a failure of this Surveillance relative to the shield building OPERABILITY. [The 18 month Frequency is based on the need to perform this Surveillance under conditions that apply during a plant outage.~~

~~OR~~

~~The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.~~

~~EGTS~~ ~~7~~ ~~7~~ ~~60~~ ~~EGTS~~ ~~EGTS~~ ~~EGTS train~~ ~~EGTS~~ 2 1 4 1 4 2 2 5 2 5

~~-------------------------------REVIEWER'S NOTE-------------------------------~~
~~Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.~~
~~---]~~ 6

REFERENCES None.

JUSTIFICATION FOR DEVIATIONS
ITS 3.6.7 BASES, SHIELD BUILDING

1. The heading and title for ISTS 3.6.8 include the parenthetical expression (Ice Condenser). This identifying information is not included in the Sequoyah Nuclear (SQN) ITS. This information is provided in the NUREG to assist in identifying the appropriate Specifications to be used as a model for a plant-specific ITS conversion, but serves no purpose in a plant-specific implementation. Therefore, necessary editorial changes were made. In addition, SQN design does not include the Spray Additive System (ISTS 3.6.7). Therefore, ISTS 3.6.7 is not included in the SQN ITS and ISTS 3.6.8 is renumbered as ITS 3.6.7.

2. Changes are made (additions, deletions, and/or changes) to the ISTS Bases which reflect the plant-specific nomenclature, number, reference, system description, analysis, or licensing basis description.

3. Changes have been made to be consistent with changes made to the Specification.

4. The ISTS contains bracketed information and/or values that are generic to all Westinghouse vintage plants. The brackets are removed and the proper plant specific information/value is changed to reflect the current licensing basis.

5. ISTS ~~SR 3.6.8.1,~~ SR 3.6.8.2~~, and SR 3.6.8.4~~ provides two options for controlling the Frequencies of Surveillance Requirements. SQN is proposing to control the Surveillance ~~Frequencies~~ Frequency for ITS SR 3.6.7.1~~, SR 3.6.7.2, and SR 3.6.7.4~~ under the Surveillance Frequency Control Program.

6. The Reviewer's Note has been deleted. This information is for the NRC reviewer to be keyed into what is needed to meet this requirement. This Note is not meant to be retained in the final version of the plant specific submittal.

7. There are no allowances in the LCO for a shield building access opening door to be open when maintenance is being performed on an access opening.

8. Changes are made to include details moved from the Current Technical Specifications to the Bases.

CONTAINMENT SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

c. After every 720 hours of charcoal adsorber operation by verifying within 31 days after removal that a laboratory analysis of representative carbon sample obtained in accordance with Regulatory Position C.6.b of Regulatory Guide 1.52, Revision 2, March 1978, shows the methyl iodide penetration less than 2.5% when tested in accordance with ASTM D3803-1989 at a temperature of 30°C (86°F) and a relative humidity of 70%. See ITS 5.5.9

SR 3.6.10.3 SR 3.6.10.4 d. ~~At least once per 18 months by~~: In accordance with the Surveillance Frequency Control Program LA02

1. Verifying that the pressure drop across the combined HEPA filters and charcoal adsorber banks is less than 5 inches Water Gauge while operating the filter train at a flow rate of 4000 cfm ± 10%. See ITS 5.5.9

SR 3.6.10.3 2. Verifying that the filter train starts on an actual or simulated ~~a Phase A containment isolation Test~~ Signal. L02 LA01

SR 3.6.10.4 3. Verify the operation of the filter cooling bypass valves.

SR 3.6.10.6 4. Verifying that each system produces a negative pressure of greater than or equal to 0.5 inches W. G. in the annulus within 1 minute after a start signal. INSERT 1 L05 ~~See ITS 3.6.7~~

e. After each complete or partial replacement of a HEPA filter bank by verifying that the HEPA filter banks remove greater than or equal to 99.95% of the DOP when they are tested in-place in accordance with ANSI N510-1975 while operating the system at a flow rate of 4000 cfm ± 10%.

f. After each complete or partial replacement of a charcoal adsorber bank by verifying that the charcoal adsorbers remove greater than or equal to 99.95% of a halogenated hydrocarbon refrigerant test gas when they are tested in-place in accordance with ANSI N510-1975 while operating the system at a flow rate of 4000 cfm ± 10%. See ITS 5.5.9

INSERT 1 L05

~~on a STAGGERED TEST BASIS for each EGTS Air Cleanup Subsystem train~~

In accordance with the Surveillance Frequency Control Program LA02

ITS

A01

ITS 3.6.10

CONTAINMENT SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

c. After every 720 hours of charcoal adsorber operation by verifying within 31 days after removal that a laboratory analysis of representative carbon sample obtained in accordance with Regulatory Position C.6.b of Regulatory Guide 1.52, Revision 2, March 1978, shows the methyl iodide penetration less than 2.5% when tested in accordance with ASTM D3803-1989 at a temperature of 30°C (86° F) and a relative humidity of 70%. See ITS 5.5.9

SR 3.6.10.3
SR 3.6.10.4

d. ~~At least once per 18 months by~~: In accordance with the Surveillance Frequency Control Program LA02

1. Verifying that the pressure drop across the combined HEPA filters and charcoal adsorber banks is less than 5 inches Water Gauge while operating the filter train at a flow rate of 4000 cfm + 10%. See ITS 5.5.9

SR 3.6.10.3 2. Verifying that the filter train starts on an actual or simulated ~~a Phase A containment isolation Test~~ Signal. L02

SR 3.6.10.4 3. Verify the operation of the filter cooling bypass valves. LA01

SR 3.6.10.6 4. Verifying that each system produces a negative pressure of greater than or equal to 0.5 inches W.G. in the annulus within 1 minute after a start signal. ~~See ITS 3.6.7~~

INSERT 1 L05

e. After each complete or partial replacement of a HEPA filter bank by verifying that the HEPA filter banks remove greater than or equal to 99.95% of the DOP when they are tested in-place in accordance with ANSI N510-1975 while operating the system at a flow rate of 4000 cfm + 10%.

f. After each complete or partial replacement of a charcoal adsorber bank by verifying that the charcoal adsorbers remove greater than or equal to 99.95% of a halogenated hydrocarbon refrigerant test gas when they are tested in-place in accordance with ANSI N510-1975 while operating the system at a flow rate of 4000 cfm + 10%. See ITS 5.5.9

INSERT 1 L05

~~on a STAGGERED TEST BASIS for each EGTS Air Cleanup Subsystem train~~

In accordance with the Surveillance Frequency Control Program LA02

DEFINITIONS

RATED THERMAL POWER (RTP)

1.27 RATED THERMAL POWER (RTP) shall be a total reactor core heat transfer rate to the reactor coolant of 3455 MWt.

REACTOR TRIP SYSTEM (RTS) RESPONSE TIME

1.28 The REACTOR TRIP SYSTEM RESPONSE TIME shall be the time interval from when the monitored parameter exceeds its (RTS) trip setpoint at the channel sensor until loss of stationary gripper coil voltage. The response time may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured. In lieu of measurement, response time may be verified for selected components provided that the components and the methodology for verification have been previously reviewed and approved by NRC. See ITS Chapter 1.0

REPORTABLE EVENT

1.29 DELETED

SHIELD BUILDING INTEGRITY

1.30 SHIELD BUILDING INTEGRITY shall exist when: See ITS Chapter 1.0

a. The door in each access opening is closed except when the access opening is being used for normal transit entry and exit. See ITS 3.6.7

LCO 3.6.10 b. The emergency gas treatment system is OPERABLE.

c. The sealing mechanism associated with each penetration (e.g., welds, bellows or O-rings) is OPERABLE. See ITS 3.6.7

SHUTDOWN MARGIN

1.31 SHUTDOWN MARGIN shall be the instantaneous amount of reactivity by which the reactor is subcritical or would be subcritical from its present condition assuming all full length rod cluster assemblies (shutdown and control) are fully inserted except for the single rod cluster assembly of highest reactivity worth which is assumed to be fully withdrawn. See ITS Chapter 1.0

SITE BOUNDARY

1.32 The SITE BOUNDARY shall be that line beyond which the land is not owned, leased, or otherwise controlled by the licensee.

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DISCUSSION OF CHANGES
ITS 3.6.10, EMERGENCY GAS TREATMENT SYSTEM (EGTS)

the Bases. The additional allowance to test EGTS train actuation on an actual or simulated actuation signal is discussed in DOC L02.

The removal of these details, which are related to system design, from the Technical Specifications is acceptable, because this type of information is not necessary to be included in the Technical Specifications to provide adequate protection of public health and safety. The ITS retains the requirement that two emergency gas treatment system trains shall be OPERABLE, and verifies that each train starts on a valid signal. This change is acceptable, because the removed information will be adequately controlled in the ITS Bases. Changes to the Bases are controlled by the Technical Specification Bases Control Program in Chapter 5. This program provides for the evaluation of changes to the Bases to ensure the Bases are properly controlled. This change is designated as a less restrictive removal of detail change, because information relating to system design is being removed from the Technical Specifications.

LA02 *(Type 5 – Removal of SR Frequency to the Surveillance Frequency Control Program)* CTS 4.6.1.8 requires each EGTS cleanup subsystem to be operated for at least 10 hours with the heaters on at least once per 31 days. ITS SR 3.6.10.1 requires a similar Surveillance and specifies the periodic Frequency as, "In accordance with the Surveillance Frequency Control Program." CTS 4.6.1.8.b.3 requires, in part, verification of each EGTS cleanup subsystem flow rate every 18 months. ITS SR 3.6.10.5 requires the same verification and specifies the periodic Frequency as, "In accordance with the Surveillance Frequency Control Program." CTS 4.6.1.8.d.2 requires verification that each EGTS cleanup subsystem filter train starts on a Phase A containment isolation Test signal at least once per 18 months. ITS SR 3.6.10.3 requires a similar verification and specifies the periodic Frequency as, "In accordance with the Surveillance Frequency Control Program." CTS 4.6.1.8.d.3 requires verification that the EGTS cleanup subsystem filter cooling bypass valves operate at least one per 18 months. ITS SR 3.6.10.4 requires a similar verification and specifies the periodic Frequency as, "In accordance with the Surveillance Frequency Control Program." This changes the CTS by moving the specified Frequencies for these SRs and associated Bases to the Surveillance Frequency Control Program.

INSERT 2

The removal of these details related to Surveillance Requirement Frequencies from the Technical Specifications is acceptable, because this type of information is not necessary to be included in the Technical Specifications to provide adequate protection of public health and safety. The existing Surveillance Frequencies are removed from Technical Specifications and placed under licensee control pursuant to the methodology described in NEI 04-10. A new program (Surveillance Frequency Control Program) is being added to the Administrative Controls section of the Technical Specifications describing the control of Surveillance Frequencies. The surveillance test requirements remain in the Technical Specifications. The control of changes to the Surveillance Frequencies will be in accordance with the Surveillance Frequency Control Program. The Program shall ensure that Surveillance Requirements specified in the Technical Specifications are performed at intervals sufficient to assure the associated Limiting Conditions for Operation are met. This change is designated

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INSERT 2

CTS 4.6.1.8.d.4 requires verification that each EGTS Air Cleanup Subsystem train produces a negative pressure within limits in the annulus within 1 minute after a start signal. ITS SR 3.6.10.6 requires a similar verification and specifies the periodic Frequency as, "In accordance with the Surveillance Frequency Control Program." The change to CTS 4.6.1.8.d.4 to perform the Surveillance on a STAGGERED TEST BASIS is discussed in DOC L05.

DISCUSSION OF CHANGES
ITS 3.6.10, EMERGENCY GAS TREATMENT SYSTEM (EGTS)

the Surveillances for the two fans can be larger or smaller under the ITS than under the CTS.

L04 *(Category 6 – Relaxation of Surveillance Requirement Acceptance Criteria)* CTS 4.6.1.8.a requires the periodic operation of each EGTS train for at least 10 hours with the heaters on. ITS SR 3.6.10.1 requires the periodic operation of each EGTS train for at least 15 continuous minutes with the heaters on. This changes the CTS by reducing the amount of time each EGTS train is required to be operated.

The purpose of CTS 4.6.1.8.a is to periodically verify that each train of EGTS can operate properly. The requirement to operate each train for at least 10 hours per month with the heaters on in order to reduce the buildup of moisture on the adsorbers and HEPA filters was derived from the guidance provided in Regulatory Guide (RG) 1.52, "Design, Testing, and Maintenance Criteria for Post Accident Engineered-Safety-Feature Atmosphere Cleanup System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants," Revision 2, Regulatory Position 4.d. However, this was changed in RG 1.52, Revision 3. RG 1.52, Revision 3, Regulatory Position 6.1 states, "Each ESF atmosphere cleanup train should be operated continuously for at least 15 minutes each month, with the heaters on (if so equipped), to justify the operability of the system and all its components." The Ventilation Filter Testing Program (VFTP) also requires that a laboratory test of a sample of the charcoal adsorber used in each of the Engineered Safety Features (ESF) systems be tested in accordance with ASTM D3803-1989. Generic Letter 99-02, "Laboratory Testing of Nuclear-Grade Activated Charcoal," dated June 3, 1999, informed licensees that the use of any standard other than ASTM D3803-1989 to test the charcoal sample may result in an overestimation of the capability of the charcoal to adsorb radioiodine. As a result, TVA requested license amendments to the Sequoyah Nuclear Plant (SQN) Unit 1 and Unit 2 Technical Specifications to revise the required filter testing to be in accordance with ASTM D3803-1989. The NRC approved the SQN Unit 1 and Unit 2 license amendments on November 2, 2000 (ADAMS Accession Number ML003766942). This change is acceptable because the ASTM D3803-1989 Standard no longer requires operation for 10 hours utilizing the heaters. This change is designated as less restrictive because less stringent Surveillance Requirements are being applied in the ITS than were applied in the CTS.

INSERT 3

INSERT 3

L05 *(Category 7 – Relaxation Of Surveillance Frequency)* CTS 4.6.1.8.d.4 requires a drawdown of the shield building annulus by each EGTS Air Cleanup Subsystem train to within limits at least once per 18 months. ITS SR 3.6.10.6 requires a drawdown of the shield building annulus to within limits "In accordance with the Surveillance Frequency Control Program." The specified Surveillance Frequency that is being moved to the Surveillance Frequency Control Program is "18 months on a STAGGERED TEST BASIS for each EGTS Air Cleanup Subsystem train." This changes the CTS by allowing the drawdown test for each EGTS Air Cleanup Subsystem train to be performed less frequently. Moving the specified Surveillance Frequency to the Surveillance Frequency Control Program is discussed in DOC LA02.

The purpose of CTS 4.6.1.8.d.4 is to verify the integrity of the shield building boundary by ensuring the shield building annulus can be rapidly drawn to a negative pressure of at least 0.5 inches water gauge. Therefore, this is a test of shield building integrity and does not need to be performed every 18 months using each EGTS Air Cleanup Subsystem train. Staggering use of the EGTS Air Cleanup Subsystem trains every 18 months will ensure both trains are capable of performing the test. This change is acceptable because performing the drawdown test using one train of EGTS Air Cleanup Subsystem every 18 months will adequately verify shield building integrity. OPERABILITY of the EGTS Air Cleanup Subsystem will be maintained through the application of the other Surveillances of ITS 3.6.10. This change is designated as less restrictive, because the shield building annulus drawdown Surveillance will be performed less frequently with each EGTS Air Cleanup Subsystem train under the ITS than under the CTS.

CTS

~~SBACS (Dual and Ice Condenser)~~ EGTS Air Cleanup Subsystem
3.6.~~13~~ 10 1

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
4.6.1.8.d.2	SR 3.6.~~13~~.3 10 Verify each ~~SBACS~~ EGTS Air Cleanup Subsystem train actuates on an actual or simulated actuation signal.	~~[[18] months~~ 1 4 ~~OR~~ In accordance with the Surveillance Frequency Control Program ~~]~~ 4
4.6.1.8.d.3	SR 3.6.~~13~~.4 10 ~~[~~ Verify each ~~SBACS~~ EGTS Air Cleanup Subsystem filter cooling bypass ~~damper~~ valve can be ~~opened~~ operated.	~~[[18] months~~ 1 3 4 ~~OR~~ In accordance with the Surveillance Frequency Control Program ~~]]~~ 4
4.6.1.8.b.3	SR 3.6.~~13~~.5 10 Verify each ~~SBACS~~ EGTS Air Cleanup Subsystem train flow rate is ~~≥ [ ]~~ ≥ 3600 and ≤ 4400 cfm.	~~[[18] months on a STAGGERED TEST BASIS~~ 1 3 4 ~~OR~~ In accordance with the Surveillance Frequency Control Program ~~]~~ 4

INSERT 1 5

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5 **INSERT 1**

4.6.1.8.d.4	SR 3.6.10.6	Verify the shield building can be maintained at a negative pressure ≥ 0.5 inch water gauge in the annulus by one EGTS Air Cleanup Subsystem train within 60 seconds after a start signal.	In accordance with the Surveillance Frequency Control Program

CTS

~~SBACS (Dual and Ice Condenser)~~ EGTS Air Cleanup Subsystem
3.6.~~13~~ 10 1

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
4.6.1.8.d.2 SR 3.6.~~13~~ 10.3	Verify each ~~SBACS~~ EGTS Air Cleanup Subsystem train actuates on an actual or simulated actuation signal.	~~[[18] months~~ 1 4 ~~OR~~ In accordance with the Surveillance Frequency Control Program ~~]~~ 4
4.6.1.8.d.3 SR 3.6.~~13~~ 10.4	~~[~~ Verify each ~~SBACS~~ EGTS Air Cleanup Subsystem filter cooling bypass ~~damper~~ valve can be ~~opened~~ operated.	~~[[18] months~~ 1 3 4 ~~OR~~ In accordance with the Surveillance Frequency Control Program ~~]]~~ 4
4.6.1.8.b.3 SR 3.6.~~13~~ 10.5	Verify each ~~SBACS~~ EGTS Air Cleanup Subsystem train flow rate is ~~≥ [ ]~~ ≥ 3600 and ≤ 4400 cfm.	~~[[18] months on a STAGGERED TEST BASIS~~ 3 1 4 ~~OR~~ In accordance with the Surveillance Frequency Control Program ~~]~~ 4

INSERT 1 5

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5 **INSERT 1**

4.6.1.8.d.4	SR 3.6.10.6	Verify the shield building can be maintained at a negative pressure ≥ 0.5 inch water gauge in the annulus by one EGTS Air Cleanup Subsystem train within 60 seconds after a start signal.	In accordance with the Surveillance Frequency Control Program

JUSTIFICATION FOR DEVIATIONS
ITS 3.6.10, EMERGENCY GAS TREATMENT SYSTEM (EGTS)

1. The ISTS 3.6.13 title "Shield Building Air Cleanup System (SBACS)" has been changed to "Emergency Gas Treatment System (EGTS)" consistent with the Sequoyah Nuclear Plant (SQN) site specific terminology. The heading for ISTS 3.6.13 includes the parenthetical expression (Dual and Ice Condenser). This identifying information is not included in the SQN ITS. This information is provided in the NUREG-1431, Rev. 4.0 to assist in identifying the appropriate Specifications to be used as a model for a plant-specific ITS conversion, but serves no purpose in a plant-specific implementation. In addition, SQN design does not include the Spray Additive System (ISTS 3.6.7) or the Hydrogen Mixing System (ISTS 3.6.9). Therefore, ISTS 3.6.7 and ISTS 3.6.9 are not included in the SQN ITS and ISTS 3.6.13 is renumbered as ITS 3.6.10.

   Air Cleanup Subsystem

2. Changes are made (additions, deletions, and/or changes) to the ISTS which reflect the plant-specific nomenclature, number, reference, system description, analysis, or licensing basis description.

3. The ISTS contains bracketed information and/or values that are generic to Westinghouse vintage plants. The brackets are removed and the proper plant specific information/value is inserted to reflect the current licensing basis.

4. ISTS SR 3.6.13.1, SR 3.6.13.3, SR 3.6.13.4, and SR 3.6.13.5 (ITS SR 3.6.10.1, SR 3.6.10.3, SR 3.6.10.4, and SR 3.6.10.5, respectively) provide two options for controlling the Frequencies of Surveillance Requirements. SQN is proposing to control the Surveillance Frequencies for ITS SR 3.6.10.1, SR 3.6.10.3, SR 3.6.10.4, and SR 3.6.10.5 under the Surveillance Frequency Control Program.

5. ITS SR 3.6.10.6 is added to reflect the requirements of CTS 4.6.1.8.d.4. Changes associated with CTS 4.6.1.8.d.4 are described in Discussion of Changes LA02 and L05. ITS SR 3.6.10.6 is also similar to the requirements of ISTS SR 3.6.8.4 but will not specify a flow rate for the EGTS Cleanup Subsystem train. The current licensing basis for this acceptance criteria is derived from the license amendment requested by TVA and approved by the NRC on December 23, 1982.

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1

B 3.6 CONTAINMENT SYSTEMS

B 3.6.~~13~~ 10 ~~Shield Building Air Cleanup System (SBACS) (Dual and Ice Condenser)~~ Emergency Gas Treatment System (EGTS) Air Cleanup Subsystem

1

BASES

BACKGROUND

The ~~SBACS~~ EGTS Air Cleanup Subsystem is required by 10 CFR 50, Appendix A, GDC 41, "Containment Atmosphere Cleanup" (Ref. 1), to ensure that radioactive materials that leak from the primary containment into the shield building (secondary containment) following a Design Basis Accident (DBA) are filtered and adsorbed prior to exhausting to the environment. 1

The containment has a secondary containment called the shield building, which is a concrete structure that surrounds the steel primary containment vessel. Between the containment vessel and the shield building inner wall is an annular space that collects any containment leakage that may occur following a loss of coolant accident (LOCA). This space also allows for periodic inspection of the outer surface of the steel containment vessel.

INSERT 1 ~~The SBACS establishes a negative pressure in the annulus between the shield building and the steel containment vessel. Filters in the system then control the release of radioactive contaminants to the environment.~~ 2
Shield building OPERABILITY is required to ensure retention of primary containment leakage and proper operation of the ~~SBACS~~ EGTS Air Cleanup Subsystem. 1

The ~~SBACS~~ EGTS Air Cleanup Subsystem consists of two separate and redundant trains. Each train includes a heater, ~~[cooling coils,]~~ a prefilter, moisture separators, a high efficiency particulate air (HEPA) filter, an activated charcoal adsorber section for removal of radioiodines, and a fan. Ductwork, valves and/or dampers, and instrumentation also form part of the system. The moisture separators function to reduce the moisture content of the airstream. A second bank of HEPA filters follows the adsorber section to collect carbon fines and provide backup in case of failure of the main HEPA filter bank. Only the upstream HEPA filter and the charcoal adsorber section are credited in the analysis. The system initiates and maintains a negative air pressure in the shield building by means of filtered exhaust ventilation of the shield building following receipt of a ~~safety injection (SI)~~ Phase A containment isolation signal. The system is described in Reference 2. 3 4

The prefilters remove large particles in the air, and the moisture separators remove entrained water droplets present, to prevent excessive loading of the HEPA filters and charcoal absorbers. Heaters may be included to reduce the relative humidity of the airstream on systems that operate in high humidity. ~~Continuous operation of each train, for at least 10 hours per month, with heaters on, reduces moisture buildup on their HEPA filters and adsorbers.~~ ~~[The cooling coils cool the air to keep the charcoal beds from becoming too hot due to absorption of fission product.]~~ TSTF-522 3

2 **INSERT 1**

The EGTS design consists of two subsystems ~~common to both units~~. The annulus vacuum control subsystem is used to establish and maintain a negative pressure within the secondary containment annulus during normal plant operation ~~(non safety-related)~~. The annulus vacuum control subsystem does not perform any safety function. The air cleanup subsystem is actuated following a LOCA to maintain a negative pressure in the annulus area between the shield building and the steel containment. Filters in the air cleanup subsystem then control the release of radioactive contaminants to the environment. The air cleanup subsystem is the portion of EGTS that performs a safety function and is required to be OPERABLE. OPERABILITY requirements associated with the shield building are specified in LCO 3.6.7, “Shield Building.”

BASES

SURVEILLANCE REQUIREMENTS (continued)

~~-----REVIEWER'S NOTE-----~~
~~Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.~~
~~----------~~] 7 5

INSERT 4

REFERENCES

1. 10 CFR 50, Appendix A, GDC 41.
2. U FSAR, Section ~~[6.5]~~ 6.2.
3. U FSAR, Chapter ~~[~~15~~]~~.
4. Regulatory Guide 1.52, Revision ~~[~~2~~]~~.

1 3

5 **INSERT 4**

SR 3.6.10.6

The EGTS Air Cleanup Subsystem produces a negative pressure to prevent leakage from the shield building. This Surveillance verifies that the shield building can be rapidly drawn down to - 0.5 inch water gauge in the annulus. This test is used to ensure shield building boundary integrity. Establishment of this pressure is confirmed by this SR, which demonstrates that the shield building can be drawn down to a negative pressure of ≥ 0.5 inches of water gauge in the annulus in ≤ 60 seconds using one EGTS Air Cleanup Subsystem train. The time limit ensures that no significant quantity of radioactive material leaks from the shield building prior to developing the negative pressure. Since this Surveillance is a shield building boundary integrity test, it does not need to be performed with each EGTS Air Cleanup Subsystem train; thus, this Surveillance is performed on a STAGGERED TEST BASIS. The primary purpose of this SR is to ensure shield building integrity. The secondary purpose of this SR is to ensure that the EGTS Air Cleanup Subsystem train being tested functions as designed. Upon failure to meet this SR, the leak tightness of the shield building must be immediately assessed to determine the impact on the OPERABILITY of the shield building. If a negative pressure of ≥ 0.5 inch water gauge cannot be maintained in the annulus by either EGTS Air Cleanup Subsystem train (i.e., loss of shield building safety function), the shield building must be declared inoperable and ACTIONS of LCO 3.6.7 performed in accordance with LCO 3.0.6 and Specification 5.5.13, “Safety Function Determination Program (SFDP).”

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

1

B 3.6 CONTAINMENT SYSTEMS

B 3.6.~~13~~ 10 ~~Shield Building Air Cleanup System (SBACS) (Dual and Ice Condenser)~~ Emergency Gas Treatment System (EGTS) Air Cleanup Subsystem

1

BASES

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The prefilters remove large particles in the air, and the moisture separators remove entrained water droplets present, to prevent excessive loading of the HEPA filters and charcoal absorbers. Heaters may be included to reduce the relative humidity of the airstream on systems that operate in high humidity. ~~Continuous operation of each train, for at least 10 hours per month, with heaters on, reduces moisture buildup on their HEPA filters and adsorbers.~~ ~~[The cooling coils cool the air to keep the charcoal beds from becoming too hot due to absorption of fission product.]~~ TSTF-522 3

2 **INSERT 1**

The EGTS design consists of two subsystems ~~common to both units~~. The annulus vacuum control subsystem is used to establish and maintain a negative pressure within the secondary containment annulus during normal plant operation ~~(non safety-related)~~. The annulus vacuum control subsystem does not perform any safety function. The air cleanup subsystem is actuated following a LOCA to maintain a negative pressure in the annulus area between the shield building and the steel containment. Filters in the air cleanup subsystem then control the release of radioactive contaminants to the environment. The air cleanup subsystem is the portion of EGTS that performs a safety function and is required to be OPERABLE. OPERABILITY requirements associated with the shield building are specified in LCO 3.6.7, "Shield Building."

BASES

SURVEILLANCE REQUIREMENTS (continued)

~~-----------------------------------REVIEWER'S NOTE-----------------------------------~~
~~Plants controlling Surveillance Frequencies under a Surveillance Frequency Control Program should utilize the appropriate Frequency description, given above, and the appropriate choice of Frequency in the Surveillance Requirement.~~
~~--~~ ~~]~~ 7 5

INSERT 4

REFERENCES

1. 10 CFR 50, Appendix A, GDC 41.
2. U FSAR, Section ~~[6.5]~~ 6.2.
3. U FSAR, Chapter ~~[~~15~~]~~.
4. Regulatory Guide 1.52, Revision ~~[~~2~~]~~.

1 3

5 **INSERT 4**

SR 3.6.10.6

The EGTS Air Cleanup Subsystem produces a negative pressure to prevent leakage from the shield building. This Surveillance verifies that the shield building can be rapidly drawn down to - 0.5 inch water gauge in the annulus. This test is used to ensure shield building boundary integrity. Establishment of this pressure is confirmed by this SR, which demonstrates that the shield building can be drawn down to a negative pressure of ≥ 0.5 inches of water gauge in the annulus in ≤ 60 seconds using one EGTS Air Cleanup Subsystem train. The time limit ensures that no significant quantity of radioactive material leaks from the shield building prior to developing the negative pressure. Since this Surveillance is a shield building boundary integrity test, it does not need to be performed with each EGTS Air Cleanup Subsystem train; thus, this Surveillance is performed on a STAGGERED TEST BASIS. The primary purpose of this SR is to ensure shield building integrity. The secondary purpose of this SR is to ensure that the EGTS Air Cleanup Subsystem train being tested functions as designed. Upon failure to meet this SR, the leak tightness of the shield building must be immediately assessed to determine the impact on the OPERABILITY of the shield building. If a negative pressure of ≥ 0.5 inch water gauge cannot be maintained in the annulus by either EGTS Air Cleanup Subsystem train (i.e., loss of shield building safety function), the shield building must be declared inoperable and ACTIONS of LCO 3.6.7 performed in accordance with LCO 3.0.6 and Specification 5.5.13, “Safety Function Determination Program (SFDP).”

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

Licensee Response/NRC Response/NRC Question Closure

Id	**431**
NRC Question Number	**CET003**
Select Application	**NRC Question Closure**
Attachment 1	
Attachment 2	
Response Statement	
Response Date/Time	
Closure Statement	**This question is closed and no further information is required at this time to draft the Safety Evaluation.**
Question Closure Date	**3/12/2015**
Notification	**Mark Blumberg Scott Bowman Kristy Bucholtz Margaret Chernoff Michelle Conner Khadijah Hemphill Andrew Hon Lynn Mynatt Ray Schiele Roger Scott**
Added By	**Khadijah Hemphill**
Date Added	**3/12/2015 2:53 PM**
Date Modified	
Modified By	

ITS NRC Questions

Id	**11**
NRC Question Number	**CSS-001**
Category	**Technical**
ITS Section	**3.3**
ITS Number	
DOC Number	
JFD Number	
JFD Bases Number	
Page Number(s)	
NRC Reviewer Supervisor	**Rob Elliott**
Technical Branch POC	**Steve Wyman**
Conf Call Requested	**N**
NRC Question	**NRC staff was unable to locate the setpoint calculation for the reactor coolant pump underfrequency setpoint in your submittal. Please provide this information.**
Attach File 1	
Attach File 2	
Issue Date	**2/14/2014**
Added By	**Khadijah Hemphill**
Date Modified	
Modified By	
Date Added	**2/14/2014 10:32 AM**
Notification	**Scott Bowman Michelle Conner Khadijah Hemphill Lynn Mynatt Lisa Regner Ray Schiele Carl Schulten Roger Scott**

Licensee Response/NRC Response/NRC Question Closure

Id	**7**
NRC Question Number	**CSS-001**
Select Application	**Licensee Response**
Attachment 1	**SQN-EEB-MS-TI28-0076 Rev.5.pdf** (40MB)
Attachment 2	
Response Statement	**The SQN calculation for the reactor coolant pump underfrequency setpoint is SQN-EEB-MS-TI28-0076 Rev.5. This is being provided as Attachment 1.**
Response Date/Time	**2/14/2014 1:00 PM**
Closure Statement	
Question Closure Date	
Notification	**Scott Bowman Michelle Conner Khadijah Hemphill Lynn Mynatt Lisa Regner Ray Schiele Carl Schulten Roger Scott**
Added By	**Scott Bowman**
Date Added	**2/14/2014 12:04 PM**
Date Modified	
Modified By	

ORIGINAL

QA Record

NPG CALCULATION COVERSHEET/CCRIS UPDATE

REV 0 EDMS/RIMS NO.	CTS TYPE:	EDMS TYPE:	EDMS ACCESSION NO (N/A for REV. 0)
B87 940628 001	Calculations	Calculations(Nuclear)	B87 '140131 001

Calc Title: Demonstrated Accuracy Calculation
RCP UNDERFREQUENCY RELAYS

	ORG	PLANT	BRANCH	NUMBER	CUR REV	NEW REV
CALC ID	NUC	SQN	EEB	SQN-EEB-MS-TI28-0076	4	5

CTS UPDATE ONLY ☐
(Verifier Approval Signatures Not Required)

No CTS Changes ☐
(For calc revision, CTS been reviewed and no CTS changes required)

UNITS	SYSTEMS	UNIDS
0 ☐, 1 ☐, 2 ☐, 3 ☐	068, 202, 250	Various

DCN,EDC,N/A	APPLICABLE DESIGN DOCUMENT(S)	CLASSIFICATION
N/A	N/A	EM

QUALITY RELATED?	SAFETY RELATED? (If yes, QR = yes)	UNVERIFIED ASSUMPTION	SPECIAL REQUIREMENTS AND/OR LIMITING CONDITIONS?	DESIGN OUTPUT ATTACHMENT?	SAR/TS and/or ISFSI SAR/CoC AFFECTED
Yes ☒ No ☐	Yes ☒ No ☐	Yes ☐ No ☒	Yes ☐ No ☒	Yes ☐ No ☒	Yes ☐ No ☒

CALCULATION NUMBER REQUESTOR	PREPARING DISCIPLINE	VERIFICATION METHOD	NEW METHOD OF ANALYSIS
Name: Gregory G. Mailen Phone: 843-8065	ELECTRICAL	DESIGN REVIEW	☐ Yes ☒ No

PREPARER (PRINT NAME AND SIGN)	DATE	CHECKER (PRINT NAME AND SIGN)	DATE
Gregory G. Mailen Gregory G. Mailen	1/16/14	NAVIN S. SHAH NSShah	1-23-14
VERIFIER (PRINT NAME AND SIGN)	**DATE**	**APPROVAL (PRINT NAME AND SIGN)**	**DATE**
NAVIN S. SHAH NSShah	1-23-14	JANICE CRUZ Janice Cruz	1/23/14

STATEMENT OF PROBLEM/ABSTRACT

Determine the accuracy of the subject instrument loops and demonstrate that the accuracy is adequate for the intended purpose. Primary elements are not located in a Harsh environment. The subject devices are not part of PAM.

RCP UNDERFREQUENCY RELAYS

Calculations were performed to determine the accuracy of the subject instrument loops. The determined accuracies were compared to the required accuracies, setpoints, safety limits and/or operating limits and the accuracy for the loops listed below.

1-81-068-344D
1-81-068-346E
1-81-068-348F
1-81-068-350G
2-81-068-344D
2-81-068-346E
2-81-068-348F
2-81-068-350G

MICROFICHE/EFICHE Yes ☐ No ☒ FICHE NUMBER(S)

NPG CALCULATION COVERSHEET/CTS UPDATE

CALC ID	ORG	PLANT	BRANCH	NUMBER	REV
	NUC	SQN	EEB	SQN-EEB-MS-TI28-0076	5

ALTERNATE CALCULATION IDENTIFICATION

BUILDING	ROOM	ELEVATION	COORD/AZIM	FIRM

CATEGORIES D09

KEY NOUNS (A-add, D-delete)

ACTION (A/D)	KEY NOUN	A/D	KEY NOUN

CROSS-REFERENCES (A-add, C-change, D-delete)

ACTION (A/C/D)	XREF CODE	XREF TYPE	XREF PLANT	XREF BRANCH	XREF NUMBER	XREF REV

CTS ONLY UPDATES:
Following are required only when making keyword/cross reference CCRIS updates and page 1 of form NEDP-2-1 is not included:

PREPARER (PRINT NAME AND SIGN)	DATE	CHECKER (PRINT NAME AND SIGN)	DATE
PREPARER PHONE NO.	EDMS ACCESSION NO.		

ORIGINAL

QA Record
A3

TVAN CALCULATION COVERSHEET

Title	Plant SQN Unit 1&2
DEMONSTRATED ACCURACY CALCULATION RCP UNDERFREQUENCY RELAYS	

Preparing Organization	Key Nouns (For RIMS)
EEB-I&C	I&C, INSTR, CALIBRATION,SETPOINT, ACCURACY
Branch/Project Identifiers SQN-EEB-MS-TI28-0076	Each time these calculations are issued, preparer must ensure that the original (R0) RIMS accession number is filled in.

Applicable Design Document(s)		Rev	(for RIMS use)	RIMS Accession Number
SQN-DC-V-27.9		R0	'940711G0001	B87 940628 001
		R3		B87 980612 016
SAR affected: ☐ Yes ☒ No Section(s): TABLE CH. 7, 8, 15	UNID System(s) 068, 202, 250	R4		B87 000327 002
		R		

Revision 0	R3	R4	R		Yes	No
Design Change Document No. (or indicate Not Applicable)	N/A	N/A		Quality Related?	☒	☐
Prepared DAVID E. HAUN	D.D. Mailen	D.D. Mailen		Safety Related?	☒	☐
Checked ALAN P. JANNEY	LmBegley	LmBegley		These calculations contain unverified assumption(s) that must be verified later?	☐	☒
Reviewed M. J. SCHELDROTH	LmBegley	LmBegley		These calculations contain special requirements and/or limiting conditions?	☐	☒
Approved CRAIG R. BUTCHER	[signature]	[signature]		These calculations contain a design output attachment?	☐	☒
Date 6/24/94	5/15/98	11/9/98		Calculation Revision: Entire Calculation ☒; Selected pages ☐; Not Applicable ☐		

Statement of Problem:

Determine the accuracy of the subject instrument loop(s) and demonstrate that the accuracy is adequate for the intended purpose. Primary elements ☐ are ☒ are not located in a Harsh environment. Subject devices ☐ are ☒ are not part of PAM.

RCP UNDERFREQUENCY RELAYS

Abstract

Calculations were performed to determine the accuracy of the subject instrument loop(s). The determined accuracies were compared to the required accuracies, setpoints, safety limits and/or operating limits and the accuracy for the loops listed below were demonstrated to be acceptable for the intended function of the instrument loops listed below.

1-81-068-344D
1-81-068-346E
1-81-068-348F
1-81-068-350G
2-81-068-344D
2-81-068-346E
2-81-068-348F
2-81-068-350G

☒ Microfilm and return calculation to Calculation Library. Address:OPS 1A-SQN ☐ Microfilm and destroy.
☐ Microfilm and return calculation to:

TVA 10697 (DNE-OA-6-86) QA Record DNE CALCULATIONS ORIGINAL A4

Title DEMONSTRATED ACCURACY CALCULATION RCP UNDERFREQUENCY RELAYS	Plant/Unit SQN / UNIT 2 + 1

Preparing Organization EEB-I&C	KEY NOUNS (Consult RIMS Descriptors List) I&C, INSTR, CALIBRATION, SETPOINT, ACCURACY
Branch/Project Identifiers SQN-EEB-MS-TI28-0076	Each time these calculations are issued, preparers must ensure that the original (RO) RIMS accession number is filled in.

	Rev	(for RIMS' use)	rims accession number
			~~B87 940627 008~~ 6/27/94
	~~R0~~		
Applicable Design Document(s) SQN-DC-V-27.9	R0	'94 0711G0001	B87 940628 001
	R1	'95 0320G0036	B87 950313 009
SAR Section(s): CH. 7, 8, 15 / UNID System(s): 068, 202, 250	R2		B87 980305 002

Revision 0	R1	R2	R3	Safety-related? Yes (✓) No ( )
ECN No. (or Indicate Not Applicable) DCN M-10396-A	DCN M10441A	NA	NA	Statement of Problem
Prepared *David E. Haun* DAVID E. HAUN	*[signature]*	*[signature]*	*[signature]*	Determine the accuracy of the subject instrument loop(s) and demonstrate that the accuracy is adequate for the intended purpose. Primary elements are located in a HARSH environment.
Checked *Alan P. Janney*	*Alan P. Janney*	*[signature]*	*[signature]*	Subject devices / /are /X/are not part of PAM.
Reviewed *MJ Armedroth*	*MJ Armedroth*	*[signature]*	*[signature]*	
Approved *[signature]*	*[signature]* FOR	*[signature]*	*[signature]*	RCP UNDERFREQUENCY RELAYS
Date 6/24/94	2/23/95	2/25/98	5/15/98	
USE FORM TVA 10534 IF MORE SPACE REQUIRED — List all pages added by this revision	SEE REV LOG	See Rev Log	See Rev Log	R1 Revises Entire Calculation R2 Revises Entire Calculation
List all pages deleted by this revision				
List all pages changed by this revision				

ABSTRACT [These calculations contain an unverified assumption(s) that must be verified later. Yes ( ) No (X)]

Calculations were performed to determine the accuracy of the subject instrument loop(s). The determined accuracies were compared to the required accuracies, setpoints, safety limits and/or operating limits and the accuracy for the loop(s) listed below were demonstrated to be acceptable for the intended function of the instrument loop(s). This calculation applies to the instrument loop(s) listed below:

Calculation Contains Special Requirements or Limiting Conditions
YES ☒ NO
DDM 11-4-97

2-81-068-344D
2-81-068-346E
2-81-068-348F
2-81-068-350G R2

1-81-068-344D
1-81-068-346E
1-81-068-348F
1-81-068-350G R1

( ) Microfilm and store calculations in RIMS Service Center — Microfilm and destroy. ( )
(X) Microfilm and return calculations to: ERCU — Address: ~~DSK 1A~~ - SQN OPS-1B

cc: RIMS, SL 25 C-K DNE1 - 2548W

TVA

Title: DEMONSTRATED ACCURACY CALCULATION
RCP UNDERFREQUENCY RELAYS SQN-EEB-MS-TI28-0076

REVISION LOG

Revision No.	DESCRIPTION OF REVISION	Date Approved
0	Initial Issue per DCN M-10396-A. This calculation consists of 141 pages. Legibility Evaluated and Accepted for Issue — C Butcher (LE Signature) — 6/24/94 (Date) FSAR Compliance Review — C Butcher (LE Signature) — 6/24/94 (Date) **NOTE** Upon the next major revision of this calculation, as-found data shall be retrieved from past performances of 2-SI-TFT-068-230.0 (Reference 25) in accordance with requirement 4 of this calculation. This data is to be evaluated to determine the amount of conservatism in the existing drift error analysis and to ensure compliance with the allowable value. - CHANGED CALCULATION NUMBER FROM SQN-EEB-MS-TI28-0075 TO SQN-EEB-MS-TI28-0076 AFTER INITIAL APPROVAL. David Hann (PREPARED) 6-27-94 (DATE) — C.R. Butcher / [illegible] (LE SIGNATURE) 6-27-94 (DATE)	

R2

TVA

Title: Demonstrated Accuracy Calculation
RCP Underfrequency Relays SQN-EEB-MS-TI28-0076

REVISION LOG

Revision No.	DESCRIPTION OF REVISION	Date Approved
1.	DCN M10441A adds the Unit 1 information for the UF relay replacement. The values used in the Unit 2 calculations are the same as the Unit 1 values, therefore the resulting setpoint and allowable values are the same for both units. This revision adds the Unit 1 references. The following documents were added for Unit 1: Attachment 3: Unit 1 Tech Spec Table 2.2.1 and section 3/4.3.1; FSAR Table 7.5.2-1 (FSAR Change 11-42) Attachment 5: 1,2-45N763-2 R9 (DCA from M10441A) Attachment 8: Excerpts from 1-SI-TDC-068-218.0 Attachment 9: Excerpts from 1-SI-IRT-099-400.0 Attachment 15: Excerpts from 1-SI-TFT-068-230.0 The Unit 2 Technical Specification Table 2.2.1 referenced in Revision 0 has been deleted from the Tech Specs and added to the FSAR. Therefore, this table has been deleted from this calculation and the appropriate FSAR change added. The information in the Attachments listed above has been reorganized as necessary to group like tables and information together and all the pages of the subject Attachments have been renumbered. Pages Deleted: FSAR Compliance Review R0 Independent Review form R0 Pages Added: Attachment 3 pages 1-3 were replaced by Attachment 3 pages 1-18. Attachment 5 page 1 of 1 was replaced by pages 1 and 2. Attachment 8 pages 1 thur 9 have been replaced by pages 1 thru 21. Attachment 9 page 1 of 1 has been replaced by Attachment 9 pages 1 and 2.	vdh 1-23-95 APS 1/30/95

TVA 10534 (EN DES-4-78)

TVA

REVISION LOG

Title: Demonstrated Accuracy Calculation
~~RCP Underfrequency Relays SQN-EEB-MS-TI28-0076~~

Revision No.	DESCRIPTION OF REVISION	Date Approved
1. (Cont.)	Attachment 15 pages 1 thru 10 have been replaced by pages 1 thru 20. Independent Review form R1 FSAR Compliance Review R1 Revision 1 Rev Log (2 pages) Revision 1 Reference Review page 6A Pages Revised: 3, 3A, 4 - 6, 9, 11, 14A, 14B, 21 Changed page number 6A to 6B Table of Contents Total Pages: 182 Legibility evaluated and accepted for issue: Barry G Kimsey 2/23/95	vdh 1-23-95 ART 1/23/95

B4

Title: DEMONSTRATED ACCURRACY CALCULATION RCP UNDERFREQUENCY RELAYS SQN-EEB-MS-TI28-0076		REVISION LOG
Revision No.	DESCRIPTION OF REVISION	Date Approved
2	This calculation has been revised for SQ962528PER corrective action to remove requirement number 4, which required the conservatism for relay drift value to be determined based on actual field data. Requirement 4 stated the functional test would be used to collect data, the functional test was not modified to take values so the 1 and 2-SI-TDC-068-218.0 surveillance values were used. This change also resolves the R0 revision log request. Pages Added: Attachment 17, 10B Pages Changed: Cover sheet, Independent Review, FSAR review, 1, 2, 3, 3A, 5, 6-6A, 14A, 27A, 11, 17, 10A, 27 Pages Removed: 6B Legibility Evaluated and Accepted for Issue. [signature] LE Signature 2/25/98 Date This calculation consists of ~~214~~ 215 pages. 2-25-98	/ /

Title: DEMONSTRATED ACCURRACY CALCULATION RCP UNDERFREQUENCY RELAYS SQN-EEB-MS-TI28-0076		REVISION LOG
Revision No.	**DESCRIPTION OF REVISION**	**Date Approved**
3	This calculation has been revised to establish the Tech Spec Allowable value and setpoint (no change to Calculated Av and setpoint used in setpoint and scaling documents). Also, removed old Tech Spec values. Pages Added: 24A, Rev log, Coversheet Pages Changed: Independent Review, FSAR review, 10, 24, 26, 27A Pages Removed: None Legibility Evaluated and Accepted for Issue. LE Signature Date 5/15/98 This calculation consists of ~~216~~ 217 pages. 5-15-98	/ /

<table>
<tr><th colspan="2">NPG CALCULATION RECORD OF REVISION</th></tr>
<tr><td colspan="2">CALCULATION IDENTIFIER SQN-EEB-MS-TI28-0076</td></tr>
<tr><td>Title</td><td>Demonstrated Accuracy Calculation
RCP UNDERFREQUENCY RELAYS SQN-EEB-MS-TI28-0076</td></tr>
<tr><td>Revision No.</td><td>DESCRIPTION OF REVISION</td></tr>
<tr><td>4</td><td>This calculation has been revised to correct the Tech Spec Allowable value to the Westinghouse Setpoint Methodology.

Added Pages: Rev Log
Pages Changed: Independent Review, FSAR Review, 10, 26, 27A
Pages Removed: 24A

Legibility Evaluated and Accepted for Issue.
J.H. Rinnie 11/9/98
Signature Date

This calculation consists of 217 sheets.</td></tr>
<tr><td>5</td><td>This calculation has been revised to support Tech Spec format change and TSFT-493 implementation for Tech Spec Table 2.2-1 item 16 'Underfrequency-Reactor Coolant Pumps'. This change will determine new component "As Found" calibration value using the square root sum of the squares (SRSS) methodology. The "As Left" value is not changed as it is based on a single term, Ab only. The analysis will maintain the existing Westinghouse methodology. This change will be incorporated by an EDC for the TSFT-493 changes.

Pages Added: Cover / CTS sheets, Att. 18
Pages Changed: Rev Log, Independent Review, 3A, 4, 5, 6, 10, 24, 26
Pages Removed: FSAR review

FSAR section(s): 7.2 and 15.3 were reviewed and are not impacted by the results of this calculation.

This calculation consists of 222 sheets.</td></tr>
<tr><td></td><td></td></tr>
</table>

NPG CALCULATION VERIFICATION FORM		
Calculation Identifier	SQN-EEB-MS-TI28-0076	Revision: 5

Method of design verification used:	
1. Design Review ☒	
2. Alternate Calculation ☐	Verifier: Navin S Shah Date: 1-22-14
3. Qualification Test ☐	

Comments:

All comments between myself and the preparer have been resolved. This calculation revision is found to be in compliance with NEDP-2. The FSAR compliance review has been performed. The methodology utilized in this calculation revision is commensurate with the guidelines provided in Branch Technical Instruction EEB-TI-28.

BRANCH/PROJECT IDENTIFIER SQN-EEB-MS-TI28-0076
DEMONSTRATED ACCURACY CALCULATION

T A B L E   O F   C O N T E N T S

P U R P O S E

The purpose of this calculation is a) to determine the accuracy of the instrumentation covered by this calculation, and b) to demonstrate that the instrumentation is sufficiently accurate to perform its intended function without safety or operational limits being exceeded.

A S S U M P T I O N S

✓ This calculation contains no assumptions.

___ The following assumptions were used in the performance of this calculation. These assumptions require further analysis. This calculation may require revision if the assumptions below are shown to be invalid.

Calculation REQUIREMENTS

R2

1) CALIBRATION FREQUENCY MUST NOT EXCEED 22.5 MONTHS (i.e. 18 MONTHS + 25% EXTENSION)

2) THE RELAY OPERATING ADJUSTMENT MUST HAVE 3 CONSECUTIVE INCORRECT CYCLES BEFORE TIMING BEGINS. NEW RELAY SETTING IS 10 CYCLES PER SHEET 22 OF THIS CALCULATION (EXCLUDING 3 CONSECUTIVE MEASUREMENT CYCLES). TIME DELAY COUNTER WILL RESET IF ONE CYCLE OCCURS ABOVE THE TRIP FREQUENCY.

3) RELAY ACCEPTANCE BAND AND M&TE = ±0.05 HZ.

(CONTINUED)

Entire page replaced by Revision 1. R1

REQUIREMENTS (Continued)

~~4) Reference 25, 1-SI-TFT-068-230.0 and 2-SI-TFT-068-230.0, shall be revised to record and document the actual as-found relay trip point during functional testing, while verifying that this trip point does not violate the allowable value of 56.3 Hz. This data will be evaluated upon the next major revision of this calculation, provided enough data exists, to determine the amount of conservatism in the existing drift error analysis and to ensure compliance with the Technical Specification allowable value. (See Sheet 14A)~~ R1 R2 R1

Special Requirements/Limiting Conditions None R2

BRANCH/PROJECT IDENTIFIER SQN-EEB-MS-TI28-0076
DEMONSTRATED ACCURACY CALCULATION

SOURCE OF DESIGN INPUT INFORMATION
(References)

REF	ATT	REFERENCE (RIMS #)	
1	1	DCN M10396A (Excerpts) DCN M10441A (Excerpts)	
2	2	SQN-DC-V-27.9 Rev. 4 (Excerpts)	
3	3	Technical Specifications Unit 1 Table 2.2-1 and Section 3/4.3.1 and Unit 2 Table 2.2-1 and Section 3/4.3.1; FSAR Table 7.2.1-5 (Change No. 11-42)	
4	-	SQN-EEB-PL&S Rev. 49	R5
5	4	ABB Technical Bulletin 7.4.6-1F and 7.4.1.7-5	
6	5	1,2-45N763-2 Rev. 6 and Rev. 9 (DCN M10396A and DCN M10441A DCA's respectively)	
7	-	ENVIRONMENTAL DESIGN CRITERIA SQN-DC-V-21.0 Rev 22	R5
8	6	RPS Circuit Protector UF Relays Setpoint and Scaling Calculation ED-Q2099-890137 Rev. 0 (RIMs # B22900315102)	
9	-	Calculation 72186RDM Rev. 0, Review of Electronic Components in a Radiation Environment <5 x 10^4 RADs (RIMs # B4360721903)	

REV 2 PREP GGM DATE 2/23/98 CHECK LMB DATE 2/23/98 SHEET 3A C/O 4
REV 5 PREP HDM DATE 1-16-14 CHECK NSS DATE 1-22-14 SHEET 3A C/O 4
REV ___ PREP ___ DATE ___ CHECK ___ DATE ___ SHEET ___ C/O ___

SOURCE OF DESIGN INPUT INFORMATION
(References)

REF	ATT	REFERENCE (RIMS #)	
10	-	Branch Technical Instruction, Setpoint Calculations, BTI-EEB-TI-28 Rev. 10	R5
11	7	ABB Seismic Qualification Report RC-5524-A	
12	8	RCP UF Relay Calibration 1-SI-TDC-068-218.0 and 2-SI-TDC-068-218.0 (Excerpts)	
13	9	Response Time Scheduling and Verification of Reactor Trip and Engineering Safety Feature Systems 1-SI-IRT-099-400.0 and 2-SI-IRT-099-400.0 (Acceptance criteria for RCP UF System).	
14	-	Calculation SQN-EQP-39 "Effects of Cable Insulation Resistance on Instrument Accuracy", Rev. 3 (RIMs # B87021011002)	R5
15	-	"6.9 kV RCP Relay Boards 10CFR50.49 Category and Operating Times", SQN-0SG7-0035 Rev. 5	
16	10	"Demonstrated Accuracy Calculation for RCP RF Relays (81)" WBPE0689009008 Rev. 3 (RIMs # B18940104255)	

SOURCE OF DESIGN INPUT INFORMATION
(References)

REF	ATT	REFERENCE (RIMS #)	
17	-	Instrument Setpoint, Scaling And Calibration Program, NPG-SPP-06.7	R5
18	-	NEDP-2	
19	-	NTB Calculation "40 Year Normal Operating Radiation Dose to RCP UV and UF Panels" SQNAPS3-093 Rev. 1 (RIMs # B87930121015)	
20	-	NTB Calculation "Interim Normal Operating Radiation Dose for Equipment Outside the Shield Building" SQNNAL3-017 Rev. 13 (RIMs # B87100322006)	R5
21	11	"Off-Frequency Turbine Operation Curve" TI-28 Curve Book Rev. 79	
22	12	0-AR-ECB6-B Rev. 1 (Excerpts for window 19)	
23	13	ABB Statement regarding relay drift and seismic report (RIMS # B27940607001)	
24	14	Report No. S298-RP-01 (Excerpts) Southern Testing Services "Nuclear Environmental and Seismic Qualification ABB 422B1295 Type 81 Relay" (RIMs # T49911120821)	

SOURCE OF DESIGN INPUT INFORMATION
(References)

REF	ATT	REFERENCE (RIMS #)	
25	15	Functional Test of RCP 1, 2, 3, 4 Underfrequency Relays 1-SI-TFT-068-230.0 and 2-SI-TFT-20.0 (Excerpts)	
26	16	Diversified Electronics Specification Sheet and Schematic for SP-0133 Underfrequency Relay	
27	17	Determination of relay drift value using field data.	
28	18	Proposed Technical Specification Change Request 11-08 cover sheet (Changes setpoint from 56 to 57 Hertz)	R5

DESIGN INPUT DATA

A) DEFINITIONS & ABBREVIATIONS

Aa	ACCIDENT ACCURACY-ACCURACY OF A DEVICE IN A HARSH ENVIRONMENT CAUSED BY AN ACCIDENT
Aas	COMBINED ACCIDENT AND SEISMIC ACCURACY
Ab	ACCEPTANCE BAND-THE RANGE OF VALUES AROUND THE CORRECT VALUE DETERMINED TO BE ACCEPTABLE WITHOUT RECALIBRATION
AB	AUXILIARY BOILER LINE BREAK
AF	AFW PUMP TURBINE STEAM SUPPLY LINE BREAK
An	NORMAL ACCURACY-ACCURACY OF A DEVICE LOCATED IN A ENVIRONMENT NOT AFFECTED BY AN ACCIDENT OR PRIOR TO AN ACCIDENT
As	POST SEISMIC ACCURACY
AV	ALLOWABLE VALUE-SAFETY LIMIT/REQUIRED ACCURACY MINUS NON-MEASUREABLES; USED FOR THE PURPOSE OF DETERMINING REPORTABILITY ONLY.
CV	CVCS LETDOWN LINE BREAK
De	DRIFT INACCURACY
HELB	HIGH ENERGY LINE BREAK
IAD	INTEGRATED ACCIDENT DOSE
ICRe	INPUT TEST INSTRUMENT READING INACCURACY
ICTe	INPUT TEST INSTRUMENT CALIBRATION INACCURACY
INDRe	INDICATOR READING ERROR
IRe	INACCURACY DUE TO CABLE LEAKAGE
L	LOSS OF COOLANT ACCIDENT
M	MARGIN-THE DIFFERENCE BETWEEN THE SAFETY LIMIT/OPERATING LIMIT AND THE NORMAL/ACCIDENT ACCURACY (Mn=NORMAL MARGIN Ma=ACCIDENT MARGIN)
N/A	NOT APPLICABLE
OCRe	OUTPUT TEST INSTRUMENT READING INACCURACY

DESIGN INPUT DATA

A) DEFINITIONS & ABBREVIATIONS CONTINUED

OCTe	OUTPUT TEST INSTRUMENT CALIBRATION INACCURACY
PRCSe	PROCESS UNCERTAINTY
PSEe	INACCURACY DUE TO POWER SUPPLY VARIATIONS
PV	PROCESS VALUE (ACTUAL)
RADe	INACCURACY DUE TO ACCIDENT RADIATION EXPOSURE
Re	REPEATABILITY INACCURACY
RH	RHR LINE BREAK
RNDe	NORMAL RADIATION DOSE BETWEEN CALIBRATION
Se	INACCURACY FOLLOWING A SEISMIC EVENT
SECu	SPAN ERROR CORRECTION UNCERTAINTY
SL	SAFETY LIMIT
SP	SETPOINT
SPEe	ZERO ERROR DUE TO EFFECTS OF OPERATING PRESSURE
TAe	TEMPERATURE EFFECT AT ACCIDENT CONDITIONS
TID	TOTAL 40 YEARS INTEGRATED DOSE
TNe	TEMPERATURE EFFECT IN THE MAXIMUM/MINIMUM ABNORMAL TEMPERATURE RANGES
TPRe	TEST POINT RESISTOR ERROR
WLe	WATERLEG UNCERTAINTY
WLHP	WATERLEG HIGH POINT
WLLP	WATERLEG LOW POINT
EMI	ELECTROMAGNETIC INTERFERENCE
RFI	RADIO FREQUENCY INTERFERENCE

DESIGN INPUT DATA

A) DEFINITIONS & ABBREVIATIONS CONTINUED

THE FOLLOWING DEFINITIONS ARE RELEVANT TO THE WESTINGHOUSE SETPOINT METHODOLOGY (CONTAINED AS PART OF REFERENCE 4):

CSA	=	Channel Statistical Allowance
PMA	=	Process Measurement Accuracy
PEA	=	Primary Element Accuracy
SCA	=	Sensor Calibration Accuracy
SMTE	=	Sensor Measurement and Test Equipment Accuracy
SD	=	Sensor Drift
STE	=	Sensor Temperature Effects
SPE	=	Sensor Pressure Effects
RCA	=	Rack Calibration Accuracy
RMTE	=	Rack Measurement and Test Equipment Accuracy
RCSA	=	Rack Comparator Setting Accuracy
RD	=	Rack Drift
RTE	=	Rack Temperature Effects
EA	=	Environmental Allowance
TA	=	TOTAL ALLOWANCE

$$CSA = EA + \{(PMA)^2+(PEA)^2+(SCA+SMTE+SD)^2+(STE)^2+(SPE)^2+(RCA+RMTE+RCSA+RD)^2+(RTE)^2\}^{1/2}$$

D E S I G N   I N P U T   D A T A

B) LOOP COMPONENT LIST

LOOP ID#	COMPONENT ID#
2-81-068-344D	2-81-068-344D
(RCP 1)	(RELAY PNL 1A)
2-81-068-346E	2-81-068-346E
(RCP 2)	(RELAY PNL 1B)
2-81-068-348F	2-81-068-348F
(RCP 3)	(RELAY PNL 2A)
2-81-068-350G	2-81-068-350G
(RCP 4)	(RELAY PNL 2B)
1-81-068-344D	1-81-068-344D
(RCP 1)	(Relay Pnl 1A)
1-81-068-346E	1-81-068-346E
(RCP 2)	(Relay Pnl 1B)
1-81-068-348F	1-81-068-348F
(RCP 3)	(Relay Pnl 2A)
1-81-068-350G	1-81-068-350G
(RCP 4)	(Relay Pnl 2B)

R1

DESIGN INPUT DATA
C) LOOP FUNCTION

Reactor coolant pump under frequency trip protects against low flow resulting from bus under frequency. This trip opens the reactor coolant pump (RCP) breakers and trips the reactor on under frequency condition. Two of four inputs detecting an under frequency condition will initiate a reactor trip above 10% power (Reference 2).

C) LOOP REQUIREMENTS AND LIMITS (BISTABLE)

RESPONSE TIME:	≤ 0.6 SECONDS (Reference 3) (See response time discussion on sheet 22) New relay setting = 10 cycles Note: Settings excludes 3 cycles measurement
SAFETY LIMITS:	55.8 Hertz (Reference 4) Lower Safety Limit
OPERATING LIMITS:	58.5 Hertz Upper Operational Limit (See sheet 10A)
SETPOINT:	57 Hertz (Established by this calculation)

R5

UPPER OPERATIONAL LIMIT

The primary concern with the RCP Underfrequency setpoint change is that there may exist a possibility of erroneous reactor trips due to normal frequency fluctuations. Based on the results of this calculation, the worst case inaccuracy would allow the relay to trip as high as 57 + 0.711 = 57.711 Hz. Although the setpoint could be as low as 56.55 (55.8 Hz safety limit + 0.711 Hz , rounded to the nearest 0.05 Hz for field attainability) without violating the safety limit, 57 Hz was selected to allow for any calibration frequency extensions that may be necessary in the future. In order to lower the setpoint below 56.55 Hz, coordination with Westinghouse would be required to determine the possibility of lowering the safety limit of 55.8 Hz and the impacts on their safety analysis.

The relay has a time delay function to help in preventing spurious trips. The timer begins when the relay detects three consecutive bad cycles. This time delay counter (set at 10 cycles) will fully reset if one good cycle occurs prior to the relay timing out and tripping. In order to meet response time requirements, analysis (see sheet 22) has determined total relay operating time to be 0.232 seconds (13 cycles including 3 cycles measurement).

In order to establish an upper operational limit, it is necessary to define normal occurring plant frequency fluctuations:

The operators receive a MCR alarm when frequency drops below 59.85 Hz. This provides 59.85 - 57.711 = 2.139 Hz of margin between alarm and worst case RCP reactor trip (See Reference 22).

The Off-Frequency Turbine Operation curve (Reference 21) allows for 50 minutes total accumulated time limit during unit life (40 yrs) as low as 58.5 Hz and 10 minutes as low as 56 Hz. This equates to 0.00024% (58.5 Hz) and 0.00005% (56 Hz) of the time. Normal continuous operation is shown to be 59.5 to 60.5 Hz. Per Reference 21, any frequency less than 59 Hz would be seen as vibration problems on the turbine and require the unit to be taken off-line unless load was critical.

Tech. Spec. section 3/4.3.8 requires 60 ± 1.2 Hz for Diesel Generator operation and Design Criteria SQN-DC-V-11.6 specifies 60 ± 0.6 Hz as the continuous operating frequency for the 120-V AC Vital Instrument power system. Although these systems are not directly related to the 6900-V Unit Boards supplying the RCP's, they are cited as examples of normal occurring plant frequencies.

Based on the above, an RCP Underfrequency setpoint of 57 Hz (57.711 maximum) is not within the region of normal occurring frequencies. The plant would be aware of frequency problems prior to reaching a frequency as low as 57 Hz. Therefore, it is highly unlikely that an erroneous trip will result from this setpoint. The Upper Operational Limit for the RCP Underfrequency Relays is established at 58.5 Hz. This value is considered conservative with regard to the normal occurring plant frequencies referenced above.

Prepared David E. Hamm — Signature 4-25-94 — Date

Checked Alan P. Dennis — Signature 4/25/94 — Date

M/N Concurrence — LE Signature 5/6/94 — Date

LOWER OPERATIONAL LIMIT (TIME)

N/A

The total system response time must be less ≤ 0.6 seconds (Ref. 3 and page 22 of this calculation). Therefore, lower operational limit time value less than 0.6 seconds is conservative and does not require analysis.

DESIGN INPUT DATA

D) COMPONENT DATA

VALID FOR DEVICES IDENTIFIED ON SHEET(S): 9

COMPONENT: RCP UF RELAYS CONTRACT #: SE-1899 REFERENCE #: 1

MANUFACTURER/MODEL: ASEA BROWN BOVERI / 422B1295 (TYPE 81) REFERENCE #: 1

INPUT RANGE & UNITS: 54-63 HZ. NOTE #: — REFERENCE #: 5

OUTPUT RANGE & UNITS: CONTACT OPEN NOTE #: — REFERENCE #: 6

OVERRANGE LIMIT: N/A NOTE #: — REFERENCE #: —

CALIBRATED SPAN: N/A NOTE #: — REFERENCE #: —

ROOM #/ PANEL #: ROOM A1 / PNLS 1A, 1B, 2A, 2B NOTE #: — REFERENCE #: 1,6

ELEVATION/ COORDINATE: EL. 714' / A3-Q A14-Q NOTE #: — REFERENCE #: 1,6,7 R1

MIN/MAX ABNORMAL TEMP: 50 / 110°F NOTE #: — REFERENCE #: 7

ACCIDENT TEMPERATURE: 115°F NOTE #: — REFERENCE #: 7

RADIATION TID (RAD): 1.8×10^3 NOTE #: 16 REFERENCE #:

RADIATION IAD (RAD): 5.45×10^2 NOTE #: — REFERENCE #: 7 R2

INSTRUMENT TAP INFORMATION REFERENCE #: N/A

WLHP TAP ELEVATION: N/A WLHP CONDENSING POT ELEVATION: N/A

WLLP TAP ELEVATION: N/A WLLP CONDENSING POT ELEVATION: N/A

EVENT/CATEGORY/OPERATING TIME: NOTE #: — REFERENCE #: 15

N/A / N/A / N/A

REV	PREP	DATE	CHECK	DATE	SHEET	C/O
0	DEH	3-14-94	APJ	3/15/94	11	12
1	VDH	1-23-95	APJ	1/23/95	11	12
2	JJM	2/23/98	JMO	2/23/98	11	12

DESIGN INPUT DATA
D) COMPONENT DATA CONTINUED

COMPONENT: RCP UF RELAYS (TRIP POINT)

PARAMETER	VALUE/UNITS	NOTE #	REFERENCE #
Re (RCA)	±0.008 HZ	1	5
De (RD)	±0.553 HZ	2	8
TNe (RTE)	±0.008 HZ	3	5,7
SPEe	N/A	4	—
SECu	N/A	4	—
PSEe	0	5	5
RNDe	N/A	6,16	9,7
TPRe	N/A	7	—
ICTe (RMTE)	±0.05 HZ	8	5,10,12
ICRe (RMTE)	±0.05 HZ	8	5,10,12
OCTe (RMTE)	N/A	9	6
OCRe (RMTE)	N/A	9	6
Ab (RCSA)	±0.05 HZ	14	5,10,12
Se	±0.2 HZ	13	11,24
RADe	N/A	6	9,7
TAe	N/A	3	1,5,7
WLe	N/A	10	—
PRCSe	N/A	11	—
INDRe	0	12	—
IRe	NEGLIGIBLE	15	7,14
EMI/RFI (ERRORS)	NEGLIGIBLE	17	24

REV 0	PREP DEH	DATE 6-7-94	CHECK APJ	DATE 6/7/94	SHEET 12	C/O 13
REV 1	PREP	DATE	CHECK	DATE	SHEET	C/O
REV 2	PREP	DATE	CHECK	DATE	SHEET	C/O

DESIGN INPUT DATA

D) COMPONENT DATA CONTINUED

COMPONENT: RCP UF RELAYS (TIMER)

PARAMETER	VALUE/UNITS	NOTE #	REFERENCE #
Re (RCA)	± 1 CYCLE	18	5
De (RD)	± 1 CYCLE	19	5
TNe (RTE)	± 1 CYCLE	20	5,7
SPEe	N/A	4	—
SECu	N/A	4	—
PSEe	0	5	5
RNDe	N/A	6,16	9,7
TPRe	N/A	7	—
ICTe (RMTE)	± 1 CYCLE	21	5,10
ICRe (RMTE)	± 1 CYCLE	21	5,10
OCTe (RMTE)	N/A	9	6
OCRe (RMTE)	N/A	9	6
Ab (RCSA)	± 1 CYCLE	22	5,10
Se	± 0.5 CYCLES	23	11,24
RADe	N/A	6	9,7
TAe	N/A	20	5,7
WLe	N/A	10	—
PRCSe	N/A	11	—
INDRe	0	12	—
IRe	NEGLIGIBLE	15	7,14
EMI/RFI (ERRORS)	NEGLIGIBLE	24	24

DESIGN INPUT DATA

E) COMPONENT DATA NOTES

COMPONENT: RCP UF RELAYS

#	NOTE
1	PER REFERENCE 5, THE RELAY HAS A REFERENCE ACCURACY OF ±0.008 HZ. THEREFORE, Rc = ±0.008 HZ.
2	THERE IS NO AVAILABLE INFORMATION REGARDING DRIFT ERROR FOR THE SUBJECT RELAY, HOWEVER, REFERENCE 8 ANALYZES FIELD DATA TO DETERMINE DRIFT ERROR FOR UNDERFREQUENCY RELAYS MANUFACTURED BY DIVERSIFIED ELECTRONICS / MODEL SP-0133. REFERENCE 8 DEFINES A DRIFT ERROR OF ±0.553 HZ AT A 95% CONFIDENCE LEVEL AS BEING ACCEPTABLE FOR A 22.5 MONTH CALIBRATION FREQUENCY. THIS DRIFT ERROR ALSO INCLUDES THE RELAY REFERENCE ACCURACY AND NORMAL TEMPERATURE EFFECTS. IN ACCORDANCE WITH THE METHODOLOGY OF REFERENCE 10 - SECTION 4.3.3.3, THIS DRIFT ERROR IS USED IN THIS CALCULATION ON THE BASIS OF SIMILARITY. BOTH RELAYS HAVE SIMILAR SOLID STATE CIRCUITRY IN CONSTRUCTION, UTILIZE DIGITAL COUNTING TECHNIQUES TO MEASURE FREQUENCY AND HAVE EXTREMELY STABLE CRYSTAL OSCILLATORS TO PROVIDE TIME BASE MEASUREMENTS. THIS METHODOLOGY IS CONSIDERED CONSERVATIVE SINCE THIS CALCULATION DOES NOT INCLUDE RELAY REFERENCE ACCURACY AND NORMAL TEMPERATURE EFFECTS IN THE DRIFT ERROR. BASED ON THE ABOVE, De = ±0.553 HZ. (SEE REFERENCES 5 AND 26 FOR RELAY SCHEMATICS) (CONTINUED)

DESIGN INPUT DATA
E) COMPONENT DATA NOTES

COMPONENT: RCP UF RELAYS

#	NOTE
2 (CONT)	ADDITIONAL CONSERVATISM IN USING A DRIFT ERROR OF THIS MAGNITUDE LIES IN THE FACT THAT THE WESTINGHOUSE RELAYS BEING REPLACED HAVE A SPECIFIED DRIFT ERROR OF $(\pm 1\%\,CS)(6\,HZ) = \pm 0.06\,HZ$ (REFERENCE 4) AND ARE CONSIDERED TO BE AN OLDER, OBSOLETE MODEL WITH LESS RELIABLE PERFORMANCE CHARACTERISTICS. THE NEW RELAYS BEING OF DIGITAL SOLID-STATE CONSTRUCTION WOULD HAVE TO EXHIBIT A DRIFT ERROR OF $\left(\frac{0.553}{63-54}\right)(100\%) = 6.1\%\,CS$ BEFORE EXCEEDING THE ± 0.553 HZ USED IN THIS ANALYSIS. THIS EQUATES TO $\left(\frac{0.553}{0.008}\right) = 69$ TIMES THE MANUFACTURER SPECIFIED ACCURACY OF THE RELAY. FURTHERMORE, REFERENCE 23 STATES THAT "USING A SETPOINT DRIFT OF 0.5 HZ OVER A 22.5 MONTH PERIOD IS TOO CONSERVATIVE. THIS RELAY EMPLOYS A VERY STABLE CRYSTAL CONTROLLED OSCILLATOR AS THE FREQUENCY REFERENCE. A CHANGE IN CHARACTERISTICS OF THAT MAGNITUDE WOULD BE AN INDICATION OF A "DEFECTIVE" RELAY. 0.1 HZ COULD BE USED AND STILL BE VERY CONSERVATIVE." BASED ON THE ABOVE, A DRIFT ERROR OF ± 0.553 HZ IS HIGHLY CONSERVATIVE AND ADEQUATE JUSTIFICATION EXISTS FOR ITS USE IN THIS CALCULATION.

(CONTINUED)

DESIGN INPUT DATA
E) COMPONENT DATA NOTES

COMPONENT: RCP UF RELAYS

#	NOTE
2 (Cont.)	Attachment 17 is a determination of the relay drift value in Hertz over an eighteen month period. This data is based on 4 relays per unit. The drift value determined for 22.5 months is ± 0.057 Hertz and is less than the value used is this calculation ± 0.553 Hertz. The difference between the two values is the amount of conservatism in this calculation. This value was determined for SQ962528PER corrective action, which was written to remove calculation requirement number 4.

R2

DESIGN INPUT DATA

E) COMPONENT DATA NOTES

COMPONENT: RCP UF RELAYS

#	NOTE
3	THE SUBJECT RELAY IS LOCATED IN AN ENVIRONMENT WHERE MIN./MAX. ABNORMAL TEMPERATURES 50°F / 110°F AND ACCIDENT TEMPERATURE 115°F ARE WITHIN THE MANUFACTURER SPECIFIED RELAY ACCURACY RANGE OF -20°C TO +55°C (-4°F TO +131°F) PER REFERENCE 5. THEREFORE, TNc = Re = ± 0.008 Hz. PER REFERENCE 1 - SAFETY ASSESSMENT, THESE COMPONENTS ARE NOT REQUIRED TO OPERATE TO MITIGATE AN ACCIDENT, THEREFORE, TAc = N/A.
4	THIS DEVICE DOES NOT MEASURE PRESSURE, THEREFORE, SPEc & SECu = N/A.
5	THE RELAY CIRCUIT POWER SUPPLY PROVIDED BY THE MANUFACTURER HAS AN ALLOWABLE VARIATION OF 24-32 VDC (REFERENCES 1, 5), HOWEVER, THERE IS NO EFFECT ON FREQUENCY FROM THIS VOLTAGE VARIATION DUE TO THE DIGITAL COUNTING TECHNIQUE. THEREFORE, PSEc = 0. R1

REV 0	PREP DEH	DATE 6-7-94	CHECK APJ	DATE 6/7/94	SHEET 14B C/O 15
REV 1	PREP vdh	DATE 1-23-95	CHECK APJ	DATE 1/23/96	SHEET 14B C/O 15
REV 2	PREP	DATE	CHECK	DATE	SHEET C/O

DESIGN INPUT DATA
E) COMPONENT DATA NOTES

COMPONENT: RCP UF RELAYS

#	NOTE
6	THE DEVICE IS LOCATED IN AN ENVIRONMENT WHERE THE TOTAL INTEGRATED DOSE (TID) AND INTEGRATED ACCIDENT DOSE (IAD) DO NOT EXCEED 5X10^4 RADS OVER THE DEVICE'S CALIBRATION INTERVAL OF 22.5 MONTHS. BASED ON INFORMATION IN REFERENCE 9, RADIATION EFFECTS NEED NOT BE CONSIDERED. THEREFORE, RNDc & RADe = N/A.
7	THERE IS NO TEST POINT RESISTOR IN THE MEASURING CIRCUIT, THEREFORE, TPRe = N/A.
8	PER REFERENCE 10, CALIBRATION EQUIPMENT SHALL HAVE AN ACCURACY BETTER THAN OR EQUAL TO THE DEVICE BEING CALIBRATED. REFERENCE 5, DEFINES THE MINIMUM INCREMENT THAT CAN BE SET AT THE OPERATING POINT AS 0.05 HZ. THEREFORE, IN ORDER TO ENSURE A FIELD ATTAINABLE VALUE AND MAINTAIN A ONE TO ONE RATIO WITH THE ACCEPTANCE BAND, ICTe & ICRe = ± 0.05 Hz. (SEE NOTE 14)
9	THE OUTPUT OF THE DEVICE IS CONTACT OPEN. NO CALIBRATION ERRORS ARE ASSOCIATED WITH IT, THEREFORE, OCTe & OCRe = N/A.

REV 0	PREP DEH	DATE 3-4-94	CHECK APJ	DATE 3/15/94	SHEET 15 C/O 16
REV 1	PREP	DATE	CHECK	DATE	SHEET C/O
REV 2	PREP	DATE	CHECK	DATE	SHEET C/O

DESIGN INPUT DATA

E) COMPONENT DATA NOTES

COMPONENT: RCP UF RELAYS

#	NOTE
10	THESE RELAYS HAVE NO WATERLEG, THEREFORE, WLc = N/A.
11	THERE IS NO PROCESS UNCERTAINTY ASSOCIATED WITH THIS DEVICE. FREQUENCY IS MEASURED DIRECTLY, THEREFORE, PRCSc = N/A.
12	THE ONLY INDICATOR IS THE ADJUSTMENT SCREWS DURING CALIBRATION. THE ACTUAL FREQUENCY AND NOT THE ADJUSTMENT SCREWS WILL BE USED, THEREFORE, INDRc = 0.
13	PER VENDOR SEISMIC QUALIFICATION REPORT (REFERENCE 11), NO FRAGILITY OR MIS-OPERATION WAS FOUND WITHIN THE 6g ZPA LIMITATION OF THE ACTUATOR. ADDITIONALLY, TEST RESULTS SHOW THAT RELAY RESPONSE WAS NORMAL WITH NO CONTACT CHATTER OR DAMAGE DURING ANY PHASE OF TESTING. PER REFERENCE 23, BECAUSE THE ENTIRE MEASURING CIRCUITRY OF THE RELAY IS SOLID-STATE, IT IS THE VENDOR'S OPINION THAT THE RELAY WOULD HAVE MAINTAINED ITS PUBLISHED ACCURACY OF ±0.008 HZ DURING THE VIBRATION AND A SEISMIC ERROR OF 0.1 HZ WOULD BE VERY CONSERVATIVE. HOWEVER, NO ATTEMPT WAS MADE TO DETERMINE THE RELAY'S OPERATING POINT WITH THE HIGH ACCURACY NECESSARY TO DOCUMENT AN ERROR AS SMALL AS ±0.008HZ. (CONTINUED)

DESIGN INPUT DATA

E) COMPONENT DATA NOTES

COMPONENT: RCP UF RELAYS

#	NOTE
13 (CONT)	REFERENCE 24, SEISMIC QUALIFICATION OF ABB 422B1295 RELAY, RECORDS TEST DATA BEFORE, DURING AND AFTER THE SEISMIC TEST. RESULTS INDICATE THAT THE RELAY MAINTAINED STRUCTURAL INTEGRITY, PROPER OPERATION, ELECTRICAL CONTINUITY AND NO CONTACT CHATTER. THIS REPORT DOCUMENTS A TRIP POINT BETWEEN 56.8 TO 57 HZ BOTH BEFORE AND AFTER THE TEST WITH PROPER OPERATION AT THE TRIP POINT DURING TESTING. THERE WAS NO DOCUMENTED CHANGE IN THE TRIP POINT BEFORE, DURING OR AFTER THE TEST, HOWEVER THE TRIP POINT WAS NOT DOCUMENTED WITH AN ACCURACY HIGH ENOUGH TO DETECT SMALL ERRORS. FOR THE PURPOSE OF CONSERVATISM THE SEISMIC ERROR SHALL EQUAL THE DEVIATION BY WHICH THE TRIP POINT WAS RECORDED. (57 − 56.8 = 0.2 HZ). THEREFORE, $Se = \pm 0.2$ HZ.
14	PER REFERENCE 10, THE ACCEPTANCE BAND SHOULD BE ESTABLISHED GREATER THAN OR EQUAL TO THE DEVICE REFERENCE ACCURACY (±0.008 HZ), HOWEVER, REFERENCE 5 DEFINES THE MINIMUM INCREMENT THAT CAN BE SET AT THE OPERATING POINT AS 0.05 HZ. THEREFORE, TO ENSURE A FIELD ATTAINABLE VALUE, $Ab = \pm 0.05$ HZ.

DESIGN INPUT DATA

E) COMPONENT DATA NOTES

COMPONENT: RCP UF RELAYS

#	NOTE
15	PER REFERENCE 14, CABLES ROUTED THROUGH AREAS WHICH HAVE ACCIDENT TEMPERATURES LESS THAN OR EQUAL TO 231°F HAVE NEGLIGIBLE EFFECTS DUE TO LOWER INSULATION RESISTANCE. THE SUBJECT DEVICE EXPERIENCES A MAXIMUM TEMPERATURE OF 115°F (REFERENCE 7), WHICH IS WELL BENEATH 231°F AND WITHIN THE MANUFACTURER SPECIFIED RELAY ACCURACY RANGE OF -4°F TO +131°F. (REFERENCE 5). BASED ON THIS INFORMATION, IRe = NEGLIGIBLE
16	REFERENCE 7 LISTS A TOTAL INTEGRATED DOSE OF (TID) = 1.8×10^3 RADs. R2
17	PER REFERENCE 24, THE EMI/RFI TESTING PERFORMED REVEALED PROPER OPERATION WITH NO FAILURES AND NO LOSS OF OPERABILITY AT ANY TIME BEFORE, DURING AND AFTER TESTING. TEST RESULTS SHOW THAT THE RELAY TRIP POINT REMAINED UNCHANGED BEFORE, DURING AND AFTER TESTING. THEREFORE, EMI/RFI ERRORS ARE DEEMED NEGLIGIBLE.

D E S I G N   I N P U T   D A T A

E) COMPONENT DATA NOTES

COMPONENT: RCP UF RELAYS

#	NOTE
18	PER REFERENCE 5, THE RELAY TIMER HAS A TYPICAL ACCURACY OF ±1 CYCLE. THEREFORE, Re = ±1 CYCLE.
19	PER REFERENCE 5 (ATTACHMENT 4 - SHEET 19), AFTER THE RELAY HAS BEEN PROPERLY SET BY TEST, THE ACCURACY AND REPEATABILITY WOULD STAY WITHIN ±1 CYCLE FOR 2 YEAR INTERVALS OR LONGER. THEREFORE, De = ±1 CYCLE (CONSERVATIVELY).
20	THE SUBJECT RELAY IS LOCATED IN AN ENVIRONMENT WHERE MIN/MAX ABNORMAL TEMPERATURES 50°F/110°F AND ACCIDENT TEMPERATURE 115°F ARE WITHIN THE MANUFACTURER SPECIFIED RELAY ACCURACY RANGE OF -20°C TO +55°C (-4°F TO +131°F) PER REFERENCE 5. THEREFORE, TNe = Re = ±1 CYCLE. PER REFERENCE 1 - SAFETY ASSESSMENT, THESE COMPONENTS ARE NOT REQUIRED TO OPERATE TO MITIGATE AN ACCIDENT. THEREFORE, TAe = N/A.
21	PER REFERENCE 10, CALIBRATION EQUIPMENT SHALL HAVE AN ACCURACY BETTER THAN OR EQUAL TO THE DEVICE BEING CALIBRATED. THEREFORE, ICTe AND ICRe = ±1 CYCLE.

D E S I G N   I N P U T   D A T A
E) COMPONENT DATA NOTES

COMPONENT: RCP UF RELAYS

#	NOTE
22	PER REFERENCE 10, THE ACCEPTANCE BAND SHOULD BE ESTABLISHED GREATER THAN OR EQUAL TO THE DEVICE REFERENCE ACCURACY. THEREFORE, Ab = ± 1 CYCLE THIS VALUE IS FIELD ATTAINABLE SINCE THE TIMER IS ADJUSTABLE TO 1 CYCLE INCREMENTS. (REFERENCE 5).
23	REFERENCE 24, SEISMIC QUALIFICATION OF ABB 422B1295 RELAY, RECORDS TEST DATA BEFORE, DURING AND AFTER THE SEISMIC TEST. RESULTS INDICATE THAT THE RELAY MAINTAINED STRUCTURAL INTEGRITY, PROPER OPERATION, ELECTRICAL CONTINUITY AND NO CONTACT CHATTER. THIS REPORT DOCUMENTS TIMER ACTIVATION OF 59.5 CYCLES BEFORE THE TEST AND 60 CYCLES AFTER THE TEST FOR A TOTAL POSSIBLE SHIFT OF 0.5 CYCLES. THEREFORE, FOR THE PURPOSE OF CONSERVATISM, Se = ± 0.5 CYCLES

BRANCH/PROJECT IDENTIFIER SQN-EEB-MS-TI28-0075
DEMONSTRATED ACCURACY CALCULATION

DESIGN INPUT DATA
E) COMPONENT DATA NOTES

COMPONENT: RCP UF RELAYS

#	NOTE
24	PER REFERENCE 24, THE EMI/RFI TESTING PERFORMED REVEALED PROPER OPERATION WITH NO FAILURES AND NO LOSS OF OPERABILITY AT ANY TIME BEFORE, DURING AND AFTER TESTING. THIS REPORT DOCUMENTS TIMER ACTIVATION OF 54 CYCLES BOTH BEFORE AND AFTER THE TEST. NO SHIFT IN TIME DELAY WAS DOCUMENTED AS A RESULT OF THIS TEST. THEREFORE, EMI/RFI ERRORS ARE DEEMED NEGLIGIBLE.

REV 0	PREP DEH	DATE 6-22-94	CHECK ART	DATE 6/22/94	SHEET 18B	C/O 18C
REV 1	PREP	DATE	CHECK	DATE	SHEET	C/O
REV 2	PREP	DATE	CHECK	DATE	SHEET	C/O

COMPUTATIONS/ANALYSES

A) PROCESS UNCERTAINTY DISCUSSION/CALCULATION

✓ NO PROCESS UNCERTAINTY EXISTS FOR THIS CALCULATION BECAUSE:

- ✓ THE MEASURED PARAMETER IS THE PARAMETER OF CONCERN; THEREFORE, PROCESS VARIATIONS ARE ACCOUNTED FOR IN THE DETERMINATION OF SAFETY AND/OR OPERATIONAL LIMITS.
- ___ OTHER: SEE DISCUSSION BELOW.

___ PROCESS UNCERTAINTY DOES EXIST AND IS DETAILED IN THE FOLLOWING DISCUSSION/CALCULATION.

COMPUTATIONS/ANALYSES

B) WATERLEG UNCERTAINTY DISCUSSION/CALCULATION

✓ APPLICABLE TO ALL LOOPS LISTED ON SHEET 9

___ APPLICABLE ONLY TO LOOPS: ___

✓ WATERLEG UNCERTAINTY IS NOT CONSIDERED FOR THE CALCULATION BECAUSE:

✓ NO WATERLEG EXISTS FOR THIS CALCULATION.

___ THE EFFECTS OF WATERLEG CHANGES ARE INSIGNIFICANT. SEE DISCUSSION/CALCULATION BELOW.

___ OTHER. SEE DISCUSSION/CALCULATION BELOW.

___ A WATERLEG UNCERTAINTY DOES EXIST FOR THIS LOOP. SEE CALCULATION/DISCUSSION BELOW.

___ SEE SENSING LINE DIAGRAM ON SHEET ___ OF THIS CALCULATION.

COMPUTATIONS/ANALYSES

C) ACCURACY DISCUSSION

✓ The accuracy of this instrument for normal, post seismic and accident conditions will be determined by considering the parameters tabulated in the design input section of this calculation.

The accuracy calculation for seismic (As) is bounding for all seismic events.

✓ The square root of the sum of the squares method shall be used in this calculation for calculating accuracy since the factors affecting accuracy are independent variables.

✓ Bi-directional errors and uni-directional errors will be combined in a manner such that the sum of the positive uni-directional errors will be added to the positive portion of the bi-directional error (obtained from the square root of the sum of the squares method), and the sum of the negative uni-directional errors will be added to the negative portion of the bi-directional error.

This method is conservative. Therefore, it will be used in this calculation.

Example: (+/-) 10 = bi-directional error
+5 = first uni-directional error
-2 = second uni-directional error

Total Error = (+10 +5) to (-10 -2) = +15 to -12

✓ other: PARAMETERS ARE COMBINED BY THE METHODOLOGY EMPLOYED IN WESTINGHOUSE SETPOINT METHODOLOGY (CONTAINED IN REFERENCE 4) TO ENSURE CONSERVATIVE CALCULATION ANALYSIS CONSISTENT WITH THAT WHICH EXISTS IN REF. 4 FOR THE PREVIOUSLY INSTALLED RELAYS.

For the purpose of this calculation, accuracy is defined as the range of actual process values that may exist for a given indicated or bistable trip value, e.g. an accuracy of +10 psig to -5 psig means that for a indicated or bistable trip value of 100 psig, the actual process pressure may be anywhere between 95 and 110 psig.

All system analysis based on or using accuracy values from this calculation should take into account the fact that operator action and/or automatic initiations may occur at a process value differing from the indicated or setpoint values by the amount of the calculated inaccuracies.

COMPUTATIONS/ANALYSES

C) ACCURACY DISCUSSION (CONTINUED)

✓ THE FOLLOWING DEVICES ARE CALIBRATED INDIVIDUALLY. THEIR ACCEPTANCE BANDS ARE AS FOLLOWS:

DEVICE	Ab	REFERENCE
2-81-068-344D	±0.05 Hz	5,10,12
2-81-068-346E	↓	↓
2-81-068-348F	↓	↓
2-81-068-350G	↓	↓
1-81-068-344D	±0.05 Hz	5,10,12
1-81-068-346E	↓	↓
1-81-068-348F	↓	↓
1-81-068-350G	↓	↓

R1

N/A THE FOLLOWING DEVICES ARE CALIBRATED TOGETHER. THE ACCEPTANCE BAND FOR THE COMBINATION OF THESE DEVICES IS AS FOLLOWS:

DEVICE	Ab	REFERENCE

RESPONSE TIME DISCUSSION

Per Reference 3, total system response time must be $\leq$ 0.6 seconds. This is verified by reference 13 which divides total system response time into three categories:

Rack Time with an acceptance criteria of 0.435 seconds, SSPS logic time with an acceptance criteria of 0.006 seconds and RX Trip time with an acceptance criteria of 0.150 seconds. Combining these three times yields 0.591 seconds, which is less than the required 0.6 seconds. Rack Time consists of the response time of the underfrequency relay and the SSPS input relay. Per reference 13, the SSPS input relays have an acceptance criteria of 0.05 seconds. Therefore, the underfrequency relay must have a response time less than (0.435 - 0.05) = 0.385 seconds to comply with overall system response time requirements.

Reference 12 calibrates and tests response time for the underfrequency relays. If the relay response time exceeds 300 ms an engineering evaluation of total system response time is performed to determine if 0.6 seconds has been exceeded.

Per reference 5, the relay experiences 3 cycles of measurement in addition to its setting (timer begins after relay has detected 3 "bad" cycles). In addition, the relay has a worst-case (seismic) inaccuracy of ± 5.12 cycles associated with its setting and a reference accuracy of ± 1 cycle per this calculation.

Based on the above, a relay setting of 10 cycles yields the following including worst-case (seismic) inaccuracies):

3 cycles measurement + 10 ± 5.12 cycles setting = 13 ± 5.12 cycles total (7.88 - 18.12 cycles)

1/57 Hz = 0.0175 seconds/cycle

7.88 cycles (0.0175 seconds/cycle) = 0.138 seconds

13 cycles (0.0175 seconds/cycle) = 0.228 seconds

18.12 cycles (0.0175 seconds/cycle) = 0.318 seconds

This corresponds to a worst case (seismic) relay response time between 0.138 and 0.318 seconds at a setting of 0.228 seconds.

Using the reference accuracy of ± 1 cycle at a setting of 10 cycles yields the following:

3 cycles measurement + 10 ± 1 cycle setting = 13 ± 1 cycles total (12 - 14 cycles)

12 cycles (0.0175 seconds/cycle) = 0.210 seconds

14 cycles (0.0175 seconds/cycle) = 0.246 seconds

This corresponds to a typical (as-left) relay response time between 0.210 and 0.246 seconds at a setting of 0.228 seconds.

The worst-case response time of 0.318 seconds is within the 0.385 second requirement derived above.

Based on this analysis, a relay setting of 10 cycles is considered acceptable with regard to overall system response time requirements.

COMPUTATIONS/ANALYSES
D) ACCURACY CALCULATION INDEX

RCP UNDERFREQUENCY RELAYS

I. (setpoint)	A.	Re (RCA)
	B.	De (RD)
	C.	TNe (RTE)
	D.	ICTe (RMTE)
	E.	ICRe (RMTE)
	F.	Ab (RCSA)
	G.	Se
II. (setpoint)	A.	An (CSA)
	B.	Aa
	C.	As
	D.	Aas
	E.	Anf
	F.	Afc
	G.	Alc
	H.	AV
III. (timer)	A.	Re (RCA)
	B.	De (RD)
	C.	TNe (RTE)
	D.	ICTe (RMTE)
	E.	ICRe (RMTE)
	F.	Ab (RCSA)
	G.	Se
IV. (timer)	A.	An (CSA)
	B.	Aa
	C.	As
	D.	Aas
	E.	Anf
	F.	Afc
	G.	Alc
	H.	AV

COMPUTATIONAL / ANALYSES
D) ACCURACY CALCULATION

RCP UNDER FREQUENCY RELAYS

I. (setpoint)

A.	Re (RCA)	=	± 0.008 Hz
B.	De (RD)	=	± 0.553 Hz
C.	TNe (RTE)	=	± 0.008 Hz
D.	ICTe (RMTE)	=	± 0.05 Hz
E.	ICRe (RMTE)	=	± 0.05 Hz
F.	Ab (RCSA)	=	± 0.05 Hz
G.	Se	=	± 0.2 Hz

II. (setpoint) Westinghouse Setpoint Methodology (contained as part of Reference 4) is used to combine error components for this device. See accuracy discussion on sheet 20. There is no sensor associated with this channel; therefore, Sensor accuracy is not applicable. Per Westinghouse Setpoint Methodology, the total statistical error allowance for this channel is as follows:

A. An = CSA $= \sqrt{[(RCA)+(RMTE)+(RD)+(RCSA)]^2+[(RTE)]^2}$

$= \sqrt{[(0.008)+(0.05+0.05)+(.553)+(0.05)]^2+[(0.008)]^2}$

$= \sqrt{[(0.711)]^2+[(0.008)]^2} = \pm 0.711$ Hz

B. As $= \sqrt{[(An)]^2+[(Se)]^2} = \sqrt{[(0.711)]^2+[(0.2)]^2} = \pm 0.739$ Hz

C. Aa = An = ± 0.711 Hz

D. Aas = As = ± 0.739 Hz

E. Anf $= \sqrt{[(RCA)]^2+[(RMTE)]^2+[(RD)]^2+[(RCSA)]^2}$

$RMTE = \sqrt{(ICTe)^2+(ICRe)^2}$ R5

$RMTE = \sqrt{(0.05)^2+(0.05)^2} = 0.07071$ Hz

$= \sqrt{(0.008)^2+(0.07071)^2+(0.553)^2+(0.05)^2} = \pm 0.56$ Hz

F. Afc = Anf = ± 0.56 Hz

G. Alc = Ab = ± 0.05 Hz

H. Per Westinghouse Setpoint Methodology, to provide a conservative trigger value the difference between the STS trip setpoint and the STS Allowable Value is determined by two methods. The first is simply the values used in the statistical calculation, T_1 = (RD) + (RCA) + (RMTE) + (RCSA). The second extracts these values from the calculations and compares these numbers statistically against the total allowance as follows:
$T_2 = TA - \{(PMA)^2+(PEA)^2+(SCA+SMTE+SD)^2+(SPE)^2+(STE)^2+(RTE)^2\}^{1/2} - EA$. The lowest of the two values is used for the trigger value.

$T_1 = (0.553) + (0.008) + (0.05 + 0.05) + (0.05) = 0.711$ Hz

Total Allowance (TA) = Setpoint - Value used in the analysis for Reactor Trip Safety Limit (Ref. 4)

TA = 57 Hz - 55.8 Hz = 1.2 Hz

Note: all terms except TA and RTE are not applicable in T_2

$T_2 = 1.2 - [(0.008)^2]^{1/2} = 1.192$ Hz

The lowest of the two trigger values is 0.711 Hz, therefore,
Allowable Value = Setpoint - 0.711 Hz = 56.289 Hz ≈ 56.3 Hz

COMPUTATIONS/ANALYSES
D) ACCURACY CALCULATIONS

RCP UNDERFREQUENCY RELAYS

III. (timer)	A.	Re (RCA)	=	± 1 cycle
	B.	De (RD)	=	± 1 cycle
	C.	TNe (RTE)	=	± 1 cycle
	D.	ICTe (RMTE)	=	± 1 cycle
	E.	ICRe (RMTE)	=	± 1 cycle
	F.	Ab (RCSA)	=	± 1 cycle
	G.	Se	=	± 0.5 cycles

IV. (timer) Westinghouse Setpoint Methodology (contained as part of Reference 4) is used to combine error components for this device. See accuracy discussion on sheet 20. There is no sensor associated with this channel, therefore, Sensor accuracy is not applicable. Per Westinghouse Setpoint Methodology, the total statistical error allowance for this channel is as follows:

A. An = CSA

$$= \sqrt{[(RCA) + (RMTE) + (RD) + (RCSA)]^2 + [(RTE)]^2}$$

$$= \sqrt{[(1) + (1 + 1) + (1) + (1)]^2 + [(1)]^2}$$

$$= \sqrt{[5]^2 + [1]^2} = \pm 5.099 \approx \pm 5.10 \text{ cycles}$$

$$= \pm 5.10 \text{ cycles } (1/57 \text{ seconds/cycle}) = \pm 0.089 \text{ seconds}$$

B. As $= \sqrt{An^2 + Se^2} = \sqrt{5.1^2 + 0.5^2} = \pm 5.12$ cycles $= \pm 0.090$ seconds

C.	Aa	= An	= ± 5.10 cycles	= ± 0.089 seconds
D.	Aas	= As	= ± 5.12 cycles	= ± 0.090 seconds
E.	Anf	= An	= ± 5.10 cycles	= ± 0.089 seconds
F.	Afc	= Anf	= ± 5.10 cycles	= ± 0.089 seconds
G.	Alc	= Ab	= ± 1 cycle	= ± 0.018 seconds

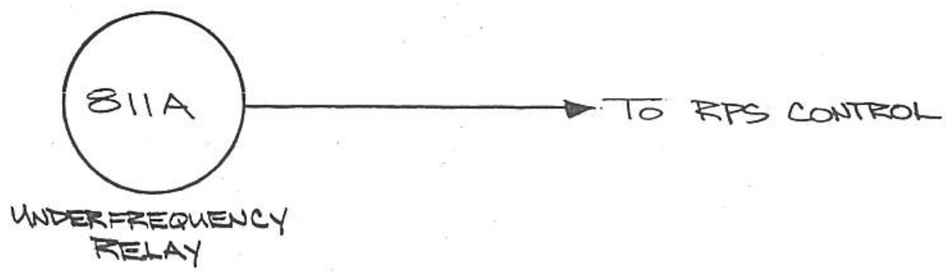
H. AV $\leq$ 0.6 seconds total system response time per technical specifications (reference 3).

S U P P O R T I N G   G R A P H I C S

A) LOOP DIAGRAM

✓ APPLICABLE TO ALL LOOPS LISTED ON SHEET 9.

___ APPLICABLE ONLY TO LOOPS: ____________



(SAME FOR RCP'S 1,2,3 & 4)

REV 0	PREP DEH	DATE 3-4-94	CHECK APJ	DATE 3/14/94	SHEET 25A	C/O 26
REV 1	PREP	DATE	CHECK	DATE	SHEET	C/O
REV 2	PREP	DATE	CHECK	DATE	SHEET	C/O

RANCH/PROJECT IDENTIFIER SQN-EEB-MS-TI28-0076
DEMONSTRATED ACCURACY CALCULATION

SUMMARY OF RESULTS (BISTABLE – DECREASING SETPOINT)

X APPLICABLE TO ALL LOOPS LISTED ON SHEET 9

___APPLICABLE ONLY TO LOOPS: ______________

OPERATIONAL LIMIT	58.5
PV = SP + Aa	57.711
PV = SP + As	57.739
PV = SP + An	57.711
SETPOINT (SP)	57
PV = SP - An	56.289
PV = SP - As	56.261
PV = SP - Aa	56.289
SAFETY LIMIT	55.8

MARGIN 0.489 (normal)
0.461 (seismic)

ALL VALUES SHOWN ARE Hz

(REFER TO ACCURACY DISCUSSION, SHEET 20 FOR CLARIFICATION OF ABOVE)

-Av 56.3 (Per sheet 24) - Aas 0.739

CALIBRATION INFORMATION from page 24:
As Found Afc = ± 0.56 Hz
As Left Alc = ± 0.05 Hz R5

REV 4 PREP GGM DATE 10/28/98 CHECK LMB DATE 10/30/98 SHEET 26 C/O 27
REV 5 PREP JJM DATE 1-16-14 CHECK NSS DATE 1-22-14 SHEET 26 C/O 27
REV___PREP_______DATE________CHECK______DATE________SHEET____C/O__

SUMMARY OF RESULTS (BISTABLE- INCREASING SETPOINT)

✓ APPLICABLE TO ALL LOOPS LISTED ON SHEET 9.

___ APPLICABLE ONLY TO LOOPS: ___

ANALYTICAL LIMIT	0.385 (SHEET 22)	MARGIN 0.068 (NORMAL)
PV = SP + Aa	0.317	0.067 (SEISMIC)
PV = SP + As	0.318	
PV = SP + An	0.317	
(TIMER) SETPOINT (SP)	0.228	
PV = SP - An	0.139	
PV = SP - As	0.138	
PV = SP - Aa	0.139	
OPERATIONAL LIMIT	~~Ø~~ N/A	R2

ALL VALUES SHOWN ARE SECONDS

(REFER TO ACCURACY DISCUSSION, SHEET 20,22 FOR CLARIFICATION OF ABOVE)

+ AV ≤ 0.6 TOTAL SYSTEM RESPONSE TIME PER TECH. SPECS. + Aas 0.090

CONCLUSIONS

_____ APPLICABLE TO ALL LOOPS LISTED ON SHEET 9 .

_____ APPLICABLE ONLY TO LOOPS: ____________________

The worst case normal inaccuracy of the RCP Underfrequency Relay determined by this calculation is ± 0.711 Hz with a worst case seismic inaccuracy of ± 0.739 Hz. This calculation has demonstrated that the subject devices are adequate for their intended function by determining that positive margins of 0.489 Hz (normal) and 0.461 Hz (seismic) are maintained at the new setpoint of 57 Hz.

The loop response time is primarily dependent on the time delay setting of the subject relay. The relay time-delay setting is established by this calculation as 10 cycles (excluding the additional 3 cycle measurement period). See response time discussion on sheet 22. The new Setpoint (57 Hz) and Calculation Allowable Value (56.3 Hz) are the Technical Specification values. R4

Additionally, the issue of erroneous trips has been addressed by this calculation and the new setpoint of 57 Hz has been shown acceptable with regard to the Upper Operational Limit of 58.5 Hz established on sheet 10A. It should be noted references 16 and 8 document setpoints of 57.5 Hz for WBN and 57 Hz for BFN respectively.

PROCUREMENT REQUEST FORM

TO: R.C. Jenkins, PEG MANAGER, OPS-1A, SQN

FROM: V. Hudgins, NE, DSP-1B, SQN

DATE: 1-5-94

SUBJECT: PROCUREMENT OF ITEMS AND/OR MATERIALS FOR Sequoyah NUCLEAR PLANT, UNITS 2, 1

PR NUMBER: SE-1899 REVISION: 0

DCN M10396A

Page

PLEASE TAKE THE NECESSARY ACTION TO PROCURE THE ITEM(S) AND/OR MATERIAL DESCRIBED HEREIN.

CHECK AS REQUIRED:

■ THIS PR IS OUTAGE RELATED: UNIT 2 CYCLE 6

☐ THIS PR IS FOR EMERGENCY PURCHASE *(Documented justification required, see line 9).*

SCHEDULE DATES	NEED DATES	EXPECTED DATE *(BY PEG or M&P)*
PEG PACKAGE ISSUE DATE *(Released to M&P or Purchasing)*	N/A	
AWARD OF CONTRACT	N/A	
VENDOR TECHNICAL DATA SUBMITTALS		
DELIVERED TO SITE/APPROVED FOR ISSUE (AFI)	/	/

LEAD ENGINEER / ENGINEERING MANAGER

Craig R Butt 1/25/94

cc (Attachment): R. Quirk, ENGINEERING TASK MANAGER, DSE-1A

QA Record

(BELOW INFORMATION BY PEG)

RIMS ACCESSION NUMBER B25 940208 109 *(Required)*

TO: V. Hudgins, DSP 1B-SQN *(Address)*

FROM: R. Jenkins, PEG MANAGER, OPS1A-SQN

DATE: FEB 08 1994

Attachment No. 1 Sheet 1 of 9

Identifier SQN-FEB-MG-T178-0076

CHECK AS REQUIRED:

☒ WE ACKNOWLEDGE THIS PROCUREMENT REQUEST. ADDITIONAL PROCUREMENT PACKAGE INFORMATION IS INDICATED ON LINE 10

☐ THIS PR IS BEING REJECTED AND RETURNED PER THE FOLLOWING REMARKS:

Mickey G Hazelwood
Assigned Procurement Engineer

Allen W. Thomas
for Procurement Engineering Group Manager

cc (Attachment): RIMS, ET SLP–K

PEG FILES, OPS1A-SQN

M.G. Hazelwood, PROCUREMENT ENGINEER, OPS1A-SQN

TVA 10606 (NP 8/92)

MGH

PROJECT	UNIT(s) ☐ 0 ☒ 1 ☒ 2 ☐ 3	DATE	PR NUMBER and REVISION
SQN		1-5-94	SE-1899

PREPARED BY / EXTENSION	CHECKED BY / EXTENSION	PROJECT CONTROL NO. (PCN)
Vickie Hudgins x8243	Alan Janney x8083	498

DCN M10396A
Page ______

DESCRIPTIVE TITLE
Underfrequency relays for Reactor Coolant Pumps

1. END USE (Equipment UNID and description if applicable)
RCP PT and relay Bds. (1,2-PX-068-344-D; -346-E; -348-F; -350-G)
(1,2-81-068-344-D; -346-E; -348-F; -350-G)

A. BUILDING OR AREA (include room nos.) AB / room A1
C. COLUMN LINES A3, A14 / Q
B. ELEVATION 714
D. SYSTEMS 68, 250, 202

2. ATTACHMENT(s) ☐ PR CONTINUATION SHEET INCLUDED ☐ N/A
OTHER: Bill of Material (2 sheets); Data Sheets 1 and 2; Environmental Data sheet [illegible] 1-27-94

3. ECN/DCN NUMBERS: M10396A, M10441A
REFERENCE DOCUMENTS:

4. DESIGN BASIS FOR END USE (HOST) EQUIPMENT
A. SAFETY CLASSIFICATION:
■ SAFETY-RELATED ☐ NOT SAFETY-RELATED
B. ASME SECTION III
CLASS ☐ 1 ☐ 2 ☐ 3 ■ N/A
C. TVA PIPING CLASS ______ ☐ N/A
D. IEEE CLASS 1E ■ YES ☐ NO
IF YES, ATTACH ENVIRONMENTAL SHEET
E. 10 CFR 50.49 ☐ YES ■ NO
IF YES, ATTACH ENVIRONMENTAL SHEET
F. ☐ MECHANICAL EQ ■ N/A

G. SEISMIC QUALIFICATION REQUIRED: ☐ NO (nonseismic)
■ YES
☐ by TVA
☐ in DCN pkg
■ by vendor
■ SEISMIC CAT. I
☐ ACTIVE, must operate [initials] 1-21-94
■ before SSE
■ during SSE
☐ after SSE
☐ PASSIVE
☐ Remain structurally intact all phases of SSE
☐ SEISMIC CAT. I (L) / II
☐ I (L)–A must retain position & pressure
☐ I (L)–B position ONLY

5. DESIGN CRITERIA (List referenced paragraphs) SQN-DC-V-41, 3.1; SQN-DC-V-21.0, 1.2
SQN-DC-V-27.9, 4b; SQN-DC-V-27.4, 3.5; SQN-DC-V-11.3, 4.3, 3.2.4

6. IDENTICAL OR SIMILAR PROCUREMENTS WERE PURCHASED ON: ☐ N/A
CONTRACT NO. SE-1716 DCN/ECN M09394A, M09395A PROJECT: ______

7. DESIGN BASIS VERIFIED BY (for NE cross discipline reviews or if PR is initiated outside NE [i.e., MODS]) ☒ N/A
NE ORG./SIGNATURE(s)/INTL(s).

8. BUDGET AUTHORIZATION (Project Mgr. signature, account no. for material and processing costs, or other accounting designation)
NUMBER ______ SIGNATURE ______ ■ N/A
ESTIMATED TOTAL MATERIAL COST $

9. ☐ EMERGENCY PURCHASE JUSTIFICATION
☐ SOLE SOURCE JUSTIFICATION
☐ OTHER
☐ SEE ATTACHED

Attachment No. 1 Sheet 2 of 9
Identifier SQN-EEB-MS-TI28-0076

VENDOR MANUALS:
☐ Not required
■ Required for items 1, 2, 6

TO BE SUPPLIED:
☐ With equipment
■ By (Date) 4-4-94

10. PEG ACKNOWLEDGE INFORMATION:
(1) Relays & mounting kits procured on PEG PKG SE-1899A.
(2) Cable & terminal lugs reserved in stores under PEG PKG SE-1899-1.
(3) Test Blocks procured on PEG PKG SE-1899B.

TVA 10606 (NP 8/92)

DCN M10396A
Page

CONTRACT REFERENCE OR REQUISITION NO.	ITEM	CLASSIFICATION	DESCRIPTION	QUANTITY	UNITS	MARK NO.
SE-1899A BWP332Y	1	IE	Underfrequency Relay, type 81, operating range 54-60Hz adjustable in 0.05 Hz increments; operating time/time delay adjustable in 1-99 cycles (1 cycle increments); 48/125 VDC control voltage; 2 form B or C contacts with .3 amp inductive interrupting rating; EMI resistent in accordance with TVA SS-E18.14.01; ASEA Brown Boveri catalog number 422B1295, or equal (4 spares included)	12	ea	
SE-1899A ~~BWP111M~~ MLH 2/7/94 BVP111M	2	IE	AC-DC converter, ITE-96, accessory power supply for use with ITE protective relays from 120 VAC source provides unregulated 48 VDC for one relay, catalog no. 200B1248, ASEA Brow Boveri or equal (4 spares included)	12	ea	
BWP267F SE-1899A	3	IE	Mounting Kit for type 81 relay (4 spares included)	12	ea	
SE-1899-1 BJK234H	4	IE	Cable, No. 14 AWG, 1/C, Type SIS, 600V, Irradiated cross-linked polyethylene, Class IE-LOCA	1000	ft	WJG-6

Attachment No. 1 Sheet 3 of 9
Identifier SQN-EEB-MS-TI28-0075

Electrical BILL OF MATERIAL

PROJECT UF Relay for Reactor Coolant Pumps

DWG NO.

KNOXVILLE, TENN DATE 1-24-94

REV NO	DCN NO.	DATE	MADE	CHKD	SUPV	ENGR	INSP	SUBM	RECM	APPR
3										
2										
1										
0	M10396A M10441A	1-20-94	vdl	APJ						

~~ECN~~ DCN vdl 1-20-94

SH 1 OF 2

SE-1899 R0

CONTRACT REFERENCE OR REQUISITION NO	ITEM	CLASSIFICATION	DESCRIPTION	QUANTITY	UNITS	MARK NO.
SE-1899-1 ARM608L	5		Ring tongue terminal lug for No. 14 AWG wire (14-16 #10 stud)	400	ea	
SE-1899B BWP969E	6	1E	Test Block, 6P, with cover class 1E, semiflushed type PK2, ~~GE # 642212083~~ * or equal (4 spares included)	12	ea	
			* Appears to be an error in P/N. Vendor will assign P/N after award. MWH 2/7/94			

DCN M10396A
Page

Attachment No. 1 Sheet 4 of 9
Identifier SQN-EEB-MS-TI28-0076

REV NO	ECN NO.	DATE	MADE	CHKD	SUPV	ENGR	INSP	SUBM	RECM	APPR
3										
2										
1										
0	M10396A M10441A	1-24-94	vdh	APJ						

Electrical BILL OF MATERIAL

PROJECT UF Relay for Reactor Coolant Pumps

DWG NO.

KNOXVILLE, TENN DATE 1-24-94

SH 2 OF 2 SE-1899 R0

TVA 10581-01 (EN DES-2-84)

REQUISITION NO. ______

DCN M10396A
Page ______

GENERAL	1	ITEM NO.	
	2	QUANTITY	12
	3	INSTRUMENT NO.	See Below
	4	IEEE CLASS	(X) 1E ( ) NA
	5	SEISMIC CATEGORY	(X) 1 ( ) 1(L) ( ) NA
	6	ASME CODE CLASS	NA ( ) NA
	7	MANUFACTURER	ABB
	8	MODEL NO.	422B1295
	9	CASE STYLE/MATL	MS
	10	ENCLOSURE	MS
	11	MOUNTING	MS
	12		
	13	1,2-81-068-344-D	
	14	1,2-81-068-346-F	
	15	1,2-81-068-348-F	
	16	1,2-81-068-350-G	
	17		
	18	Type 81 Underfrequency Relay with an operating	
	19	range of 54-60Hz adjustable in 0.05 increments;	
	20	an operating time/time delay adjustable in	
	21	1-99 cycles (1 cycle increments); control voltage of	
	22	48/125 VDC; two form B or C contacts with .3	
	23	amp inductive interrupting rating; EMI resistent	
	24	in accordance with TVA Standard SS-E18.14.01.	
	25	ASEA Brown Boveri Catalog number 422B1295	
	26	or equal	
	27		
	28		
	29		
	30		
	31		
	32		
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	46		
	47		
	48		

X---DATA BY BIDDER
*---OR EQUAL
NA--NOT APPLICABLE
MS--MFR STANDARD

DSGNR: vdh DATE: 1-24-94
CHKR: APJ DATE: 1/24/94
PLANT: SQN

NOTES: (1)

Attachment No. 1 Sheet 5 of 9
Identifier SQN-EEB-MS-TI28-0076

PR NO. SE-1899 R0
ECN NO. M10396/M10441

SPECIFICATION NO.

DATA SHEET NO. 1

TVA 10581-01 (EN DES-2-84) REQUISITION NO. ____

GENERAL	1	ITEM NO.	
	2	QUANTITY	12
	3	INSTRUMENT NO.	See Below
	4	IEEE CLASS	(X) 1E ( ) NA
	5	SEISMIC CATEGORY	(X) 1 ( ) 1(L) ( ) NA
	6	ASME CODE CLASS	NA ( ) NA
	7	MANUFACTURER	ASEA Brown Boveri
	8	MODEL NO.	200B1248
	9	CASE STYLE/MATL	MS
	10	ENCLOSURE	MS
	11	MOUNTING	MS
	12		
	13	1,2-PX-068-344-D	
	14	1,2-PX-068-346-E	
	15	1,2-PX-068-348-F	
	16	1,2-PX-068-350-G (4 spares)	
	17		
	18	ITE-96, AC-DC Converter, accessory power supply for	
	19	use with ITE protective relays from 120 VAC source;	
	20	provide unregulated 48VDC for one relay	
	21	ABB catalog No. 200B1248	
	22		
	23		
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	48		

DCN M10396A
Page

X---DATA BY BIDDER
*---OR EQUAL
NA--NOT APPLICABLE
MS--MFR STANDARD

NOTES: (1)

Attachment No. 1 Sheet 6 of 9
Identifier SQN-EEB-MS-TI28-0076

DSGNR: vdh DATE: 1-24-94
CHKR: APJ DATE: 1/24/94

PLANT: SQN

PR NO. SE-1899 R0
~~ECN~~ NO. M10396A/M10441A DCN 1-24-94

SPECIFICATION NO.

DATA SHEET NO. 2

TVA 10581-30 (EN DES 2-84)

REQUISITION NO.

DCN M10396A

Page

1	ITEM NO.					
2	INSTRUMENT NO.		SEE BELOW			
3						
4			Maximum			
5						
6	NORMAL	TEMPERATURE	104°F			
7		PRESSURE	—			
8		HUMIDITY	80%			
9		RADIATION	1.8X10³ RADS			
10		DUST	( )YES (X)NO	( )YES ( )NO	( )YES ( )NO	( )YES ( )NO
11						
12						
13						
14	ABNORMAL	TEMPERATURE	110°F			
15		PRESSURE	—			
16		HUMIDITY	90%			
17		RADIATION				
18		OPERATE SUBMERGED	( )YES (X)NO	( )YES ( )NO	( )YES ( )NO	( )YES ( )NO
19		NON-OPERATE SUB	( )YES (X)NO	( )YES ( )NO	( )YES ( )NO	( )YES ( )NO
20		DEPTH				
21	ACCIDENT	TEMPERATURE	NA			
22		PRESSURE	NA			
23		HUMIDITY	NA			
24		RADIATION DOSE	1X10⁴ RADS			
25		MAX RAD DOSE RATE/TIME	NA			
26		CAUSTIC SPRAY	( )YES (X)NO	( )YES ( )NO	( )YES ( )NO	( )YES ( )NO
27		OPRG TIME (1)	NA			
28		SUBMERGENCE DEPTH	NA			
29		REQ'D ACCURACY	NA			
30						

ITEM NO.:

INSTRUMENT NO.: 1,2-PX-068-344-D 1,2-PX-068-346-E 1,2-PX-068-348-F 1,2-PX-068-350-G

1,2-81-068-344-D 1,2-81-068-346-E 1,2-81-068-348-F 1,2-81-068-350G

FUNCTION:

REMARKS:

Information above is relative to RCP Panels located on elevation 714 of the Auxiliary Bldg. per 47E235-49

Attachment No. 1 Sheet 7 of 9

Identifier SQN-~~EEB~~-MS-TI28-0076

CAUSTIC SPRAY COMPOSITION:

NA

NOTES: (1) OPERATING TIME IS TIME AFTER THE BEGINNING OF THE ACCIDENT

DSGNR: [illegible] DATE: 1-24-94

CHKR: ARJ DATE: 1/24/94

SPECIFICATION NO.

ENVIRONMENTAL CONDITIONS FOR CLASS 1E EQPT

DATA SHEET NO. ~~1~~ 3 SHEET 1 R0

PLANT: SQN

PR NO. SE-1899 R0

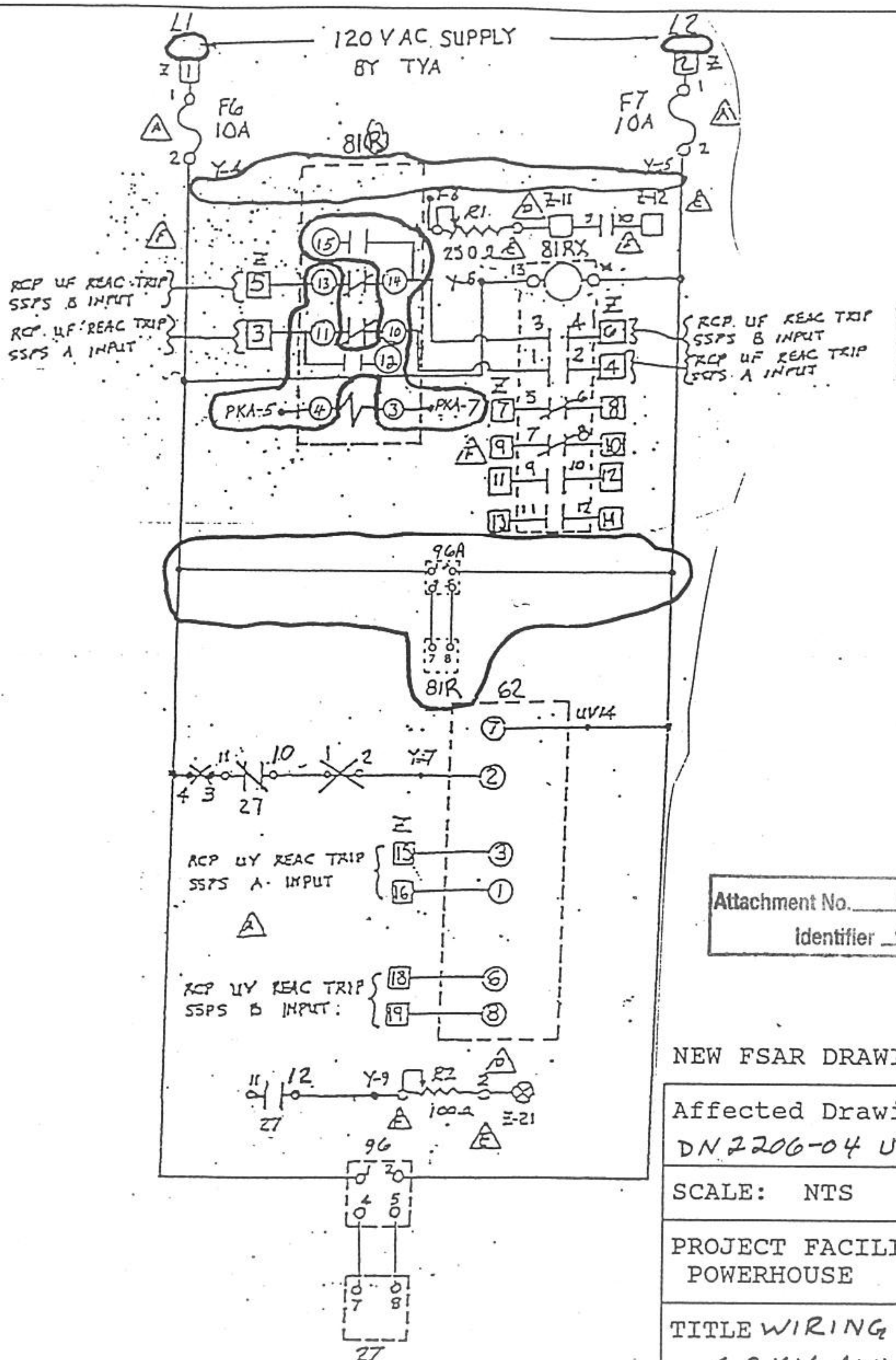
~~ECN~~ DCN NO. M10396A/M10441A

[illegible] 1-24-94

[illegible] 1/31/94

DCN NO. M10396A

SHEET



Attachment No. 1 Sheet 8 of 9
Identifier SQN-EEB-MS-TI28-0076

NEW FSAR DRAWING: ☐ Yes ■ No

Affected Drawing DN2206-04 UO MD R.F	Category 3
SCALE: NTS	EXCEPT AS NOTED
PROJECT FACILITY POWERHOUSE	UNIT 2
TITLE WIRING SCHEMATIC 6.9KV AUX POWER RELAY	
DCA M10396-	
SEQUOYAH NUCLEAR PLANT TENNESSEE VALLEY AUTHORITY	N

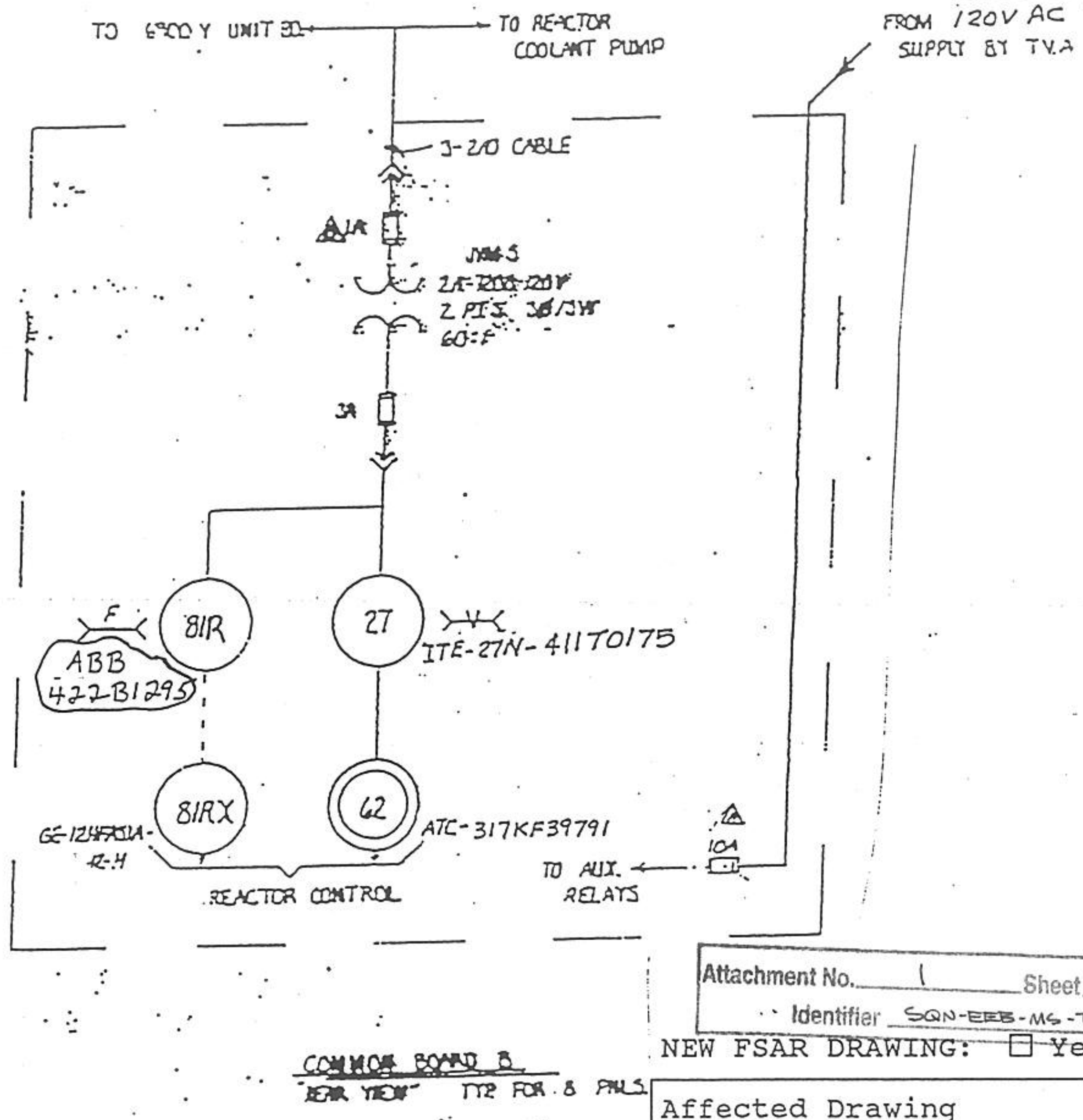
Contract No. 823380
Prerequisites DCN M09395A

Anticipated CCDs 1,2-DN2206-04

REVISION	RESP. ENGR.	DESIGN VERIFIED	CHANGE REFERENCE
0	[signature]	[signature]	DCN M10396A

DCN NO. M10396A

SHEET



Attachment No. 1 Sheet 9 of 9
Identifier SQN-EEB-MS-TI28-0076

NEW FSAR DRAWING: ☐ Yes ■ No

Affected Drawing DN2206-03 UOMD R.0	Category 3
SCALE: NTS EXCEPT AS NOTED	
PROJECT FACILITY POWERHOUSE	UNIT 2
TITLE ONE LINE DIAGRAM 6.9KV AUX POWER RELAY PANEL	
DCA M10396-	
SEQUOYAH NUCLEAR PLANT TENNESSEE VALLEY AUTHORITY	N

Contract No. 823380
Prerequisites DCN M09395A

Anticipated CCDs 1,2-DN2206-03

REVISION	RESP. ENGR.	DESIGN VERIFIED	CHANGE REFERENCE
0	[signature]	[signature]	DCN M10396A

Attachment No. 2 Sheet 1 of 3
Identifier SQN-EEB-MS-TI28-0076

c. Reactor coolant pump underfrequency trip

This trip is required to protect against low flow resulting from bus underfrequency; for example, a major power grid frequency disturbance. The function of this trip shall be to open the reactor coolant pump (RCP) breakers and trip the reactor for an under-frequency condition. The setpoint of the underfrequency relays is adjustable between 54 and 59 Hz.

There shall be one underfrequency sensing relay connected to the load side of each Reactor Coolant Pump breaker. Power level above the P-7 setpoint and an underfrequency condition sensed by more than one Reactor Coolant Pump motor shall result in the tripping of all of the Reactor Coolant Pump breakers as well as directly tripping the reactor. Signals from these relays shall be time delayed to prevent spurious trips caused by short-term frequency perturbations. Undervoltage sensing relays shall be provided across the power feed to each underfrequency sensor in order to ensure that each underfrequency input to the Reactor Protection System will indicate an underfrequency condition exists on loss of power to the sensing device. The contacts of this undervoltage relay shall be in series with the output of the underfrequency sensing relays in each channel. Reference 8.1.3.17, Sheet 5 shows the logic. Functional requirements for the RCP underfrequency trip are provided in Reference 8.1.3.16.

The only inputs to the Reactor Protection System associated with the Reactor Coolant Pumps come from the undervoltage and underfrequency sensors. These sensors are located on the load side of the Reactor Coolant Pump breakers, within a Seismic Category I structure, and shall be designed in accordance with the requirements of IEEE 279-1971.

The trip signal for the Reactor Coolant Pump breakers, associated with the underfrequency condition, is an output from the Reactor Trip System, as shown in Reference 8.1.3.17.

The Westinghouse analysis of the loss of flow accident has shown that for frequency decay rates less than 6.8 Hz per second no Reactor Coolant Pump trip is necessary. TVA has performed an analysis to confirm that the worst case frequency decay rate at the RCP input terminals is below this limit. The results of the TVA analysis shows a frequency decay rate of less than 5 Hz per second.

5. Low-Low Steam Generator Water Level Reactor Trip

This trip shall protect the reactor from loss of heat sink in the event of a major feedwater line rupture or a loss of feedwater to one or more steam generators. This trip shall be actuated on two out of three low-low water level signals occurring in any steam generator. If a

Table 3.2.1-1 (Continued)
LIST OF REACTOR TRIPS

Reactor Trip	Coincidence Logic	Interlocks	Comments
12. Reactor coolant pump undervoltage	2/4	Interlocked with P-7	Low voltage on all buses permitted below P-7.
13. Reactor coolant pump underfrequency	2/4	Interlocked with P-7	Underfrequency on 2 buses will cause reactor trip; reactor trip blocked below P-7.
14. Low-low steam generator water level	2/3 per loop	No interlocks	See Section 3.2.1 for a discussion of Environmental Allowance Modifier and Trip Time Delay
15. Safety injection signal	Coincident with actuation of safety injection	No interlocks	(See FSAR Section 7.3 for Engineered Safety Features actuation conditions)
16. Turbine-generator trip			
a. Low auto stop oil pressure	2/3	Interlocked with P-9	Blocked below P-9
b. Turbine stop valve	4/4	Interlocked with P-9	Blocked below P-9
17. Manual	1/2	No interlocks	

Note: See Table 3.2.1-2, Protection System Interlocks for definition of designations

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Table 3.2.1-2
PROTECTION SYSTEM INTERLOCKS

Designation	Derivation	Function
	Power Escalation Permissives	
P-6	1/2 Neutron flux (intermediate range) above setpoint	Allows manual block of source range reactor trip
	2/2 Neutron flux (intermediate range) below setpoint	Defeats the block of source range reactor trip
P-10	2/4 Neutron flux (power range) above setpoint	Allows manual block of power range (low setpoint reactor trip)
		Allows manual block of intermediate range reactor trip and intermediate range rod stops (C-1)
		Blocks source range reactor trip (back-up for P-6)
	3/4 Neutron flux (power range) below setpoint	Defeats the block of power range (low setpoint) reactor trip
		Defeats the block of intermediate range reactor trip and intermediate range rod stops (C-1)
		Input to P-7
P-7	3/4 Neutron flux, power range below setpoint (from P-10) and 2/2 Turbine impulse chamber pressure below setpoint (from P-13)	Blocks reactor trip on: Low flow, reactor coolant and pump undervoltage and underfrequency, pressurizer low pressure, and pressurizer high level
P-8	3/4 Neutron flux (power range) below setpoint	Blocks low primary coolant flow reactor trip for low flow in a single loop.

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TABLE 2.2-1 (Continued)

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	TRIP SETPOINT	ALLOWABLE VALUES	
14. Deleted			R145
15. Undervoltage-Reactor Coolant Pumps	$\geq$ 5022 volts-each bus	$\geq$ 4739 volts-each bus	
16. Underfrequency-Reactor Coolant Pumps	$\geq$ 56.0 Hz - each bus	$\geq$ 55.9 Hz - each bus	
17. Turbine Trip			
A. Low Trip System Pressure	$\geq$ 45 psig	$\geq$ 43 psig	
B. Turbine Stop Valve Closure	$\geq$ 1% open	$\geq$ 1% open	
18. Safety Injection Input from ESF	Not Applicable	Not Applicable	
19. Intermediate Range Neutron Flux - (P-6) Enable Block Source Range Reactor Trip	$\geq$ 1 x 10-5% of RATED THERMAL POWER	$\geq$ 6 x 10-6% of RATED THERMAL POWER	
20. Power Range Neutron Flux (not P-10) Input to Low Power Reactor Trips Block P-7	$\leq$ 10% of RATED THERMAL POWER	$\leq$ 12.4% of RATED THERMAL POWER	R145

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TABLE 2.2-1 (Continued)

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	TRIP SETPOINT	ALLOWABLE VALUES
b. RCS Loop ΔT Equivalent to Power > 50% RTP		
Coincident with Steam Generator Water Level--Low-Low (Adverse)	≥ 15.0% of narrow range instrument span	≥ 14.4% of narrow range instrument span
and Containment Pressure (EAM)	≤ 0.5 psig	≤ 0.6 psig
or		
Steam Generator Water Level--Low-Low (EAM)	≥ 10.7% of narrow range instrument span	≥ 10.1% of narrow range instrument span
14. Deleted		
15. Undervoltage-Reactor Coolant Pumps	≥ 5022 volts-each bus	≥ 4739 volts - each bus
16. Underfrequency-Reactor Coolant Pumps	≥ 56 Hz - each bus	≥ 55.9 Hz - each bus
17. Turbine Trip		
A. Low Trip System Pressure	≥ 45 psig	≥ 43 psig
B. Turbine Stop Valve Closure	≥ 1% open	> 1% open
18. Safety Injection Input from ESF	Not Applicable	Not Applicable

R132

R76

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3/4.3 INSTRUMENTATION

3/4.3.1 REACTOR TRIP SYSTEM INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

3.3.1.1 As a minimum, the reactor trip system instrumentation channels and interlocks of Table 3.3-1 shall be OPERABLE.

R194

APPLICABILITY: As shown in Table 3.3-1.

ACTION:

As shown in Table 3.3-1.

SURVEILLANCE REQUIREMENTS

4.3.1.1.1 Each reactor trip system instrumentation channel and interlock shall be demonstrated OPERABLE by the performance of the CHANNEL CHECK, CHANNEL CALIBRATION and CHANNEL FUNCTIONAL TEST operations for the MODES and at the frequencies shown in Table 4.3-1. R16

4.3.1.1.2 The logic for the interlocks shall be demonstrated OPERABLE prior to each reactor startup unless performed during the preceeding 92 days. The total interlock function shall be demonstrated OPERABLE at least once per 18 months during CHANNEL CALIBRATION testing of each channel affected by interlock operation.

4.3.1.1.3 The REACTOR TRIP SYSTEM RESPONSE TIME of each reactor trip function shall be demonstrated to be within its limit at least once per 18 months. Neutron detectors are exempt from response time testing. Each test shall include at least one logic train such that both logic trains are tested at least once per 36 months and one channel per function such that all channels are tested at least once every N times 18 months where N is the total number of redundant channels in a specific reactor trip function as shown in the "Total No. of Channels" column of Table 3.3.1. R194

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3/4.3 INSTRUMENTATION

3/4.3.1 REACTOR TRIP SYSTEM INSTRUMENTATION

LIMITING CONDITION FOR OPERATION

3.3.1 As a minimum, the reactor trip system instrumentation channels and interlocks of Table 3.3-1 shall be OPERABLE.

APPLICABILITY: As shown in Table 3.3-1. R182

ACTION:

As shown in Table 3.3-1.

SURVEILLANCE REQUIREMENTS

4.3.1.1.1 Each reactor trip system instrumentation channel and interlock shall be demonstrated OPERABLE by the performance of the CHANNEL CHECK, CHANNEL CALIBRATION and CHANNEL FUNCTIONAL TEST operations for the MODES and at the frequencies shown in Table 4.3-1.

4.3.1.1.2 The logic for the interlocks shall be demonstrated OPERABLE prior to each reactor startup unless performed during the preceeding 92 days. The total interlock function shall be demonstrated OPERABLE at least once per 18 months during CHANNEL CALIBRATION testing of each channel affected by interlock operation.

4.3.1.1.3 The REACTOR TRIP SYSTEM RESPONSE TIME of each reactor trip function shall be demonstrated to be within its limit at least once per 18 months. Neutron detectors are exempt from response time testing. Each test shall include at least one logic train such that both logic trains are tested at least once per 36 months and one channel per function such that all channels are tested at least once every N times 18 months where N is the total number of redundant channels in a specific reactor trip function as shown in the "Total No. of Channels" column of Table 3.3.1. R182

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SITE
STANDARD
PRACTICE

MANAGEMENT OF THE FINAL SAFETY
ANALYSIS REPORT (FSAR)

APPENDIX A

11-42
Change No.

REQUEST FOR SAR CHANGE

REQUESTED BY: Gregory G. Mailen DATE: July 25, 1994

SECTION: NE-EE PHONE: 843-8065

CHANGE REQUIRED DUE TO:

☐ *DCN or Plant Modification. Explain: ______

☑ *Technical Specification Change. Explain: The Tech Spec has been revised by letter TVA-SQN-TS-94-03 (RIMs S64 940511 802).

☐ *Inaccurate or inadequate information contained in the current FSAR.
Explain: ______

☐ *Nonintent Change.
Explain: ______

☐ *Typographical error.

* Attach a marked up copy of FSAR page and revised figures (if applicable) indicating proposed change.

NOTE: Justification is required to accompany any proposed SAR change with the exception of typographical corrections. Contact site licensing organization if confusion or uncertainty exists over whether an error is typographical or nonintent.

Gregory G. Mailen	July 25, 1994	[signature]	10/26/94
(Preparer)	Date	Reviewer	Date
[signature]	10/27/94	[signature]	11/4/94
DOR Section Supervisor	Date	**Licensing Approval	Date

REFERENCES (base on design document, if possible): ______

COMMENTS: ______

Transmit to: Site Licensing Manager
**Forward to: DCRM - Living FSAR Notebook
Originator

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flood (DBF) or within a nonflooded structure or are designed for submerged operation.

7.2.1.2.6 Minimum Performance Requirements

The performance requirements are as follows:

1. System response times:

The reactor trip system response time shall be the time interval from when the monitored parameter exceeds its trip setpoint at the channel sensor until loss of stationary gripper coil voltage. 6

~~Typical maximum allowable time delays in generating the reactor trip signal:~~

		Time (sec)	
a.	~~Power range nuclear power (High and low setpoint)~~	~~0.5~~	
b.	~~Neutron flux rates (positive and negative)~~	~~0.5~~	
c.	~~Overtemperature ΔT (Maximum)~~	~~8.0~~	8
d.	~~Overpower ΔT (Maximum)~~	~~8.0~~	6
e.	~~Pressurizer Pressure (low and high)~~	~~2.0~~	
f.	~~Pressurizer high water level~~	~~2.0~~	
g.	~~Low reactor coolant flow~~	~~1.0~~	
h.	~~Reactor coolant pump bus under frequency~~	~~0.6~~	
i.	~~Reactor coolant pump bus undervoltage~~	~~1.2~~	
j.	~~Low-low steam generator water level~~	~~2.0*~~	8
k.	~~Turbine trip~~	~~1.0~~	
l.	~~Steam generator water level high turbine trip-reactor trip~~	~~≤2.5~~	6

~~*Does not include Trip Time Delay Function~~ 8

The reactor trip system instrumentation response time values are provided in Table 7.2.1-5.

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Identifier SQN-EEB-MS-TI28-0076

REACTOR TRIP SYSTEM INSTRUMENTATION RESPONSE TIMES

FUNCTIONAL UNIT	RESPONSE TIME
1. Manual Reactor Trip	Not Applicable
2. Power Range Neutron Flux	≤ 0.5 seconds ⋆
3. Power Range, Neutron Flux, High Positive Rate	Not Applicable
4. Power Range, Neutron Flux, High Negative Rate	≤ 0.5 seconds ⋆
5. Intermediate Range, Neutron Flux	Not Applicable
6. Source Range, Neutron Flux	Not Applicable
7. Overtemperature Delta T	≤ 8.0 seconds ⋆
8. Overpower Delta T	≤ 8.0 seconds
9. Pressurizer Pressure -- Low	≤ 2.0 seconds
10. Pressurizer Pressure -- High	≤ 2.0 seconds
11. Pressurizer Water Level -- High	Not Applicable
12. Loss of Flow - Single Loop (Above P-8)	≤ 1.0 seconds

⋆ Neutron detectors are exempt from response time testing. Response time of the neutron flux signal portion of the channel shall be measured from detector output or input of first electronic component in channel.

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REACTOR TRIP SYSTEM INSTRUMENTATION RESPONSE TIMES

FUNCTIONAL UNIT	RESPONSE TIME
13. Loss of Flow - Two Loops (Above P-7 and below P-8)	≤ 1.0 seconds
14. Main Steam Generator Water Level -- Low - Low	
A. RCS Loop ΔT (P ≤ 50% RTP: P > 50% RTP)	≤ 8.0 seconds (1)
B. Steam Generator Water Level -- Low-Low (Adverse EAM)	≤ 2.0 seconds (1)
C. Containment Pressure (EAM)	≤ 2.0 seconds (1)
15. Deleted	
16. Undervoltage - Reactor Coolant Pumps	≤ 1.2 seconds
17. Underfrequency - Reactor Coolant Pumps	≤ 0.6 seconds
18. Turbine Trip	
A. Low Fluid Oil Pressure	Not Applicable
B. Turbine Stop Valve	Not Applicable
19. Safety Injection Input from ESF	Not Applicable
20. Reactor Trip Breakers	Not Applicable
21. Automatic Trip Logic	Not Applicable
22. Reactor Trip System Interlocks	Not Applicable

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(1) Does not include Trip Time Delays. Response times noted include the transmitters, Eagle-21 process protection cabinets, solid state protection cabinets, and actuation devices. This reflects the response time necessary for THERMAL POWER in excess of 50% RTP.

b. Containment pressure (not required for Steam Generator tube rupture) 6

2. Secondary System Accidents

   a. Pressurizer pressure
   b. Steam line pressures
   c. Steam line pressure rate
   d. Reactor coolant average temperature (T_{avg}) 8
   e. Containment pressure

7.3.1.2.3 Spatially Dependent Variables

The only variable sensed by the Engineered Safety Features Actuation System which has spatial dependence is reactor coolant temperature. The effect on the measurement is negated by taking multiple samples from the reactor coolant hot leg and electronically averaging these samples in the process protection system. 8

7.3.1.2.4 Limits, Margins and Levels

Prudent operational limits, available margins and setpoints before onset of unsafe conditions or requiring protective action are discussed in Chapters 15 and the SQN Technical Specifications. (Refer also to Subparagraph 7.1.2.1.9)

7.3.1.2.5 Abnormal Events

The malfunctions, accidents, or other unusual events which could physically damage protection system components or could cause environmental changes are as follows:

1. Loss of coolant accident (See Sections 15.3 and 15.4)
2. Steam breaks (See Sections 15.3 and 15.4)
3. Earthquakes (See Chapter 3 and Chapter 2)
4. Fire (See Subsection 9.5.1)
5. Explosion (Hydrogen buildup inside containment) (See Section 15.4)
6. Missiles (See Section 3.5 and 10.2.3)
7. Flood (See Chapters 2 and 3)

7.3.1.2.6 Minimum Performance Requirements

Minimum performance requirements are as follows:

1. System response times:

   The Engineered Safety Features actuation system response time, or time delay, is defined as the interval required for the Engineered Safety Features sequence to be initiated subsequent to the point in time that the appropriate variables(s) exceed setpoint(s). The delay

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time includes sensor, process and logic (digital) delay plus, the time delay associated with tripping open the reactor trip breakers, although the reactor trip (on Engineered Safety Feature Actuation Signal) theoretically occurs before or simultaneously with Engineered Safety Features sequence initiation (See Figure 7.2.1-1, Sheet 8). The ESFAS response time values are provided in ~~Chapter 16 (Technical Specifications).~~ Table 7.3.1-4. 6

Add Insert A →

2. System accuracies:

Loss of Coolant Protection Actuation Signals

a. Pressurizer low pressure (1)

Steam Break Protection Actuation Signals

a. Steam line pressure (1)

b. T_{avg} (1) 8

c. Containment pressure signal (1)

NOTE (1)

See "Westinghouse Setpoint Methodology for Protection Systems, Sequoyah Units 1 and 2," WCAP 11239.

3. Ranges of sensed variables to be accommodated until conclusion of protection action is assured:

Typical ranges required in generating the required actuation signals for loss of coolant protection are given:

a. Pressurizer pressure	1700 to 2500 psig
b. Containment pressure (Ice Condenser System)	-1 to 15 psig

Typical ranges required in generating the required actuation signals for steam break protection are given:

a. T_{avg}	530 to 630°F
b. Steam line pressure	0 to 1200 psig
c. Containment pressure (Ice Condenser System)	-1 to 15 psig

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Insert A

The design of the alternating current distribution system in conjunction with the worst-case accident conditions introduces a potential five-second delay in achieving minimum equipment operating voltage for 480-volt safety-related loads with offsite power available. This potential delay results from the worst-case automatic tap changer movement on the common station service transformers. The response times shown in Table 7.3.1-4 support surveillance test conditions with the onsite power system at normal voltage levels. The accident analysis supports an additional five-second duration for safety related equipment that is affected by the potential in achieving adequate voltage.

ENGINEERED SAFETY FEATURES RESPONSE TIMES

INITIATING SIGNAL AND FUNCTION	RESPONSE TIME IN SECONDS
1. Manual	
a. Safety Injection (ECCS)	Not Applicable
Feedwater Isolation	Not Applicable
Reactor Trip (SI)	Not Applicable
Containment Isolation-Phase "A"	Not Applicable
Containment Ventilation Isolation	Not Applicable
Auxiliary Feedwater Pumps	Not Applicable
Essential Raw Cooling Water System	Not Applicable
Emergency Gas Treatment System	Not Applicable
b. Containment Spray	Not Applicable
Containment Isolation-Phase "B"	Not Applicable
Containment Ventilation Isolation	Not Applicable
Containment Air Return Fan	Not Applicable
c. Containment Isolation-Phase "A"	Not Applicable
Emergency Gas Treatment System	Not Applicable
Containment Ventilation Isolation	Not Applicable
d. Steam Line Isolation	Not Applicable
2. Containment Pressure - High	
a. Safety Injection (ECCS)	≤ 32.0 (1)
b. Reactor Trip (from SI)	≤ 3.0
c. Feedwater Isolation	≤ 8.0 (2)
d. Containment Isolation-Phase "A" (3)	≤ 18.0 (8) (15) / 28.0 (9)
e. Containment Ventilation Isolation	≤ 5.5 (8) (13)
f. Auxiliary Feedwater Pumps	≤ 60.0 (11)
g. Essential Raw Cooling Water System (16)	≤ 60.0 (8) (15) / 75.0 (9)
h. Emergency Gas Treatment System	≤ 38.0 (9)

ENGINEERED SAFETY FEATURES RESPONSE TIMES

INITIATING SIGNAL AND FUNCTION	RESPONSE TIME IN SECONDS
3. Pressurizer Pressure - Low	
a. Safety Injection (ECCS)	≤ 32.0 (1) / 28.0 (7) (15)
b. Reactor Trip (from SI)	≤ 3.0
c. Feedwater Isolation	≤ 8.0 (2)
d. Containment Isolation-Phase "A" (3)	≤ 18.0 (8) (15)
e. Containment Ventilation Isolation	≤ 5.5 (8) (13)
f. Auxiliary Feedwater Pumps	≤ 60.0 (11)
g. Essential Raw Cooling Water System (16)	≤ 60.0 (8) (15) / 75.0 (9)
h. Emergency Gas Treatment System	≤ 28.0 (8) (15)
4. Deleted	
5. Negative Steam Line Pressure Rate - High	
a. Steam Line Isolation	≤ 8.0

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ENGINEERED SAFETY FEATURES RESPONSE TIMES

INITIATING SIGNAL AND FUNCTION	RESPONSE TIME IN SECONDS
6. Steam Line Pressure - Low	
a. Safety Injection (ECCS)	≤ 28.0 (7) (15) / 28.0 (1)
b. Reactor Trip (from SI)	≤ 3.0
c. Feedwater Isolation	≤ 8.0 (2)
d. Containment Isolation-Phase "A" (3)	≤ 18.0 (8) (15) / 28.0 (9)
e. Containment Ventilation Isolation	Not Applicable
f. Auxiliary Feedwater Pumps	≤ 60.0 (11)
g. Essential Raw Cooling Water System (16)	≤ 60.0 (8) (15) / 75.0 (9)
h. Steam Line Isolation	≤ 8.0
i. Emergency Gas Treatment System	≤ 38.0 (9)
7. Containment Pressure -- High - High	
a. Containment Spray	≤ 208 (9)
b. Containment Isolation-Phase "B" (12)	≤ 65 (8) (15) / 75 (9)
c. Steam Line Isolation	≤ 7.0
d. Containment Air Return Fan	≥ 540.0 and ≤ 660
8. Steam Generator Water Level -- High-High	
a. Turbine Trip	≤ 2.5
b. Feedwater Isolation	≤ 11.0 (2)
9. Main Steam Generator Water Level -- Low-Low	
a. Motor - driven Auxiliary Feedwater Pumps (4)	≤ 60.0 (14)
b. Turbine - driven Auxiliary Feedwater Pumps (5) (11)	≤ 60.0 (14)

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ENGINEERED SAFETY FEATURES RESPONSE TIMES

INITIATING SIGNAL AND FUNCTION	RESPONSE TIME IN SECONDS
10. Station Blackout	
a. Auxiliary Feedwater Pumps	≤ 60 (11)
11. Trip of Main Feedwater Pumps	
a. Auxiliary Feedwater Pumps	≤ 60 (11)
12. Loss of Power	
a. 6.9 kv Shutdown Board - Degraded Voltage of Loss of Voltage	≤ 10 (10)
13. RWST Level-Low Coincident with Containment Sump Level - High and Safety Injection	
a. Automatic Switchover to Containment Sump	≤ 250
14. Containment Purge Air Exhaust Radioactivity - High	
a. Containment Ventilation Isolation	≤ 10 (6)

TABLE NOTATION

1. Diesel generator starting and sequence loading delays included. Response time limit includes opening of valves to establish SI path and attainment of discharge pressure for centrifugal charging pumps, SI and RHR pumps.

2. Using air operated valve. The ESFAS instrumentation channel RESPONSE TIME requirement for specific feedwater air-operated valve(s) can also be met when the associated air-operated valve is either closed with air supply(s) isolated, isolated by a closed manual valve, or isolated by a closed feedwater isolation valve with power removed. When using one of these provisions for satisfying the air-operated valve response time, the closed or isolated condition described above will be verified at least once per 7 days.

3. The following valves are exceptions to the response times shown in the table and will have the values listed in seconds for the initiating signals and function indicated:

Valves: FCV-26-240, -243

Response times:	2.d.	21 (8) (15) / 31(9)
	3.d.	22 (8) (15)
	6.d.	21 (8) (15) / 31(9)

Valves: FCV-61-96, -97, -110, -122, -191, -192, -193, -194

Response times:	2.d.	31 (8)
	3.d.	32 (8)
	6.d.	31 (8)

Valve: FCV-70-143

Response times:	2.d.	61 (8) (15) / 71(9)
	3.d.	62 (8) (15)
	6.d.	61 (8) (15) / 71(9)

4. On 2/3 any Steam Generator

5. On 2/3 in 2/4 Steam Generator

6. Radiation detectors for Containment Ventilation Isolation may be excluded from Response Time Testing.

7. Diesel generator starting and sequence loading delays not included. Offsite power available. Response time limit includes opening and closing of valves to establish SI path and attainment of discharge pressure for centrifugal charging pumps.

8. Diesel generator starting and sequence loading delays not included. Response time limit includes operating time of valves.

9. Diesel generator starting and sequence loading delays included. Response time limit includes operating time of valves.

10. The response time for loss of voltage is measured from the time voltage is lost until the time full voltage is restored by the diesel. The response time for degraded voltage is measured from the time the load shedding signal is generated, either from the degraded voltage or the SI enable timer, to the time full voltage is restored by the diesel. The response time of the timers is covered by the requirements on their setpoints.

11. The provisions of Technical Specification 4.0.4 are not applicable for entry into MODE 3 for the turbine-driven Auxiliary Feedwater Pump.

12. The following valves are exceptions to the response times shown in the table and will have the values listed in seconds for the initiating signals and the function indicated:

    Valves: FCV-67-89, -90, -105, -106
    Response times: 7.b. 75 (8) (15) / 85 (9)

    Valve: FCV-70-141
    Response times: 7.b. 70 (8) (15) / 80 (9)

13. Containment purge valves only. Containment radiation monitor valves have a response time of 6.5 seconds or less.

14. Does not include Trip Time Delays. Response times noted include the transmitters, Eagle-21 process protection cabinets, solid state protection cabinets, and actuation devices (up to and including pumps). This reflects the response times necessary for THERMAL POWER in excess of 50% RTP.

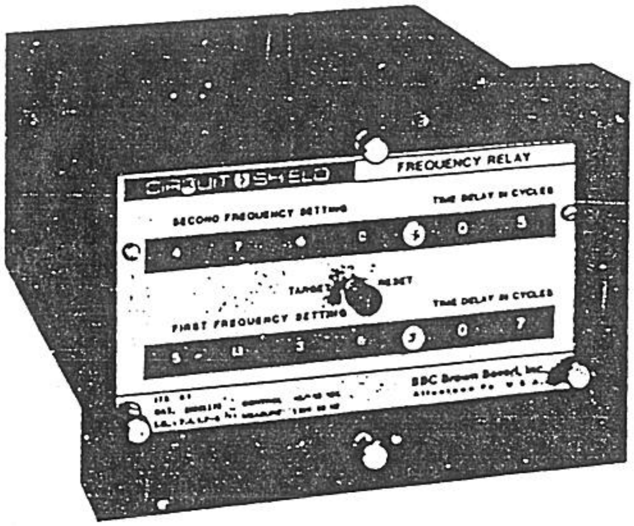
15. The response time shown is for system/valve response with normal equipment operating voltage available during periodic testing. Additional margin is included in the analysis to account for potential delays in achieving minimum equipment operating voltage.

16. The Essential Raw Cooling Water system 6.9 kv pumps are exceptions to the response times shown in the table and will have the values listed in seconds for the initiating signals and the function indicated:

Essential Raw Cooling Water System Pumps

Response times:	2.g.	65.0 (8) / 75.0 (9)
	3.g.	65.0 (8) / 75.0 (9)
	6.g.	65.0 (8) / 75.0 (9)

Type 81 One and Two Step Frequency Relays



Application

The Type 81 Frequency Relay is a reliable solid state relay designed to provide accurate detection of abnormal frequency conditions on electrical power systems. The Type 81 is available in one stage and two stage models. Single step models are provided with means to select either underfrequency or overfrequency operation. Two stage models may be set up for either two steps of underfrequency detection, two steps of overfrequency detection or for overfrequency and underfrequency protection.

The relay has operating characteristics which make it ideal for application on closely coordinated system load shedding programs. The accuracy and stability of the relay characteristics permits settings much closer to system frequency, and closer steps between settings of relays in a load shedding program, than possible with electromechanical relays.

Another application is typical to large industrial plants which have some local generation. Normally, they depend on a tie line with a utility for some portion of their power needs. If the tie breaker at the utility end should open, the generator in the plant would be overloaded especially if it also attempts to pick up utility load tapped on the tie line. This overload causes an underfrequency condition on the industrial system. The Type 81 can be used to open the tie to the utility system and drop nonessential load. Essential loads can be maintained to the limit of the generator capability.

In DSG applications, typical protection includes a two step Type 81 providing an under and overfrequency window and a Type 27/59 providing an under and overvoltage window.

The relay uses digital counting techniques to provide an accurate measure of frequency. The time base measurement is provided by an extremely stable crystal oscillator reference. The set point accuracy is 0.008 Hz. The relay is provided with TRIP POINT and TIME DELAY settings. These settings are easily made on the front panel of the relay. For underfrequency operation the time delay period begins when the relay has counted three consecutive cycles below the trip frequency. The time delay counter will be fully reset if one cycle occurs above the trip frequency.

Features

- High accuracy
- Easy to set
- Low burden
- High seismic capability - 6g ZPA
- Transient immunity
- Available in one stage or two stage models

2 YEAR WARRANTY

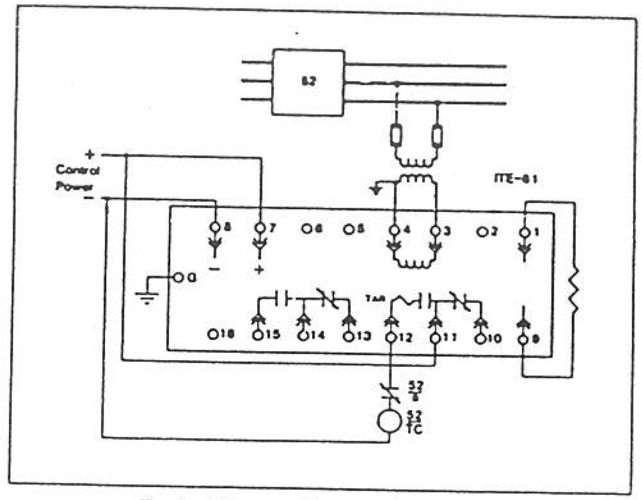
Attachment No. 4 Sheet 1 of 19
Identifier SQN-EEB-MS-TI28-0076

ASEA BROWN BOVERI

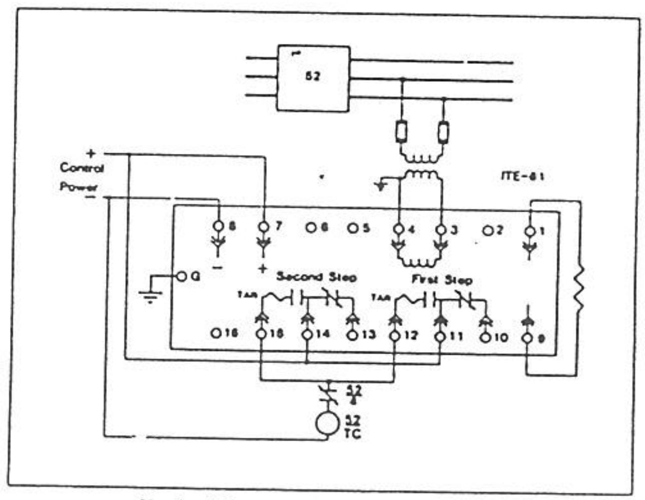
Type 81 Frequency Relays

SPECIFICATIONS

Operating Range:	Models available for: 45 - 52 Hz; 54 - 63 Hz
Input Circuit Rating:	60-140 Vac
Undervoltage Cutoff Function:	Adjustable 60 - 100 volts; Factory set at 60 volts
Burden:	0.7 VA
Control Power:	Models available for: 48/125 Vdc @ 0.06A. 24/32 Vdc @ 0.10A.
Operating Time:	Adjustable 1 - 99 cycles (must have 3 consecutive incorrect cycles before timing begins)
Output Contacts:	2 Form C contacts (for 1 step unit); 1 Form C contact for each step (for 2 step unit)
Output Circuit Rating:	@ 125 Vdc; 30A tripping; 5A continuous; 1A opening resistive; 0.3A opening inductive
Temperature:	Minus 20 to Plus 70°C
Seismic Capability:	More than 6g ZPA biaxial multi-frequency vibration without damage or malfunction. (ANSI/IEEE C37.98)
Transient Immunity:	More than 3000 V, 1 MHz bursts at 60 Hz repetition rate, continuous (ANSI C37.90a - 1974); fast transient test; EMI immunity.
Dielectric:	2000 Vac RMS, 60 seconds all circuits to ground
Weight:	Unboxed - 3.3 lbs (1.5 Kg); Boxed - 4.0 lbs (1.8 Kg)
Volume:	0.26 cubic feet



Typical Connections—1 Step Relay



Typical Connections—2 Step Relay

HOW TO SPECIFY

Frequency Relay shall be Asea Brown Boveri Type 81 or approved equal. Relay operating point shall be settable in 0.05 Hz increments. Time delay shall be adjustable in 1 cycle increments. Relay shall be capable of withstanding 6g ZPA seismic stress without malfunctions. Operation indicator shall be provided. An undervoltage cutoff function shall be provided to block operation for low line voltage conditions.

ADDITIONAL INFORMATION

Instruction Book	IB 7.4.1.7-5
Relay Selection Sheet	7.4.0.3
Prices	7.10.0.5

HOW TO ORDER

For a complete listing of available frequency relays, see selection sheet 7.4.0.3.

To place an order, or for further information, contact your nearest District Office, or the Sales Manager, Protective Relays.

Attachment No. 4 Sheet 2 of 19
Identifier SQN-EEB-MS-TI28-0075

ABB Power Transmission Inc.
Protective Relay Division
35 N. Snowdrift Road, Allentown, PA 18106
Telephone (215) 395-6888
FAX 215-395-1055
Supersedes Issue E Printed in U.S.A. 1088

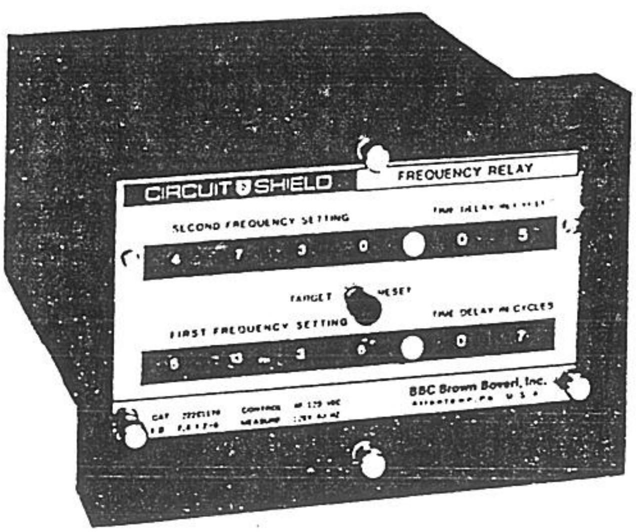
ABB
ASEA BROWN BOVERI

IB 7.4.1.7-5
Issue C

INSTRUCTIONS

Frequency Relays

TYPE 81 Catalog Series 422



Two Step Frequency Relay

Attachment No. 4 Sheet 3 of 19
Identifier SQN-EEB-MS-TI28-0076

ASEA BROWN BOVERI

TABLE OF CONTENTS

INTRODUCTION

These instructions contain the information required to properly install, operate, and test the ABB Circuit-Shield™ Type 81 Frequency Relay, catalog series 422.

The relay is housed in a case suitable for conventional semiflush panel mounting. All connections to the relay are made at the rear of the case and are clearly numbered. Relays of the 422 catalog series are similar to earlier designs of the 222 series. Both series provide the same basic functions and are of totally drawout construction; however, the 422 series relays provide integral test facilities. Also, sequenced disconnects on the 422 series prevent nuisance operation during withdrawal or insertion of the relay if the normally-open contacts are used in the application.

All settings are made on the front panel of the relay, behind a removable clear plastic cover. The target is reset by means of a pushbutton extending through the relay cover.

PRECAUTIONS

The following precautions should be taken when applying these relays:

1. Incorrect wiring may result in damage. Be sure wiring agrees with the connection diagram for the particular relay before energizing. *Important: connections for the 422 catalog series units are different than the 222 series units.*

2. Apply only the rated voltage marked on the relay front panel. The proper polarity must be observed when the dc control power connections are made.

3. For relays with dual-rated control voltage, withdraw the relay from the case and check that the movable link on the printed circuit board is in the correct position for the system control voltage.

4. Internal movable links are used to set up the mode of operation of the relay. Be sure to inspect and set the links prior to placing the relay in service. See section on connections for more information.

5. High voltage insulation tests are not recommended. See section on testing for additional information.

6. The entire circuit assembly of the relay is removable. The unit should insert smoothly. Do not use excessive force.

7. Follow test instructions to verify that the relay is in proper working order.

CAUTION: *since troubleshooting entails working with energized equipment, care should be taken to avoid personal shock. Only competent technicians familiar with good safety practices should service these devices.*

PLACING THE RELAY INTO SERVICE

1. RECEIVING, HANDLING, STORAGE

Upon receipt of the relay (when not included as part of a switchboard) examine for shipping damage. If damage or loss is evident, file a claim at once and promptly notify Asea Brown Boveri. Use normal care in handling to avoid mechanical damage. Keep clean and dry.

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Identifier SQN-EEB-MS-TI28-0076

2. INSTALLATION

Mounting:
The outline dimensions and panel drilling and cutout information is given in Fig. 1.

Connections:
Internal connections are shown in Figure 2. Typical external connections are shown in Figure 3. *Important: connections are different for 422 series units compared to 222 series units.*

These relays have metal front panels which are connected through printed circuit board runs and connector wiring to a terminal at the rear of the relay case. The terminal is marked "G". In all applications this terminal should be wired to ground.

Internal selector plugs are provided to set up various operating modes. The relay must be withdrawn from its case and the plugs set properly for the application. See Figure 4 for the locations of the selector plugs.

Control Power Selector Plug:
Control power must be connected in the proper polarity. For relays with dual-rated control power: before energizing, withdraw the relay from its case and inspect that the movable link on the lower printed circuit board is in the correct position for the system control voltage. (For units rated 110vdc, the plug should be placed in the position marked 125vdc.)

Operating Mode Selector Plug:
An internal selector plug is provided to choose whether the relay will function as an underfrequency relay or overfrequency relay. If the relay has two stages, a plug will be provided for each stage. The operation of each stage is independently set. In other words, the relay may be set for (2) steps of underfrequency operation, or for (1) step of overfrequency and (1) step of underfrequency operation, or (2) steps of overfrequency operation.

Target Operation Selector Plug:
This plug sets the mode of operation of the target. This is a new feature not previously available on 222 series units. Setting the plug in the SHUNT or INT position provides for the target to be operated electronically at the same time the output relay is energized. With the plug in the SERIES or EXT position, a trip circuit current of 1 ampere or more is required in the coil labelled TAR on the internal connection diagram. (The polarity of this current does not matter.)

(Note: a number of units, catalog number 422xx1xx have been produced without the trip current operated target feature. Targets on these units are electronically activated when the tripping outpu is energized.)

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Identifier SQN-EEB-MS-TI28-0076

3. SETTINGS

Coded Trip Point Frequency Setting

For 60 Hertz models, Table 1 provides setting codes for frequencies between 54 and 63 Hz in steps of 0.05 Hz. Table 2 provides settings for 50 Hz. models for frequencies between 45 and 52 Hz. These tables include the settings commonly used in most applications. Should special settings be required outside these ranges, or between two values given, the codes may be requested from the factory.

Trip point adjustment is accomplished by setting the four thumbwheel switches to the numbers shown in the table which corresponds to the desired trip frequency. Each of the thumbwheel switches is labelled 0 to 15. Settings are shown in the tables in the same arrangement left to right as they are to be made on the relay.

Time Delay Setting

The time delay thumbwheel switches are labelled directly in cycles. The adjustment range is 1 to 99 cycles. The time delay period will not start until (3) consecutive "bad" cycles have been detected. Therefore the *total operating time* is the dial setting plus 3 cycles. The timing function will reset upon receiving one "good" cycle. *Do not set the time delay to 00". This will cause a constant trip.*

IMPORTANT: THE SETTINGS SHOULD NOT BE CHANGED WITH THE RELAY IN SERVICE. AN INCORRECT OPERATION MAY OCCUR DURING THE TRANSITION FROM ONE SETTING TO ANOTHER.

Undervoltage Cutoff Function
The undervoltage cutoff function will block operation of the frequency relay when the input line voltage drops below its setting. This is an internal adjustment that must be set by test. The factory setting is 60 vac nominal. Refer to the section on testing for re-calibration procedure.

APPLICATION DATA

The ABB Circuit-Shield™ Type 81 Frequency Relay is a reliable solid-state relay designed to provide accurate detection of abnormal frequency conditions on electrical power systems. The Type 81 is available in one-stage and two-stage models. Single-stage models are provided with means to select either underfrequency operation or overfrequency operation. Two-stage models may be set up for either two steps of underfrequency operation as might be found in load-shedding applications; or, for one step of underfrequency and one step of overfrequency operation as would typically be found in generator protection; or, for two steps of overfrequency.

These relays use solid-state technology and digital counting techniques to provide accurate frequency measurement. The time base for measurement is provided by a very stable crystal oscillator. Standard set point accuracy is 0.008 Hz. Models with an accuracy of 0.005 Hz. can be supplied on request. Trip frequency and time delay settings are easily made on the front panel of the relay by means of thumbwheel switches. The timer begins when the relay has detected 3 consecutive "bad" cycles; therefore, the total operating time of the relay is the delay set on the front panel plus 3 cycles. The time delay counter is fully reset if one "good" cycle occurs prior to the relay timing out and tripping.

The Type 81 has operating characteristics which make it ideal for application on closely coordinated system load shedding programs. The accuracy and stability of the relay characteristic permits settings much closer to normal system frequency, and closer steps between settings of relays in a load shedding program than possible with electromechanical relays.

Another application is typical to large industrial plants which have some local generation. Normally they depend on a tie line to a utility for some portion of their power needs. If the breaker at the utility end should open, the generator in the plant would be overloaded, especially if it also attempts to pick up utility load tapped on the tie line. This overload causes an underfrequency condition on the industrial system. The Type 81 can be used to open the tie to the utility system and to drop non-essential loads in the plant. Essential loads can by maintained to the limit of the generator capability.

In DSG applications, typical protection includes a two step Type 81 providing an under and overfrequency window and an ABB Type 27/59 providing an under and overvoltage window. If the frequency or voltage deviates from within either of these windows the tie to the utility system is opened.

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CHARACTERISTICS OF COMMON UNITS

Nominal System Frequency	Number of Steps	Output Contacts	Connection Diagram	Control Voltage	Catalog Number
60 Hz	1	2 form C	16D422A	48/125 vdc	422B1275
				48/110 vdc	422B1205
				24/ 32 vdc	422B1295
				24/125 vdc	422B1285
				250 vdc	422B1255
50 Hz	1	2 form C	16D422A	48/125 vdc	422D1275
				48/110 vdc	422D1205
				24/ 32 vdc	422D1295
				110/220 vdc	422D1225
				250 vdc	422D1255
60 Hz	2	1 form C for each step	16D422B	48/125 vdc	422C1276
				48/110 vdc	422C1206
				24/ 32 vdc	422C1296
				250 vdc	422C1256
50 Hz	2	1 form C for each step	16D422B	48/125 vdc	422E1276
				48/110 vdc	422E1206
				24/ 32 vdc	422E1296
				110/220 vdc	422E1226
				250 vdc	422E1256

SPECIFICATIONS:

Input Circuit: 60-140 Vac Continuous; 300 Vac for 10 seconds.

Input Burden: 0.7 VA

Undervoltage Cutoff Function: adjustable 60-100 vac, factory setting 60 volts.
operating time: approximately 30 milliseconds.
reset time: approximately 65 milliseconds.

Trip Point Setting Range: 60 Hz. models - see Table 1 for settings 63.00-54.00 Hz.
50 Hz. models - see Table 2 for settings 52.00-45.00 Hz.
(Settings outside these ranges are possible. Consult factory for feasibility and setting codes.)

Trip Point Accuracy and Repeatability: +/-0.008 Hz., -20 to +55 deg C.
(+/-0.005 Hz. available on request)

Time Delay Range: Adjustable 1 to 99 cycles; (add 3 cycles measurement time for total operating time.)

Accuracy and repeatability: typical: +/-1 cycle,
limits: +3/-2 cycles.

Operating Temperature Range: -30 to +75 deg. C.

Output Circuit:

Contact ratings at	125 Vdc	250 Vdc
Tripping	30 amperes	30 amperes
Continuous	5 amperes	5 amperes
Break	0.3 ampere	0.1 ampere

Note: 250vdc contact ratings apply only to units rated for 250 vdc control and for other units with catalog suffix "-CAP"; eg: 422C1276-CAP.

Series Target Coil: 1 ampere or more trip circuit current will insure target operation. Withstand: 30 amperes, 1 second.
Coil resistance: negligible.

For output circuits with less than 1 ampere current, set relay selector plug for Internal (shunt) operation.

Control Power: models available for

8/125 vdc	at 0.03 ampere standby,	0.07 ampere max.
48/110 vdc	at 0.03 ampere standby,	0.07 ampere max.
24/ 32 vdc	at 0.04 ampere standby,	0.11 ampere max.
24/125 vdc	at 0.04 ampere standby,	0.11 ampere max.
110/220 vdc	at 0.03 ampere standby,	0.07 ampere max.
250 vdc	at 0.03 ampere standby,	0.06 ampere max.
120 vac	- consult factory.	

Allowable variation:

24v nominal:	19- 29 vdc.
32v nominal:	25- 38 vdc.
48v nominal:	38- 58 vdc.
110v nominal:	88-125 vdc.
125v nominal:	100-140 vdc.
220v nominal:	175-246 vdc.
250v nominal:	200-280 vdc.

Dielectric Strength: 2000 vac, 50/60 Hz., 60 seconds, all circuits to ground.

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Identifier SQN-EEB-MS-TI28-0076

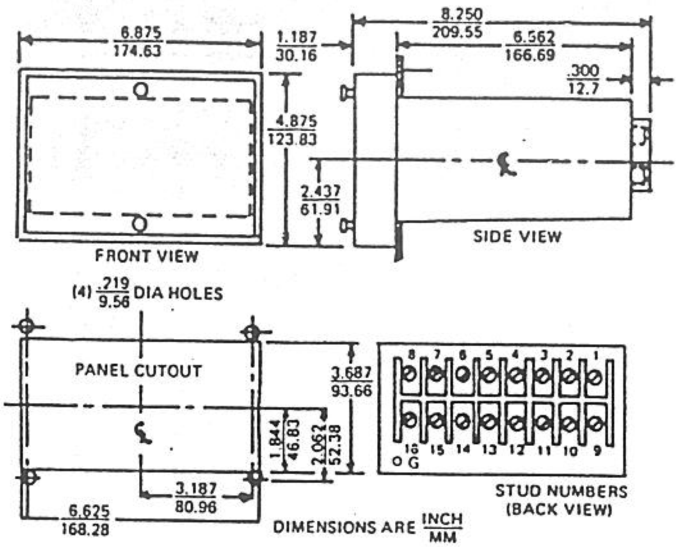

Figure 1: Relay Outline and Drilling

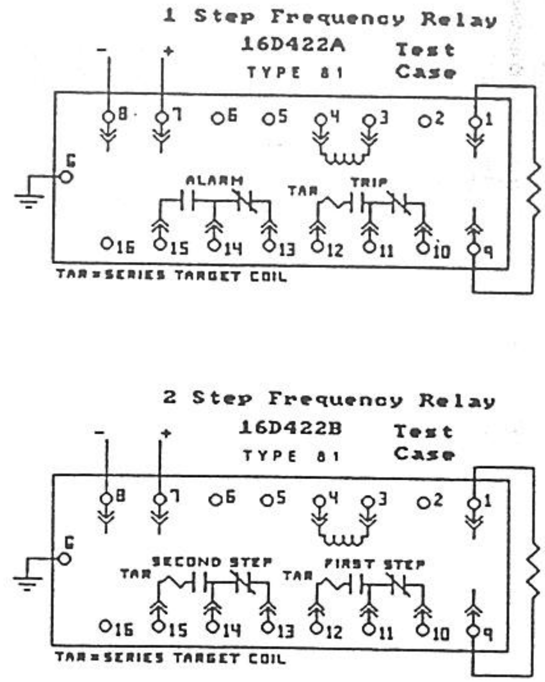

Figure 2: Internal Connections

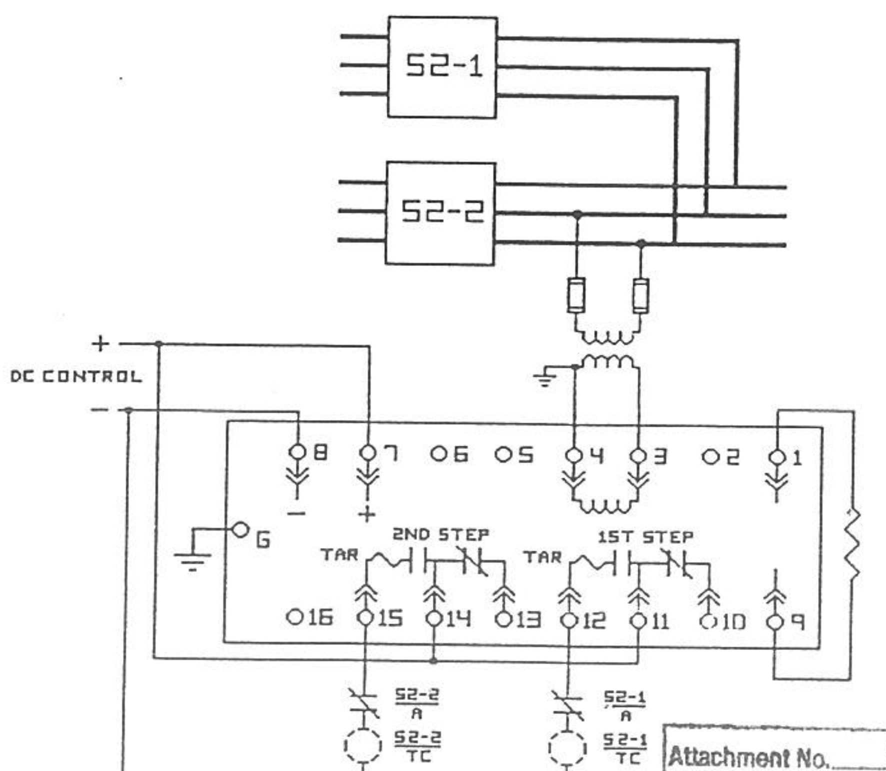

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Figure 3a: Typical External Connections

Load Shedding Application
Relay Set for 2 Steps of Underfrequency

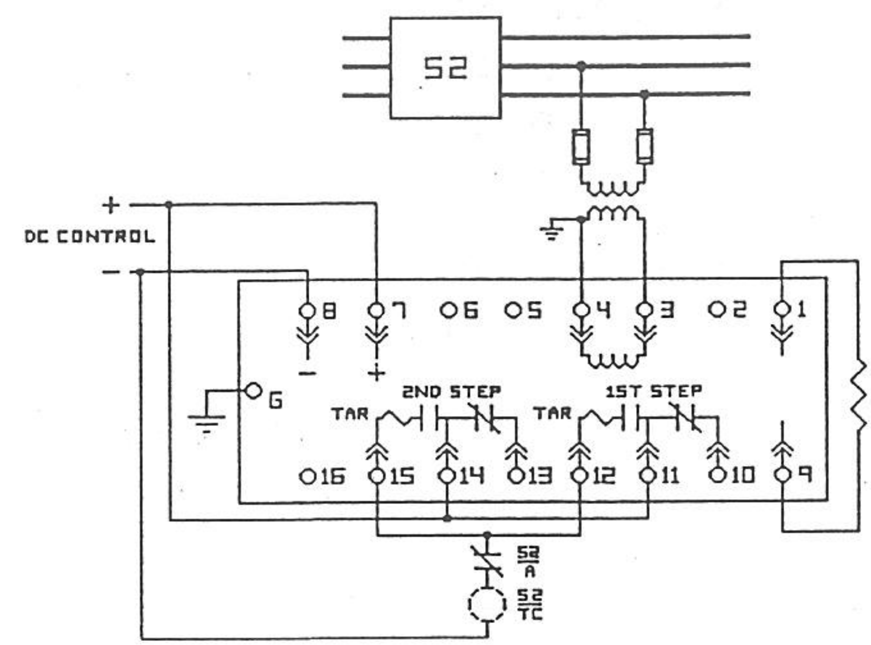

Figure 3b: Typical External Connections

Generator Protection Application
2 Step Relay Set for Under and Overfrequency Operation

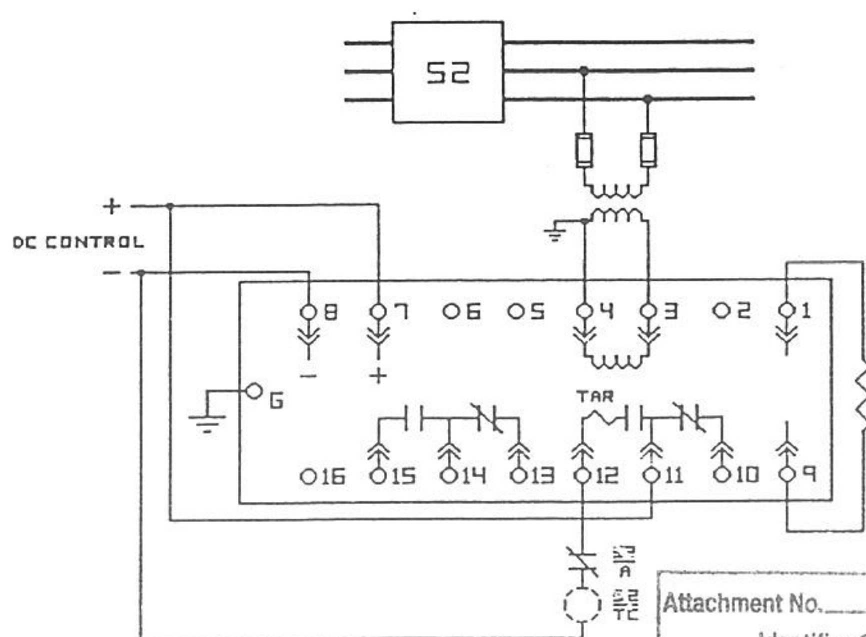

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Figure 3c: Typical External Connections

Single Step Relay

TABLE 1 - TRIP POINT FREQUENCY CODES *For 60Hz Units Only*

TRIP POINT FREQ	SWITCH SETTINGS			
63.00	15	7	6	9
62.95	12	1	7	9
62.90	12	4	7	9
62.85	13	7	7	9
62.80	14	0	8	9
62.75	14	3	8	9
62.70	15	6	8	9
62.65	12	10	8	9
62.60	12	3	9	9
62.55	13	6	9	9
62.50	14	9	9	9
62.45	15	2	0	10
62.40	12	6	0	10
62.35	12	9	0	10
62.30	13	2	1	10
62.25	14	5	1	10
62.20	15	8	1	10
62.15	12	2	2	10
62.10	13	5	2	10
62.05	14	8	2	10
62.00	15	1	3	10
61.95	12	5	3	10
61.90	13	8	3	10
61.85	14	1	4	10
61.80	15	4	4	10
61.75	12	8	4	10
61.70	13	1	5	10
61.65	15	4	5	10
61.60	12	8	5	10
61.55	13	1	6	10
61.50	14	4	6	10
61.45	15	7	6	10
61.40	13	1	7	10
61.35	14	4	7	10
61.30	15	7	7	10
61.25	13	1	8	1
61.20	14	4	8	10
61.15	15	7	8	10
61.10	13	1	9	10
61.05	14	4	9	10
61.00	15	7	9	10
60.95	13	1	0	11
60.90	14	4	0	11
60.85	12	8	0	11
60.80	13	1	1	11
60.75	15	4	1	11
60.70	12	8	1	11
60.65	14	1	2	11
60.60	12	5	2	11
60.55	13	8	2	11
60.50	15	1	3	11
60.45	13	5	3	11
60.40	14	8	3	11
60.35	12	2	4	11
60.30	14	5	4	11
60.25	12	9	4	11
60.20	13	2	5	11
60.15	15	5	5	11
60.10	13	9	5	11
60.05	15	2	6	11

TRIP POINT FREQ	SWITCH SETTINGS			
60.00	13	6	6	11
59.95	15	9	6	11
59.90	12	3	7	11
59.85	14	6	7	11
59.80	12	0	8	11
59.75	14	3	8	11
59.70	12	7	8	11
59.65	14	0	9	11
59.60	13	4	9	11
59.55	15	7	9	11
59.50	13	1	0	12
59.45	15	4	0	12
59.40	13	8	0	12
59.35	15	1	1	12
59.30	13	5	1	12
59.25	12	9	1	12
59.20	14	2	2	12
59.15	12	6	2	12
59.10	14	9	2	12
59.05	13	3	3	12
59.00	15	6	3	12
58.95	14	0	4	12
58.90	12	4	4	12
58.85	14	7	4	12
58.80	13	1	5	12
58.75	15	4	5	12
58.70	14	8	5	12
58.65	12	2	6	12
58.60	15	5	6	12
58.55	13	9	6	12
58.50	12	3	7	12
58.45	15	6	7	12
58.40	13	0	8	12
58.35	12	4	8	12
58.30	15	7	8	12
58.25	13	1	9	12
58.20	12	5	9	12
58.15	15	8	9	12
58.10	14	2	0	13
58.05	13	6	0	13
58.00	15	9	0	13
57.95	14	3	1	13
57.90	13	7	1	13
57.85	12	1	2	13
57.80	15	4	2	13
57.75	14	8	2	13
57.70	13	2	3	13
57.65	12	6	3	13
57.60	15	9	3	13
57.55	14	3	4	13
57.50	13	7	4	13
57.45	12	1	5	13
57.40	12	5	5	13
57.35	15	8	5	13
57.30	14	2	6	13
57.25	13	6	6	13
57.20	13	0	7	13
57.15	12	4	7	13
57.10	15	7	7	13
57.05	14	1	8	13

TRIP POINT FREQ	SWITCH SETTINGS			
57.00	14	5	8	13
56.95	13	9	8	13
56.90	13	3	9	13
56.85	12	7	9	13
56.80	12	1	0	14
56.75	15	4	0	14
56.70	15	8	0	14
56.65	14	2	1	14
56.60	14	6	1	14
56.55	13	0	2	14
56.50	13	4	2	14
56.45	13	8	2	14
56.40	12	2	3	14
56.35	12	6	3	14
56.30	12	10	3	14
56.25	12	4	4	14
56.20	12	8	4	14
56.15	15	1	5	14
56.10	15	5	5	14
56.05	15	9	5	14
56.00	15	3	6	14
55.95	15	7	6	14
55.90	15	1	7	14
55.85	15	5	7	14
55.80	15	9	7	14
55.75	15	3	8	14
55.70	15	7	8	14
55.65	15	1	9	14
55.60	12	6	9	14
55.55	12	10	9	14
55.50	12	4	0	15
55.45	12	8	0	15
55.40	13	2	1	15
55.35	13	6	1	15
55.30	13	0	2	15
55.25	14	4	2	15
55.20	14	8	2	15
55.15	14	2	3	15
55.10	15	6	3	15
55.05	15	0	4	15
55.00	12	5	4	15
54.95	12	9	4	15
54.90	13	3	5	15
54.85	14	7	5	15
54.80	14	1	6	15
54.75	15	5	6	15
54.70	12	10	6	15
54.65	12	4	7	15
54.60	13	8	7	15
54.55	14	2	8	15
54.50	15	6	8	15
54.45	15	0	9	15
54.40	12	5	9	15
54.35	13	9	9	15
54.30	14	3	10	15
54.25	15	7	10	15
54.20	12	2	11	15
54.15	13	6	11	15
54.10	14	0	12	15
54.05	15	4	12	15
54.00	13	9	12	15

DIAL SETTINGS ARE SHOWN IN THE SAME ARRANGEMENT AS THEY ARE TO BE MADE ON THE FRONT PANEL OF THE RELAY

Attachment No. 4 Sheet 10 of 19
Identifier SQN-EEB-MS-TI28-0075

TABLE 2 - TRIP POINT FREQUENCY CODES *For 50Hz Units Only*

TRIP POINT FREQ	SWITCH SETTINGS			
52.00	15	6	4	9
51.95	14	8	4	9
51.90	13	0	5	9
51.85	12	2	5	9
51.80	11	4	5	9
51.75	10	6	5	9
51.70	9	8	5	9
51.65	8	0	6	9
51.60	8	2	6	9
51.55	15	3	6	9
51.50	14	5	6	9
51.45	13	7	6	9
51.40	13	9	6	9
51.35	12	1	7	9
51.30	11	3	7	9
51.25	11	5	7	9
51.20	10	7	7	9
51.15	10	9	7	9
51.10	9	1	8	9
51.05	9	3	8	9
51.00	8	5	8	9
50.95	8	7	8	9
50.90	8	9	8	9
50.85	15	0	9	9
50.80	15	2	9	9
50.75	15	4	9	9
50.70	14	6	9	9
50.65	14	8	9	9
50.60	14	0	0	10
50.55	14	2	0	10
50.50	14	4	0	10
50.45	14	6	0	10
50.40	13	8	0	10
50.35	13	0	1	10
50.30	13	2	1	10
50.25	13	4	1	1
50.20	13	6	1	10
50.15	14	8	1	10
50.10	14	0	2	10
50.05	14	2	2	10
50.00	14	4	2	10
49.95	14	6	2	10
49.90	14	8	2	10
49.85	15	0	3	10
49.80	15	2	3	10

TRIP POINT FREQ	SWITCH SETTINGS			
49.75	15	4	3	10
49.70	8	7	3	10
49.65	8	9	3	10
49.60	9	1	4	10
49.55	9	3	4	10
49.50	10	5	4	10
49.45	10	7	4	10
49.40	11	9	4	10
49.35	11	1	5	10
49.30	12	3	5	10
49.25	13	5	5	10
49.20	13	7	5	10
49.15	14	9	5	10
49.10	15	1	6	10
49.05	8	4	6	10
49.00	9	6	6	10
48.95	9	8	6	10
48.90	10	0	7	10
48.85	11	2	7	10
48.80	12	4	7	10
48.75	13	6	7	10
48.70	14	8	7	10
48.65	8	1	8	10
48.60	9	3	8	10
48.55	10	5	8	10
48.50	11	7	8	10
48.45	12	9	8	10
48.40	14	1	9	10
48.35	15	3	9	10
48.30	8	6	9	10
48.25	10	8	9	10
48.20	11	0	0	11
48.15	12	2	0	11
48.10	14	4	0	11
48.05	15	6	0	11
48.00	9	9	0	11
47.95	11	1	1	11
47.90	12	3	1	11
47.85	14	5	1	11
47.80	8	8	1	11
47.75	9	0	2	11
47.70	11	2	2	11
47.65	13	4	2	11
47.60	15	6	2	11
47.55	9	9	2	11
47.50	11	1	3	11
47.45	13	3	3	11
47.40	15	5	3	11
47.35	9	8	3	11
47.30	11	0	4	11

TRIP POINT FREQ	SWITCH SETTINGS			
47.25	13	2	4	11
47.20	15	4	4	11
47.15	9	7	4	11
47.10	11	9	4	11
47.05	14	1	5	11
47.00	8	4	5	11
46.95	10	6	5	11
46.90	13	8	5	11
46.85	15	0	6	11
46.80	10	3	6	11
46.75	12	5	6	11
46.70	15	7	6	11
46.65	9	0	7	11
46.60	12	2	7	11
46.55	15	4	7	11
46.50	9	7	7	11
46.45	12	9	7	11
46.40	15	1	8	11
46.35	10	4	8	11
46.30	13	6	8	11
46.25	8	9	8	11
46.20	10	1	9	11
46.15	13	3	9	11
46.10	8	6	9	11
46.05	12	8	9	11
46.00	15	0	0	12
45.95	10	3	0	12
45.90	13	5	0	12
45.85	8	8	0	12
45.80	12	0	1	12
45.75	15	2	1	12
45.70	10	5	1	12
45.65	14	7	1	12
45.60	9	0	2	12
45.55	13	2	2	12
45.50	8	5	2	12
45.45	12	7	2	12
45.40	15	9	2	12
45.35	11	2	3	12
45.30	15	4	3	12
45.25	11	7	3	12
45.20	14	9	3	12
45.15	10	2	4	12
45.10	14	4	4	12
45.05	10	7	4	12
45.00	14	9	4	12

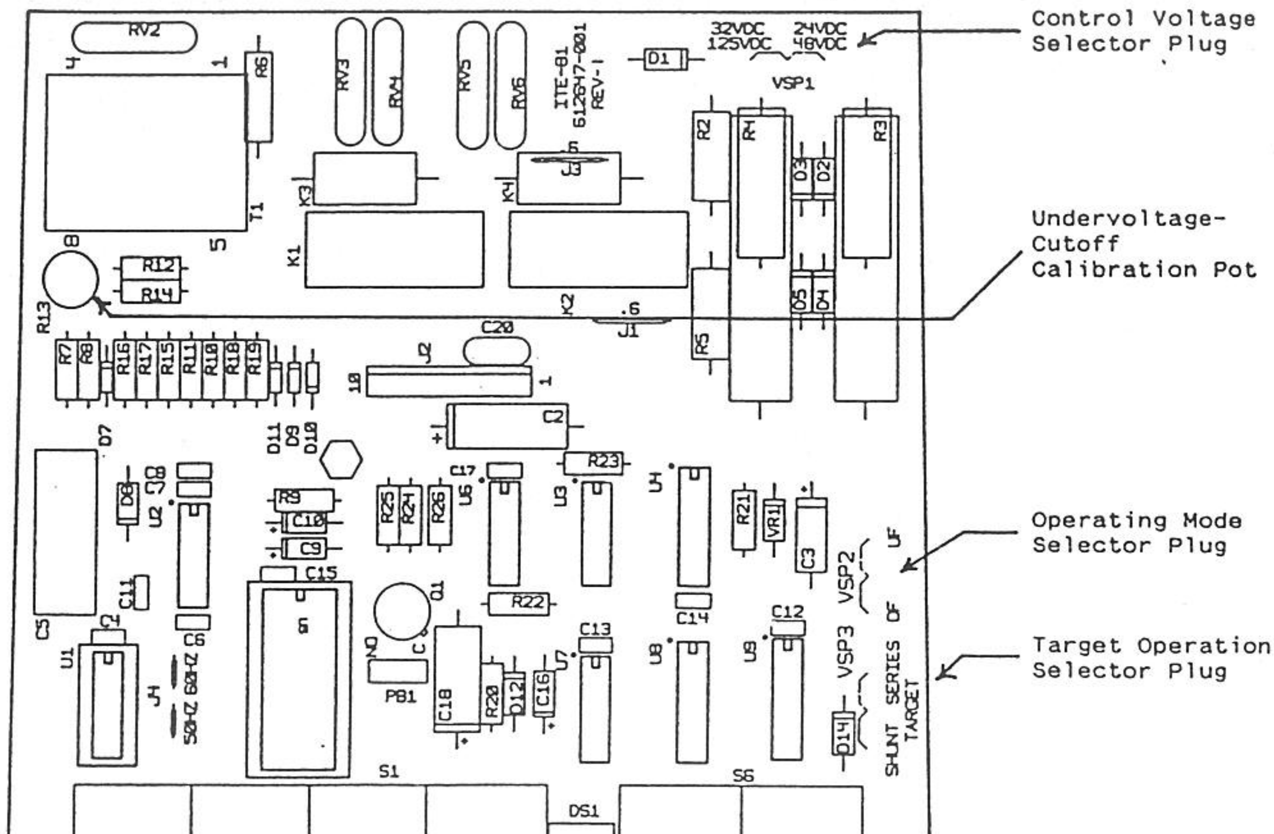
DIAL SETTINGS ARE SHOWN IN THE SAME ARRANGEMENT AS THEY ARE TO BE MADE ON THE FRONT PANEL OF THE RELAY

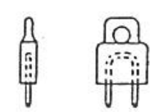
Note:
The ABB Circuit-Shield Type 81 relay is capable of a setting resolution of 0.01 Hertz. Contact the factory if you need a setting code for a frequency set point not listed in the tables.

Attachment No. 4 Sheet 11 of 19
Identifier SQN-EEB-MS-TI28-0076

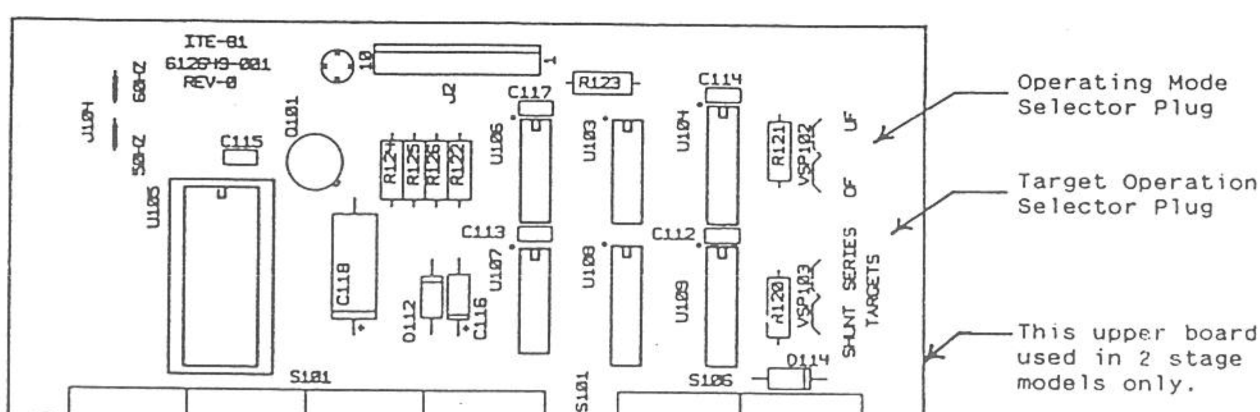
Figure 4: Location of Selector Plugs

These drawings represent typical printed circuit board layouts for relays of catalog series 422 units. The selector plugs must be positioned properly for the desired modes of operation. Refer to page 3 for a description of plug functions.





Selector Plug



Calculation of TIME DELAY switch settings:

If the required operating time of the relay has been given in *seconds*, this value must be converted to the proper switch settings in *cycles*. Use the following formula:

Setting in cycles = (t * f) - 3 where t = desired operating time in seconds
f = set point frequency

For example: with a set point of 58.5 Hz, a total operating time of 0.20 seconds is desired. Setting = (0.2 * 58.5) - 3 = 11.7 - 3 = 8.7 cycles; therefore set the TIME DELAY switches to "09" cycles.

TESTING

1. MAINTENANCE AND RENEWAL PARTS

No routine maintenance is required on the Type 81 relay. Follow test instructions to verify that the relay is in proper working order. We recommend that an inoperative relay be returned to the factory for repair; however, a schematic diagram and circuit description will be provided on request. Renewal parts will be quoted by the factory on request.

See Paragraph 4 for basic information on units of catalog series 222 which are no longer in production.

Drawout Element - Catalog Series 422

Metal handles provide leverage to withdraw the relay assembly from the case. Removing the unit in an application that uses the normally-closed contact will cause an operation. The assembly is identified by the catalog number stamped on the front panel of the unit and by a serial number stamped on the bottom of the board.

Test connections are readily made to the drawout relay unit by using standard banana plug leads at the rear vertical circuit board. This rear board is marked for easier identification of the connection points.

Important: in order to test the drawout unit, a resistor must be connected temporarily between terminals 1 and 9 on the rear vertical circuit board. The value of this resistor depends on the control voltage rating of the relay and should be marked on the rear board. A 25 watt resistor is sufficient. If no resistor is available, the resistor assembly mounted on the rear of the relay case could be removed and used. *If the resistor from the case is used, be sure to remount it on the case at the conclusion of testing.*

> *Exception:* for dual rated relays (48/125 vdc, 24/32 vdc, 48/110 vdc, 24/125vdc, 110/220 vdc), the resistor is required only when the relay is set up for the *higher* of the two voltage ratings.

External Resistor Values:

Relay rating:	24/32 vdc	48/125 v	48/110 v	24/125 v	110/220 v	250 vdc
Resistor value:	250 ohm	3500 ohm	3000 ohm	3500 ohm	4500 ohm	8000 ohm

Test Plug:
A test plug assembly, catalog number 400X0002 is available for use with the 422 series unit. This device plugs into the relay case on the switchboard and allows access to all external circuits wired to the case. See Instruction Book IB 7.7.1.7-8 for details of this device.

Attachment No. 4 Sheet 13 of 19
Identifier SQN-EEB-MS-TI28-0076

2. HIGH POTENTIAL TESTS

High potential tests are not recommended. A hi-pot test was performed at the factory before shipping. If a control wiring insulation test is required, partially withdraw the relay unit from the case sufficient to break the rear connections before applying the test voltage.

On 422 series units, a link on the rear vertical circuit board is removed temporarily when high potential tests are conducted at the factory. After testing, the link is restored to its position to connect certain surge suppression components to ground for normal operation. The link is labelled "remove for hipot".

3. ACCEPTANCE TESTS

Functional Test without Variable Frequency Source:

A typical test circuit is shown in Figure 5. Set the relay for the desired modes of operation. If target operation is to be by trip circuit current, reset the plugs for Series (External) operation, and connect a lockout relay as a load on the output contacts. If a lockout relay is not available, set the target for Shunt (Internal) operation at this time. Set the frequency codes and the time delay per the following chart:

Relay Model	Internal Plug Set for	Frequency Codes	Time Delay Setting
60 Hz.	Underfrequency	15 1 3 10 (62.00 Hz)	90 cycles
	Overfrequency	15 9 0 13 (58.00 Hz)	90 cycles
50 Hz.	Underfrequency	15 6 4 9 (52.00 Hz)	75 cycles
	Overfrequency	9 9 0 11 (48.00 Hz)	75 cycles

Apply rated dc control voltage to the relay. (Be sure voltage selector plug is in the proper position. Reset the target. Apply a 120 vac 60 Hz input signal for 60 Hz units, or 120 vac 50Hz for 50 Hz. units. After approximately a 1.5 second delay, the relay contacts should transfer to the trip condition and the target should set.

Lower the input voltage. At 66-54 volts input, the contacts should transfer back to the "normal" state as the undervoltage blocking function operates. If a different value is required for the application, adjust internal trimmer potentiometer R13 and repeat the test.

At the conclusion of these tests be sure to reset the relay to the values required for the application. Also recheck the positions of the selector plugs.

Calibration Tests with Variable Frequency Source:

A typical test circuit is shown in Figure 6. Set the internal plugs for the desired modes of operation and for the dc control voltage. Set the target for internal (Shunt) operation. Follow the same basic procedure given above in "Functional Testing" to confirm basic operation and undervoltage cutoff functions.

Operating Point Test: Set the desired frequency codes on the thumbwheel switches. Set the time delay switches to 01 cycle. Apply dc control voltage. Set the level of the variable frequency source to approximately 120 vac. Raise and lower the frequency of the test source slowly to determine the relay's operating point. The operating point should be within +/- 0.008 Hz of the setpoint.

Time Delay Test: Set the desired time delay on the thumbwheel switches. Apply rated dc control power. Reset the target. For underfrequency operation, set the variable frequency source to 0.2 Hertz below the relay's frequency setting. For overfrequency operation, set the variable frequency source to 0.2 Hertz above the frequency setting. Set the voltage levels of both sources at approximately 120vac. Switch relay input from the line frequency source to the variable source. Record the operating time of the relay. Compare to the expected delay time.

For example: if the time delay switches were set for 20 cycles, and the frequency of the variable source were set to 58.8 Hertz, the total operating time expected would be calculated as follows:

1 cycle of 58.8 Hz = 1/58.8 = 17.0 milliseconds.

Total operating time = 3 cycles measurement + time delay switch setting
= 3 cycles measurement + 20 cycles timer setting
= 23 cycles total X 17.0 milliseconds per cycle
= 391 milliseconds

Allowable tolerance = +3/-2 cycles: which in this example gives 357-442 ms.

Note: for settings below about 6 cycles, point-on-wave switching effects and inherent limitations of the test equipment can make accurate measurement difficult. In such cases, a longer delay setting should be used to confirm basic relay operation.

Attachment No. 4 Sheet 14 of 19
Identifier SQN-~~EEB~~-MS-TI28-0076

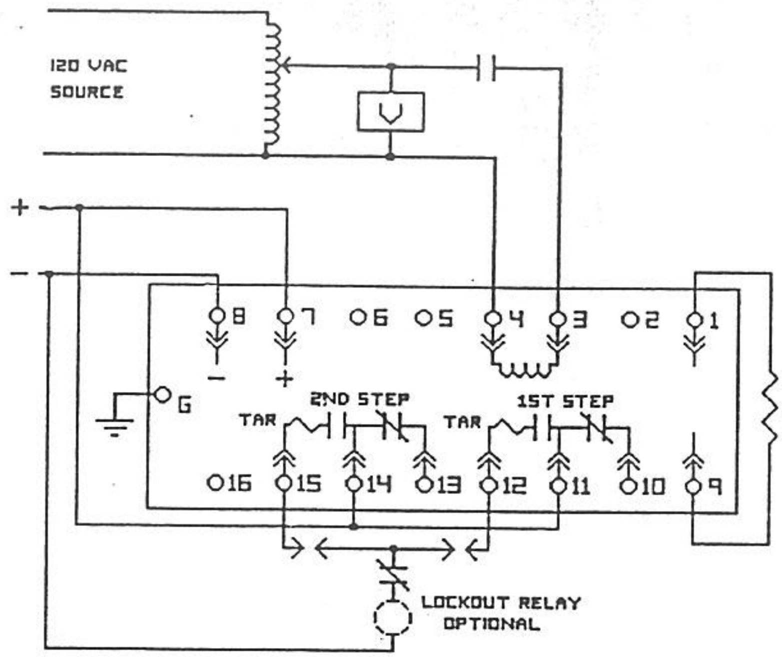


Figure 5: Typical Test Circuit - Functional Test
(2 Stage Relay Shown)

Attachment No. 4 Sheet 15 of 19
Identifier SQN-EEB-MS-TI28-0075

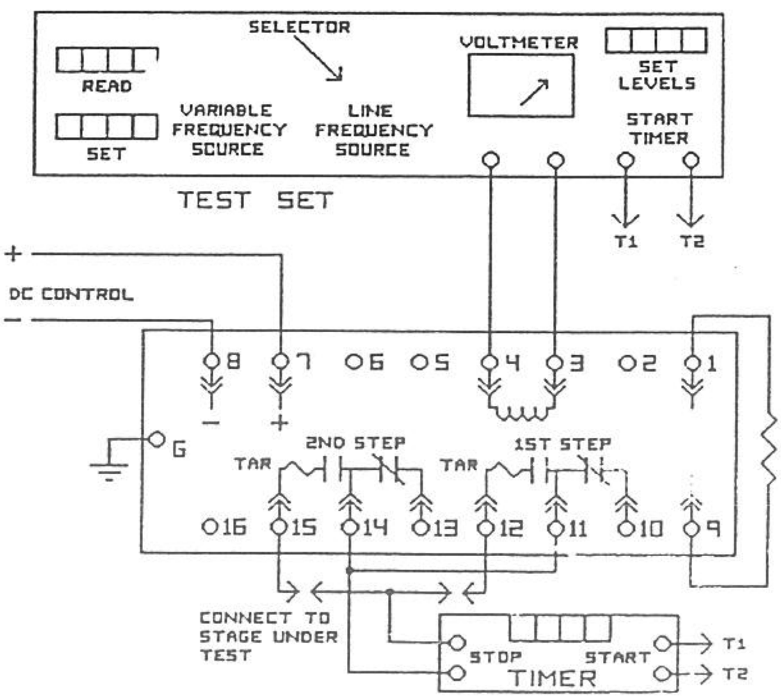


Figure 6: Typical Test Circuit - Calibration Test
(2 Stage Relay Shown)

4. OBSOLETE RELAYS - CATALOG SERIES 222

Type 81 relays of catalog series 222 are no longer in production. The information that follows is a guide to the functions and connections in the event you are setting or testing the older series, or should you need to replace a 222 series with a 422 series unit.

Connections; if replacing a 222 series unit with the newer 422 series, note the differences in connections, and rewire accordingly.

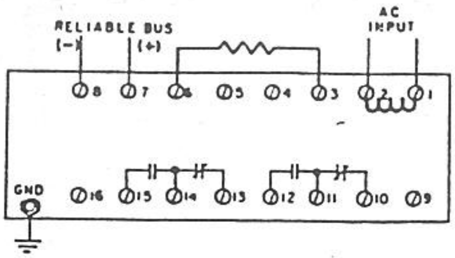
Settings: the frequency setting codes given in Tables 1 and 2 apply to both the 222 and 422 series units. The undervoltage cutoff function is adusted using internal pot R11. Using the 18 point extender board, catalog 200X0018, will make it easier to adjust R11.

Testing: test procedures for the 222 series units are fundamentally the same as those given for the 422 series. Modify the test connections as necessary.

SUMMARY OF CHARACTERISTICS - CATALOG SERIES 222 (Obsolete)

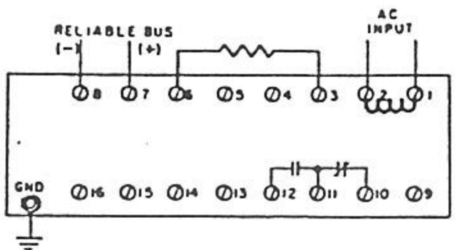
Function	Rated Frequency	Number of Steps	Connection Diagram	Control Voltage	Catalog Number
Underfrequency Only	60 Hz	1	16D222A	48/125 vdc	222A1075 222A1175
				24/125 vdc	222A1085
	50 Hz			48/125 vdc	222F1175
Under or Overfrequency	60 Hz	1	16D222B	48/125 vdc 24/ 32 vdc	222B1176 222B1196
	50 Hz			48/125 vdc 24/ 32 vdc	222D1176 222D1196
	60 Hz	1	16D222A	48/125 vdc 24/ 32 vdc	222E1175 222B1195
	50 Hz			48/125 vdc 48/110 vdc 24/ 32 vdc	222D1175 222D1105 222D1195
	60 Hz	2	16D222C	48/125 vdc 24/ 32 vdc	222C1176 222C1196
	50 Hz			48/125 vdc 48/110 vdc 24/ 32 vdc	222E1176 222E1106 222E1196

Internal Connection Diagrams - Catalog Series 222 (obsolete)

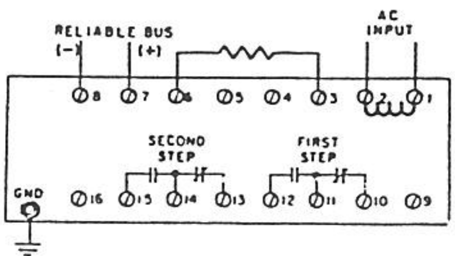


16D222A

Note: the external resistor is not required on catalog numbers 222A1175, 222F1175, and 222A1085.



16D222B

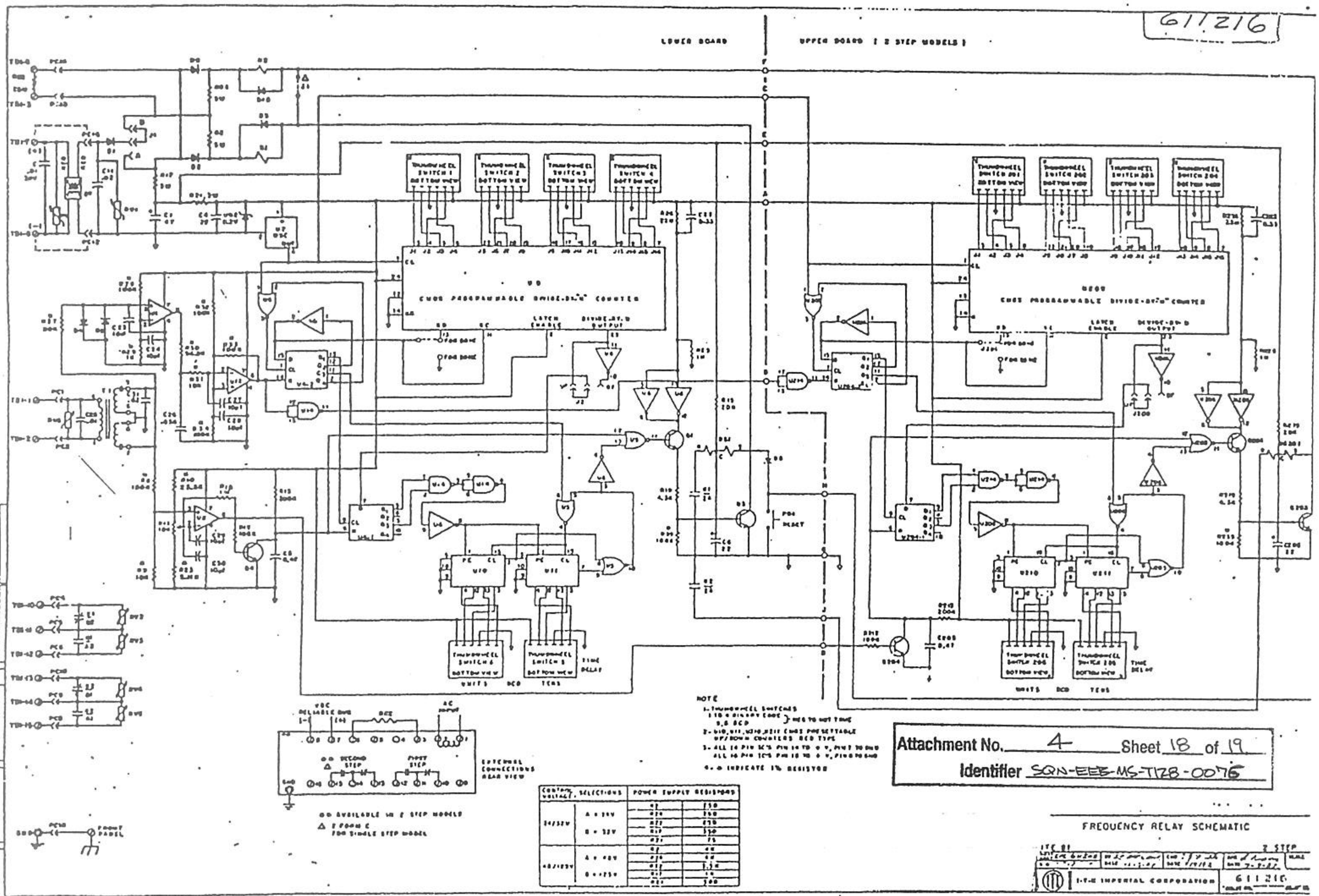


16D222C

Contacts labelled "First Step" are associated with the bottom row of setting switches on the front panel. Contacts labelled "Second Step" are associated with the top row. Contacts shown in "normal" condition. If function set for underfrequency, contacts will transfer when frequency drops below setting. If function set for overfrequency, contacts will transfer when frequency exceeds setting.

Note: Where used, external resistor is supplied mounted and wired on the relay. Resistor must be in place for proper relay operation.

Attachment No. 4 Sheet 17 of 19
Identifier SQN-EEB-MS-TI28-0076



Attachment No. 4 Sheet 18 of 19
Identifier SQN-EEB-MS-TI28-0076

ABB Power T & D Company Inc.
Protective Relay Division

35 North Snowdrift Road
Allentown, PA 18106

Telephone: (215) 395-7333
FAX: 215-395-1055

B27 940622 001

Date: 10 - 12 - 90

Page 1 of 1

Sending to FAX # 615-365-1142

Attention of: ASHT BOWMICK X1026, TRAILER A-1, EBASCO 9SR.

From: R. CONRAD

Reference: TYPE 81 ACCURACY AND REPEATABILITY

Message: THE ACCURACY LIMIT OF +3/-2 CYCLES STATED IN INSTRUCTION BOOK 7.4.1.7-5 WAS INTENDED TO COVER ALL POSSIBLE CONTINGENCIES INCLUDING COMMON TEST SET-UP PROBLEMS AND SOME MARGIN. IN ACTUAL OPERATION, AFTER THE RELAY HAS BEEN PROPERLY SET BY TEST, THE ACCURACY & REPEATABILITY WOULD STAY WITHIN +/- 1 ~ FOR 2 YEAR INTERVALS OR LONGER. THE TEST SET-UP MUST BE OF THE TYPE WHERE THE FREQUENCY IS CHANGED WITH A CLEAN TRANSITION FROM ONE FREQUENCY TO ANOTHER. IT SHOULD NOT BE SIMPLY SWITCHED BETWEEN TWO DIFFERENT SOURCES OPERATING AT DIFFERENT FREQUENCIES.

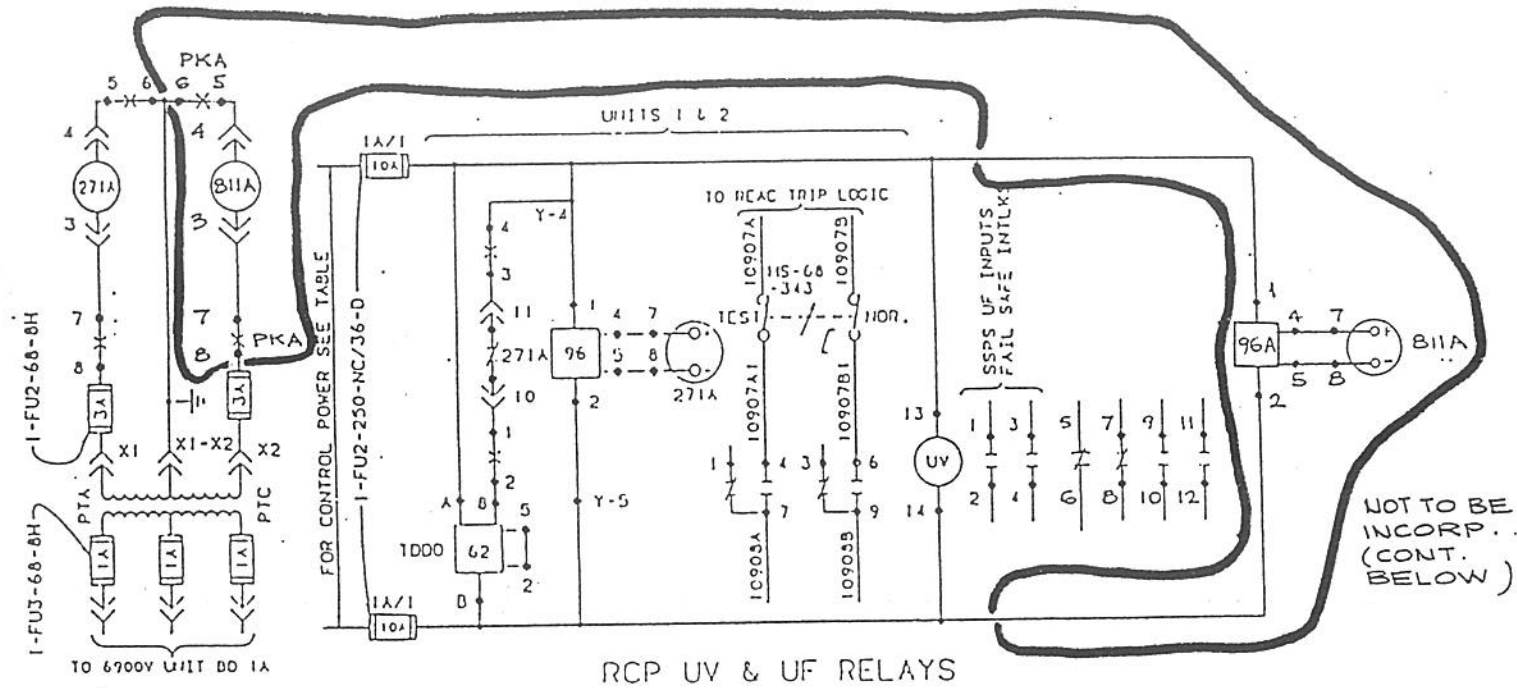
Attachment No. 4 Sheet 19 of 19
Identifier SQN-EEB-MG-T178-0076

I CONCUR WITH THE ABOVE STATEMENT MADE BY MR CONRAD.

Clifford Downs
Mgr - Technical Support
ABB Allentown

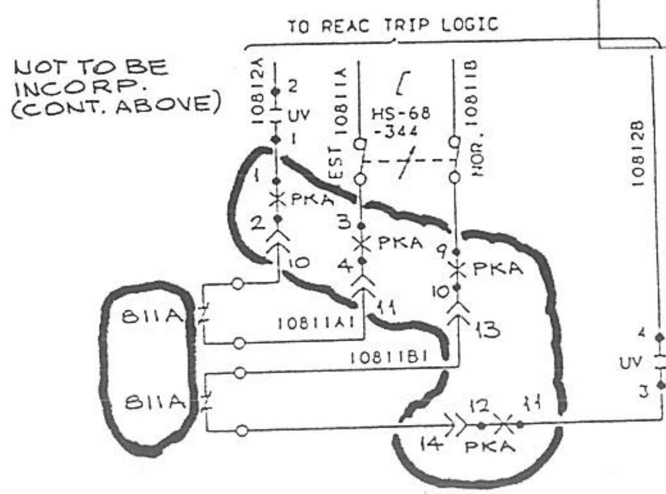
6/21/94

DCN-M10441A
PAGE



RCP UV & UF RELAYS

Attachment No. 5 Sheet 1 of 2
Identifier SQN-EEB-MS-TI28-0076



NEW FSAR DRAWING: YES ☐ NO ■
DCA SPLITS/COMBINES FSAR DRAWING: YES ☐ NO ☐

DISCIPLINE	ELECTRICAL
CONTRACT NO.	N/A
PREREQUISITES	N/A
ANTICIPATED CCD	N/A

AFFECTED DRAWING CCD-1,2-45N763-2 R.9 — CATEGORY 1

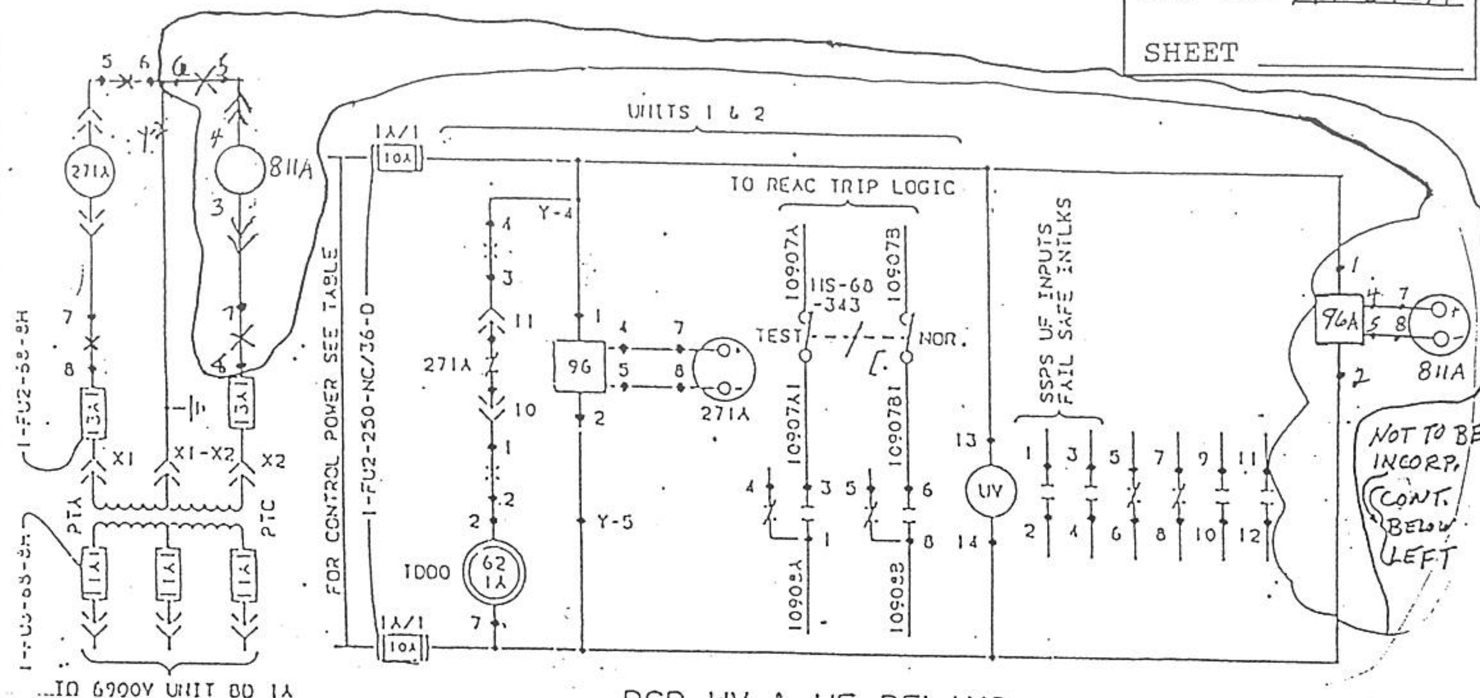
DCA-M10441-

SEQUOYAH NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY

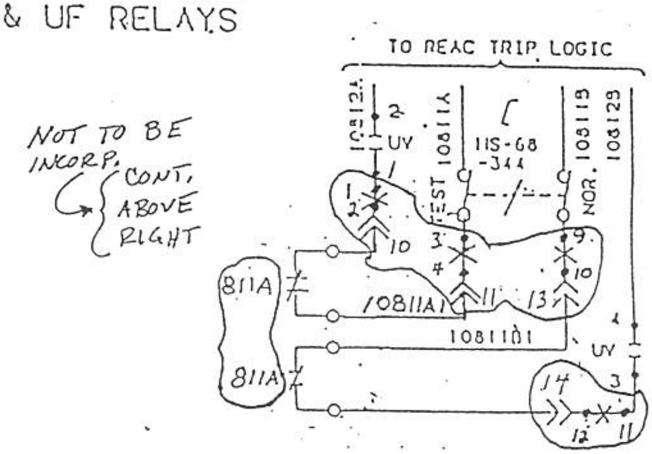
REV	RESP ENGR	DESIGN VERIFIED	CHANGE REFERENCE
0	[signature]		DCN M10441A

DCN NO. M10396A

SHEET



RCP UV & UF RELAYS



Attachment No. 5 Sheet 2 of 2
Identifier SQN-EEB-MS-TI28-0075

NEW FSAR DRAWING: ☐ Yes ☐ No

Affected Drawing	Category
CCD-1,2-45N763-2 R.6	1
SCALE: NTS EXCEPT AS NOTED	
PROJECT FACILITY POWERHOUSE	UNIT 2
TITLE WIRING DIAGRAMS 6900V UNIT AUX POWER SCHEMATIC DIAGRAMS	
DCA M10396-	
SEQUOYAH NUCLEAR PLANT TENNESSEE VALLEY AUTHORITY	9

Contract No. N/A
Prerequisites NONE

Anticipated CCDs N/A

REVISION	RESP. ENGR.	DESIGN VERIFIED	CHANGE REFERENCE
0	[signature]	[signature]	DCN M10396A

QA Record

TVA 10697 (DNE-QA-6-86) DNE CALCULATIONS

Title RPS Circuit Protector Under Frequency Relays SETPOINT AND SCALING CALCULATION		Plant/Unit SQNP / Unit 1,2
Preparing Organization EEB-I&C	KEY NOUNS (Consult RIMS Descriptors List) I&C, INSTR, CALIBRATION, SETPOINT, ACCURACY	
Branch/Project Identifiers ED-Q2099-890137	Each time these calculations are issued, preparers must ensure that the original (RO) RIMS accession number is filled in. Rev (for RIMS' use) (88) rims accession number	
	RO 900330F0010 B22 '90 0315 102	
Applicable Design Document(s) EEB-TI-28 REV 1	R	
	R	
SAR Section(s) See Review Sheet | UNID System(s) 99	R	

Revision 0	R1	R2	R3	Safety-related? Yes (X) No ( )
ECN No. (or Indicate Not Applicable) E0422, DCN-W9831A (U2)	DCN-H7F69A (U1) DCN-H7F70A (U3)			Statement of Problem
Prepared Paul A. Wilkel				Determine the accuracy of the subject instrument loop(s) and demonstrate that the accuracy is adequate for the intended purpose. Primary elements are located in a Mild environment.
Checked Leonard H. Steele				
Reviewed [signature]				
Approved [signature]				
Date 3/12/90				
USE FORM TVA 10534 IF MORE SPACE REQUIRED | List all pages added by this revision				
List all pages deleted by this revision				ORIGINAL
List all pages changed by this revision				

ABSTRACT (These calculations contain an unverified assumption(s) that must be verified later. Yes ( ) No (X))

Calculations were performed to determine the accuracy of the subject instrument loop(s). The determined accuracies were compared to the required accuracies, setpoints, safety limits and/or operating limits and the accuracy for the loop(s) listed below were demonstrated to be acceptable for the intended function of the instrument loop(s). This calculation applies to the instrument loop(s) listed below:

Under Frequency (81) Relays which provide trip functions for RPS Circuit protectors Unit 1,2,3 (See page 7).

ESSENTIAL CALCULATION
DIRECT DESIGN INPUT
FSAR COMPLIENCE REVIEW [signature] 3/12/90
LEAD ELECTRICAL ENGINEER

SEE SHEET 6 FOR LIST OF REFERENCES AND ATTACHMENTS
REV 0 OF THIS CALCULATION CONSISTS OF 51 SHEETS, 37 ATTACHMENTS AND NA APPENDICES FOR A TOTAL OF 88 SHEETS.

( ) Microfilm and store calculations in RIMS Service Center Microfilm and destroy ( )
(X) Microfilm and return calculations to DE SQN Address ...

cc: RIMS, SL 26 C-K

ENGINEERING RECORDS PROCESSING
CALCULATION CONTROL
ANNEX C BFN

Attachment No. 6 Sheet 1 of 1
Identifier SQN-EEB-MS-TI28-0076

ASEA BROWN BOVERI	SEISMIC QUALIFICATION REPORT	Number: RC-5524-A
		Page: 1 of 4
Title: 81 FREQUENCY RELAY		Date: 4/6/83
		Prep. by: R. Conrad

Test Model : Cat. # 222C1176

Test Procedure : Per ABB Specification RC-2051-B to meet the requirements of ANSI C37.98 (IEEE-501-1978).

Test Facility : NTS, Acton Division, Acton, Mass.

Documentation : NTS/ACTON report 18333-83N
Relay Settings and Status Monitoring (Page 2)
Test Response Spectra (Page 3)

Testing : A broad-band, multi-frequency vibration, of 30 seconds duration, imposed biaxial at 45°, in four orientations:

1) Left-to-right
2) Front-to-back
3) Right-to-left
4) Back-to-front

Attachment No. 7 Sheet 1 of 5
Identifier SQN-EEB-MS-TI78-0076

For each orientation, the relay status is tested and monitored in three functional states:

1) Non-operating (i.e. not picked up, etc.)
2) Operated (i.e. tripped, etc.)
3) Transitional

The required combinations total 12 full-level tests.

Results : No fragility or mis-operation was found within the 6g ZPA limitation of the actuator.

Notes : The biaxial motion produces an acceleration with equal vertical and horizontal components, thus yielding a total ZPA of 8.5g at 45°. The TRS shows the vertical component, as analyzed at one third octave intervals between 1 and 100 Hz. The analysis is shown for damping factors of 5, 3, 2, and 1%.

Generic : Other relays qualified by this test series:

All ABB type 81 relays, 222 series
All ABB type 40 relays, 226 series

Test case models are also qualified by this report in conjunction with supplementary tests (Acton 24839-89N, 5/25/88), using test levels equal to or greater than the TRS shown on page 3 of this report:

All ABB type 81 relays, 422 series
All ABB type 40 relays, 426 series

ASEA BROWN BOVERI	IEEE-501 SEISMIC QUALIFICATION	Number: RC-5524-A
		Page: 2 of 4
Title: Type 81 FREQUENCY RELAY		

TEST SET-UP

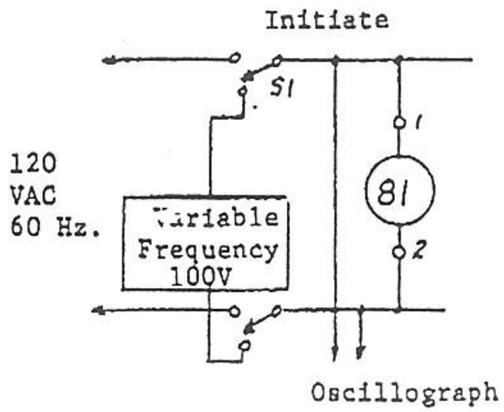
RELAY SETTINGS

Step 1: Underfrequency, 59 Hz., (Code 15, 6, 3, 12), Time Delay: 4 Cycles
Step 2: Overfrequency, 61 Hz., (Code 5, 7, 9, 10), Time Delay: 4 Cycles
Undervoltage Cut-Off: 60 VAC

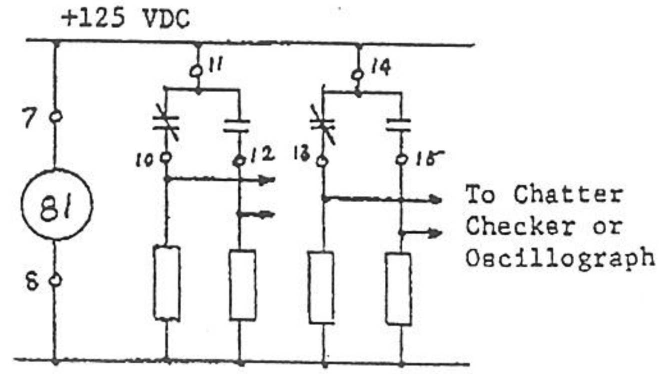
Attachment No. 7 Sheet 2 of 5
Identifier SQN-EEB-MS-TI28-0076

RELAY CONNECTIONS

INPUT



OUTPUT

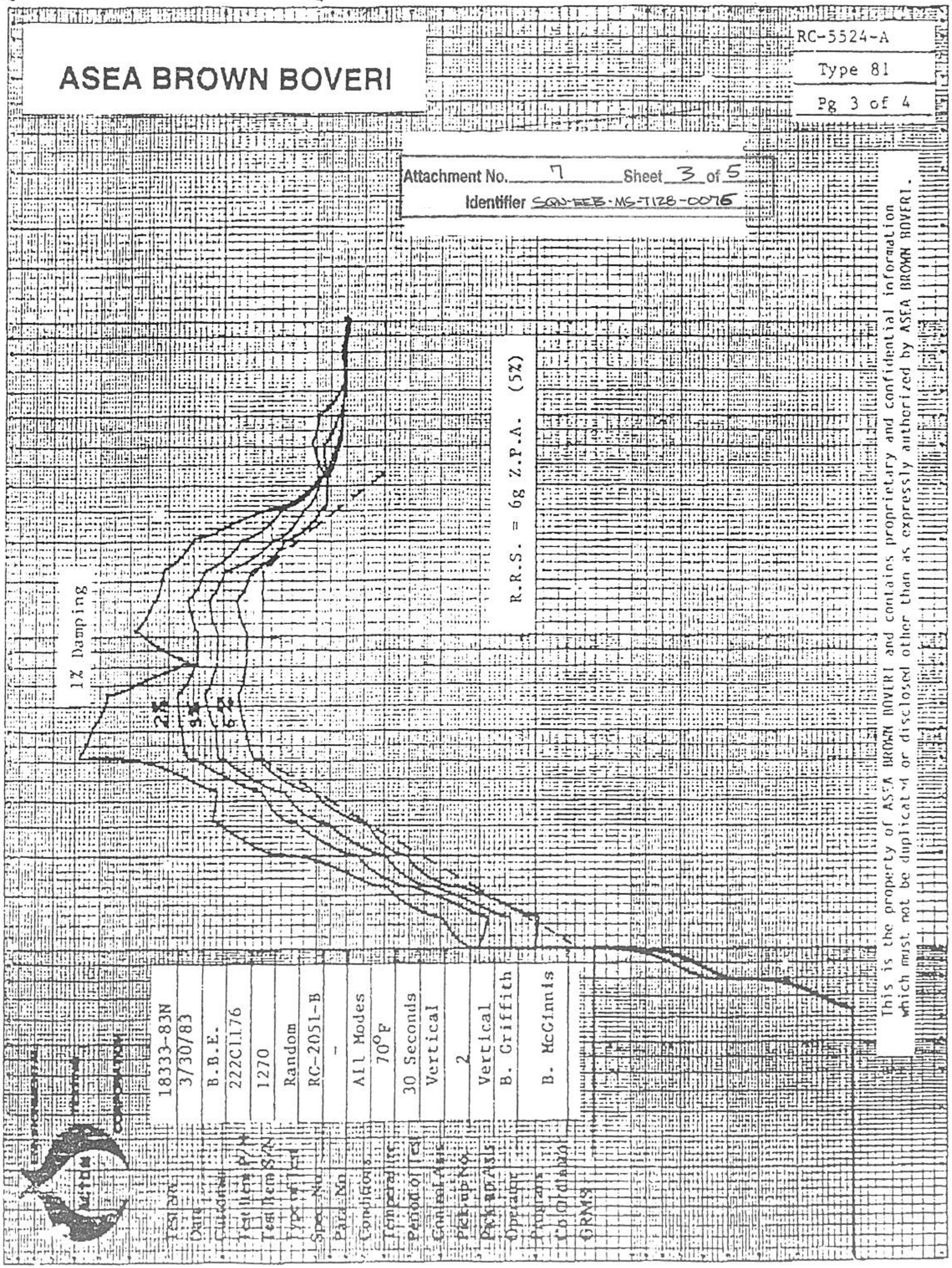


DATA LOG: (Lab Report - Acton #18333-83N)

Relay State	Test Motion	Relay Input AC, Volts	Relay Response	Contact Chatter	Oscillo-graph Record	Damage
Non-Operate	L-R	60 Hz, 120V (100%)	Normal	None	-	None
↓	F-B	↓	↓	↓	-	↓
↓	R-L	↓	↓	↓	-	↓
↓	B-F	↓	↓	↓	-	↓
Operate	L-R	57 Hz, 100V (85%)	Normal	None	-	None
↓	F-B	↓	↓	↓	-	↓
↓	R-L	↓	↓	↓	-	↓
↓	B-F	↓	↓	↓	-	↓
Transition	L-R	Sweep, 57-63 Hz.	Normal	-	Timing	None
↓	F-B	↓	↓	-	↓	↓
↓	R-L	↓	↓	-	↓	↓
↓	B-F	↓	↓	-	↓	↓

ASEA BROWN BOVERI

Attachment No. 7 Sheet 3 of 5
Identifier SQN-EEB-MS-TI28-0075



ASEA BROWN BOVERI	SEISMIC QUALIFICATION REPORT	Number: RC-5524-A
		Page: 4 of 4
Title: 81 FREQUENCY RELAY		

Attachment No. 7 Sheet 4 of 5
Identifier SQN-EEB-MS-TI28-0076

INTERPRETATION OF TEST RESULTS AND CONCLUSION

This Seismic Qualification Report describes a test program in which the ABB Protective Relay was tested to meet the requirements of ANSI C37.98 (formerly IEEE 501) "Seismic Testing of Relays". The purpose of this test was to determine the fragility level of the relay, that is, the highest level of seismic excitation that the relay can withstand and still perform its required Class 1E functions.

The relay was mounted in a rigid test fixture using standard panel mounting methods. The testing was performed with a repeatable, 30 second duration, broad-band multi-frequency input motion. The analysis was made at 1/3 octave intervals for frequencies between 1 and 100 hertz at 5% damping. The TRS was also analyzed at several other damping factors.

All test runs used biaxial motion (at an angle of 45^{0} above the horizontal) in four input orientations. In each orientation the relay was tested in three operating states: non-operating, operating and transitional modes for a total of 12 test runs. For each test run, the input motion was applied for a duration of 30 seconds. This subjected the device to 6 horizontal and 12 vertical excitations in each direction at maximum level which is more than equivalent to 5 OBE's and 1 SSE in each direction. Therefore, the referenced test program exceeds the seismic aging requirements for 5 OBE's before SSE testing as specfied for qualification programs per ANSI C37.98 and IEEE 344-1975. Page 2 of the report summarizes the results of the 12 test runs performed on the relay.

It should be further noted that these 12 tests were conducted at the maximum limit of the test equipment. Therefore, this test report demonstrates a more severe test than required by the Standards, since ANSI C37.98 defines the OBE level to the 1/2 the SSE level.

As shown on page 3 of the report, the TRS for the relay represents the table limits since no fragility limits or mis-operations were found.

In conclusion, this test program demonstrates the seismic qualification of this device to the requirements of ANSI C37.98 and IEEE 344-1975.

ASEA BROWN BOVERI	CERTIFICATION	Number: RC-5024-D Page: 1 of 4
Title: EQUIPMENT PERFORMANCE SPECIFICATIONS 81 FREQUENCY RELAYS		

CLASS 1E ELECTRICAL EQUIPMENT CERTIFICATION

Attachment No. 7 Sheet 5 of 5
Identifier SQN-EEB-MS-TI28-0076

IDENTIFICATION

ABB S.O. FILE# ISSUED:

CUSTOMER

STATION

ORDER NO.

SPECIFICATION --

AGENT/A&E --

SAMPLE

MATERIAL

ABB ITEM	CUST. ITEM	QUANTITY	DEVICE	CATALOG NO.

QUALIFIED LIFE: 40 years

The above material is hereby certified to be qualified in accordance with the principles of IEEE Standard 323-1974 for application as Class 1E Equipment in Nuclear Generating Stations. This certification is limited to the devices identified above when used within the limits of the ratings and conditions detailed by the attached equipment performance specifications, including seismic levels and recommended surveillance and maintenance. Substantiating documentation is on file at the factory location in the form of Qualification Summary report RC-5124-D, and Seismic Test Report RC-5524-A.

CERTIFIED BY:

R. Conrad
Q. A. Manager

Wm. Kotheimer
Director of Engineering

1.0 INTRODUCTION

1.1 Purpose

This Instruction describes the operability testing requirements for Unit 1, Reactor Coolant Pump underfrequency (UF) relays associated with system 68.

1.2 Scope

This Instruction covers calibration of the Reactor Coolant Pump underfrequency relays. Underfrequency relays covered by this Instruction include the following:

RELAY	LOCATION
81-1A	RCP Relay Panel 1A
81-1B	RCP Relay Panel 1B
81-2A	RCP Relay Panel 2A
81-2B	RCP Relay Panel 2B

This Instruction partially satisfies Surveillance Requirement (SR) 4.3.1.1.1.B.17.

Applicability mode 1.

Performance modes are 1 through 6.

1.3 Frequency/Condition

This Instruction shall be performed at least every 18 months or for post maintenance testing following relay maintenance.

2.0 REFERENCES

2.1 Performance References

Attachment No. 8 Sheet 1 of 21
Identifier SQN-EEB-MS-TI28-0076

NONE

2.2 Developmental References

A. SQN Technical Specifications (TS) Unit 1, 2.2 table 2.2-1 item 16.

B. SQN Technical Specifications, Unit 1, 3.3.1.1 table 3.3-1 item 17.

C. SQN Technical Specifications, Unit 1, 3.3.1.1 table 3.3-2 item 17.

D. SQN Technical Specifications, Unit 1, 4.3.1.1.1 table 4.3-1 item 17.

2.0 REFERENCES (continued)

2.2 Developmental References (continued)

E. T&CS Relay Setting Sheets 7571-88, 7572-88, 7573-88, and 7574-88.

F. Westinghouse Setpoint Methodology for Protection systems Sequoyah units 1 and 2 (WCAP-11239).

G. TVA drawings: 45N763-2
45N721-1
45N721-3

H. Mfr. drawings: D-N2206-05, (Contract Number 823380).

I. 1-SI-TFT-068-230.0, "Periodic Functional Test of RCP Underfrequency Relays unit 1."

J. TVA Field Test Manual.

K. SSP-8.1, "Conduct of Testing."

L. I.1. 41-504.1, "Type SDF-1 Solid State Underfrequency Relay."

3.0 PRECAUTIONS AND LIMITATIONS

A. All standard safety practices shall be observed while working on or near electrically energized equipment.

B. All conditions and restraints imposed by Technical Specifications 3.3.1.1 shall be met during Instruction performance.

C. This Instruction shall be performed in accordance with SSP-8.1: Conduct of Testing.

D. Test equipment used to perform calibration on UF Relays for RCP 1 and 2 cannot be used in calibration of UF relays for RCP 3 and 4.

E. Removal of 2 out of 4 underfrequency relays will cause a reactor trip with reactor power greater than 10%.

F. Only one (1) underfrequency relay at a time shall be removed from service for calibration during Modes 1 and 2.

Attachment No. 8 Sheet 2 of 21
Identifier SQN-EEB-MS-TI28-0076

Date

4.0 PREREQUISITES

4.1 Initial Actions

[1] **RECORD** Work Initiating Document (WID) number implementing this Instruction.

WID No. ______________________
(N/A if not required)

[2] **VERIFY** the following:

A. Instruction copy is a verified copy. ☐

B. **PRETEST** briefing in accordance with SSP-8.1. ☐

[3] **RECORD** performer and participant identification on Data Package Cover Sheet. ☐

4.2 Special Tools, Measuring and Test Equipment (M&TE), Parts, and Supplies

[1] **OBTAIN** the following M&TE. ☐

Description		TVA ID No.	Cal. Due
Keithley model 197 Multimeter	RCPs # 1 & 2 - TRAIN A		
	RCPs # 3 & 4 - TRAIN B		
Frequency Test Set Model FTS-300	RCPs # 1 & 2 - TRAIN A		
	RCPs # 3 & 4 - TRAIN B		

4.3 Field Preparations

[1] None

Attachment No. 8 Sheet 3 of 21
Identifier SQN-EEB-MS-TI28-0016

Date

4.0 PREREQUISITES (continued)

4.4 Approvals and Notifications

[1] **DETERMINE** status light(s) to be removed from service, **AND**

NOTIFY unit 1 ASOS/SRO of status light(s) being removed from service. Limiting condition for operation of TS 3.3.1.1 and Limitations section 3.0 shall apply during performance of this Instruction, if in mode 1.

A. **RCP Bus 1 Underfrequency** Panel 1-M-6, 1-XX-55-6A Window 2 (Alarm for relay 81-1A, Section 6.2).

B. **RCP Bus 2 Underfrequency** Panel 1-M-6, 1-XX-55-6A Window 22 (Alarm for relay 81-1B Section 6.3).

C. **RCP Bus 3 Underfrequency** Panel 1-M-6, 1-XX-55-6A Window 42 (Alarm for relay 81-2A Section 6.4).

D. **RCP Bus 4 Underfrequency** Panel 1-M-6, 1-XX-55-6A Window 62 (Alarm for relay 81-2B Section 6.5).

E. **RCP Bus Underfrequency/Undervoltage** Panel 1-M-6, 1-XA-55-6A Window 32

____

[2] **OBTAIN** approval from the following prior to beginning section 6.0 of this Instruction. ASOS/SRO to verify performance of this Instruction will not adversely affect plant.

Position	Signature / Date / Time
Unit 1 ASOS/SRO	/ /

5.0 ACCEPTANCE CRITERIA

5.1 The underfrequency relays are considered acceptable if they are within the required tolerances specified in Instruction.

5.2 All identified adverse conditions shall be documented on Deficiency Log and WR initiated, as required to repair/replace defective component.

5.3 ASOS and CG cognizant supervisor shall be informed of all deficiencies.

Date

6.0 PERFORMANCE

6.1 Pre-work Instructions

[1] **VERIFY** the following:

A. Precautions and Limitations in Section 3.0 have been reviewed. ☐

B. Prerequisites in Section 4.0 are met. ☐

CAUTION **A trip on 2 of 4 channels will cause a reactor trip if reactor power is greater than 10%.**

[3] **IF** instruction is being performed in modes 2 through 6, **THEN**

ENSURE no other instruction is being performed which could simulate reactor power greater than 10% prior to removal of any relays.

[4] **PLACE** orange sticker on status light: **RCP Bus Underfrequency/ Undervoltage** Panel 1-M-6, 1-XA-55-6A Window 32 (E-4). ☐

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Identifier SQN-EEB-MS-TI28-0016

Date

6.2 Calibration of Underfrequency Relay 81-1A

[1] **PLACE** orange sticker on status light: **RCP Bus 1 Underfrequency** Panel 1-M-6, 1-XX-55-6A Window 2. ☐

NOTE Step 6.2 [2] through [5] may be marked N/A, if instruction is being performed in modes 2 through 6.

[2] **VERIFY** the following status lights **are not** in ALARM condition.

PERFORM lamp check **and**

ENSURE all lamps are operable.

a. **RCP BUS 2 UNDERFREQUENCY** Panel 1-M-6, 1-XX-55-6A Window 22. ☐

b. **RCP BUS 3 UNDERFREQUENCY** Panel 1-M-6, 1-XX-55-6A Window 42. ☐

c. **RCP BUS 4 UNDERFREQUENCY** Panel 1-M-6, 1-XX-55-6A Window 62. ☐

[3] **INFORM** UO that the following status lights will actuate when RCP test switch **HS-68-344** is placed in **TRIP POSITION**:

a. **RCP Bus 1 Underfrequency** Panel 1-M-6, 1-XX-55-6A window 2. ☐

b. **RCP Bus Underfrequency/Undervoltage**, Reactor Protection and Safeguards, panel 1-M-6, 1-XA-55-6A window 32 (E-4). ☐

[4] **PLACE** HS-68-344, RCP 1, Test Switch (Elev. 685, Box 3420) in **TRIP POSITION**. ☐

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Date

6.2 Calibration of Underfrequency Relay 81-1A (continued)

[5] **VERIFY** the following alarm energized:

a. **RCP BUS 1 UNDERFREQUENCY**, panel 1-M-6, 1-XX-55-6A window 2. ☐

b. **RCP BUS UNDERFREQUENCY/UNDERVOLTAGE**, Reactor Protection and Safeguards, panel 1-M-6, 1-XA-55-6A window 32 (E-4). ☐

c. **Computer point #Y0320D, RCP Bus 1 Underfreq** Part RE alarms actuated. ☐

______

NOTE If steps 6.2 [2] through [5] were performed, then step [6] can be marked as N/A.

[6] **NOTIFY** UO that the following status lights will actuate when underfrequency relay device 81-1A is removed from case.

a. **RCP Bus 1 Underfrequency**, panel 1-M-6, 1-XX-55-6A window 2.

b. **RCP Bus 1 Underfrequency**, Reactor protection and safeguards, panel 1-M-6, 1-XX-55-6A window 32 (E-4).

c. **Computer point #Y0320D, RCP Bus 1 Underfreq** Part RE computer alarms.

______

[7] **REMOVE** UF relay device 81-1A, **AND**

CONNECT frequency test set-up to UF relay.

a. Constant 120Vac source to terminal 2 and 4. ☐

b. Frequency test set on terminal 8 and 9. ☐

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6.2 Calibration of Underfrequency Relay 81-1A (continued)

[8] **ADJUST** voltage to approximately 120Vac on frequency test set. ☐

[9] **VARY** frequency of test set as necessary, **AND**

MEASURE, AND

RECORD "As Found" pick up frequency.

As Found pick-up Frequency:__________Hz.
Acceptance Criteria: 56 Hz ± 0.1 Hz (55.9 to 56.1Hz.)
TS Allowable setpoint is equal to or greater than 55.9Hz.

____

[10] **ADJUST** frequency test set for normal frequency of 60Hz @ 120V and fault frequency of 55Hz @ 120Vac. ☐

[11] **MEASURE, AND**

RECORD "As Found" time delay for relay pick-up below.

As Found trip time:__________ msec.
Acceptance Criteria: 200 msec ± 10 msec (190 to 210 msec.)
(12 cycles ± 0.6 cycles (11.4 to 12.6 cycles)

____

[12] **DETERMINE** if relay time response was greater than 300 msec.
HOLD
POINT **IF** time did not exceed 300 msec, **THEN** N/A this step.

IF time exceeded 300 msec, **THEN**

PERFORM engineering evaluation of channel total response time, **AND**

DETERMINE if TS 3.3.1.1 table 3.3-2, item 17 was exceeded (Less than 600 msec, 36 cycles total loop response time), **AND**

DOCUMENT evaluation on Test Director's Log.

____

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6.2 Calibration of Underfrequency Relay 81-1A (continued)

NOTE Steps 6.3 [13] test the undervoltage detector.

[13] **ADJUST** frequency test set output to 120 volts, **AND**

VERIFY UF relay picks up at approximately 55Hz. ______

[14] **DECREASE** frequency test set output voltage source as required until relay drops out, **THEN**

MEASURE, AND

RECORD undervoltage detector drop out voltage.

Dropout Voltage:__________Vac.
Acceptance Criteria: 25 to 45Vac. ______

[15] **REMOVE** CONSTANT AC source **AND**

CONNECT frequency test set output to terminal 2 and 4, to test regulated power supply. ☐

CAUTION **To prevent power supply damage, extreme care shall be used when measuring Voltage across relay pin points.**

[16] **WHILE** varying voltage source from 70Vac to 132Vac,

VERIFY output voltage of 17.1 to 18.9 Vdc is maintained across relay pin points 1 & 6. ______

[17] **WHILE** varying voltage source from 70Vac to 132Vac,

VERIFY output voltage of 4.75 to 5.25 Vdc is maintained across relay pin points 1 & 17. ______

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NOTE N/A step 6.2 [18] if no calibration and record as left data in step 6.2 [19].

6.2 Calibration of Underfrequency Relay 81-1A (continued)

[18] **RECONNECT** frequency test set-up to UF relay,

A. Constant 120VAC source to terminal 2 and 4. ☐

B. Frequency test set on terminal 8 and 9. ☐

CALIBRATE UF relay 81-1A to tolerance specified in step 6.2 [19]. ______

[19] **RECORD** as left data below.

As Left pick-up Frequency:__________Hz.
T S, Setpoint: 56 Hz.
Acceptance Criteria: (55.95 to 56.05) ______

NOTE N/A step 6.2 [20] if no calibration required and record as left data in step 6.2 [21].

[20] **ADJUST** frequency test set for normal/frequency to 60Hz @ 120V and fault frequency to 55Hz @ 120Vac, **AND**

CALIBRATE UF relay device 81-1A to tolerance specified in step 6.2 [21]. ☐

[21] **RECORD** as left data below.

As Left trip time:__________ msec.
Acceptance Criteria: 200 msec ± 10 msec (190 to 210)
(12 cycles ± 0.6 cycles (11.4 to 12.6)) ______

[22] **DISCONNECT** test equipment from relay, **AND**

REINSTALL UF relay 81-1A. ______

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Date

NOTE Step 6.2 [23] may be marked as N/A, if switch was left in normal.

6.2 Calibration of Underfrequency Relay 81-1A (continued)

[23] RETURN HS-68-344, RCP 1, Test Switch, (Elev. 685, Box 3420) to NORMAL POSITION.

Operations

NOTE Step 6.2 [24] b. may be marked as N/A, if any RCP is not running.

[24] VERIFY that the following are not in "Alarm" Condition:

a. RCP BUS 1 UNDERFREQUENCY, panel 1-M-6, 1-XX-55-6A window 2. □

b. RCP BUS UNDERFREQUENCY/UNDERVOLTAGE, Reactor Protection and Safeguards, panel 1-M-6, XA-55-6A window 32 (E-4). □

c. Computer Point #Y0320D, RCP Bus 1 Underfreq Part RE computer alarms. □

[25] OPEN disconnect fingers 8 and 9 on Underfrequency Relay device 81-1A. □

[26] ADJUST frequency test set for a normal 60Hz @ 120Vac and a fault frequency of 55.95Hz @ 120Vac. □

[27] CONNECT frequency test set output test leads to relay terminals 8 and 9 of 81-1B underfrequency relay. □

[28] TURN test set on AND

VERIFY RCP Bus 1 UNDERFREQUENCY, Panel 1-M-6, 1-XX-55-6A window 2 is clear.

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Date

6.2 Calibration of Underfrequency Relay 81-1A (continued)

[29] **TURN** output test switch to **TEST POSITION AND**

VERIFY RCP BUS 1 UNDERFREQUENCY, PANEL 1-M-6, 1-XX-55-6A window 2 **ILLUMINATES**.

[30] **TURN** frequency test-set off **AND**

DISCONNECT test-set from terminals 8 and 9 of underfrequency relay device 81-1A. ☐

[31] **CLOSE** disconnect fingers 8 and 9 on Underfrequency Relay device 81-1A **AND**

REPLACE relay cover.

IV

NOTE Step 6.2 [33] b. can be marked as N/A if RCP are not running.

[32] **VERIFY** that the following are not in "Alarm Condition".

a. **RCP BUS 1 UNDERFREQUENCY**, panel 1-M-6, 1-XX-55-6A window 2. ☐

b. **RCP BUS UNDERFREQUENCY/UNDERVOLTAGE**, Reactor Protection and Safeguards, panel 1-M-6, 1-XA-55-6A window 32. ☐

c. **Computer point #Y0320D, RCP BUS UF** Part RE computer alarm. ☐

[33] **REMOVE** orange sticker on annunciator: **RCP BUS 1 UNDERFREQUENCY**, panel 1-M-6, 1-XX-55-6A window 2. ☐

Attachment No. 8 Sheet 12 of 21
Identifier SQN-EEB-MS-TI28-0076

1.0 INTRODUCTION

1.1 Purpose

This Instruction describes the operability testing requirements for Unit 2, Reactor Coolant Pump underfrequency (UF) relays associated with system 68.

1.2 Scope

This Instruction covers calibration of the Reactor Coolant Pump underfrequency relays. Underfrequency relays covered by this Instruction include the following:

RELAY	LOCATION
81-1A	RCP Relay Panel 1A
81-1B	RCP Relay Panel 1B
81-2A	RCP Relay Panel 2A
81-2B	RCP Relay Panel 2B

This Instruction partially satisfies Surveillance Requirement (SR) 4.3.1.1.1.B.17.

Applicability mode 1.

Attachment No. 8 Sheet 13 of 21
Identifier SQN-EEB-MS-TI28-0076

Performance modes are 1 through 6.

1.3 Frequency/Condition

This Instruction shall be performed at least every 18 months or for post maintenance testing following relay maintenance.

2.0 REFERENCES

2.1 Performance References

None

2.2 Developmental References

A. SQN Technical Specifications (TS) Unit 2, 2.2 table 2.2-1 item 16.

B. SQN Technical Specifications, Unit 2, 3.3.1 table 3.3-1 item 17.

C. SQN Technical Specifications, Unit 2, 3.3.1 table 3.3-2 item 17.

D. SQN Technical Specifications, Unit 2, 4.3.1.1.2 table 4.3-1 item 17.

2.2 Developmental References (continued)

E. T&CS Relay Setting Sheets 6468-87, 6469-87, 6470-87, and 6471-87.

F. Westinghouse Setpoint Methodology for Protection systems Sequoyah units 1 and 2 (WCAP-11239).

G. TVA drawings: 45N763-2
45N721-2
45N721-4

H. Mfr. drawings: D-N2206-05, (Contract Number 823380).

I. 2-SI-TFT-068-230, "Periodic Functional Test of RCP Underfrequency Relays unit 2."

J. TVA Field Test Manual.

K. SSP 8.1, "Conduct of Testing."

L. I.1. 41-504.1, "Type SDF-1 Solid State Underfrequency Relay."

Attachment No. 8 Sheet 14 of 21
Identifier SQN-EEB-MS-TI28-0075

3.0 PRECAUTIONS AND LIMITATIONS

A. All standard safety practices shall be observed while working on or near electrically energized equipment.

B. All conditions and restraints imposed by Technical Specifications 3.3.1 shall be met during Instruction performance.

C. This Instruction shall be performed in accordance with SSP-8.1: Conduct of Testing.

D. Test equipment used to perform calibration on UF relays for RCP 1 and 2 cannot be used in calibration of UF relays for RCP 3 and 4.

E. Removal of 2 out of 4 underfrequency relays will cause a reactor trip with reactor power greater than 10%.

F. Only one (1) underfrequency relay at a time shall be removed from service for calibration during Modes 1 and 2.

Date

4.0 PREREQUISITES

4.1 Initial Actions

[1] RECORD Work Initiating Document (WID) number implementing this Instruction.

WID No. ______________
(N/A if not required)

[2] VERIFY the following:

A. INSTRUCTION COPY is a verified copy. ☐

B. PRETEST briefing in accordance with SSP-8.1. ☐

[4] RECORD performer and participant identification on Data Package Cover Sheet. ☐

4.2 Special Tools, Measuring and Test Equipment (M&TE), Parts, and Supplies

[1] OBTAIN the following M&TE. ☐

Description		TVA ID No.	Cal. Due
Keithley model 197 Multimeter	RCPs # 1 & 2 - TRAIN A		
	RCPs # 3 & 4 - TRAIN B		
Frequency Test Set Model FTS-300	RCPs # 1 & 2 - TRAIN A		
	RCPs # 3 & 4 - TRAIN B		

4.3 Field Preparations

None

Attachment No. 8 Sheet 15 of 21
Identifier SQN-EEB-MS-TI28-0075

Date

5.0 ACCEPTANCE CRITERIA

5.1 The underfrequency relays are considered acceptable if they are within the required tolerances specified in Instruction.

5.2 All identified adverse conditions shall be documented on deficiency log and WR initiated, as required to repair/replace defective component.

5.3 ASOS and CG cognizant supervisor shall be informed of all deficiencies.

6.0 PERFORMANCE

Attachment No. 8 Sheet 16 of 21
Identifier SQN-EEB-MS-TI28-0075

6.1 Pre-work Instructions

1. VERIFY the following:

   A. Precautions and Limitations in Section 3.0 have been reviewed. □

   B. Prerequisites in Section 4.0 are met. □

CAUTION A trip on 2 of 4 channels will cause a reactor trip if reactor power is greater than 10%.

[3] IF instruction is being performed in modes 2 through 6, THEN

ENSURE no other instruction is being performed which could simulate reactor power greater than 10% prior to removal of any relays.

[4] PLACE orange sticker on status light: RCP Bus Underfrequency/ Undervoltage Panel 2-M-6, 2-XA-55-6A Window 32 (E-4). □

Date

6.2 Calibration of Underfrequency Relay 81-1A (continued)

NOTE If steps 6.2 [2] through [5] were performed, then step [6] can be marked as N/A.

[6] NOTIFY UO that the following status lights will actuate when underfrequency relay device 81-1A is removed from case.

a. RCP Bus 1 Underfrequency panel 2-M-6, 2-XX-55-6A window 2.

b. RCP Bus 1 Underfrequency, Reactor protection and safeguards, panel 2-M-6, 2-XX-55-6A window 32 (E-4).

c. Computer point #Y0320D, RCP Bus 1 Underfreq Part RE computer alarms.

Attachment No. 8 Sheet 17 of 21
Identifier SQN-EEB-MS-TI28-0075

[7] REMOVE UF relay device 81-1A, AND

CONNECT frequency test set-up to UF relay.

a. Constant 120Vac source to terminal 2 and 4. ☐

b. Frequency test set on terminal 8 and 9. ☐

[8] ADJUST voltage to approximately 120Vac on frequency test set. ☐

[9] VARY frequency of test set as necessary, AND

MEASURE, AND

RECORD "As Found" pick up frequency.

As Found pick-up Frequency:__________Hz.
Acceptance Criteria: 56Hz ± 0.1 Hz (55.9Hz to 56.1Hz)
TS Allowable setpoint is equal to or greater than 55.9.

[10] ADJUST frequency test set for normal frequency of 60Hz @ 120Vac and fault frequency of 55Hz @ 120Vac. ☐

Date

6.2 Calibration of Underfrequency Relay 81-1A (continued)

[11] MEASURE, AND

RECORD "As Found" time delay for relay pick-up below.

As Found trip time:__________ msec.
Acceptance Criteria: 200 msec ± 10 msec (190 to 210 msec.)
(12 cycles ± 0.6 cycles (11.4 to 12.6 cycles)

[12] DETERMINE if relay time response was greater than 300 msec.

HOLD POINT IF time did not exceed 300 msec, THEN

NA this step.

IF time exceeded 300 msec, THEN

Attachment No. 8 Sheet 18 of 21
Identifier SQN-EEB-MS-TI28-0075

PERFORM engineering evaluation of channel total response time, AND

DETERMINE if TS 3.3.1 table 3.3-2, item 17 was exceeded (Less than 600 msec, 36 cycles total loop response time), AND

DOCUMENT evaluation on Test Deficiency Log.

NOTE Steps 6.3 [13] test the undervoltage detector.

[13] ADJUST frequency test set output to approximately 120Vac, AND

VERIFY UF relay picks up at approximately 55Hz.

[14] DECREASE frequency test set output voltage as required until relay drops out, THEN

MEASURE, AND

RECORD undervoltage detector drop out voltage.

Dropout Voltage:__________Vac.
Acceptance Criteria: 25 to 45Vac.

[15] REMOVE CONSTANT AC source and

CONNECT frequency test set output to terminal 2 and 4 to test regulated power supply. □

Date

6.2 Calibration of Underfrequency Relay 81-1A (continued)

CAUTION To prevent power supply damage, extreme care shall be used when measuring Voltage across relay pin points.

[16] WHILE varying voltage source from 70Vac to 132Vac,

VERIFY output voltage of 17.1 to 18.9 Vdc is maintained across relay pin points 1 & 6. ________

[17] WHILE varying voltage source from 70Vac to 132Vac,

VERIFY output voltage of 4.75 to 5.25Vdc is maintained across relay pin points 1 & 17. ________

NOTE NA step 6.2 [18] if no calibration needed and record as left data in step 6.2 [19].

Attachment No. 8 Sheet 19 of 21
Identifier SQN-EEB-MS-TI28-0076

[18] RECONNECT frequency test set-up to UF relay,

A. Constant 120Vac source to terminals 2 and 4. ☐

B. Frequency test set on terminals 8 and 9. ☐

CALIBRATE UF relay device 81-1A to tolerance specified in step 6.2 [19]. ☐

____

[19] RECORD as left data below.

As Left pick-up Frequency:__________Hz.
T S, Setpoint: 56Hz.
Acceptance Criteria: (55.95 to 56.05Hz.)

____

NOTE NA step 6.2 [20] if no calibration required and record as left data in step 6.2 [21].

[20] ADJUST frequency test set for normal frequency to 60Hz @120Vac and fault frequency to 55Hz @120v, AND

CALIBRATE UF relay device 81-1A to tolerance specified in step 6.2 [21].

Date

6.2 Calibration of Underfrequency Relay 81-1A (continued)

[21] RECORD as left data below.

As Left trip time:__________ msec.
Acceptance Criteria: 200 msec ± 10 msec (190 to 210 msec.)
(12 cycles ± 0.6 cycles (11.4 to 12.6 cycles)

[22] DISCONNECT test equipment from relay, AND

REINSTALL UF relay 81-1A.

NOTE Step 6.2 [23] may be marked as N/A, if switch was left in normal.

[23] RETURN HS-68-344, RCP 1, Test Switch, (Elev. 685, Box3423) to NORMAL POSITION.

Attachment No. 8 Sheet 20 of 21
Identifier SQN-EEB-MS-TR8-0076

Operations

NOTE Step 6.2 [24] b.may be marked as N/A, if any RCP is not running.

[24] VERIFY that the following are not in "Alarm" Condition:

a. RCP BUS 1 UNDERFREQUENCY, panel 2-M-6, 2-XX-55-6A window 2. ☐

b. RCP BUS UNDERFREQUENCY/UNDERVOLTAGE, Reactor Protection and Safeguards, panel 2-M-6, 2-XA-55-6A window 32 (E-4). ☐

c. Computer Point #Y0320D, RCP Bus 1 Underfreq Part RE computer alarms. ☐

[25] OPEN disconnect fingers 8 and 9 on Underfrequency Relay device 81-1A. ☐

[26] ADJUST frequency test set for a normal 60Hz @ 120Vac and a fault frequency of 55.95Hz @ 120Vac. ☐

[27] CONNECT frequency test set output test leads to relay terminals 8 and 9 of 81-1B underfrequency relay. ☐

Date

6.2 Calibration of Underfrequency Relay 81-1A (continued)

[28] TURN test set on AND

VERIFY RCP Bus 1 UNDERFREQUENCY, Panel 2-M-6, 2-XX-55-6A window 2 is clear.

[29] TURN output test switch to TEST POSITION, AND

VERIFY RCP BUS 1 UNDERFREQUENCY, PANEL 2-M-6, 2-XX-55-6A window 2 ILLUMINATES.

[30] TURN frequency test-set off AND

DISCONNECT test-set from terminals 8 and 9 of underfrequency relay device 81-1A. ☐

[31] CLOSE disconnect fingers 8 and 9 on Underfrequency Relay device 81-1A AND

REPLACE relay cover.

IV

NOTE Step 6.2 [33] b. may be marked as N/A, if any RCP is not running.

[32] VERIFY that the following are not in "Alarm Condition".

a. RCP BUS 1 UNDERFREQUENCY, panel 2-M-6, 2-XX-55-6A window 2. ☐

b. RCP BUS UNDERFREQUENCY/UNDERVOLTAGE, Reactor Protection and Safeguards, panel 2-M-6, 2-XA-55-6A window 32. ☐

c. Computer point #Y0320D, RCP BUS 1 UNDERFREQUENCY Part RE computer alarm. ☐

[33] REMOVE orange sticker on annunciator: RCP BUS 1 UNDERFREQUENCY, panel 2-M-6, 2-XX-55-6A window 2. ☐

Attachment No. 8 Sheet 21 of 21
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Attachment No. 9 Sheet 1 of 2
Identifier SQN-EEB-MS-TI28-0076

APPENDIX E
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ACCEPTANCE CRITERIA

REACTOR TRIP

REACTOR TRIP FUNCTION	SENSE LINE	XMTR	EAGLE 21	RACK	INPUT RELAY	SSPS LOGIC	RX TRIP	TOTAL	DESIRED MAXIMUM	TECH SPEC ALLOWABLE
PWR RNG HI NEUTRON FLUX	N/A	N/A	N/A	0.336	** N/A	0.006	0.150	0.492	0.492	0.50 sec.
PWR RNG LO NEUTRON FLUX	N/A	N/A	N/A	0.336	** N/A	0.006	0.150	0.492	0.492	0.50 sec.
PWR RNG HI NEG RATE	N/A	N/A	N/A	0.336	** N/A	0.006	0.150	0.492	0.492	0.50 sec.
PRZR PRESS LOW	0.200	0.695	0.309	N/A	0.05	0.006	0.150	1.410	1.970	2.00 sec.
PRZR PRESS HIGH	0.200	0.695	0.309	N/A	0.05	0.006	0.150	1.410	1.970	2.00 sec.
LOSS OF FLOW RCS	0.056	* 0.414	0.309	N/A	0.05	0.006	0.150	0.985	0.985	1.00 sec.
RCP UNDERVOLTAGE	N/A	N/A	N/A	1.026	** N/A	0.006	0.150	1.182	1.182	1.20 sec.
RCP UNDERFREQUENCY	N/A	N/A	N/A	0.435	** N/A	0.006	0.150	0.591	0.591	0.60 sec.
[C.1] OVERTEMP ΔT PRZR PRESS	0.200	0.695	0.309	N/A	0.05	0.006	0.150	1.410	7.880	8.00 sec.
[C.1] OVERTEMP ΔT NEUTRON FLUX IMBALANCE	N/A	0.336	0.309	N/A	0.05	0.006	0.150	0.851	7.880	8.00 sec.
OVERTEMP ΔT, T AVG	N/A	7.365	0.309	N/A	0.05	0.006	0.150	7.880	7.880	8.00 sec.
OVERPOWER ΔT, T AVG	N/A	7.365	0.309	N/A	0.05	0.006	0.150	7.880	7.880	8.00 sec.
SG LVL LO LO RCS LOOP ΔT	N/A	7.365	0.309	N/A	0.05	0.006	0.150	7.880	7.880	8.00 sec.
SG LVL LO LO ADVERSE EAM	0.280	0.450	0.309	N/A	0.05	0.006	0.150	1.245	1.970	2.00 sec.
SG LVL LO LO CONTMT PRESS	0.139	0.500	0.309	N/A	0.05	0.006	0.150	1.154	1.970	2.00 sec.

NOTE 1 Barton transmitters are used for SG Level and PRZR Pressure. When using the AMS Noise Analysis methodology to test these transmitters, the sense line time can be added to the Acceptance Criteria for the transmitters. The transmitter Noise Analysis time includes sense line delays and will be reflected in the SI for these transmitters.

NOTE 2 The Reactor Trip time is measured from the loss of UV voltage at the SSPS through the Reactor Trip Breaker to the loss of voltage at the control rod drive gripper coil.

* Denotes the most restrictive transmitter time.

** Input Relay is included in rack times for these functions.

APPENDIX E
Page 2 of 16

Attachment No. 9 Sheet 2 of 2
Identifier SQN-EEB-MS-TI28-0076

ACCEPTANCE CRITERIA

REACTOR TRIP

REACTOR TRIP FUNCTION	SENSE LINE	XMTR	EAGLE 21	RACK	INPUT RELAY	SSPS LOGIC	RX TRIP	TOTAL	DESIRED MAXIMUM	TECH SPEC ALLOWABLE
PWR RNG HI NEUTRON FLUX	N/A	N/A	N/A	0.336	** N/A	0.006	0.150	0.492	0.492	0.50 sec.
PWR RNG LO NEUTRON FLUX	N/A	N/A	N/A	0.336	** N/A	0.006	0.150	0.492	0.492	0.50 sec.
PWR RNG HI NEG RATE	N/A	N/A	N/A	0.336	** N/A	0.006	0.150	0.492	0.492	0.50 sec.
PRZR PRESS LOW	0.200	0.695	0.309	N/A	0.05	0.006	0.150	1.410	1.970	2.00 sec.
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LOSS OF FLOW RCS	0.056	* 0.414	0.309	N/A	0.05	0.006	0.150	0.985	0.985	1.00 sec.
RCP UNDERVOLTAGE	N/A	N/A	N/A	1.026	** N/A	0.006	0.150	1.182	1.182	1.20 sec.
RCP UNDERFREQUENCY	N/A	N/A	N/A	0.435	** N/A	0.006	0.150	0.591	0.591	0.60 sec.
[C.1] OVERTEMP ΔT PRZR PRESS	0.200	0.695	0.309	N/A	0.05	0.006	0.150	1.410	7.880	8.00 sec.
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OVERTEMP ΔT, T AVG	N/A	7.365	0.309	N/A	0.05	0.006	0.150	7.880	7.880	8.00 sec.
OVERPOWER ΔT, T AVG	N/A	7.365	0.309	N/A	0.05	0.006	0.150	7.880	7.880	8.00 sec.
SG LVL LO LO RCS LOOP ΔT	N/A	7.365	0.309	N/A	0.05	0.006	0.150	7.880	7.880	8.00 sec.
SG LVL LO LO ADVERSE EAM	0.280	0.450	0.309	N/A	0.05	0.006	0.150	1.245	1.970	2.00 sec.
SG LVL LO LO CONTMT PRESS	0.139	0.500	0.309	N/A	0.05	0.006	0.150	1.154	1.970	2.00 sec.

NOTE 1 Barton transmitters are used for SG Level and PRZR Pressure. When using the AMS Noise Analysis methodology to test these transmitters, the sense line time can be added to the Acceptance Criteria for the transmitters. The transmitter Noise Analysis time includes sense line delays and will be reflected in the SI for these transmitters.

NOTE 2 The Reactor Trip time is measured from the loss of UV voltage at the SSPS through the Reactor Trip Breaker to the loss of voltage at the control rod drive gripper coil.

* Denotes the most restrictive transmitter time.

** Input Relay is included in rack times for these functions.

QA Record

EBASCO SERVICES INCORPORATED
CALCULATION COVER SHEET

Sheet 1 c/o 1a

Title: DEMONSTRATED ACCURACY CALCULATION FOR REACTOR COOLANT PUMPS UNDERFREQUENCY RELAYS (81)	Plant/ Unit WBNP/1
PREPARING ORGANIZATION EEB, Ebasco, I & C	KEY NOUNS (Consult RIMS DESCRIPTORS LIST) CALC; I&C; ACCURACY; RELAYS; RCP

BRANCH/PROJECT IDENTIFIERS WBPE0689009008	Each time these calculations are issued, preparers must ensure that the original (R0) RIMS accession number is filled in. Rev	(for RIMS' use)	RIMS accession number
	R0	901116C0027	B18901012251
APPLICABLE DESIGN DOCUMENT(S) N3-68-4001	R2	SEP 09 1993 (102)	B18 '93 0825 259
	R3	(7)	B18 '94 0104 255
SAR SECTION(S) 5.5.1 / UNID SYSTEM(S) 068	R		

Revision 0	R2	R3	R	Safety-related? Yes [✓] No [ ]
ECN NO. (or indicate Not Applicable) P-04237-A	N/A	N/A		Statement of Problem: DETERMINE THE ACCURACY OF THE INSTRUMENT(s) AND DEMONSTRATE THAT THE ACCURACY IS ADEQUATE FOR THE INTENDED SAFETY FUNCTION.
Prepared: A. Bhowmick, EJB	David P. Thornhill	Tim Reiser		
Checked/Verified: Terry Moreland	Tim Reiser	David R. Thornhill		
Reviewed: Howard Oberholtzer	[signature] 8/23/93	[signature] 1/4/94		RCP UNDERFREQUENCY RELAYS: 1-81-68-8, 1-81-68-50 1-81-68-31, 1-81-68-73
Approved: Vir Gupta	[signature]	[signature] for P. Anders.		
Date: 10/12/90	8/23/93	1/4/94		
USE FORM TVA 10534 IF MORE SPACE REQUIRED — List all pages added by this revision	See Rev Log	SEE REV LOG		
List all pages added	See Rev Log	SEE REV LOG		ORIGINAL
List all pages added by this revision	See Rev Log	SEE REV LOG		

ABSTRACT: These calculations contain an unverified assumption(s) that must be verified later. Yes [ ] No [✓]
This calculation contains special requirements and/or limiting conditions. Yes [ ] No [✓]

Revision 3 is a Rev Log Revision and must be worked in conjunction with Rev 2 to establish the complete calculation.

Calculations were performed to determine the accuracy of the subject instrument loop(s). The determined accuracies were compared to the required accuracies and the accuracy for the loop(s) listed below were demonstrated to be adequate for the intended safety function of the loop(s). This calculation applies to the instrument loop(s) listed below:

RCP UNDERFREQUENCY
RELAYS: 1-81-68-8, 1-81-68-50
1-81-68-31, 1-81-68-73

Attachment No. 10 Sheet 1 of 1
Identifier SQN-EEB-MS-TI28-0076

FSAR Compliance Review for Revision 2 : FSAR compliance R3: [signature] 1/4/94
FSAR Section 5.5.1 has been reviewed and this calculation is in compliance with the FSAR. OPT 8/20/93 PHA 8/23/93

This calculation consists of 41 pages and 12 Attachments of 61 pages for a Grand Total of ~~103~~ 102 OPT 8/20/93 pages.

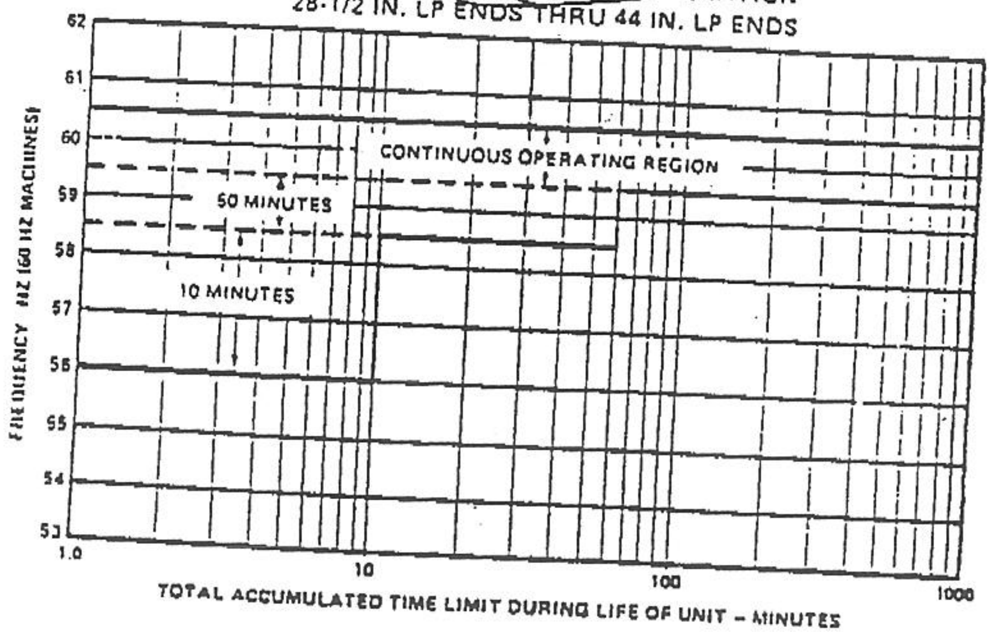
[ ] Microfilm and store calculations in RIMS Service Center
[X] Microfilm and return calculation to Calculation Library

Microfilm and destroy. [ ]
Address: A-IOB

FIGURE A.26
Page 1 of 1

Attachment No. 11		Sheet 1	of 1
Identifier SQN-EEB-MS-TI28-0075			

OFF-FREQUENCY TURBINE OPERATION
28-1/2 IN. LP ENDS THRU 44 IN. LP ENDS



You can See any off normal < 60 Hz requires trending on the main turbine. With Unit on Line any Hz < 59 would be seen by vibration problems on the turbine and require us to take the unit off Line unless load was critical.

4-19-94

Source	Setpoint	
SER 2692 Station frequency recorder	High 60.15 Low 59.85	STA FREQ EXCESSIVE ERROR

Attachment No. 17 Sheet 1 of 1
Identifier SQN-EEB-MS-TI28-0076

Probable Causes

1. System disturbance.
2. Recorder malfunction.

Corrective Actions

[1] **CONFIRM** alarm by checking 1-XI-68-8 , 1-XI-68-31 , 1-XI-68-50 , and 1-XI-68-73 . RCP frequency indications (M-5).

[2] **CONTACT** Power system Dispatcher to verify system disturbance and to recieve instructions to assist in restoring system to normal frequency.

[3] **REFER** to Switchyard letter 15, Emergency Operating Instructions for 500kV and 161kV Switchyards.

References 45N541,
45B655-ECB6-B

Q A RECORDS

To: David Haun Stone & Webster
Cc:
Bcc:
From: CLIFF DOWNS@MARKETING@ABB Allentown
Subject: ABB Type 81 Frequency Relay
Date: Friday, June 3, 1994 15:26:22 EDT
Attach:
Certify: N
Forwarded by:

Confirming our telephone conversation, your assumption of a 0.5Hz setpoint drift over a 22.5 month period (excluding temperature and radiation effects) is too conservative.

This relay employs a very stable crystal controlled oscillator as the frequency reference. A change in characteristics of that magnitude would be an indication of a "defective" relay.

I believe you should use the figure 0.1Hz and you will still be very conservative.

Regarding relay accuracy during seismic vibration, I reviewed the original test report and can add nothing to what is shown in the summary report you have. No attempt was made to determine the relay's operating point with the high accuracy needed to give you the kind of answer you are looking for. However, since the entire measuring circuitry of the Type 81 is solid-state, it is my opinion that the relay would have maintained its published accuracy of 0.008Hz during the vibration. If you use a figure of 0.1Hz here you will again be very conservative.

Cliff Downs

Clifford Downs
Mgr - Technical Support

Tel: 610-395-7333
Fax: 610-395-1055

Attachment No. 13 Sheet 1 of 1
Identifier SQN-EEB-MS-TI78-0076

QA Record

T49 911120 821

STS

SOUTHERN TESTING SERVICES, INC.

Report No. S298-RP-01
TVA Contract No.
91NNA-75865A
April 24, 1991
Revision 0

68

911204S0009

ref= T49 911120 820

Attachment No. 1A Sheet 1 of 31
Identifier SQN-EEB-MS-TI28-0076

NUCLEAR ENVIRONMENTAL AND SEISMIC QUALIFICATION FOR AN ASEA BROWN BOVERI FREQUENCY RELAY TYPE 81 PART NUMBER 422B1295 WITH A POWER ONE, INC. POWER SUPPLY PART NUMBER HA24-0.5-A

REVIEWED BY:

DARRIN R. MARTIN, QUALIFICATION TEST SPECIALIST

REVIEWED BY:

JOSEPH A. KECK, TECHNICAL REVIEWER

REVIEWED BY:

JOHN W. MASHBURN, QUALITY ASSURANCE

APPROVED BY:

FREDRICK J. SLAGLE, PRESIDENT
SOUTHERN TESTING SERVICES, INC.
TENNESSEE PROFESSIONAL ENGINEER
LICENSE NUMBER 014873

DATE: April 24, 1991

Prepared for:

TENNESSEE VALLEY AUTHORITY
WATTS BAR NUCLEAR PLANT
SPRING CITY, TN 37381

EXECUTIVE SUMMARY

Nuclear environmental and seismic qualification testing and electromagnetic interference (EMI) testing was performed on an ASEA Brown Boveri Frequency Relay Type 81 Part Number 422B1295 with a Power One, Inc. Power Supply Part Number HA24-0.5-A (Item Number 1). The environmental qualification of the frequency relay and power supply consisted of nuclear environmental qualification testing in accordance with the Tennessee Valley Authority (TVA) Specification SS-E18.10.01, "Environmental Qualification Requirements for Safety-Related Electrical Equipment," Revision 2, dated October 28, 1986, and seismic qualification (type testing) which meets or exceeds the requirements of TVA Design Criteria WB-DC-40-31.2, "Seismic Qualification of Category I Fluid System Components and Electrical or Mechanical Equipment," Revision 4, dated May 22, 1990. Electromagnetic interference testing was performed in accordance with Tennessee Valley Authority Standard Specification SS-E18.14.01, "Electromagnetic Interference (EMI) Testing Requirements for Electronic Devices," Revision 1, dated August 18, 1986. The frequency relay and power supply successfully completed the seismic and EMI qualification test program and are certified to be Class 1E environmentally and seismically qualified for service in a mild environment.

P/N HA24-0.5-A," Revision 0, dated April 2, 1991. The functional operation of the frequency relay and power supply was tested utilizing the test configuration as shown in Figure 1.1. The power supply was energized with 120 VAC, and 24 VDC was verified at the output. The functional operation of the frequency relay was tested utilizing the 24 VDC output of the power supply as the relay control power. The relay was set up for 24 VDC control power, underfrequency relay operation, internal shunt target operation, and factory set undervoltage cutoff (60 VAC). The underfrequency trip point was set at 57.00 Hertz (thumbwheel switches set at 14, 5, 8, and 13) and the time delay switches was set at 54 cycles (1 second total delay). The input circuit to the relay was set for 120 VAC and the frequency was variable between 55 and 60 Hertz (Hz). Proper operation of the relay test specimen was verified by decreasing the input frequency from 60 to 55 Hz and monitoring the output contacts utilizing a digital multimeter. Both the alarm and trip output contacts should change state one (1) second after the input reaches 57 Hz. The input frequency was then returned to 60 Hz and the output contacts returned to their normal state instantaneously. The test specimens were energized with rated coil voltage and tested in the de-energized and energized states. Two (2) sets of contacts on the relay test specimen were monitored for contact chatter before, during, and after seismic testing. A 24 VDC continuity signal was utilized for contact chatter monitoring. The 24 VDC continuity signals were monitored before, during, and after seismic testing and recorded on a strip chart recorder for evaluation. The completed seismic test procedure is contained in Appendix A.

3.0 TEST PROCEDURE

The test specimens were mounted on a hydraulically operated shaker table in a manner that simulates normal in-plant mounting. This test setup is shown in Figure 3.1. A piezoelectric accelerometer was mounted near the test specimens for vibration measurements. The accelerometer was connected to a vibration analysis system operated and monitored by Southern Testing Services, Inc. A list of test instrumentation utilized for system functionality data measurements is provided in Appendix C. The Southern Testing Services, Inc. seismic test procedure is contained in Appendix A.

The acceptance criteria are the safety-related function of the components and are identified below:

(1) Sine sweep acceleration levels shall be met or exceeded as allowable by the test equipment.

(2) No failure is detected during seismic testing (i.e., no loss of structural integrity or contact chatter).

(3) The components will show proof of operability by operating before, during, and after seismic testing.

The test methodology utilized for seismic qualification was sine sweep testing in accordance with Section 3.2.1.5.c of TVA Design Criteria WB-DC-40-31.2, "Seismic Qualification of Category I Fluid System Components and Electrical or Mechanical Equipment," Revision 4, dated May 22, 1990. This seismic testing consisted of subjecting the test specimens to accelerations of 3.0 g in both horizontal axes and the vertical axis over the frequency range of 1 to 35 to 1 Hz at a sweep rate of one (1) octave per minute. The test specimens were tested in four (4) horizontal orientations. Each 90-degree rotation advanced the test specimens to the next orientation.

Seismic testing was performed on the STS seismic simulation test system. This test system is a psuedo-biaxial seismic test system where the direction of motion of the mounting platform is inclined at an angle of 45-degrees from the horizontal. The mounting platform itself is parallel to the floor. A schematic diagram of the system is presented in Figure 3.2.

Based on a technical assessment of these device by experienced laboratory personnel and on previous test results of similar devices, these specimens does not have any closely spaced modes of vibration within the seismic frequency range of excitation. Therefore, resonance of response in one mode of vibration will not add to or influence the responses in another mode of vibration. For these devices, the high amplitude sine sweep seismic testing methodology is appropriate for seismic qualification.

The test specimens were subject to EMI testing to meet the requirements of Tennessee Valley Authority Standard Specification SS-E18.14.01. The test setups utilized for EMI testing are shown in Figures 5.1 through 5.7 of STS Test Procedure S298-TP-02 which is contained in Appendix B. A list of test instrumentation utilized for EMI testing is also contained in Appendix B.

4.0 TEST RESULTS

The results of the nuclear environmental and seismic and EMI qualification testing program are presented in summary. Detailed results of the visual and functional performance of the test specimens and seismic test program are contained in Appendix A. This appendix contains the seismic test procedure and the detailed results of all baseline and functional electrical testing. Baseline electrical testing was performed before and after each phase of the seismic testing. Functional electrical testing was performed during seismic testing and demonstrated the operability of the test specimens during each phase of the seismic testing. This report provides the vibration data measurements that were performed to achieve seismic qualification of the test specimens. A summary of each test phase of the seismic test program is shown in Table 4.1. Figures 4.1 through 4.8 show the input acceleration levels for each orientation of the seismic test program. Detailed results of the EMI test program are contained in Appendix B.

The visual inspections performed during each phase of the test program revealed no visible defects and no loss of structural integrity at any time before, during, or after seismic testing. Results of the visual inspections are shown in Table 4.2.

The electrical testing performed revealed no failures and no loss of electrical continuity at any time before, during, or after seismic testing. Results of the electrical testing are shown in Table 4.3. A portion of the strip chart recording of the electrical continuity signals is shown in Figure 4.9.

TABLE 4.3

ELECTRICAL TESTING SUMMARY

TEST RUN NO.	TEST SPECIMEN ORIENTATION	DESCRIPTION
1.	H1/V TEST RUN 1	NO LOSS OF ELECTRICAL CONTINUITY BEFORE, DURING, OR AFTER SEISMIC TESTING
2.	H1/V TEST RUN 2	NO LOSS OF ELECTRICAL CONTINUITY BEFORE, DURING, OR AFTER SEISMIC TESTING
3.	H2/V TEST RUN 3	NO LOSS OF ELECTRICAL CONTINUITY BEFORE, DURING, OR AFTER SEISMIC TESTING
4.	H2/V TEST RUN 4	NO LOSS OF ELECTRICAL CONTINUITY BEFORE, DURING, OR AFTER SEISMIC TESTING
5.	H3/V TEST RUN 5	NO LOSS OF ELECTRICAL CONTINUITY BEFORE, DURING, OR AFTER SEISMIC TESTING
6.	H3/V TEST RUN 6	NO LOSS OF ELECTRICAL CONTINUITY BEFORE, DURING, OR AFTER SEISMIC TESTING
7.	H4/V TEST RUN 7	NO LOSS OF ELECTRICAL CONTINUITY BEFORE, DURING, OR AFTER SEISMIC TESTING
8.	H4/V TEST RUN 8	NO LOSS OF ELECTRICAL CONTINUITY BEFORE, DURING, OR AFTER SEISMIC TESTING

The EMI testing performed revealed no failures and no loss of operability at any time before, during, or after EMI testing. Results of the EMI testing are shown in Table 4.4. Detailed results of the EMI testing are contained in Appendix B.

TABLE 4.4

EMI TESTING SUMMARY

EMI TEST PROGRAM PHASE	TEST RESULTS
1. CONDUCTED EMI TRANSIENT SUSCEPTIBILITY	NO LOSS OF FREQUENCY RELAY OR POWER SUPPLY OPERABILITY
2. CONDUCTED RF EMI SUSCEPTIBILITY	NO LOSS OF FREQUENCY RELAY OR POWER SUPPLY OPERABILITY
3. LINE COUPLED TRANSIENT EMI SUSCEPTIBILITY	NO LOSS OF FREQUENCY RELAY OR POWER SUPPLY OPERABILITY
4. LINE COUPLED RF EMI SUSCEPTIBILITY	NO LOSS OF FREQUENCY RELAY OR POWER SUPPLY OPERABILITY
5. CONDUCTED EMISSIONS TESTING	NO LOSS OF FREQUENCY RELAY OR POWER SUPPLY OPERABILITY
6. SURGE WITHSTAND CAPABILITY (SWC) TESTING	NO LOSS OF FREQUENCY RELAY OR POWER SUPPLY OPERABILITY
7. RADIATED RF EMI FIELD SUSCEPTIBILITY	NO LOSS OF FREQUENCY RELAY OR POWER SUPPLY OPERABILITY

5.0 CONCLUSION

The ASEA Brown Boveri Frequency Relay Type 81 Part Number 422B1295 with a Power One, Inc. Power Supply Part Number HA24-0.5-A (Item Number 1) test specimens successfully completed the nuclear environmental and seismic qualification testing program described in Section 1.0, INTRODUCTION, of this report. It was demonstrated that the test specimens possessed sufficient integrity to withstand, without compromise of structure or function, the simulated seismic and EMI environment. All acceptance criteria identified in Section 3.0, TEST PROCEDURE, were met by the test specimens during the test program. This test program resulted in the frequency relay with power supply being certified as Class 1E nuclear environmentally and seismically qualified for service in a mild environment.

SOUTHERN TESTING SERVICES, INC. (STS)

TITLE: SEISMIC TEST PROCEDURE FOR AN ASEA BROWN BOVERI FREQUENCY RELAY TYPE 81 P/N 422B1295 WITH A POWER ONE, INC. POWER SUPPLY P/N HA24-0.5-A

PROCEDURE NO. S298-TP-01
REVISION NO. 0

PREPARED BY: Joseph A. Keck DATE: April 2, 1991

REVIEWED BY: Dennis R. Martin DATE: April 2, 1991

REVIEWED BY: John W. Mashburn (QA) DATE: April 2, 1991

APPROVED BY: [illegible] DATE: April 2, 1991

1.0 PURPOSE:

This test procedure identifies the methodology to be utilized to perform seismic testing of an ASEA Brown Boveri Frequency Relay Type 81 Part Number 422B1295 with a Power One, Inc. Power Supply Part Number HA24-0.5-A.

2.0 EQUIPMENT DESCRIPTION:

The equipment to be tested consists of an ASEA Brown Boveri Frequency Relay Type 81 Part Number 422B1295 with a Power One, Inc. Power Supply Part Number HA24-0.5-A. The components identified above are utilized in control circuit applications.

3.0 TEST SPECIMEN:

The test specimens consist of one (1) ASEA Brown Boveri Frequency Relay Type 81 Part Number 422B1295 Serial Number 00422-07 and one (1) Power One, Inc. Power Supply Part Number HA24-0.5-A Serial Number 00454-07. The test specimens shall be mounted on a seismic test fixture fabricated by Southern Testing Services, Inc. with functional test configuration as shown in Figure 3.1. The seismic test fixture shall be bolted into place.

4.0 DATA RECORDING INSTRUMENTATION:

MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CALIBRATION LAST	CALIBRATION DUE
Trig-Tek, Inc. Compressor	801B	594	12/07/90	12/07/91
Trig-Tek, Inc. Vibration Monitor	610B	555	12/07/90	12/07/91
Trig-Tek, Inc. Sweep Generator	701LM	608	12/07/90	12/07/91
PCB Piezotronics Accelerometer	308B10	23744	11/26/90	11/26/91
CEC/Bell & Howell Galvanometer Amplifier	1-172-26	3014	10/22/90	04/22/91
Honeywell Visicorder	1508	15-806	10/22/90	04/22/91

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Identifier SQN-EEB-MS-TI28-0076

SOUTHERN TESTING SERVICES, INC. (STS)

TITLE: SEISMIC TEST PROCEDURE FOR AN ASEA BROWN BOVERI FREQUENCY RELAY TYPE 81 P/N 422B1295 WITH A POWER ONE, INC. POWER SUPPLY P/N HA24-0.5-A

PROCEDURE NO. S298-TP-01
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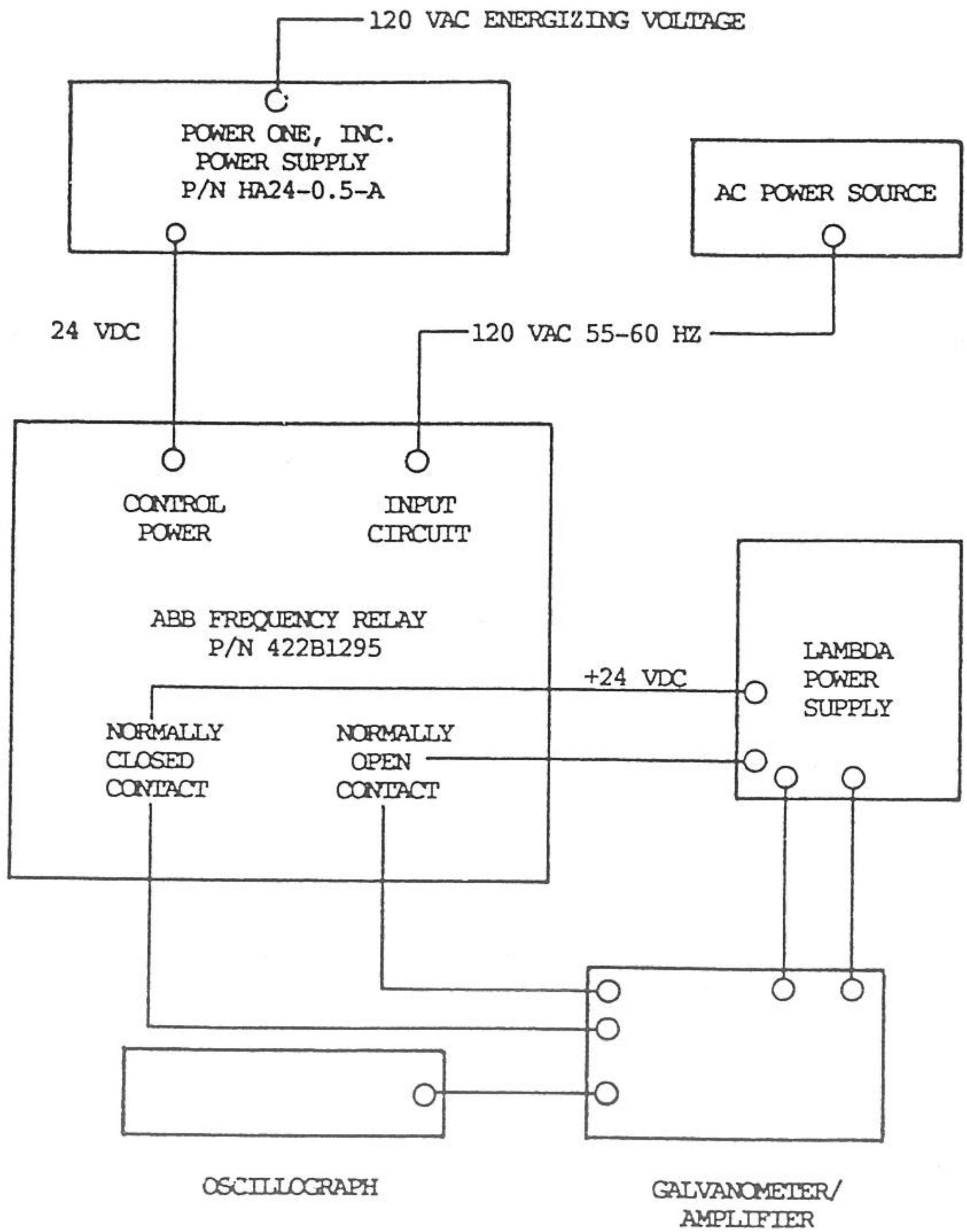

FIGURE 3.1 FUNCTIONAL TEST CONFIGURATION

SOUTHERN TESTING SERVICES, INC. (STS)

TITLE: SEISMIC TEST PROCEDURE FOR AN ASEA BROWN BOVERI FREQUENCY RELAY TYPE 81 P/N 422B1295 WITH A POWER ONE, INC. POWER SUPPLY P/N HA24-0.5-A

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4.0 DATA RECORDING INSTRUMENTATION:

MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CALIBRATION LAST	CALIBRATION DUE
Lambda Power Supply	LMF24-OVMYB-3126	D90665	N.A.	N.A.
Fluke Digital Multimeter	87	48400998	09/25/90	09/25/91
Honeywell XY Plotter	540TPRXYY	1186	12/17/90	06/17/91
California Instruments AC Power	1001TC	L33966	N.A.	N.A.
Source w/ Precision Oscillator	847T	X62588	N.A.	N.A.
General Radio Counter	1191	00374	09/21/90	09/21/91

5.0 TEST PROCEDURE:

5.1 The test specimens shall be visually examined and functionally tested for determination of baseline physical condition. The functional operation of the frequency relay and power supply shall be tested utilizing the test configuration as shown in Figure 3.1. The power supply shall be energized with 120 VAC and 24 VDC shall be verified at the output. The functional operation of the frequency relay shall be tested utilizing the 24 VDC output of the power supply as the relay control power. The relay shall be set up for 24 VDC control power, underfrequency relay operation, internal shunt target operation, and factory set undervoltage cutoff (60 VAC). The underfrequency trip point shall be set at 57.00 Hertz (thumbwheel switches set at 14, 5, 8, and 13) and the time delay switches shall be set at 54 cycles (1 second total delay). The input circuit to the relay shall be set for 120 VAC and the frequency shall be variable between 55 and 60 Hertz (Hz). Proper operation of the relay test specimen shall be verified by decreasing the input frequency from 60 to 55 Hz and monitoring the output contacts utilizing a digital multimeter. Both the alarm and trip output contacts should change state one (1) second after the input reaches 57 Hz. The input frequency shall then be returned to 60 Hz and the output contacts should return to their normal state instantaneously. Proper operation of the

SOUTHERN TESTING SERVICES, INC. (STS)

TITLE: SEISMIC TEST PROCEDURE FOR AN ASEA BROWN BOVERI FREQUENCY RELAY TYPE 81 P/N 422B1295 WITH A POWER ONE, INC. POWER SUPPLY P/N HA24-0.5-A

5.0 TEST PROCEDURE:

5.1 test specimens as described above will be the failure criteria for the components. The results of the visual examination and the functional testing shall be recorded in Data Section 5.1.

JAK 4/4/91
Initials Date

5.2 The test specimens shall be mounted on the seismic simulation table in a manner which duplicates the normal in-plant mounting.

JAK 4/4/91
Initials Date

5.3 The test specimens shall be subjected to sine sweep seismic testing with input accelerations of 3.0 g in both horizontal axes and in the vertical axis from 1 to 35 to 1 Hz at a sweep rate of 1 octave per minute. The power supply test specimen shall be energized with 120 VAC during seismic testing and the 24 VDC output shall be connected to the control power input of the frequency relay test specimen. The frequency relay shall be set up as described in Section 5.1. The relay test specimen shall be tested in the normal (60 Hz input) and trip (equal to or below 57 Hz input) operating conditions. One (1) normally open and one (1) normally closed set of contacts on the relay shall be monitored for contact chatter utilizing 24 VDC continuity signals. The 24 VDC signals shall be recorded before, during, and after seismic testing. The test specimens shall be rotated through four horizontal orientations with the seismic testing described above performed for each orientation. Testing shall be performed in the sequence most convenient to test operations. Following each orientation the test specimens shall be functionally tested as described in Section 5.1 to verify proper operation. Proper operation of the power supply and frequency relay test specimens as described above, and retention of structural integrity will be the failure criteria for the components. Visual examination and functional testing results shall be recorded in Data Section 5.3.

JAK 12/12/91
Initials Date

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5.0 TEST PROCEDURE:

5.4 After completion of seismic testing the test specimens shall be removed from the seismic simulation table and visually examined as described in Section 5.1. The results of the examination shall be recorded in Data Section 5.4.

JAK — Initials   4/4/91 — Date

5.5 All personnel initialing any section of this test procedure have initialed and signed Data Section 5.5.

JAK — Initials   4/4/91 — Date

6.0 REFERENCES:

6.1 IEEE 344-1975, "IEEE Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations," dated January 31, 1975.

6.2 Tennessee Valley Authority Design Criteria WB-DC-40-31.2, "Seismic Qualification of Category I Fluid System Components and Electrical or Mechanical Equipment," Revision 4, dated May 22, 1990.

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DATA SECTION 5.1

VISUAL INSPECTION:
No visible defects were observed.

FUNCTIONAL TESTING:

POWER SUPPLY:

OUTPUT: 24.0 VDC

PROPER OPERATION: YES NO

FREQUENCY RELAY:

TRIP FREQUENCY: 56.8-57 HZ TIME DELAY: 59.5 CYCLES

PROPER OPERATION: YES NO

JAK 4/4/91
Initials Date

DATA SECTION 5.3

ORIENTATION #1: H1/V RUN NO'S. 1 (NORMAL) AND 2 (TRIP)

VISUAL INSPECTION:
No visible defects were observed.

LOSS OF STRUCTURAL INTEGRITY: YES NO

FUNCTIONAL TESTING:

CONTACT CHATTER: YES NO

PROPER OPERATION: YES NO

ORIENTATION #2: H2/V RUN NO'S. 3 (NORMAL) AND 4 (TRIP)

VISUAL INSPECTION:
No visible defects were observed.

LOSS OF STRUCTURAL INTEGRITY: YES NO

SOUTHERN TESTING SERVICES, INC. (STS)

TITLE: SEISMIC TEST PROCEDURE FOR AN ASEA BROWN BOVERI FREQUENCY RELAY TYPE 81 P/N 422B1295 WITH A POWER ONE, INC. POWER SUPPLY P/N HA24-0.5-A

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DATA SECTION 5.3

ORIENTATION #2: H2/V RUN NO'S. 3 (NORMAL) AND 4 (TRIP)

FUNCTIONAL TESTING:

CONTACT CHATTER: YES NO

PROPER OPERATION: YES NO

ORIENTATION #3: H3/V RUN NO'S. 5 (NORMAL) AND 6 (TRIP)

VISUAL INSPECTION:
No visible defects were observed.

LOSS OF STRUCTURAL INTEGRITY: YES NO

FUNCTIONAL TESTING:

CONTACT CHATTER: YES NO

PROPER OPERATION: YES NO

ORIENTATION #4: H4/V RUN NO'S. 7 (NORMAL) AND 8 (TRIP)

VISUAL INSPECTION:
No visible defects were observed.

LOSS OF STRUCTURAL INTEGRITY: YES NO

FUNCTIONAL TESTING:

CONTACT CHATTER: YES NO

PROPER OPERATION: YES NO

JAK
Initials

4/4/91
Date

DATA SECTION 5.4

VISUAL INSPECTION:
No visible defects were observed.

SOUTHERN TESTING SERVICES, INC. (STS)

TITLE: SEISMIC TEST PROCEDURE FOR AN ASEA BROWN BOVERI FREQUENCY RELAY TYPE 81 P/N 422B1295 WITH A POWER ONE, INC. POWER SUPPLY P/N HA24-0.5-A

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DATA SECTION 5.4

FUNCTIONAL TESTING:

POWER SUPPLY:

OUTPUT: 24.0 VDC

PROPER OPERATION: YES NO

FREQUENCY RELAY:

TRIP FREQUENCY: 56.8 - 57 HZ TIME DELAY: 60 CYCLES

PROPER OPERATION: YES NO

JAK 4/4/91
Initials Date

DATA SECTION 5.5

Name (Print)	Signature	Initials
Joseph A. Keck	Joseph A. Keck	JAK
WILLIAM R SCHMIDT	William Schmidt	WLS

SOUTHERN TESTING SERVICES, INC. (STS)

TITLE: ELECTROMAGNETIC INTERFERENCE TEST PROCEDURE FOR AN ASEA BROWN BOVERI FREQUENCY RELAY TYPE 81 P/N 422B1295 WITH A POWER ONE, INC. POWER SUPPLY P/N HA24-0.5-A

PROCEDURE NO. S298-TP-02
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PREPARED BY: Joseph A. Keck DATE: April 2, 1991

REVIEWED BY: Dennis R. Martin DATE: April 2, 1991

REVIEWED BY: John W. Mashburn (QA) DATE: April 2, 1991

APPROVED BY: [illegible] DATE: April 2, 1991

1.0 PURPOSE:

This test procedure identifies the methodology to be utilized to perform electromagnetic interference (EMI) testing of an ASEA Brown Boveri Frequency Relay Type 81 Part Number 422B1295 with a Power One, Inc. Power Supply Part Number HA24-0.5-A.

2.0 EQUIPMENT DESCRIPTION:

The equipment to be tested consists of an ASEA Brown Boveri Frequency Relay Type 81 Part Number 422B1295 with a Power One, Inc. Power Supply Part Number HA24-0.5-A. The components identified above are utilized in control circuit applications.

3.0 TEST SPECIMEN:

The test specimens consist of one (1) ASEA Brown Boveri Frequency Relay Type 81 Part Number 422B1295 Serial Number 00422-07 and one (1) Power One, Inc. Power Supply Part Number HA24-0.5-A Serial Number 00454-07. The test specimens shall be panel mounted to simulate actual in-plant mounting. The functional test configuration shall be as shown in Figure 3.1. The panel shall be positioned as necessary to facilitate EMI testing.

4.0 DATA RECORDING INSTRUMENTATION:

MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CALIBRATION LAST	CALIBRATION DUE
Electro Metrics, Receiver	EMC-25MkIII	613	12/3/90	12/3/91
RSR, digital voltmeter	705	916044	5/10/90	5/10/91
Tektronix, oscilloscope	475	B27092	12/5/90	12/5/91
Tektronix, high voltage probe	P6015	84509	9/26/90	9/26/91
Hewlett Packard, Digitizing Oscilloscope	54111D	2710A03255	3/18/91	3/18/92

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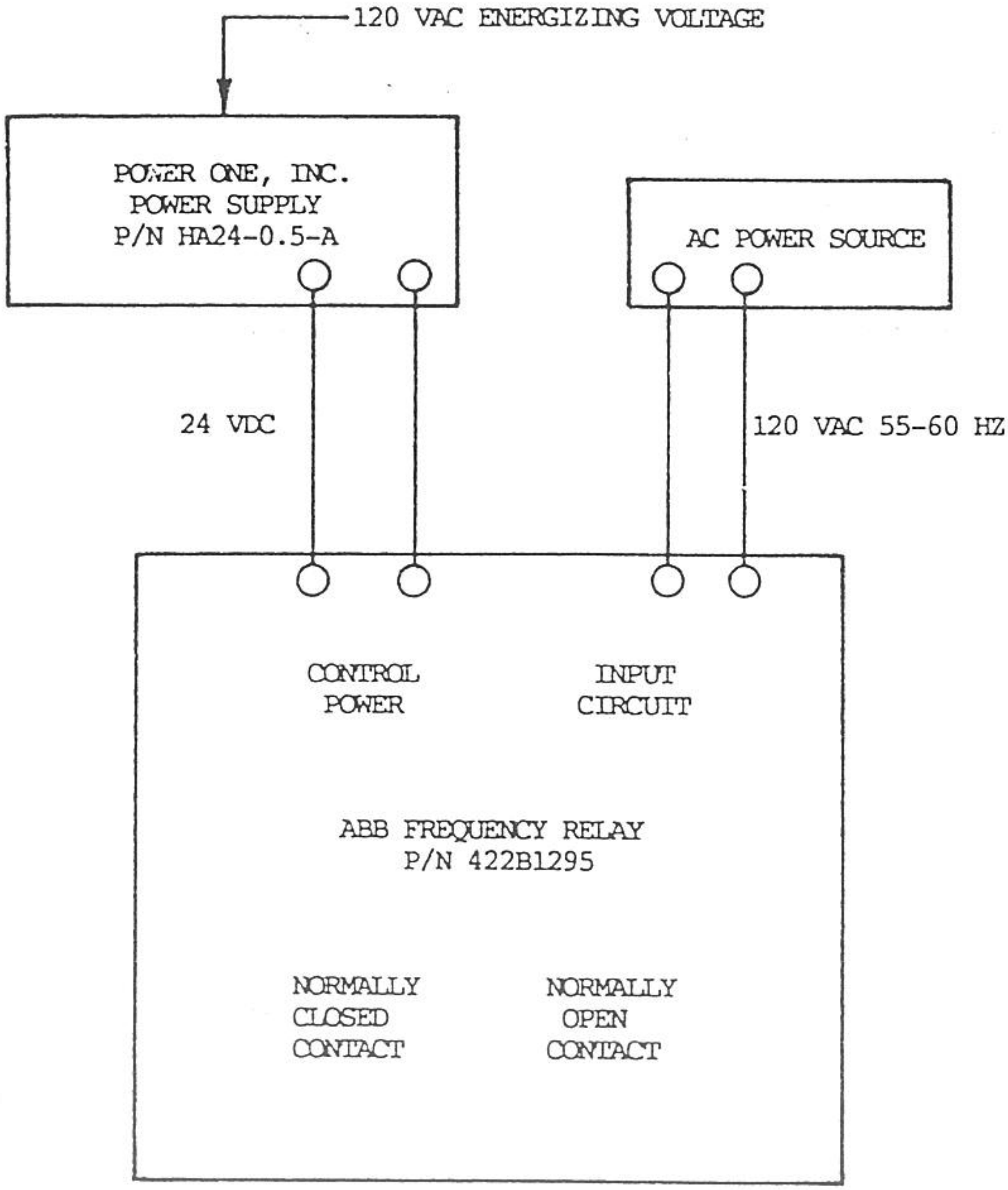

FIGURE 3.1 FUNCTIONAL TEST CONFIGURATION

SOUTHERN TESTING SERVICES, INC. (STS)

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4.0 DATA RECORDING INSTRUMENTATION:

MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CALIBRATION LAST	CALIBRATION DUE
IFI Electric Field Sensor	EFS-1	660-C	7/9/90	7/9/91
IFI Light Modulator	LMT-B	353	7/9/90	7/9/91
IFI Light Demodulator	LDI	LDI 222	7/9/90	7/9/91

5.0 TEST PROCEDURE:

5.1 The test specimens shall be visually examined and functionally tested for determination of baseline physical condition. The functional operation of the frequency relay and power supply shall be tested utilizing the test configuration as shown in Figure 3.1. The power supply shall be energized with 120 VAC and 24 VDC shall be verified at the output. The functional operation of the frequency relay shall be tested utilizing the 24 VDC output of the power supply as the relay control power. The relay shall be set up for 24 VDC control power, underfrequency relay operation, internal shunt target operation, and factory set undervoltage cutoff (60 VAC). The underfrequency trip point shall be set at 57.00 Hertz (thumbwheel switches set at 14, 5, 8, and 13) and the time delay switches shall be set at 54 cycles (1 second total delay). The input circuit to the relay shall be set for 120 VAC and the frequency shall be variable between 55 and 60 Hertz (Hz). Proper operation of the relay test specimen shall be verified by decreasing the input frequency from 60 to 55 Hz and monitoring the output contacts utilizing a digital multimeter. Both the alarm and trip output contacts should change state one (1) second after the input reaches 57 Hz. The input frequency shall then be returned to 60 Hz and the output contacts should return to their normal state instantaneously. Proper operation of the

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SOUTHERN TESTING SERVICES, INC. (STS)

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5.0 TEST PROCEDURE:

5.1 test specimens as described above will be the failure criteria for the components. The results of the visual examination and the functional testing shall be recorded in Data Section 5.1.

JK	4/10/91
Initials	Date

5.2 The test specimens shall be mounted on the EMI testing platform in a manner which duplicates the normal in-plant mounting.

JK	4/9/91
Initials	Date

5.3 The test specimens shall be subjected to seven (7) phases of electromagnetic interference (EMI) testing in accordance with TVA Standard Specification SS-E18.14.01, Revision 1. The power supply and frequency relay shall be tested to meet SWC Class C and SAMA Class 2-b:MFR SPEC. requirements. The 120 VAC input voltage for the power supply shall be considered the power line for the test specimen combination. The 120 VAC 55-60 Hz input circuit to the relay test specimen shall be considered the only input line. Output lines from the frequency relay alarm and trip contacts shall not be subjected to EMI testing. The power supply shall be energized with 120 VAC during EMI testing and the 24 VDC output shall be connected to the control power input of the frequency relay. The frequency relay shall be set up as described in Section 5.1. Each phase of the EMI testing shall be of long enough duration to allow for the input to the frequency relay to be changed from normal (60 Hz input) to trip (equal to or below 57 Hz input) and back to normal operating conditions. Both the alarm and trip output contacts shall be monitored for proper operation before, during, and after EMI testing. The contacts should change state one (1) second (57 cycles) after the input reaches 57 Hz and return to their normal state instantaneously once the input is returned to 60 Hz. Proper operation of the power supply and frequency relay test specimens as described above shall be the failure criteria for the components during each phase of EMI testing. The seven (7) phases of EMI testing are identified below.

5.3.1 The test specimens shall be subjected to Conducted EMI Transient Susceptibility testing to verify that the devices are not susceptible to conducted electromagnetic

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5.0 TEST PROCEDURE:

5.3.1 transients injected on the power input leads. The test configuration for this phase is shown in Figure 5.1. Excitation for this test shall consist of one or more damped oscillatory waves, 100 to 500 KHz, 6 to 7 cycles, 300 V peak-to-peak amplitude from a bipolar wave transient generator with a 150-ohm output impedance applied to each ungrounded power input lead. The EMI transients shall be of long enough duration to ensure that a transient occurs at enough points throughout the 360^{o} cycle of AC lines to ensure worst case conditions. The EMI transients shall have a repetition rate from 0.5 to 1 Hz and shall be conducted at 100, 200, 300, 400, and 500 KHz. Functional testing of the test specimens shall be as described in Section 5.3. The test specimens shall function properly before, during, and after testing with no malfunctions, undesired responses, degradation of performance, or permanent damage when subjected to this excitation. Visual examination and functional testing results shall be recorded in Data Section 5.3.1.

JK 4/12/91
Initials Date

5.3.2 The test specimens shall be subjected to Conducted RF EMI Susceptibility testing to verify that the devices are not susceptible to conducted RF EMI injected on the power input leads. The test configuration for this phase is shown in Figure 5.2. Excitation for this test shall consist of a sine wave, 0.5 to 100 MHZ, continuous wave (5 V peak-to-peak), amplitude modulated (0 to 5 V), frequency modulated (+or- 20 KHz), sweep rate of 1 to 5 MHz per second, from a signal generator with a 47-ohm output impedance applied to each ungrounded power input lead. The type of signals and sweep rate shall be selected for the maximum anticipated effects on the test specimens. Functional testing of the test specimens shall be as described in Section 5.3. The test specimens shall function properly before, during, and after testing with no malfunctions, undesired responses, degradation of performance, or permanent damage when subjected to this excitation. Visual examination and functional testing results shall be recorded in Data Section 5.3.2.

JK 4/12/91
Initials Date

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5.0 TEST PROCEDURE:

5.3.3 The test specimens shall be subjected to Line Coupled Transient EMI Susceptibility testing to verify that the devices are not susceptible to radiated transient electromagnetic fields on the input and output lines. The test configuration for this phase is shown in Figure 5.3. Excitation for this test shall consist of one or more damped oscillatory waves, 100 to 500 KHZ, 6 to 7 cycles, 300 V peak-to-peak amplitude from a bipolar wave transient generator with a 150-ohm output impedance introduced on conductors parallel and in intimate contact with each input and output line. The EMI transients shall have a repetition rate from 0.5 to 1 Hz and shall be conducted at 100, 200, 300, 400, and 500 KHz. The 150-ohm load connected to the transient generator output shall be a pure resistive load. The 50' of plastic tubing containing the 4 parallel conductors must be kept as straight as possible and any surplus length of wire must not be folded, coiled, or placed in a U-shaped position. Functional testing of the test specimens shall be as described in Section 5.3. The test specimens shall function properly before, during, and after testing with no malfunctions, undesired responses, degradation of performance, or permanent damage when subjected to this excitation. Visual examination and functional testing results shall be recorded in Data Section 5.3.3.

m.g.K. JK 4/16/91
Initials Date

5.3.4 The test specimens shall be subjected to Line Coupled RF EMI Susceptibility testing to verify that the devices are not susceptible to radiated RF electromagnetic fields on the input and output lines. The test configuration for this phase is shown in Figure 5.4. Excitation for this test shall consist of a sine wave, 0.5 to 100 MHZ, continuous wave (5 V peak-to-peak), amplitude modulated (0 to 5 V), frequency modulated (+or- 20 KHz), sweep rate of 1 to 5 MHz per second, from a signal generator with a 47-ohm output impedance introduced on conductors parallel and in intimate contact with each input and output line. The type of signals and sweep rate shall be selected for the maximum anticipated effects on the test specimens. The 47-ohm load connected to the signal generator output shall be a pure resistive load. The 50' of plastic tubing

5.0 TEST PROCEDURE:

5.3.4 containing the 4 parallel conductors must be kept as straight as possibly and any surplus length of wire must not be folded, coiled, or placed in a U-shaped position. Functional testing of the test specimens shall be as described in Section 5.3. The test specimens shall function properly before, during, and after testing with no malfunctions, undesired responses, degradation of performance, or permanent damage when subjected to this excitation. Visual examination and functional testing results shall be recorded in Data Section 5.3.4.

M.J.K. 4 JK	4/12/91
Initials	Date

5.3.5 The test specimens shall be subjected to Conducted Emissions testing to verify that the devices do not generate electromagnetic emission on the AC power leads. The test configuration for this phase is shown in Figure 5.5.a. No excitation is required. Functional testing of the test specimens shall be as described in Section 5.3. The test specimens operation shall be considered acceptable if the broadband electromagnetic emission on the AC power leads does not exceed the values shown on Figure 5.4.b. The test specimens shall function properly before, during, and after testing. Visual examination and functional testing results shall be recorded in Data Section 5.3.5.

JK	4/12/91
Initials	Date

5.3.6 The test specimens shall be subjected to a Surge Withstand Capability (SWC) test to verify that the devices can withstand surges on the signal and power input leads. The test configuration for this phase is shown in Figure 5.6. Excitation for this test shall consist of the application of surges of 2.5 KV peak oscillatory wave at a frequency of 1.5 MHz. The envelope of the oscillatory wave will decay to 50% of the peak value of the first crest within 6 to 10 cycles from the start of the wave. The source impedance of the surge generator shall be 150-ohms. Functional testing of the test specimens shall be as described in Section 5.3. The test specimens shall function properly before, during, and after testing and shall meet the requirements

SOUTHERN TESTING SERVICES, INC. (STS)

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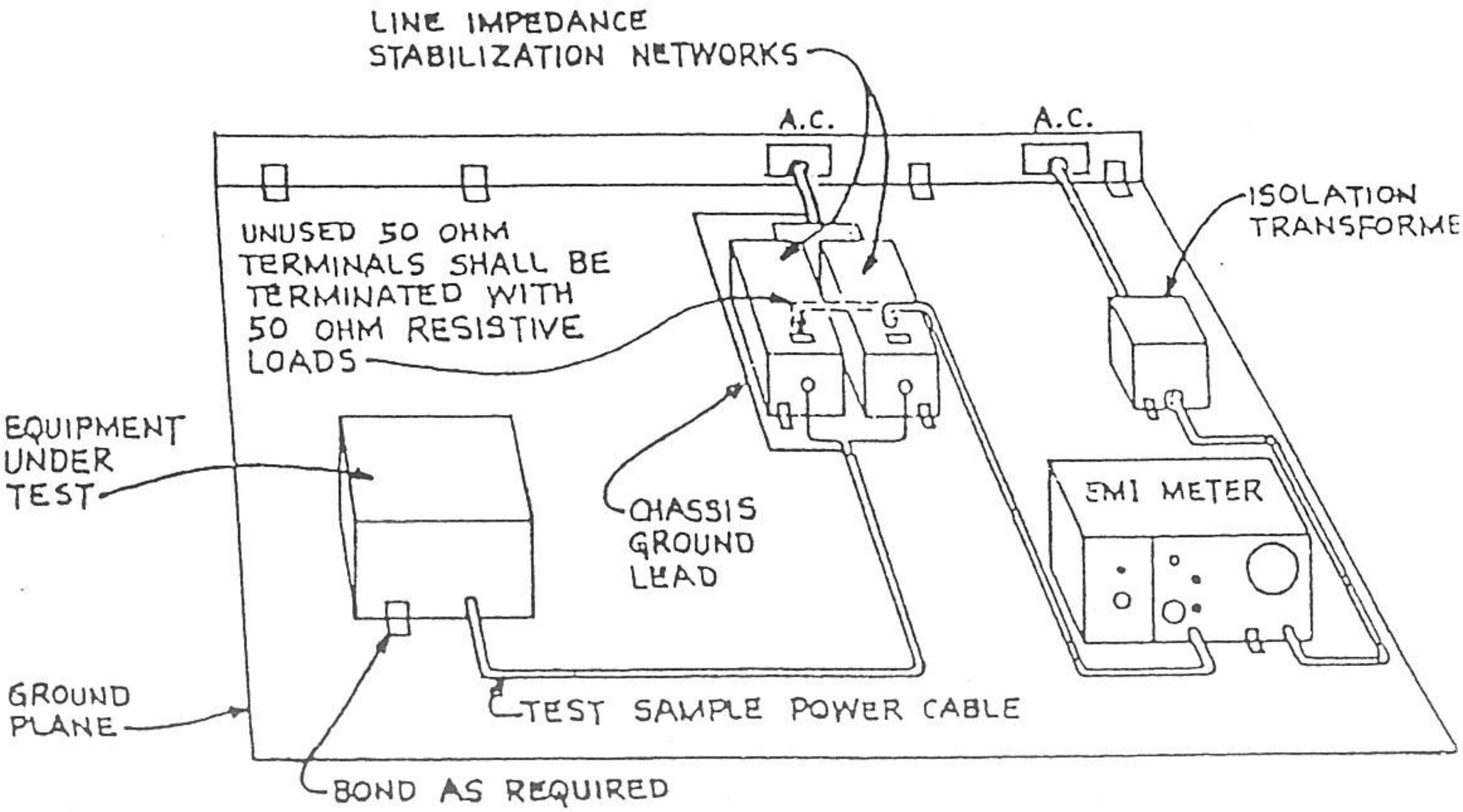

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Figure 5.5.a Conducted Emissions Test Setup

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5.0 TEST PROCEDURE:

5.3.6 of their SWC classification as listed in Section 5.3. Visual examination and functional testing results shall be recorded in Data Section 5.3.6.

M.O.K. + JK — Initials | 4/12/91 — Date

5.3.7 The test specimens shall be subjected to Radiated RF EMI Field Susceptibility testing to verify the level of susceptability of the devices to RF fields. The test configuration for this phase is shown in Figure 5.7. Excitation for this test shall be as defined by the SAMA classification for these devices as listed in Section 5.3. Functional testing of the test specimens shall be as described in Section 5.3. The test specimens shall function properly before, during, and after testing with no deviations from the normal operational characteristics in excess of those specified by the SAMA classification referenced above. Visual examination and functional testing results shall be recorded in Data Section 5.3.7.

JK — Initials | 4/1:4/91 — Date

5.4 After completion of electromagnetic interference (EMI) testing the test specimens shall be removed from the test panel and visually examined as described in Section 5.1. The results of the examination shall be recorded in Data Section 5.4.

JK — Initials | 4/11/91 — Date

5.5 All personnel initialing any section of this test procedure have initialed and signed Data Section 5.5.

+ JK — Initials | 4/16/91 — Date

SOUTHERN TESTING SERVICES, INC. (STS)

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DATA SECTION 5.1

VISUAL INSPECTION: OK

FUNCTIONAL TESTING:

POWER SUPPLY:

OUTPUT: 24 VDC

PROPER OPERATION: YES NO

FREQUENCY RELAY:

TRIP FREQUENCY: 57 HZ TIME DELAY: 54 CYCLES

PROPER OPERATION: YES NO

JK 4/10/91
Initials Date

DATA SECTION 5.3.1

VISUAL INSPECTION: OK

FUNCTIONAL TESTING:

PROPER OPERATION: YES NO

M.J.K. + JK 4/12/91
Initials Date

DATA SECTION 5.3.2

VISUAL INSPECTION: OK

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DATA SECTION 5.3.2

FUNCTIONAL TESTING:

PROPER OPERATION: YES NO

JK — Initials

4/12/91 — Date

DATA SECTION 5.3.3

VISUAL INSPECTION: OK

FUNCTIONAL TESTING:

PROPER OPERATION: YES NO

[illegible] + JK — Initials

4/16/91 — Date

DATA SECTION 5.3.4

VISUAL INSPECTION: OK

FUNCTIONAL TESTING:

PROPER OPERATION: YES NO

JK — Initials

4/15/91 — Date

DATA SECTION 5.3.5

VISUAL INSPECTION: OK

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DATA SECTION 5.3.5

FUNCTIONAL TESTING:

PROPER OPERATION: YES NO

JK 4/10/91
Initials Date

DATA SECTION 5.3.6

VISUAL INSPECTION: OK

FUNCTIONAL TESTING:

PROPER OPERATION: YES NO

M.J.K. JJK 4/16/91
Initials Date

DATA SECTION 5.3.7

VISUAL INSPECTION: OK

FUNCTIONAL TESTING:

PROPER OPERATION: YES NO

JK 4/11/91
Initials Date

DATA SECTION 5.4

VISUAL INSPECTION: OK

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DATA SECTION 5.4

FUNCTIONAL TESTING:

POWER SUPPLY:

OUTPUT: 24 VDC

PROPER OPERATION: YES NO

FREQUENCY RELAY:

TRIP FREQUENCY: 57 HZ TIME DELAY: 54 CYCLES

PROPER OPERATION: YES NO

JK — Initials 4/16/91 — Date

DATA SECTION 5.5

Name (Print)	Signature	Initials
JOHN KAVALUSKY	John Kavalusky	J.K.
Mark J. Komp	Mark J. Komp	MJK

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1.0 INTRODUCTION

1.1 Purpose

This Instruction describes the operability and functional testing required by Technical Specifications (TS) and Surveillance Requirements (SR) for the Reactor Coolant Pump one, two, three, and four (RCP) Underfrequency (UF) Relays associated with system 68.

1.2 Scope

This Instruction covers the integrated functional test and simulates automatic actuations of Underfrequency relays, verifying each associated relay, control circuit function as designed.

This Instruction satisfies SR 4.3.1.1.1.C.17.

1.3 Frequency/Condition

A. This Instruction shall be performed at least every 92 days.

B. Applicable Modes 1

C. Performance modes are 1 through 6.

Attachment No. 15 Sheet 1 of 20
Identifier SQN-EEB-MS-TI28-0076

4.0 PREREQUISITE ACTIONS

Date

4.1 Initial Conditions

[1] **CONDUCT** pre-work briefing. ☐

[2] **RECORD** performer and participant identification on Data Package Cover Sheet. ☐

4.2 Field Preparations

None.

4.3 Measurement and Test Equipment (M&TE), Parts, and Supplies

[1] **OBTAIN** the following M&TE:

DESCRIPTION	TVA ID NO.	CAL DUE
EIL Frequency Test Set Model FTS-300		
Multimeter, Digital Model 8600A (Fluke) or Keithley 197		

4.4 Approvals and Notifications

NOTE *If unit is in mode 1, only one underfrequency channel can be removed from service at any one time. All remaining channels must be in normal* ***UNTRIPPED*** *position in order to avoid a reactor trip.*

[1] **OBTAIN** Unit 1 ASOS/SRO approval prior to beginning Section 6.0 of this Instruction. SRO shall evaluate required conditions and restraints imposed by Technical Specifications 3.3.1.1 and effect on equipment operability of applicable RCP.

Position	Signature / Date / Time
Unit 1 ASOS/SRO	________ / ______ / ______

Attachment No. 15 Sheet 2 of 20
Identifier SQN-EEB-MS-TI28-0076

4.4 Approvals and Notifications (Continued) ______ Date

[2] **SIGN** SI Awareness Log. ☐

[3] **NOTIFY** Unit 1 ASOS/SRO of the following:

A. Scope of work ☐

B. Annunciator(s) which may be received during performance of this Instruction. ☐

[4] **REQUEST** UO to perform lamp test on panels 1-M-6, 1-XX-55-6A. ☐

5.0 ACCEPTANCE CRITERIA

5.1 Underfrequency relays must operate correctly and meet all conditions and criteria specified within instruction and applicable SRs of 4.3.1.1.1.C.17.

5.2 All identified adverse conditions and discrepancies in test acceptance criteria must be documented on Deficiency Log.

5.3 ASOS and CG cognizant supervisor shall be informed of all deficiencies.

5.4 WR must be initiated and documented under Remarks, Appendix A, for repair/replacement of defective components. A WR may be required before continuing with instruction when acceptance criteria is not met.

Attachment No. 15 Sheet 3 of 20
Identifier SQN-EEB-MS-TI28-0076

6.2 RCP Underfrequency Relay Functional for Mode 1

Date

6.2.1 RCP 1 Underfrequency Relay (device 811A) Functional for Mode 1

[1] **ENSURE** following annunciators **are not** in ALARM condition.

A. **RCP Bus 1 Underfrequency** Panel 1-M-6, 1-XX-55-6A, window 2. ☐

B. **RCP Bus 2 Underfrequency** Panel 1-M-6, 1-XX-55-6A, window 22. ☐

C. **RCP Bus 3 Underfrequency** Panel 1-M-6, 1-XX-55-6A, window 42. ☐

D. **RCP Bus 4 Underfrequency** Panel 1-M-6, 1-XX-55-6A, window 62. ☐

E. **RCP Bus Underfrequency/Undervoltage,** Panel 1-M-6, 1-XA-55-6A, window 32 (E-4). ☐

[2] **PLACE** orange sticker on annunciator **RCP Bus 1 Underfrequency** Panel 1-M-6, 1-XX-55-6A, window 2. ☐

[3] **PERFORM** the following:

[a] **REMOVE** UF relay cover, **AND**

OPEN connecting switches 8 and 9 on UF relay (device 811A). ☐

[b] **ADJUST** output of test set for a normal frequency of 60 hertz at 120V ac **and** a fault frequency of 55.95 Hz at 120V ac, **AND**

LEAVE test switch in **SET FAULT** position. ☐

[c] **TURN** test set **OFF, AND**

CONNECT output voltage leads from test set to relay terminals 8 and 9. ☐

[d] **TURN** test set **ON.** ☐

Attachment No. 15 Sheet 4 of 20
Identifier SQN-EEB-MS-TI28-0076

Date

6.2.1 RCP 1 Underfrequency Relay (device 811A) Functional for Mode 1 (Continued)

[4] **VERIFY** the following **are not** in ALARM condition:

A. **RCP Bus 1 Underfrequency** Panel 1-M-6, 1-XX-55-6A, window 2. ☐

B. **RCP Bus 2 Underfrequency** Panel 1-M-6, 1-XX-55-6A, window 22. ☐

C. **RCP Bus 3 Underfrequency** Panel 1-M-6, 1-XX-55-6A, window 42. ☐

D. **RCP Bus 4 Underfrequency** Panel 1-M-6, 1-XX-55-6A, window 62. ☐

E. **RCP Bus Underfrequency/Undervoltage,** Panel 1-M-6, 1-XA-55-6A, window 32 (E-4). ☐

______

NOTE *If status light window is flashing, then all testing shall be secured and Instrument Maintenance must be notified.*

[5] **TURN** test switch to **TEST** position, **AND**

VERIFY the following alarms are received:

A. **RCP Bus 1 Underfrequency**, Panel 1-M-6, 1-XX-55-6A window 2. ☐

B. **RCP Bus Underfrequency/Undervoltage**, Reactor Protection and Safeguards, Panel 1-M-6, 1-XA-55-6A window 32 (E-4). ☐

______

Attachment No. 15 Sheet 5 of 20
Identifier SQN-EEB-MS-TI28-0076

Date

6.2.1 RCP 1 Underfrequency Relay (device 811A) Functional for Mode 1 (Continued)

[6] **TURN** test set **OFF, AND**

DISCONNECT test leads from relay terminals 8 and 9. ____

[7] **ENSURE** the following alarms are **CLEARED**:

A. **RCP Bus 1 Underfrequency,** Panel 1-M-6, 1-XX-55-6A window 2. ☐

B. **RCP Bus Underfrequency/Undervoltage**, Panel 1-M-6, 1-XA-55-6A window 32 (E-4). ☐

____

[8] **CLOSE** RCP 1 UF relay connection switches 8 and 9, **AND**

REPLACE relay cover. ____

____
2nd Check

[9] **REMOVE** orange sticker from annunciator windows **RCP Bus 1 Underfrequency** Panel 1-M-6, 1-XX-55-6A, window 2. ☐

[10] **INFORM** Unit Operator that testing on RCP 1 UF relay is completed and relay has been returned to normal. ☐

Attachment No. 15 Sheet 6 of 20
Identifier SQN-EEB-MS-TI28-0076

Date

6.3 RCP Underfrequency Relay Functional for Modes 2 thru 6

6.3.1 RCP 1 Underfrequency Relay Functional Annunciators Cleared for Mode 2 thru 6

[1] **DETERMINE** status of the following RCPs, **AND**

REMOVE UV relay connecting blocks for all RCP's **NOT RUNNING, THEN**

INSTALL a test PK block with 2 jumpered to 4 to clear alarm window lights. See illustration below.

o7	o5	o3	o1
o8	o6	o4	o2

A. RCP 1: (device 271A) PK Block Cover **REMOVED** ☐ Yes ☐ No

B. Test PK block **INSTALLED** ☐ Yes ☐ No

C. RCP 2: (device 271B) PK Block Cover **REMOVED** ☐ Yes ☐ No

D. Test PK block **INSTALLED** ☐ Yes ☐ No

E. RCP 3: (device 272A) PK Block Cover **REMOVED** ☐ Yes ☐ No

F. Test PK block **INSTALLED** ☐ Yes ☐ No

G. RCP 4: (device 272B) PK Block Cover **REMOVED** ☐ Yes ☐ No

H. Test PK block **INSTALLED** ☐ Yes ☐ No

[2] **PLACE** orange sticker on RCP **Bus 1 Underfrequency/Undervoltage** Panel 1-M-6, 1-XA-55-6A, window 32 (E-4). ☐

Attachment No. 15 Sheet 7 of 20
Identifier SQN-EEB-MS-TI28-0076

6.3.2 RCP 1 Underfrequency Relay Functional for Mode 2 thru 6

Date

[1] **PLACE** orange sticker on annunciator **RCP Bus 1 Underfrequency** Panel 1-M-6, 1-XX-55-6A, window 2. ☐

[2] **ENSURE** following annunciators **are not** in ALARM condition.

A. **RCP Bus 1 Underfrequency** Panel 1-M-6, 1-XX-55-6A, window 2. ☐

B. **RCP Bus 2 Underfrequency** Panel 1-M-6, 1-XX-55-6A, window 22. ☐

C. **RCP Bus 3 Underfrequency** Panel 1-M-6, 1-XX-55-6A, window 42. ☐

D. **RCP Bus 4 Underfrequency** Panel 1-M-6, 1-XX-55-6A, window 62. ☐

E. **RCP Bus Underfrequency/Undervoltage,** Panel 1-M-6, 1-XA-55-6A, window 32 (E-4). ☐

[3] **PERFORM** the following:

[a] **REMOVE** UF relay cover, **AND**

OPEN connecting switches 8 and 9 on UF relay (device 811A). ☐

[b] **ADJUST** output of test set for a normal frequency of 60 hertz at 120V ac **and** a fault frequency of 55.95 Hz at 120V ac, **AND**

LEAVE test switch in **SET FAULT** position. ☐

[c] **TURN** test set OFF**, AND**

CONNECT output voltage leads from test set to relay terminals 8 and 9. ☐

[d] **TURN** test set **ON.** ☐

Attachment No. 15 Sheet 8 of 20

Identifier SQN-EEB-MS-TI28-0076

6.3.2 RCP 1 Underfrequency Relay Functional for Mode 2 thru 6 (Continued)

Date

[4] **VERIFY** the following ALARMS **are not** in alarm condition:

A. **RCP Bus 1 Underfrequency** Panel 1-M-6, 1-XX-55-6A, window 2. ☐

B. **RCP Bus 2 Underfrequency** Panel 1-M-6, 1-XX-55-6A, window 22. ☐

C. **RCP Bus 3 Underfrequency** Panel 1-M-6, 1-XX-55-6A, window 42. ☐

D. **RCP Bus 4 Underfrequency** Panel 1-M-6, 1-XX-55-6A, window 62. ☐

E. **RCP Bus Underfrequency/Undervoltage,** Panel 1-M-6, 1-XA-55-6A, window 32 (E-4). ☐

____

NOTE *If status light window is flashing, then all testing shall be secured and Instrument Maintenance must be notified.*

[5] **TURN** test switch to **TEST** position, **AND**

VERIFY the following alarms are received:

A. **RCP Bus 1 Underfrequency**, Panel 1-M-6, 1-XX-55-6A window 2. ☐

B. **RCP Bus Underfrequency/Undervoltage**, Panel 1-M-6, 1-XA-55-6A window 32 (E-4). ☐

____

[6] **TURN** test set **OFF, AND**

DISCONNECT test leads from relay terminals 8 and 9. __________

[7] **CLOSE** RCP 1 UF relay connection switches 8 and 9, **AND**

REPLACE relay cover. __________

Attachment No. 15 Sheet 9 of 20
Identifier SQN-EEB-MS-TI28-0076

____
2nd Check

6.3.2 RCP 1 Underfrequency Relay Functional for Mode 2 thru 6 (Continued) ______

Date

[8] **VERIFY** the following alarms are **CLEARED**:

A. **RCP Bus 1 Underfrequency**, Panel 1-M-6, 1-XX-55-6A window 2. ☐

B. **RCP Bus Underfrequency/Undervoltage**, Panel 1-M-6, 1-XA-55-6A window 32 (E-4). ☐

______

[9] **REMOVE** orange sticker from annunciator windows **RCP Bus 1 Underfrequency** Panel 1-M-6, 1-XX-55-6A, window 2. ☐

[10] **INFORM** Unit Operator that testing on RCP 1 UF relay is completed and relay has been returned to normal. ☐

[11] **IF** no other RCP relays is to be tested, **THEN**

GO TO Section 6.3.6, **OR**

CONTINUE to next RCP. ☐

Attachment No. 15 Sheet 10 of 20

Identifier SQN-EEB-MS-TI28-0076

1.0 INTRODUCTION

1.1 Purpose

This Instruction describes the operability and functional testing required by Technical Specifications (TS) and Surveillance Requirements (SR) for the Reactor Coolant Pump one, two, three, and four (RCP) Underfrequency (UF) Relays associated with system 68.

1.2 Scope

This Instruction covers the integrated functional test and simulates automatic actuations of Underfrequency relays, verifying each associated relay, control circuit function as designed.

This Instruction satisfies SR 4.3.1.1.1.C.17 and partially satisfies SR 4.3.1.1.1.B.17 when performed in conjunction with 2-SI-TDC-068-218.0.

1.3 Frequency/Condition

A. This Instruction shall be performed at least every 92 days.

B. Applicable Modes 1

C. Performance modes are 1 through 6.

Attachment No. 15 Sheet 11 of 20
Identifier SQN-EEB-MS-TI28-0076

Date

4.0 PREREQUISITE ACTIONS

4.1 Initial Conditions

[1] **CONDUCT** pre-work briefing. ☐

[2] **RECORD** performer and participant on Data Package Cover Sheet. ☐

4.2 Field Preparations

Attachment No. 15 Sheet 12 of 20
Identifier SQN-EEB-MS-TI28-0076

None.

4.3 Measurement and Test Equipment (M&TE), Parts, and Supplies

[1] **OBTAIN** the following M&TE:

DESCRIPTION		TVA ID NO.	CAL DUE
EIL Frequency Test Set Model FTS-300	RCP 1 & 2		
	RCP 3 & 4		
Multimeter, Digital Model 8600A (Fluke) or Keithley 197	RCP 1 & 2		
	RCP 3 & 4		

4.4 Approvals and Notifications

NOTE *If unit is in mode 1, only one underfrequency channel can be removed from service at any one time. All remaining channels must be in normal **UNTRIPPED** position in order to avoid a reactor trip.*

[1] **OBTAIN** Unit 2 ASOS/SRO approval prior to beginning Section 6.0 of this Instruction. SRO shall evaluate required conditions and restraints imposed by Technical Specifications 3.3.1 and effect on equipment operability of applicable RCP.

Position	Signature / Date / Time
Unit 2 ASOS/SRO	_______ / _____ / _____

Date

4.4 Approvals and Notifications (Continued)

[2] **SIGN** SI Awareness Log. ☐

[3] **NOTIFY** Unit 2 ASOS/SRO of the following:

a. Scope of work ☐

b. Annunciaton(s) which may be received during performance of this Instruction. ☐

[4] **REQUEST** UO to perform lamp test on panels 2-M-6, 2-XX-55-6A. ☐

5.0 ACCEPTANCE CRITERIA

5.1 Underfrequency relays must operate correctly and meet all conditions and criteria specified within instruction and applicable SRs of 4.3.1.1.1.B.17 and 4.3.1.1.1.C.17.

5.2 All identified adverse conditions and discrepancies in test acceptance criteria must be documented on Deficiency Log.

5.3 ASOS and CG cognizant supervisor shall be informed of all deficiencies.

5.4 WR must be initiated and documented under Remarks, Appendix A, for repair/replacement of defective components. A WR may be required before continuing with instruction when acceptance criteria is not met.

Attachment No. 15 Sheet 13 of 20
Identifier SQN-EEB-MS-TI28-0076

Date

6.2 RCP Underfrequency Relay Functional for Mode 1

6.2.1 RCP 1 Underfrequency Relay (device 811A) Functional for Mode 1

[1] **ENSURE** following annunciators are not in ALARM condition.

A. **RCP Bus 1 Underfrequency** Panel 2-M-6, 2-XX-55-6A, window 2. ☐

B. **RCP Bus 2 Underfrequency** Panel 2-M-6, 2-XX-55-6A, window 22. ☐

C. **RCP Bus 3 Underfrequency** Panel 2-M-6, 2-XX-55-6A, window 42. ☐

D. **RCP Bus 4 Underfrequency** Panel 2-M-6, 2-XX-55-6A, window 62. ☐

E. **RCP Bus Underfrequency/Undervoltage,** Panel 2-M-6, 2-XA-55-6A, window 32 (E-4). ☐

[2] **PLACE** orange sticker on annunciator **RCP Bus 1 Underfrequency** Panel 2-M-6, 2-XX-55-6A, window 2. ☐

[3] **PERFORM** the following:

[a] **REMOVE** UF relay cover, AND

OPEN connecting switches 8 and 9 on UF relay (device 811A). ☐

[b] **ADJUST** output of test set for a normal frequency of 60 hertz at 120V ac and a fault frequency of 55.95 Hz at 120V ac, AND

LEAVE test switch in **SET FAULT** position. ☐

[c] **TURN** test set **OFF**, AND

CONNECT output voltage leads from test set to relay terminals 8 and 9. ☐

Date

6.2.1 RCP 1 Underfrequency Relay (device 811A) Functional for Mode 1 (Continued)

[d] TURN test set ON. ☐

[4] VERIFY the following are not in ALARM condition:

A. RCP Bus 1 Underfrequency Panel 2-M-6, 2-XX-55-6A, window 2. ☐

B. RCP Bus 2 Underfrequency Panel 2-M-6, 2-XX-55-6A, window 22. ☐

C. RCP Bus 3 Underfrequency Panel 2-M-6, 2-XX-55-6A, window 42. ☐

D. RCP Bus 4 Underfrequency Panel 2-M-6, 2-XX-55-6A, window 62. ☐

E. RCP Bus Underfrequency/Undervoltage, Panel 2-M-6, 2-XA-55-6A, window 32 (E-4). ☐

NOTE *If status light window is flashing, then all testing shall be secured and Instrument Maintenance must be notified.*

[5] TURN test switch to TEST position, AND

VERIFY the following alarms and computer points are received:

A. RCP Bus 1 Underfrequency, Panel 2-M-6, 2-XX-55-6A window 2. ☐

B. RCP Bus Underfrequency/Undervoltage, Reactor Protection and Safeguards, Panel 2-M-6, 2-XA-55-6A window 32 (E-4). ☐

C. Computer alarm point Y0320D RCP BUS 1 UF Part RE. ☐

Date

6.2.1 RCP 1 Underfrequency Relay (device 811A) Functional for Mode 1 (Continued)

[6] **TURN** test set **OFF**, **AND**

DISCONNECT test leads from relay terminals 8 and 9. ______

[7] **ENSURE** the following alarms are **CLEARED**:

A. **RCP Bus 1 Underfrequency**, Panel 2-M-6, 2-XX-55-6A window 2. ☐

B. **RCP Bus Underfrequency/Undervoltage**, Panel 2-M-6, 2-XA-55-6A window 32 (E-4). ☐

C. Computer alarm point **Y0320D RCP BUS 1 UF Part RE.** ☐

______

[8] **CLOSE** RCP 1 UF relay connection switches 8 and 9, **AND**

REPLACE relay cover. ______

______
2nd

[9] **REMOVE** orange sticker from annunciator windows **RCP Bus 1 Underfrequency** Panel 2-M-6, 2-XX-55-6A, window 2. ☐

[10] **INFORM** Unit Operator that testing on RCP 1 UF relay is completed and relay has been returned to normal. ☐

Attachment No. 15 Sheet 16 of 20
Identifier SQN-EEB-MS-TI78-0075

Date

6.3 RCP Underfrequency Relay Functional for Modes 2 through 6

6.3.1 RCP 1-4 Undervoltage Relay Functional Annunciators Cleared for Mode 2 through 6

[1] **REMOVE** UV relay PK blocks covers for all RCP's **NOT RUNNING, THEN**

INSTALL a test PK block with 2 jumpered to 4 to clear alarm window lights. See illustration below.

○7	○5	○3	○1
○8	○6	○4	○2

A. RCP 1: (device 27-1A) PK Block Cover **REMOVED** ☐ Yes ☐ No

B. Test PK block **INSTALLED** ☐ Yes ☐ No

C. RCP 2: (device 27-1B) PK Block Cover **REMOVED** ☐ Yes ☐ No

D. Test PK block **INSTALLED** ☐ Yes ☐ No

E. RCP 3: (device 27-2A) PK Block Cover **REMOVED** ☐ Yes ☐ No

F. Test PK block **INSTALLED** ☐ Yes ☐ No

G. RCP 4: (device 27-2B) PK Block Cover **REMOVED** ☐ Yes ☐ No

H. Test PK block **INSTALLED** ☐ Yes ☐ No

CV

[2] **PLACE** orange sticker on RCP Bus Underfrequency/Undervoltage Panel 2-M-6, 2-XA-55-6A. window 32 (E-4). ☐

Date

6.3.2 RCP 1 Underfrequency Relay Functional for Mode 2 thru 6

[1] PLACE orange sticker on annunciator **RCP Bus 1 Underfrequency** Panel 2-M-6, 2-XX-55-6A, window 2. ☐

[2] ENSURE following annunciators are not in ALARM condition.

A. **RCP Bus 1 Underfrequency** Panel 2-M-6, 2-XX-55-6A, window 2. ☐

B. **RCP Bus 2 Underfrequency** Panel 2-M-6, 2-XX-55-6A, window 22. ☐

C. **RCP Bus 3 Underfrequency** Panel 2-M-6, 2-XX-55-6A, window 42. ☐

D. **RCP Bus 4 Underfrequency** Panel 2-M-6, 2-XX-55-6A, window 62. ☐

E. **RCP Bus Underfrequency/Undervoltage**, Panel 2-M-6, 2-XA-55-6A, window 32 (E-4). ☐

[3] PERFORM the following:

[a] REMOVE UF relay cover, AND

OPEN connecting switches 8 and 9 on UF relay (device 811A). ☐

[b] ADJUST output of test set for a normal frequency of 60 hertz at 120V ac and a fault frequency of 55.95 Hz at 120V ac, AND

LEAVE test switch in SET FAULT position. ☐

[c] TURN test set OFF, AND

CONNECT output voltage leads from test set to relay terminals 8 and 9. ☐

[d] TURN test set ON. ☐

Attachment No. 15 Sheet 18 of 20
Identifier SQN-EEB-MS-TI28-0076

Date

6.3.2 RCP 1 Underfrequency Relay Functional for Mode 2 thru 6 (Continued)

[4] **VERIFY** the following **ALARMS** are **not** in alarm condition:

A. **RCP Bus 1 Underfrequency** Panel 2-M-6, 2-XX-55-6A, window 2. ☐

B. **RCP Bus 2 Underfrequency** Panel 2-M-6, 2-XX-55-6A, window 22. ☐

C. **RCP Bus 3 Underfrequency** Panel 2-M-6, 2-XX-55-6A, window 42. ☐

D. **RCP Bus 4 Underfrequency** Panel 2-M-6, 2-XX-55-6A, window 62. ☐

E. **RCP Bus Underfrequency/Undervoltage**, Panel 2-M-6, 2-XA-55-6A, window 32 (E-4). ☐

______

NOTE *If status light window is flashing, then all testing shall be secured and Instrument Maintenance must be notified.*

[5] **TURN** test switch to **TEST** position, **AND**

VERIFY the following alarms and computer points are received:

A. **RCP Bus 1 Underfrequency**, Panel 2-M-6, 2-XX-55-6A window 2. ☐

B. **RCP Bus Underfrequency/Undervoltage**, Panel 2-M-6, 2-XA-55-6A window 32 (E-4). ☐

C. Computer alarm point **Y0320D RCP BUS 1 UF Part RE.** ☐

______

[6] **TURN** test set **OFF**, **AND**

DISCONNECT test leads from relay terminals 8 and 9. ______

Date

6.3.2 RCP 1 Underfrequency Relay Functional for Mode 2 thru 6 (Continued)

[7] **CLOSE** RCP 1 UF relay connection switches 8 and 9, **AND**

REPLACE relay cover. ____________

[8] **VERIFY** the following alarms are **CLEARED**:

A. **RCP Bus 1 Underfrequency**, Panel 2-M-6, 2-XX-55-6A window 2. ☐

B. **RCP Bus Underfrequency/Undervoltage**, Panel 2-M-6, 2-XA-55-6A window 32 (E-4). ☐

C. Computer alarm point **Y0320D RCP BUS 1 UF Part RE.** ☐

____

[9] **REMOVE** orange sticker from annunciator windows **RCP Bus 1 Underfrequency** Panel 2-M-6, 2-XX-55-6A, window 2. ☐

[10] **INFORM** Unit Operator that testing on RCP 1 UF relay is completed and relay has been returned to normal. ☐

[11] **IF** no other RCP relays is to be tested, **THEN**

GO TO section 6.3.6, **OR**

CONTINUE to next RCP. ☐

SPECIFICATION SHEET

DIVERSIFIED ELECTRONICS, INC.
119 N. Morton Avenue
Evansville, Indiana 47711
(812) 426-2800

CUSTOMER: NUTHERM INTERNATIONAL		PART NO. SP-0133	DATE 7-21-81
ADDRESS: MT. VERNON, IL		CUSTOMER NO	

REV	DATE	ECO	APV

SUPPLY VOLTAGE: 120 VAC, 60 Hz

TRIP FREQUENCY RANGE: 44.0 to 60.98 Hz, Adjustable

FACTORY SET POINT: 57 Hz

UNDER VOLTAGE: 50% to 90% of Nominal, Adjustable

TRIP TIME DELAY: 0.07 to 1.3 Seconds, Adjustable

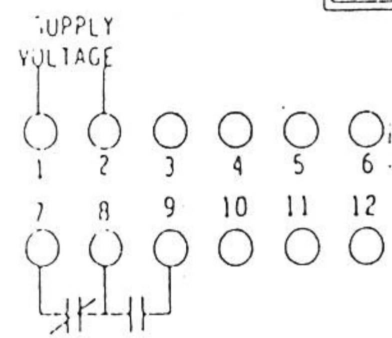
OUTPUT: SPDT, 3 Amps @ 120 VAC, Resistive

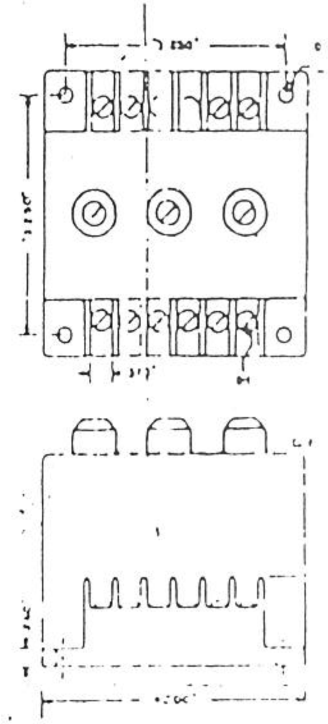
TEMPERATURE
Operate: 40°F to 160°F
Storage: -40°F to 185°F

INDICATOR: LED Glows When Frequency & Voltages Are Above the Preset Trip Point

ENCLOSURE: Style "E" Surface Mounted, Orange Lexan Material

TERMINATIONS: (12) #8-32 Screw Terminals

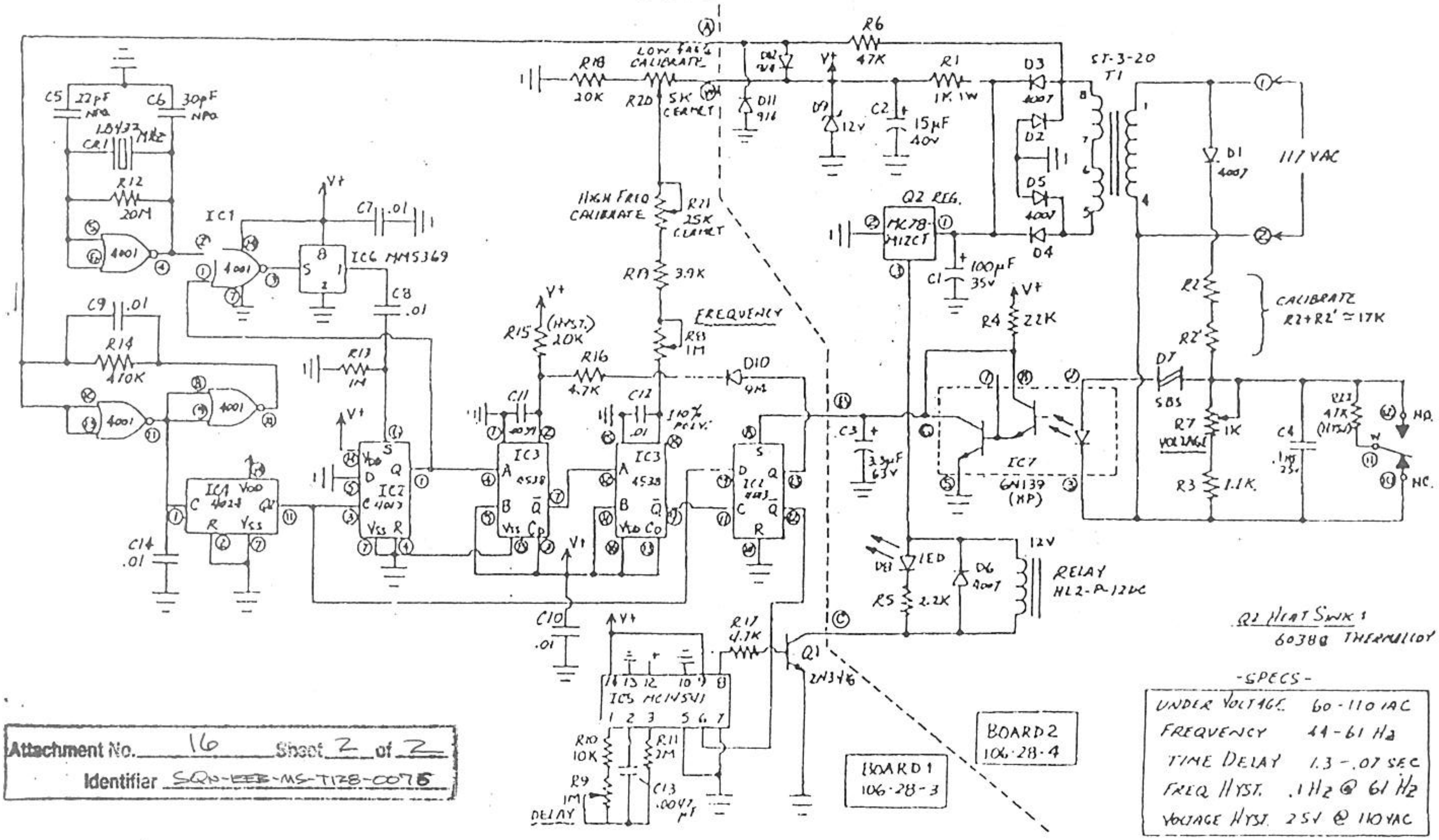




OPERATION: The SP-0133 is a frequency sensing monitor/relay used to detect when the monitor line frequency falls below a pre determined point. When the frequency falls below the under frequency limit for a period longer than the adjustable drop out delay (0.07 to 1.3 seconds), the internal relay de-energizes. When the frequency rises above the trip point, the relay energizes. There is also an under voltage feature to this model. When the voltage falls below the field adjustable setting, the relay de-energizes. When the voltage rises above the trip point, the relay energizes. The LED glows when power is applied to the input terminal and is above the under frequency and under voltage trip points.

Attachment No. 16 Sheet 1 of 2
Identifier SQN-EEB-MS-TI28-0076

DIVERSIFIED Electronics Inc. EVANSVILLE, INDIANA	PART NAME SP-0133 UNDER FREQUENCY MONITOR			PART No.
TOLERANCE UNLESS OTHERWISE SPECIFIED ½ Inches Decimals Angles	DRAWN BY R.S.C.	DATE 8-10-81	APP. BY	SCALE	Rev. Date



-SPECS-

UNDER VOLTAGE	60-110 VAC
FREQUENCY	44-61 Hz
TIME DELAY	1.3-.07 SEC
FREQ HYST.	.1 Hz @ 61 Hz
VOLTAGE HYST.	2.5V @ 110VAC

Attachment No. 16 Sheet 2 of 2

Identifier SQN-EEB-MS-TI28-0076

Determination of drift in Hertz based on field data.

					Months	Drift in	Drift	
UF Relay	10/10/95		4/26/97		18.54247	22.5	squared	30.41667
Unit 1	As Found	As left	As Found	As left	delta	months		Avg days
81-1A	56.995	56.995	56.97	56.97	-0.025	-0.03034	0.00092	per month
81-1B	56.99	56.99	56.97	56.97	-0.02	-0.02427	0.000589	
81-2A	56.999	56.999	56.97	56.97	-0.029	-0.03519	0.001238	
81-2B	56.996	56.996	56.97	56.97	-0.026	-0.03155	0.000995	

delta = As-Found - As-Left

UF Relay	5/18/96		10/8/97		16.70137	22.5	
Unit 2	As Found	As left	As Found	As left			
81-1A	56.994	56.99	56.98	56.98	-0.01	-0.01347	0.000181
81-1B	56.99	56.99	56.98	56.98	-0.01	-0.01347	0.000181
81-2A	56.99	56.99	56.98	56.98	-0.01	-0.01347	0.000181
81-2B	56.99	56.99	56.98	56.98	-0.01	-0.01347	0.000181

Standard Deviation = Sqrt { [n Sum(X^2) - (Sum x)^2] / [n(n-1)] }

n = 8 Number of samples.

S = 0.00949

Factor with 8 samples for a 95% level of confidence is 3.732

Therefore, An = 0.00949148808024783 x 3.732 0.035 Hertz

Add bias of Sum(x)/n -0.0219

An = 0.0354222335154849 + 0.0219038600477514

An = +/- 0.057 Hertz

Prepared G G Mailen 12-3-97

Checked L M Begley 12-4-97

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10-10-85
Date

6.2 Calibration of Underfrequency Relay 81-1A (continued)

[9] ADJUST voltage to approximately 120Vac on frequency test set. [✓]

[10] VARY frequency of test set as necessary, AND

RECORD "As Found" pick up frequency.

As Found pick-up Frequency: 56.995 Hz.
Acceptance Criteria: 57 Hz ± 0.1 Hz (56.9 to 57.1Hz.)

BRP

[11] ADJUST frequency test set for normal frequency of 60Hz @ 120V and fault frequency of 56Hz @ 120Vac. [✓]

[12] MEASURE, AND RECORD "As Found" time delay for relay pick-up below.

As Found trip time: 210 msec.
Acceptance Criteria: 216 msec ± 10 msec (206 to 226 msec.)
(13 cycles ± 0.6 cycles (12.4 to 13.6 cycles)

BRP

[13] DETERMINE if relay time response was greater than 300 msec.

BRP

[14] IF time in step 6.2 [12] exceeds 300 msec, INITIATE a Test Deficiency THEN

PERFORM step 6.2 [15]. [✓] N/A

NOTE Step 6.2 [15] may be N/A if time did not exceed 300 msec in step 6.2 [12].

HOLD POINT

[15] PERFORM engineering evaluation, AND

IF FSAR table 7.2.1-5, item 17 was exceeded, (greater than 600 msec, 36 cycles, total loop response time) THEN

DOCUMENT evaluation on Problem Evaluation Report.

N/A
Cognizant Engineer

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10-10-83
Date

6.2 Calibration of Underfrequency Relay 81-1A (continued)

NOTE Steps 6.2 [16] and [17] test the undervoltage detector.

[16] ADJUST frequency test set output to 120 volts, AND

VERIFY UF relay picks up at approximately 56Hz. BRP

[17] DECREASE frequency test set output voltage source as required until relay drops out, THEN

RECORD undervoltage detector drop out voltage.

Dropout Voltage: 61.9 Vac.
Acceptance Criteria: 55 to 75Vac.

BRP

NOTE N/A step 6.2 [18] if no calibration and record as left data in step 6.2 [19].

[18] CALIBRATE UF relay 81-1A to tolerance specified in step 6.2 [19]. BRP N/A

[19] RECORD as left data below.

As Left pick-up Frequency: 56.995 Hz.
Setpoint: 57 Hz.
Acceptance Criteria: (56.95 to 57.05)

BRP

NOTE N/A step 6.2 [20] if no calibration required and record as left data in step 6.2 [21].

[20] ADJUST frequency test set for normal/frequency to 60Hz @ 120V and fault frequency to 56Hz @ 120Vac, AND N/A

CALIBRATE UF relay device 81-1A to tolerance specified in step 6.2 [21]. IT N/A

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10-16-95
Date

6.3 Calibration of Underfrequency Relay 81-1B (continued)

[9] ADJUST voltage to approximately 120Vac on frequency test set. [✓

[10] VARY frequency of test set as necessary, AND

RECORD "As Found" pick up frequency.

As Found pick-up Frequency: 56.99 Hz.
Acceptance Criteria: 57 Hz ± 0.1 Hz (56.9 to 57.1Hz.)

BRP

[11] ADJUST frequency test set for normal frequency of 60Hz @ 120V and fault frequency of 56Hz @ 120Vac. [✓

[12] MEASURE, AND RECORD "As Found" time delay for relay pick-up below.

As Found trip time: 214 msec.
Acceptance Criteria: 216 msec ± 10 msec (206 to 226 msec.)
(13 cycles ± 0.6 cycles (12.4 to 13.6 cycles)

BRP

[13] DETERMINE if relay time response was greater than 300 msec.

BRP

[14] IF time in step 6.3 [12] exceeds 300 msec, INITIATE a Test Deficiency THEN

PERFORM step 6.3 [15]. [✓ N/A

NOTE Step 6.3 [15] may be N/A if time did not exceed 300 msec in step 6.3 [12].

HOLD POINT

[15] PERFORM engineering evaluation, AND

IF FSAR table 7.2.1-5, item 17 was exceeded, (greater than 600 msec, 36 cycles, total loop response time) THEN

DOCUMENT evaluation on Problem Evaluation Report.

N/A
Cognizant Engineer

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10-10-92
Date

6.3 Calibration of Underfrequency Relay 81-1B (continued)

NOTE Steps 6.3 [16] and [17] test the undervoltage detector.

[16] **ADJUST** frequency test set output to 120 volts, **AND**

VERIFY UF relay picks up at approximately 56Hz. BRP

[17] **DECREASE** frequency test set output voltage source as required until relay drops out, **THEN**

RECORD undervoltage detector drop out voltage.

Dropout Voltage: 60 Vac.
Acceptance Criteria: 55 to 75Vac.

BRP

NOTE N/A step 6.3 [18] if no calibration and record as left data in step 6.3 [19].

[18] **CALIBRATE** UF relay 81-1B to tolerance specified in step 6.3 [19]. N/A

[19] **RECORD** as left data below.

As Left pick-up Frequency: 56.99 Hz.
Setpoint: 57 Hz.
Acceptance Criteria: (56.95 to 57.05)

BRP

NOTE N/A step 6.3 [20] if no calibration required and record as left data in step 6.3 [21]

[20] **ADJUST** frequency test set for normal/frequency to 60Hz @ 120V and fault frequency to 56Hz @ 120Vac, **AND**

CALIBRATE UF relay device 81-1B to tolerance specified in step 6.3 [21]. N/A

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10-10-95
Date

6.4 Calibration of Underfrequency Relay 81-2A (continued)

[10] **VARY** frequency of test set as necessary, **AND**

RECORD "As Found" pick up frequency.

As Found pick-up Frequency: 56.999 Hz.
Acceptance Criteria: 57 Hz ± 0.1 Hz (56.9 to 57.1Hz.)

BRP

[11] **ADJUST** frequency test set for normal frequency of 60Hz @ 120V and fault frequency of 56Hz @ 120Vac. [✓

[12] **MEASURE, AND RECORD** "As Found" time delay for relay pick-up below.

As Found trip time: 224 msec.
Acceptance Criteria: 216 msec ± 10 msec (206 to 226 msec.)
(13 cycles ± 0.6 cycles (12.4 to 13.6 cycles)

BRP

[13] **DETERMINE** if relay time response was greater than 300 msec.

BRP

[14] **IF** time in step 6.4 [12] exceeds 300 msec, **INITIATE** a Test Deficiency **THEN**

PERFORM step 6.4 [15].

N/A [✓

NOTE Step 6.4 [15] may be N/A if time did not exceed 300 msec in step 6.4 [12].

HOLD POINT

[15] **PERFORM** engineering evaluation, **AND**

IF FSAR table 7.2.1-5, item 17 was exceeded, (greater than 600 msec, 36 cycles, total loop response time) **THEN**

DOCUMENT evaluation on Problem Evaluation Report.

N/A
Cognizant Engineer

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10-10-95
Date

6.4 Calibration of Underfrequency Relay 81-2A (continued)

NOTE Steps 6.4 [16] and [17] test the undervoltage detector.

[16] **ADJUST** frequency test set output to 120 volts, **AND**

VERIFY UF relay picks up at approximately 56Hz. BRP

[17] **DECREASE** frequency test set output voltage source as required until relay drops out, **THEN**

RECORD undervoltage detector drop out voltage.

Dropout Voltage: 60 Vac.
Acceptance Criteria: 55 to 75Vac.

BRP

NOTE N/A step 6.4 [18] if no calibration and record as left data in step 6.4 [19].

[18] **CALIBRATE** UF relay 81-2A to tolerance specified in step 6.4 [19]. BRP N/A

[19] **RECORD** as left data below.

As Left pick-up Frequency: 56.999 Hz.
Setpoint: 57 Hz.
Acceptance Criteria: (56.95 to 57.05)

BRP

NOTE N/A step 6.4 [20] if no calibration required and record as left data in step 6.4 [2_].

[20] **ADJUST** frequency test set for normal/frequency to 60Hz @ 120V and fault frequency to 56Hz @ 120Vac, **AND**

CALIBRATE UF relay device 81-2A to tolerance specified in step 6.4 [21]. N/A

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6.5 Calibration of Underfrequency Relay 81-2B (continued)

[10] VARY frequency of test set as necessary, AND

RECORD "As Found" pick up frequency.

As Found pick-up Frequency: 56.996 Hz.
Acceptance Criteria: 57 Hz ± 0.1 Hz (56.9 to 57.1Hz.)

BRP

[11] ADJUST frequency test set for normal frequency of 60Hz @ 120V and fault frequency of 56Hz @ 120Vac. 14

[12] MEASURE, AND RECORD "As Found" time delay for relay pick-up below.

As Found trip time: 216 msec.
Acceptance Criteria: 216 msec ± 10 msec (206 to 226 msec.)
(13 cycles ± 0.6 cycles (12.4 to 13.6 cycles)

BRP

[13] DETERMINE if relay time response was greater than 300 msec.

BRP

[14] IF time in step 6.5 [12] exceeds 300 msec, INITIATE a Test Deficiency THEN

PERFORM step 6.5 [15]. N/A 14

NOTE Step 6.5 [15] may be N/A if time did not exceed 300 msec in step 6.5 [12].

HOLD POINT

[15] PERFORM engineering evaluation, AND

IF FSAR table 7.2.1-5, item 17 was exceeded, (greater than 600 msec, 36 cycles, total loop response time) THEN

DOCUMENT evaluation on Problem Evaluation Report.

N/A
Cognizant Engineer

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6.5 Calibration of Underfrequency Relay 81-2B (continued)

NOTE Steps 6.5 [16] and [17] test the undervoltage detector.

[16] **ADJUST** frequency test set output to 120 volts, **AND**

VERIFY UF relay picks up at approximately 56Hz. BRP

[17] **DECREASE** frequency test set output voltage source as required until relay drops out, **THEN**

RECORD undervoltage detector drop out voltage.

Dropout Voltage: 62 Vac.
Acceptance Criteria: 55 to 75Vac.

BRP

NOTE N/A step 6.5 [18] if no calibration and record as left data in step 6.5 [19].

[18] **CALIBRATE** UF relay 81-2B to tolerance specified in step 6.5 [19].

BRP N/A

[19] **RECORD** as left data below.

As Left pick-up Frequency: 56.996 Hz.
Setpoint: 57 Hz.
Acceptance Criteria: (56.95 to 57.05)

BRP

NOTE N/A step 6.5 [20] if no calibration required and record as left data in step 6.5 [21].

[20] **ADJUST** frequency test set for normal/frequency to 60Hz @ 120V and fault frequency to 56Hz @ 120Vac, **AND**

CALIBRATE UF relay device 81-2B to tolerance specified in step 6.5 [21].

BRP N/A

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Date

6.2 Calibration of Underfrequency Relay 81-1A (continued)

[9] **ADJUST** voltage to approximately 120Vac on frequency test set. [✓]

[10] **VARY** frequency of test set as necessary, **AND**

RECORD "As Found" pick up frequency.

As Found Pick-up Frequency: 56.97 Hz.
Acceptance Criteria: 57 Hz ± 0.1 Hz (56.9 to 57.1Hz.)

gtn

[11] **ADJUST** frequency test set for normal frequency of 60Hz @ 120V and fault frequency of 56Hz @ 120Vac. [✓]

[12] **MEASURE, AND RECORD** "As Found" time delay for relay Pick-up below.

As Found trip time: 220.1 msec.
Acceptance Criteria: 216 msec ± 10 msec (206 to 226 msec.)
(13 cycles ± 0.6 cycles (12.4 to 13.6 cycles)

gtn

[13] **DETERMINE** if relay time response was greater than 300 msec. NO

gtn

[14] **IF** time in step 6.2 [12] exceeds 300 msec, **INITIATE** a Test Deficiency **THEN**

PERFORM step 6.2 [15]. [✓]

NOTE Step 6.2 [15] may be N/A if time did not exceed 300 msec in step 6.2 [12].

HOLD POINT

[15] **PERFORM** engineering evaluation, **AND**

IF FSAR table 7.2.1-5, item 17 was exceeded, (greater than 600 msec, 36 cycles, total loop response time) **THEN**

DOCUMENT evaluation on Problem Evaluation Report.

NA
Test Director

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6.2 Calibration of Underfrequency Relay 81-1A (continued)

NOTE Steps 6.2 [16] and [17] test the undervoltage detector.

[16] **ADJUST** frequency test set output to 120 volts, **AND**

VERIFY UF relay picks up at approximately 56Hz. gm

[17] **DECREASE** frequency test set output voltage source as required until relay drops out, **THEN**

RECORD undervoltage detector drop out voltage.

Dropout Voltage: 62.7 Vac.
Acceptance Criteria: 55 to 75Vac.

gm

NOTE N/A step 6.2 [18] if no calibration and record as left data in step 6.2 [19].

[18] **CALIBRATE** UF relay 81-1A to tolerance specified in step 6.2 [19]. gm

[19] **RECORD** as left data below.

As Left Pick-up Frequency: 56.97 Hz.
Setpoint: 57 Hz.
Acceptance Criteria: (56.95 to 57.05)

gm

NOTE N/A step 6.2 [20] if no calibration required and record as left data in step 6.2 [21].

[20] **ADJUST** frequency test set for normal/frequency to 60Hz @ 120V and fault frequency to 56Hz @ 120Vac, **AND**

CALIBRATE UF relay device 81-1A to tolerance specified in step 6.2 [21]. [ ]

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6.3 **Calibration of Underfrequency Relay 81-1B** (continued)

[9] **ADJUST** voltage to approximately 120Vac on frequency test set. [✓]

[10] **VARY** frequency of test set as necessary, **AND**

RECORD "As Found" pick up frequency.

As Found Pick-up Frequency: 56.97 Hz.
Acceptance Criteria: 57 Hz ± 0.1 Hz (56.9 to 57.1Hz.)

gm

[11] **ADJUST** frequency test set for normal frequency of 60Hz @ 120V and fault frequency of 56Hz @ 120Vac. [✓]

[12] **MEASURE, AND RECORD** "As Found" time delay for relay Pick-up below.

As Found trip time: 220.38 msec.
Acceptance Criteria: 216 msec ± 10 msec (206 to 226 msec.)
(13 cycles ± 0.6 cycles (12.4 to 13.6 cycles)

gm

[13] **DETERMINE** if relay time response was greater than 300 msec.

gm
NO

[14] **IF** time in step 6.3 [12] exceeds 300 msec, INITIATE a Test Deficiency **THEN**

PERFORM step 6.3 [15]. [✓]

NOTE Step 6.3 [15] may be N/A if time did not exceed 300 msec in step 6.3 [12].

HOLD POINT

[15] **PERFORM** engineering evaluation, **AND**

IF FSAR table 7.2.1-5, item 17 was exceeded, (greater than 600 msec, 36 cycles, total loop response time) **THEN**

DOCUMENT evaluation on Problem Evaluation Report.

NA
Test Director

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1683.3487

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Date

6.3 Calibration of Underfrequency Relay 81-1B (continued)

NOTE Steps 6.3 [16] and [17] test the undervoltage detector.

[16] **ADJUST** frequency test set output to 120 volts, **AND**

VERIFY UF relay picks up at approximately 56Hz. JTM

[17] **DECREASE** frequency test set output voltage source as required until relay drops out, **THEN**

RECORD undervoltage detector drop out voltage.

Dropout Voltage: 62.6 Vac.
Acceptance Criteria: 55 to 75Vac.

JTM

NOTE N/A step 6.3 [18] if no calibration and record as left data in step 6.3 [19].

[18] **CALIBRATE** UF relay 81-1B to tolerance specified in step 6.3 [19]. JTM

[19] **RECORD** as left data below.

As Left Pick-up Frequency: 56.97 Hz.
Setpoint: 57 Hz.
Acceptance Criteria: (56.95 to 57.05)

JTM

NOTE N/A step 6.3 [20] if no calibration required and record as left data in step 6.3 [21].

[20] **ADJUST** frequency test set for normal/frequency to 60Hz @ 120V and fault frequency to 56Hz @ 120Vac, **AND**

CALIBRATE UF relay device 81-1B to tolerance specified in step 6.3 [21]. [ ]

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6.4 Calibration of Underfrequency Relay 81-2A (continued)

[10] **VARY** frequency of test set as necessary, **AND**

RECORD "As Found" pick up frequency.

As Found Pick-up Frequency: 56.97 Hz.
Acceptance Criteria: 57 Hz ± 0.1 Hz (56.9 to 57.1Hz.)

[11] **ADJUST** frequency test set for normal frequency of 60Hz @ 120V and fault frequency of 56Hz @ 120Vac. [✓]

[12] **MEASURE, AND RECORD** "As Found" time delay for relay Pick-up below.

As Found trip time: 219.83 msec.
Acceptance Criteria: 216 msec ± 10 msec (206 to 226 msec.)
(13 cycles ± 0.6 cycles (12.4 to 13.6 cycles)

[13] **DETERMINE** if relay time response was greater than 300 msec.

NO

[14] IF time in step 6.4 [12] exceeds 300 msec, INITIATE a Test Deficiency **THEN**

PERFORM step 6.4 [15]. [✓]

NOTE Step 6.4 [15] may be N/A if time did not exceed 300 msec in step 6.4 [12].

HOLD POINT

[15] **PERFORM** engineering evaluation, **AND**

IF FSAR table 7.2.1-5, item 17 was exceeded, (greater than 600 msec, 36 cycles, total loop response time) **THEN**

DOCUMENT evaluation on Problem Evaluation Report.

NA

Test Director

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1683.3493

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Date

6.4 **Calibration of Underfrequency Relay 81-2A** (continued)

NOTE Steps 6.4 [16] and [17] test the undervoltage detector.

[16] **ADJUST** frequency test set output to 120 volts, **AND**

VERIFY UF relay picks up at approximately 56Hz. gtm

[17] **DECREASE** frequency test set output voltage source as required until relay drops out, **THEN**

RECORD undervoltage detector drop out voltage.

Dropout Voltage: 62.6 Vac.
Acceptance Criteria: 55 to 75Vac.

gtm

NOTE N/A step 6.4 [18] if no calibration and record as left data in step 6.4 [19].

[18] **CALIBRATE** UF relay 81-2A to tolerance specified in step 6.4 [19]. gtm

[19] **RECORD** as left data below.

As Left Pick-up Frequency: 56.97 Hz.
Setpoint: 57 Hz.
Acceptance Criteria: (56.95 to 57.05)

gtm

NOTE N/A step 6.4 [20] if no calibration required and record as left data in step 6.4 [21].

[20] **ADJUST** frequency test set for normal/frequency to 60Hz @ 120V and fault frequency to 56Hz @ 120Vac, **AND**

CALIBRATE UF relay device 81-2A to tolerance specified in step 6.4 [21]. N/A

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Date

6.5 Calibration of Underfrequency Relay 81-2B (continued)

[10] VARY frequency of test set as necessary, AND

RECORD "As Found" pick up frequency.

As Found Pick-up Frequency: 56.97 Hz.
Acceptance Criteria: 57 Hz ± 0.1 Hz (56.9 to 57.1Hz.)

gm

[11] ADJUST frequency test set for normal frequency of 60Hz @ 120V and fault frequency of 56Hz @ 120Vac. [ ]

[12] MEASURE, AND RECORD "As Found" time delay for relay Pick-up below.

As Found trip time: 220.1 msec.
Acceptance Criteria: 216 msec ± 10 msec (206 to 226 msec.)
(13 cycles ± 0.6 cycles (12.4 to 13.6 cycles)

gm

[13] DETERMINE if relay time response was greater than 300 msec.

gm

NO

[14] IF time in step 6.5 [12] exceeds 300 msec, INITIATE a Test Deficiency THEN

PERFORM step 6.5 [15]. [ ]

NOTE Step 6.5 [15] may be N/A if time did not exceed 300 msec in step 6.5 [12].

HOLD POINT

[15] PERFORM engineering evaluation, AND

IF FSAR table 7.2.1-5, item 17 was exceeded, (greater than 600 msec, 36 cycles, total loop response time) THEN

DOCUMENT evaluation on Problem Evaluation Report.

NA

Test Director

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1683.3499

4/26/97
Date

6.5 Calibration of Underfrequency Relay 81-2B (continued)

NOTE Steps 6.5 [16] and [17] test the undervoltage detector.

[16] **ADJUST** frequency test set output to 120 volts, **AND**

VERIFY UF relay picks up at approximately 56Hz. ________

[17] **DECREASE** frequency test set output voltage source as required until relay drops out, **THEN**

RECORD undervoltage detector drop out voltage.

Dropout Voltage: 62.6 Vac.
Acceptance Criteria: 55 to 75Vac. ________

NOTE N/A step 6.5 [18] if no calibration and record as left data in step 6.5 [19].

[18] **CALIBRATE** UF relay 81-2B to tolerance specified in step 6.5 [19]. ________

[19] **RECORD** as left data below.

As Left Pick-up Frequency: 56.97 Hz.
Setpoint: 57 Hz.
Acceptance Criteria: (56.95 to 57.05) ________

NOTE N/A step 6.5 [20] if no calibration required and record as left data in step 6.5 [21].

[20] **ADJUST** frequency test set for normal/frequency to 60Hz @ 120V and fault frequency to 56Hz @ 120Vac, **AND**

CALIBRATE UF relay device 81-2B to tolerance specified in step 6.5 [21]. [ ]

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