

Workorder: 02-000576-000
Status: RO
Entry Date: 01/21/2002 12:56
Planner/Supv: JOHN THOMAS
Requested By: BRENDA F. SIMRIL 843-8515

***** SUPERVISOR *****

PER Level Rev Level 00
Identified By LINE ORGANIZATION
Self Revealing Y

Problem Description In order to meet Appendix R safe shutdown requirements for RCS inventory control and RCP seal cooling, CCP suction supply from either the VCT or RWST must be ensured. Control logic for the VCT outlet isolation valves (LCV-62-132 and -133) and RWST outlet isolation valves (LCV-62-135, -136) is interlocked such that prior to closing either LCV-62-132 or -133 valve, LCV-62-135 or -136 will open.

In the southeast corner of FAA-29 (690-A01), cables exist for all four Unit 2 LCVs as well as CCP 2A-A and 2B-B. Thermo-Lag protects the control cables for the -135 and -136 valves, but not the power cables. Also, CCP 2A-A is protected by Thermo-Lag in this area. Subsequent to an Appendix R fire, a spurious closure signal could be generated through cables controlling valves LCV-62-132 and -133. If a low level VCT tank level signal were to occur, valves LCV-62-132 and 133 would close. Since the power cables for -135 and -136 are not protected, automatic opening can not be guaranteed. Therefore, an interaction exists such that suction to both the VCT and RWST could be lost. If CCP 2A-A is running at the time of the valve closure, it could be destroyed due to loss of suction, and at the same time, CCP 2B-B could be unavailable due to the fire.

The current Fire Hazards Analysis credits manual actions to ensure suction for the CCPs. During the development of a manual action timeline analysis for the recent Appendix R re-verification effort, it was identified that this is a time-critical action (i.e., less than 10 minutes). However, due to the availability of normal charging and letdown

BBB-10
THM

(availability of Control Air has been verified),
additional time for the manual action is available.
The reliance on time-critical operator actions
increases the risks associated with mitigation of an
Appendix R event in the subject fire area. This PER is
a result of extent of condition of PER 00-007928-000.
For operability discussions, see "Immediate Actions
Taken".

Plt Process Equip Y
Potential Oper Issue N
Potential Reportable N
Potential Degrad/Noncon(91-18) Y

ASME N
Systems Affected 062
Systems Affected 063
Systems Affected
Systems Affected
Units Affected 2
Recommendation Process PER
No action, Justify
If Process, PER Level D
If Utilize ACP, No
Immed Action Taken See attached functional evaluation.

PER re-opened to document potential GL 91-18 issue.
PER upgraded to level C. 2/27/02

Recommended Resp Org ENG/MECH
Coordinated With John Thomas
Init Sup-First Last John Thomas
Init Sup Phone 8224
Init Department ENG/MECH
Init Sup Review Date

***** LEVEL D INFORMATION *****

Lvl D Causing Org ENG/MECH
Lvl D Causing Crew
Human Perf Proc Code WMK
Apparent Cause See apparent cause for PER 00-7928-000
Lvl D Process/Proced
Hardware Disposition Rework
Technical Justify A design change will be prepared in accordance with
corrective action number 24 for PER 00-7928-000
Init Supv-First Last John Thomas

Init Supv Phone 8224
Init Sup Review Date 02/05/2002
***** OPS *****

Functional Eval (FE) Y
FE Due Date 02/28/2002
Affect Operability N
If Yes, Units/Actions
Offsite OP Review N
Op Review BFN
Op Review BLN
Op Review SQN
Op Review WBN
Reportable N
If Yes, List Basis
Ops SRO/STA-Fst Last WILLIAM ROSS
Ops SRO/STA Rev Date 02/27/2002
***** FE *****

Functional Maint
Potential Degrad/Noncon(91-18) Y

FE/Eval Due Date
Initial Evaluation
91-18 Degrad Nonconf Y
Functional/Eval Basis See attached functional evaluation.
Immed/Comp Measures
List Action/Measures
Engineer Brenda Simril
Date 02/27/2002
Supervisor John Thomas
Date 02/27/2002
OPS SRO/STA-Fst Last WILLIAM ROSS
OPS SRO/STA Rev Date 02/27/2002
***** MRC *****

Process PER Level C
Interim Action Req'd N
If YES, Specify
RCA Required N
Site Qual Conc/Ver N
Assigned Resp Org ENG/MECH
CA Develop Due Date 03/27/2002
MRC Directions NOTE: This PER was upgraded to a Level C per telecon
with John Thomas-shs-02/27/2002.
MRC CAP Review N

MRC-First Last Renee McKaig
MRC Review Date 01/23/2002

***** Resp Org *****

CA Develop Due Date 03/27/2002

Section ENG/MECH

POC-First Last John Thomas

POC Phone 8224

Reactivity Mgt Issue N

A/B-LER N

LER No.

Control of NonConfor N

If Yes, Scope

Hardware Disposition Other

Disposition RIM/EDMS

Offsite Generic Rev N

Generic Rev BFN

Generic Rev BLN

Generic Rev Corp

Generic Rev SQN

Generic Rev WBN

Process/Procedures

***** CAUSE DATA *****

Apparent Cause This issue identified as extent of condition of PER
00-7928-000.

Root Cause

Causing Org ENG/MECH

Causing Crew

Human Perf Proc Code

HP Perf Second Code

Prev/Similar Event N/A

Specify Search Basis

Extent of Condition

***** PER HUMAN PERF *****

***** PER CA/RC ITEMS *****

1 Action Item Perform functional evaluation and document corrective
appropriate corrective actions in PER 00-7928-000.

1 Action Type CORRECTIVE ACTION

1 Assigned Org ENG/MECH

1 CA Due Date 02/28/2002

1 AO Concur-Fst Last JOHN THOMAS

1 AO POC Fst Last BRENDA SIMRIL

1 CA Performed Functional evaluation completed. See attached writeup.
Corrective action # 24 has been entered into PER

00-7928-000.

1 Date Completed 02/28/2002

***** CLOSURE COMMENTS FROM CA *****

***** CAP CONCUR *****

PER Completion Date 02/28/2002

Prep-First Last John Thomas

Preparer Date 02/27/2002

Telephone No 8224

(C) Supv-First Last John Thomas

(C) Supv Ext 8224

(C) Supv Date 02/27/2002

(B) DptMgr-First Last

(B) DptMgr Date

MRC Reqd N

MRC Concurrence

Reason for N

MRC-First Last

MRC Date

(A) SiteSr-Fst Last

(A) SiteSr Date

(A) PltMgr-Fst Lst

(A) PltMgr Date

React Eng-Fst Lst

React Eng Date

Site Qual Conc Reqd N

Site Qual Concur

Reason for N

Site Qual First Last

Site Qual Date

***** VERIFICATION *****

Final Rev Level

Tags Rem-First Last

Tags Date

RO Verify Comp

RO Verify Date

ANI/ANII Required N

ANI/ANII Concurrence

Reason for N

ANI/ANII-First Last

ANI/ANII Date

Site Qual Concur

Reason for N

Site Qual First Last

Site Qual Date
RO Supv Clos-Fst Lst
Closure Date

***** EXTENSIONS *****

***** REVISIONS *****

***** GENERIC REVIEWS *****

***** OPERABILITY REVIEWS *****

***** TRENDS *****

Program Code FP

Program Code

Program Code

INPO Code FP1

INPO Code

NRC Code

NRC Code

Category PROCESS

Short Term Code

Impact 2.5

Behavior Code

Org / Prog Code PP3

GEMS

Other

CAUSE CODES

M1A Misapplication or interpretation of design inputs (engineering codes a

Total records selected: 1

*** END OF REPORT ***

FUNCTIONAL EVALUATION

Page 1 of 2

PER Number _____ Revision DATE _____

1.0 INITIATOR INFORMATION AND DESCRIPTION

Initiator: (Print Name) _____ Phone Number 8515

Describe the affected system, structure or component using UNIDs as appropriate: _____

VCT/RWST Suction Valves: 2-LCV-62-132, -133, -135, -136; CCPs 2A-A, 2B-B

Describe the degraded condition or operability concern _____

Between Column Lines A12-A15/S-U, cable interactions exist between 2-LCV-62-132, -133, -135, -136.

Cables also exist for both U2 CCPs (CCP 2A-A is protected by Thermo-Lag), U2 SI initiation, U2 VCT level indication, and U2 Thermal Barrier Cooling.

This operability determination is written to evaluate (check all that apply):

A past operability concern for reportability purposes.

A present operability concern.

A future operability concern in anticipation of an upcoming plant evolution/condition.

Date condition was found or could potentially exist in the future: 01/21/2001

Technical Specification (T/S) Review: (check one)

This component/system IS NOT covered by T/S.

This component/system IS covered by T/S Section: U1/U2 Tech Spec Licensing Cond 16

State the initiating document(s) [that is PER, WO] that prompted the need for this FE. If none exists mark NA. PER 02-00576-000

2.0 TECHNICAL EVALUATION

Describe the component's/system's function: Suction to CCP for Appendix R Fire

List the specific references used: Fire Safe Shutdown (FSSD) Analysis, SQN-SQS4-127; SQN FPR

Describe the effects of the condition on the ability of the component/system to perform its intended function:

(See Attached)

If the degraded condition of the component/system causes any loss of functional capability, evaluate whether system operability can be justified using compensatory actions or by taking credit for alternate functional capabilities (such as manual operation or diverse automatic actions):

(See Attached)

FUNCTIONAL EVALUATION

Page 2 of 2

PER Number _____ Revision _____ DATE _____

Describe an alternate means of meeting the designed functions, limitations or any required compensatory actions to make the component/system operable. Describe why the alternative, limitations, or compensatory actions do not create new or different concerns:
(See Attached)

Describe the actions required to implement the alternate functional capability, limitations, and/or compensatory actions. Include required procedures, procedure changes, temporary modifications, if known. N/A for components/systems that can perform their intended designed function(s) without limitations, credit for alternate capabilities, or compensatory actions:
(See Attached)

State definitively in the first sentence whether the component/system will or will not perform its designed function or it will with limitations. Include or reference any required limits, Compensatory Actions, or credit taken for alternate functional capability
(See Attached)

List what actions must occur for the operability question to no longer exist?

Identifier (e.g., WO, PER)	DCN F-21103-A	Responsible Org.	NE - M/N
_____	_____	_____	_____

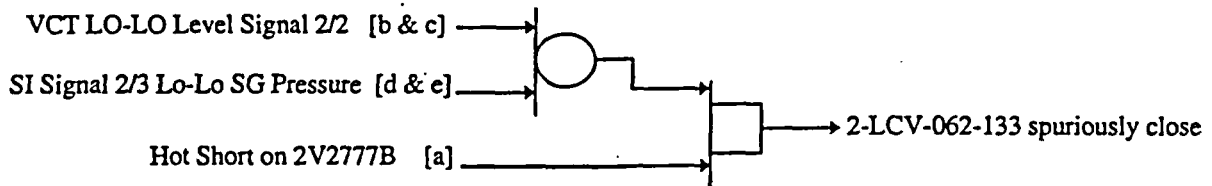
3.0 REVIEW AND APPROVAL

(Approval Signatures on Functional Evaluation Template)

Appendix R Compliance Strategies for FAA-029 (A12-A15 / S-U)

In FAA-029, from A12-A15 / S-U, interactions exist between control cables for VCT Outlet Valves 2-FCV-62-132 and -133 and the power cables for RWST Outlet Valves 2-FCV-62-135, -136. This interaction causes a potential loss of suction to the operating CCP. This loss of suction could be generated by a spurious close signal for 2-FCV-62-132 or -133, while the power supply is lost for valves 2-FCV-62-135 and -136. The logic associated with the subject control cables for 2-FCV-62-132 and -133 requires that in addition to the control cable hot short, a low level signal for the VCT or SI signal must be present to complete the valve closure logic.

In this area of concern the following combination of cable damage must all occur to prevent continued suction to the operating CCP and cause damage to the non-operating CCP. Spurious closure of 2-LCV-062-132 can be mitigated by opening 2-LCV-62-135 or -136 prior to a start of the 2B CCP since neither the pump cable or the spurious SI initiation cables are within 20 feet of the 2V2767A (control) and 2PM461, 2PM466 or 2PM75 level indication cables.



- a) 2V2777B (control) must Hot Short and therefore makeup ½ of the logic to close the VCT Outlet Isolation Valve 2-LCV-062-133
- b) 2PM461 or 2PM466 must open to makeup ½ of the Lo-Lo VCT Level Signal
- c) 2PM75 must open to makeup ½ of the Lo-Lo VCT Level Signal
- d) 2PM1360IV or 2PM1729IV must open with their associated channel I cable to makeup ½ of the SI Signal
- e) 2PM1335I or 2PM1715I must open with their associated channel IV cable to makeup ½ of the SI Signal
- f) 2V2070A (power supply) must open or short to prevent automatic opening of the interlocked RWST Outlet Isolation Valve 2-LCV-062-135
- g) 2V2100B (power supply) or 2V2101B (control) must open or short to prevent MCR opening of the RWST Outlet Isolation Valve 2-LCV-062-136
- h) 2PP562B (power) must open or short or 2PP564B (control) must open or short to prevent starting CCP 2B after either RWST Outlet Isolation Valve has been manually opened

If any one of items (a) - (h) above does not occur, seal injection and makeup to the RCS will not be lost. Though the above cables are within 20 feet, some separation does exist. The 2B CCP cables are approximately 17 ft 3 in from the level indicator cables and approximately 19 ft 8 in from the intersection of the SG pressure indicator cables

Thermo-Lag ERFBS has been installed on the cables for CCP 2A-A in the subject area. However, the loss of a suction source as discussed above (and subsequent loss of CCP 2A-A) would be significant since the cables for CCP 2B-B could be damaged by the same postulated fire.

With the requirement for a local manual action to open 2-LCV-062-135 or -136 within 10 minutes, the current configuration is acceptable based on the following justification:

- The combustible loading in the subject area is low and is composed primarily of cable insulation. No large ignition sources are located in the immediate area.
- Automatic suppression and detection is provided in the area of concern.
- The temperature rating of the detectors is 165 °F, which would activate the suppression system prior to significant cable damage occurring.
- Large scale fire tests, such as NUREG/CR-0381 SAND78-1456, "A Preliminary Report on Fire Protection Research Program Fire Barriers and Fire Retardant Coating Test", and various other tests conducted by Sandia Laboratories for the NRC, indicate that the type of fires that could be reasonably expected to occur will not cause damage to multiple circuits in less than ten minutes. All of these tests have been conducted without automatic suppression. In tests where response time of sprinkler heads were obtained, they showed the sprinklers would fuse before the cables short circuited. Some of the same tests also show that large rooms and high ceilings (as in the case of the subject area) increase the time it takes a fire to cause cable damage.
- The stated fire brigade response time for all Auxiliary and Control Building fires is 5 minutes. This time period includes response to the alarm and verification of the location of the fire.
- Annunciator responses are specified for VCT low and high levels, as well as charging flow irregularities. This would ensure that damage to either the VCT outlet valve cables or the CCP cables was immediately recognized. Also, operator training reinforces the importance of continuous monitoring of VCT volume.

Based on the above evaluation, it is determined that the local manual action to establish suction to the RWST within 10 minutes is acceptable due to the lack of combustibles, the existence of suppression and detection, the large room volume with high ceilings, and the high level of operator awareness to the status of CCP flow.

Therefore, the manual action to locally open 2-LCV-62-135 or -136 within 10 minutes is required until the implementation of DCN F-21103-A.