

FSV ISFSI FUEL STORAGE CONTAINER O-RING VACUUM LEAK TEST	Identifier: TPR-5604 Revision*: 18 Page: 1 of 17
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INTEC	Technical Procedure	For Additional Info: http://EDMS	Effective Date: 09/10/12
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Manual: INTEC FSV3

USE TYPE 1Change Number: 337143

*The current revision can be verified on EDMS.

1. INTRODUCTION

1.1 Purpose

To provide instructions for leak testing for Fort St. Vrain (FSV) Independent Spent Fuel Storage Installation (ISFSI) Fuel Storage Containers (FSC).

1.2 Scope and Applicability

This procedure specifies the actions necessary to configure and disassemble equipment for performing vacuum leak testing of FSCs per TPR-6304, "Small Volume Pressure Change Leak Test." FSV ISFSI Technical Specification Limiting Condition for Operation (LCO) 3.3.1 states "The FSC or storage well seal leakage rate shall not exceed 1×10^{-3} standard cc/sec." The test sensitivity in TPR-6304 correlates to the leak rate specified in LCO 3.3.1. Operation of the Leak Test Equipment and recording of data is performed per TPR-6304.

2. PRECAUTIONS AND LIMITATIONS

- 2.1 Personnel must follow the applicable hazard mitigations detailed in Appendix B, "Procedure Hazard Analysis."
- 2.2 Any lifts within the Modular Vault Dry Store (MVDS) building, not described in an approved procedure, must be performed per TPR-7371, "Fort St. Vrain Hoisting and Rigging Operations."
- 2.3 The O-rings on one FSC per vault (six total) must be leak tested at least every five years (25% grace period does not apply) per the ISFSI Technical Specification Surveillance Requirement (SR) (SR 3.3.1.1).
- 2.4 The FSC to be tested must be specified by the FSV ISFSI Manager below.

FSC No.: _____

ISFSI Manager initial/date: _____

- 2.5 The FSV ISFSI Manager must be notified immediately if the leak rate criteria specified in this procedure are NOT met.

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- 2.6 If the leak rate of an FSC exceeds 1×10^{-3} standard-cc/sec, ONE of the following must be done (LCO 3.3.1, Action A.1):
- A. The seal integrity of the FSC must be restored within 7 days
- OR
- B. The FSC must be transferred to a standby storage well per TPR-5653 and the storage well integrity verified per TPR-5598 within 7 days.
- 2.7 If any FSC is found to have an unacceptable leakage, the following must be done (LCO 3.3.1, Action A.2):
- A. A leak test must be performed on two additional FSCs from each vault within 30 days
- B. A report must be submitted to NRC within 90 days describing condition, results of engineering evaluations and actions being taken.
- 2.8 If seal leak rate limit is exceeded for three or more FSCs, the NRC Operations Center must be notified within 24 hours (LCO 3.3.1, Action B).
- 2.9 When using this procedure for equipment manipulations other than actual leak testing of an FSC containing fuel, unnecessary steps may be marked “Not Applicable (N/A),” and minimum personnel requirements and required materials and equipment may be adjusted as appropriate for the evolution.
- 2.10 Any deficiency, hazard, or abnormal condition noted during the performance of this inspection procedure must be entered in Appendix A and reported verbally to the FSV ISFSI Manager.

3. PREREQUISITES

NOTE: *Sections 3.1 through 3.3 and associated substeps may be performed in any order.*

3.1 Planning and Coordination

Init/Date

- _____ 3.1.1 FSV ISFSI Manager: As a minimum, ensure the following personnel are available:
- A. Certified Fuel Handlers (CFH) (3)
- B. Certified Leak Test Examiner as required by TPR-6304 (LTE)

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C. Radiological Control Technicians (RCT)/Radiological Control Monitors (RCM) (2)

D. Quality Inspector (QI)

_____ 3.1.2 FSV ISFSI Manager: Ensure a pre-job briefing is conducted per MCP-3003, “Performing Pre-job Briefings and Documenting Feedback,” with personnel performing this procedure.

_____ 3.1.3 RCT/RCM: Ensure a radiological work permit (RWP) has been processed and approved if necessary.

RWP No.: _____

3.1.4 ISFSI Manager: Verify the special charge face shield plug is installed at the well location for the FSC to be tested.

_____ ISFSI Manager Signature _____ Date

3.1.5 Certified Fuel Handler (CFH): Verify revision number of this procedure to ensure it is the current issue.

_____ Signature _____ Date

3.2 Special Tools, Equipment, Parts, and Supplies

Init/Date

_____ 3.2.1 CFH: Ensure the following are available:

A. O-rings for the leak test probe;
end seal - part number ORAR00014-V70GA,
internal seal - part number ORAR00012-VC0B and
test equipment seal - part number ORAR00010-VC0B

B. Petroleum jelly for O-rings

C. 5/8 in. open-end wrench

D. 11/16 in. open-end wrench

E. 3/4 in. open-end wrench

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- F. 5/8 in. 8 point socket and ratchet or 3/4 in. 12 point socket and ratchet (or equivalent)
- G. Plastic sheeting
- H. Flashlight
- I. Leak Test Equipment identified in TPR-6304, Appendix C
- J. Leak Test Probe (original or purge). (The original leak test probe is depicted on Drawing 362A0210 and the purge leak test probe is depicted on Drawing 510157.)
- K. Seal plug removal tool

3.3 Field Preparations

Init/Date

- _____ 3.3.1 Record which leak test probe (original or purge) is to be used.
Original _____ Purge _____
- _____ 3.3.2 Ensure that the internal O-rings in the leak test probe indicated above were replaced within the last three months.
- _____ 3.3.3 FSO: Ensure the Charge Face is posted as a “Control Area.”

3.4 Training

- 3.4.1 Ensure training requirements of Appendix B have been met.

3.5 Approvals and Notifications

- 3.5.1 FSV ISFSI Manager: Verify prerequisites completed.

_____ Date

FSV ISFI Manager Signature

- _____ 3.5.2 Log the procedure in the FSV Daily Operations Log and release it to commence work.

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4. INSTRUCTIONS

NOTE: *Unless designated in front of the step, a CFH is the person performing the steps.*

4.1 Perform a volume test with the test blank installed on the probe.

Init/Date

- | | | |
|-------|-----------|--|
| _____ | 4.1.1 | <u>IF</u> the leak test system is labeled as contaminated,
<u>THEN</u> contact the RCT/RCM before proceeding. |
| _____ | 4.1.2 | Unscrew the test probe from the test equipment as needed to access the leak test probe (test equipment seal) O-ring. |
| _____ | 4.1.3 | Examine the leak test probe (test equipment seal) O-ring for wear or damage. |
| _____ | 4.1.3.1 | <u>IF</u> replacing the O-ring,
<u>THEN</u> replace the leak test probe (test equipment seal) using part number - ORAR00010-VCOB. |
| | 4.1.3.1.1 | Lubricate O-ring using petroleum jelly, as needed. |
| _____ | 4.1.4 | Disconnect the test blank from the end of the test probe as needed. |
| _____ | 4.1.5 | Examine the leak test probe (end seal) O-ring for wear or damage. |
| _____ | 4.1.5.1 | <u>IF</u> replacing the O-ring,
<u>THEN</u> replace the leak test probe (end seal) O-ring with part number - ORAR00014-V70GA. |
| | 4.1.5.1.1 | Lubricate O-ring using petroleum jelly, as needed. |
| _____ | 4.1.6 | Inspect the accessible portions of the seating surface of the test blank. |
| _____ | 4.1.6.1 | Remove any dirt present. |
| _____ | 4.1.7 | Screw the test blank onto the test probe. |
| _____ | 4.1.8 | Re-attach the test probe to the test equipment. |

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_____ 4.1.9 FSO: Ensure the area adjacent to the leak test system is posted as an “At-the-Controls Area.” (Posting may be removed when leak test system is not in use.)

_____ 4.1.10 Leak Test Examiner (LTE): Perform a volume test with the test blank installed on the probe.

_____ 4.1.10.1 GO TO TPR-6304, and perform a volume test with the test blank installed on the probe (Appendix B), after completing Sections 1 through 4 of the procedure.
THEN RETURN TO Step 4.1.11.

_____ 4.1.11 Obtain the calculated volume of the test volume (VTV) results from test perform by the LTE and record it below.

Date/Time Completed _____ / _____

VTV _____ CC

_____ 4.1.12 Disconnect and remove the test probe as follows:

4.1.12.1 Disconnect the test probe from the test equipment.

4.1.12.2 Remove the test blank from the test probe.

NOTE: *Additional copies of pages containing Section 4.1 may be attached to document iterations of these steps.*

4.2 Prepare test probe for connection to FSC.

Init/Date

NOTE: *The leak test device, test probe, may be contaminated from prior use.*

_____ 4.2.1 Unscrew the test probe from the test equipment as needed to access the leak test probe (test equipment seal) O-ring.

_____ 4.2.2 Examine the leak test probe (test equipment seal) O-ring for wear or damage.

_____ 4.2.2.1 IF replacing the O-ring,
THEN replace the leak test probe (test equipment seal) part number - ORAR00010-VCOB.

4.2.2.1.1 Lubricate O-ring using petroleum jelly, as needed.

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- _____ 4.2.3 Disconnect the test blank from the end of the test probe as needed.
- _____ 4.2.4 Examine the leak test probe (end seal) O-ring for wear or damage.
- _____ 4.2.4.1 IF replacing the O-ring,
THEN replace the leak test probe (end seal) O-ring with
part number - ORAR00014-V70GA.
- 4.2.4.1.1 Lubricate O-ring using petroleum jelly, as
needed.
- 4.3 Prepare FSC for leak testing and connect test equipment.

Init/Date

- _____ 4.3.1 Position the leak test equipment in the vicinity of the FSC to be tested
(see Precautions and Limitations 2.2 and 2.9).
- NOTE:** *Step 4.3.2 may be worked in conjunction with Step 4.3.3.*
- _____ 4.3.2 RCT/RCM: Perform a radiological survey of the plug as it is removed
from the seal interspace leak test port and a radiation survey of the port.
- NOTE:** *The FSC seal interspace leak test port faces south.*
- _____ 4.3.3 Remove the plug from the seal interspace leak test port at the charge face
shield plug.
- 4.3.3.1 IF directed by ISFSI Manager,
THEN clean the sealing surface.

CAUTION
If the seal plug is not fully seated in seal plug removal tool it can be dropped causing damage to equipment.

- _____ 4.3.4 Ensure the seal plug is fully seated in seal plug removal tool.
- NOTE:** *Step 4.3.5 may be worked in conjunction with Step 4.3.6.*
- _____ 4.3.5 RCT/RCM: Perform a radiological survey of the seal plug as it is
removed from FSC seal interspace leak test port and a radiation survey
of the port.

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- _____ 4.3.6 Remove the seal plug from FSC seal interspace leak test port, using the seal plug removal tool.
- _____ 4.3.6.1 IF directed by ISFSI Manager,
THEN clean the sealing surface.
- _____ 4.3.7 Verify that the leak test probe thread control screw is in the full backed out counter-clockwise position.
- _____ 4.3.8 Insert the leak test probe through the shield plug and screw the leak test probe (hand tight) into the FSC seal interspace leak test port.
- _____ 4.3.9 Connect the test equipment to the leak test probe.
- _____ 4.3.10 FSO: Ensure the area adjacent to the leak test device is posted as an “At-the-Controls Area.” (Posting may be removed when leak test device is not in use.)
- 4.4 Perform a volume test with the probe attached to the FSC and a system leak test.

Init/Date

- _____ 4.4.1 Open the check valve in FSC interspace test port by screwing down the control screw on the leak test probe until it is fully seated.
- _____ 4.4.2 LTE: Verify valve opening (control screw position).
- _____ 4.4.3 LTE: GO TO TPR-6304, and perform a volume test with the probe attached to the FSC and a system leak,
THEN RETURN TO Step 4.4.4.
- _____ 4.4.4 LTE: Record test results from Step 4.4.3 below.

Date/Time Completed _____ / _____

VTV _____ cc (from TPR-6304, App. B, volume test with the probe attached to the FSC)

Leak Rate _____ cc/sec (from TPR-6304, App. B, system leak test)

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_____ 4.4.5 LTE: Compare the volume recorded in Step 4.4.4 with volume recorded in Step 4.1.11.

4.4.5.1 IF test volume indicates less than a 5 cc increase in volume or a reduction in volume
THEN perform the following:

4.4.5.1.1 Notify the ISFSI Manager

4.4.5.1.2 Return to Section 4.1.

4.4.5.2 IF test volume indicates an increase in volume of at least 5 cc,
THEN sign and date this step as verification that the check valve opened.

Sign/Date _____ / _____

_____ 4.4.6 Close the check valve in FSC interspace test port by backing out counter-clockwise the control screw on the leak test probe until it is fully released.

_____ 4.4.7 LTE: Verify valve closing (control screw position).

4.5 Remove test probe and close FSC test port.

Init/Date

NOTE: *Step 4.5.1 may be worked in conjunction with steps 4.5.2 and 4.5.3.*

_____ 4.5.1 RCT/RCM: Perform radiological surveys as leak test probe is removed and test port plugs re-installed, including the leak test equipment.

_____ 4.5.2 Unscrew the test equipment from the test probe.

_____ 4.5.3 Unscrew the test probe from the FSC seal interspace, leak test port.

_____ 4.5.4 Store the test probe as directed by supervision.

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CAUTION If the seal plug is not fully seated in the seal plug removal tool it can be dropped causing damage to equipment.
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- _____ 4.5.5 Ensure the seal plug is fully seated in seal plug removal tool to prevent dropping seal plug.
- _____ 4.5.6 Reinstall the seal plug, in the FSC seal interspace, leak test port, using the seal plug removal tool.
- _____ 4.5.7 Reinstall the plug in the seal interspace test port on the charge face shield plug.

NOTE: *Sections 4.6 and 4.7 may be performed concurrently.*

- 4.6 Perform test evaluation.
- _____ 4.6.1 FSO: Determine if FSC leak rate results are satisfactory (LCO 3.3.1).
- 4.6.1.1 IF FSC Lid Seal leak rate from Step 4.4.4 is greater than 1×10^{-3} cc/sec - the test is REJECTED, THEN IMMEDIATELY notify the ISFSI Manager to initiate retesting and/or corrective actions per Precautions and Limitations Sections 2.6, 2.7 and 2.8.
- 4.6.1.2 IF FSC Lid Seal leak rate from Step 4.4.4 is less than or equal to 1×10^{-3} cc/sec - the test is ACCEPTABLE, THEN sign and date this step.
- Sign/date _____ / _____
- _____ 4.6.2 IF FSC Lid Seal leak rate from Step 4.4.4 is greater than 1×10^{-3} cc/sec, THEN transfer the FSC to a storage well per TPR-5653 within 7 days of exceeding the seal leak rate limit. (TS 3.3.1, Action A.1.2.1)
- 4.7 Perform post performance activities.
- 4.7.1 FSO: Do the following:
- _____ 4.7.1.1 Attach a copy of the completed test reports to this procedure.

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_____ 4.7.1.2 Ensure that all procedure steps have been completed, initialed or initialed and signed as appropriate.

_____ 4.7.1.3 Request all personnel signing or initialing steps in this procedure to complete the information in the table below:

Printed Name	S Number	Job Function	Initials	Signature

NOTE: *It may be the following day before the radiological survey maps are available.*

_____ 4.7.1.4 Attach copies of the completed radiological survey maps (PRD-317, Appendix D) to this procedure.

4.7.1.5 Using input from appropriate engineering support personnel, verify the necessary deficiency recording documents and work performance documents to track and correct any deficiencies have been generated.

Signature

Date

4.7.2 ISFSI Manager: Do the following:

_____ 4.7.2.1 Ensure that all procedure steps have been completed, initialed or initialed and signed as appropriate.

4.7.2.2 Document completion of procedure on FSV Daily Operations Log.

ISFSI Manager Signature

Date

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5. RECORDS

Completed copy of this procedure and all supplemental documentation pertaining to this procedure

NOTE: [MCP-557, "Records Management,"](#) the [INL Records Schedule Matrix,](#) and associated NRC [record types list](#) provide current information on the storage, turnover, and retention requirements for these records.

6. REFERENCES

Safety Analysis Report for the Fort St. Vrain Independent Spent Fuel Storage Installation

FSV ISFSI Technical Specification 3.3.1

General Electric Company (GEC) Dwg. No. 362 A 0210, Assembly of FSC leak test equipment

GEC Specification 362 F 0152 Maintenance, Inspection and Monitoring Requirements

GEC Specification 362 F 0345 Fuel Storage Container Leak Testing After Initial Loading at the Modular Vault Dry Storage

GEC Specification 362 F 0351 Specification for Pressure and Vacuum Test Equipment for Fuel Storage Container and Storage Well Tubes

GEC Specification 362 F 0356 Method of Leak Vacuum Testing the Fuel Storage Container and Storage Well Tubes

PSCo Document DPT-95-0319, Leak Check on Fuel Storage Containers

7. APPENDIXES

Appendix A, Procedure Discrepancies

Appendix B, Procedure Hazard Analysis

Appendix C, Procedure Basis

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Appendix B

Procedure Hazard Analysis

Highly Hazardous Activity? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	HPSC No.: TPR-5604
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Disciplines (SMEs) involved in hazard analysis: (Checking the box indicates discipline is/was involved in the hazard analysis for the procedure.)

	Discipline		Discipline		Discipline
<input checked="" type="checkbox"/>	Industrial Safety	<input type="checkbox"/>	RCT/RAD Eng.	<input type="checkbox"/>	Engineering
<input type="checkbox"/>	Industrial Hygiene	<input type="checkbox"/>	Env. Protection	<input checked="" type="checkbox"/>	Operations
<input type="checkbox"/>	Fire Protection	<input checked="" type="checkbox"/>	Quality Assurance	<input type="checkbox"/>	Other:

Required Job Training/Required Personal Protective Equipment

Training	PPE
Certified Fuel Handler (2)	Substantial footwear
Radiation Control Technician/Monitor (2)	
Leak Test Examiner	
Quality Inspector – Level I, II, or III	
Industrial Ergonomics	

Sequence Of Basic Job Steps	Potential Hazards	Hazard Control/PPE
1. General to all procedure	1a. Uneven surfaces	1a. Personnel must wear substantial footwear
	1b. Slip/trip/fall	1b. Personnel must wear substantial footwear
	1c. Ergonomics	1c. Personnel must follow MCP-2692
	1d. Electrical	1d. Personnel must use GFCI protection

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Appendix C

Procedure Basis

Procedure Review Table							
Review Discipline	Rev.	DFC Intent ^b Change	DFC Nonintent ^c Change	Review Discipline	Rev.	DFC Intent ^b Change	DFC Nonintent ^c Change
Operations Management	X ^a	X	X	Industrial Safety	X	X	X
Qualified Operator	X	X	X	Engineering			
Radiological Engineering				Industrial Hygiene			
Environmental				Other			
Quality	X ^a	X	*				

a. X = review required.
 b. Reviews for intent DFCs require the same discipline reviews required for a revision.
 c. Reviews for nonintent DFCs can be performed with only Operations management and a qualified operator’s review and then implemented for immediate use. However, the remaining discipline reviews, as indicated by an asterisk (*), must be obtained within two (2) weeks. See MCP-2985, “Chapter XVI – Operations Procedures,” for definitions of intent and nonintent changes.

Step	Basis	Source	Citation
Entire Procedure	Perform testing per GEC Alsthom Engineering Systems Ltd. Technical Specifications	GEC Alsthom Engineering Systems Ltd. Technical Specification 362F0356.	
1.2	Satisfy ISFSI Technical Specification in that the FSC or STORAGE WELL seal leak rate must not exceed 1×10^{-3} standard cc/sec.	LCO 3.3.1	

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Step	Basis	Source	Citation
1.2	Satisfy DOE/RW/0333P requirements. Satisfy ISFSI Technical Specification in that the O-rings on one FSC per vault (six total) will be vacuum leak tested at least every five years.	MCP-2482, Section 4.1 and Appendix A. DOE/RW/0333P, Section 2.2.5 and Section 10. Changed in response to Audit 98-NSNF-AU-034-005. SR 3.3.1.1 and basis	
2.1	Personnel must follow the applicable hazard mitigations detailed in Appendix B.	Procedure hazard analysis	
2.2	Tests, changes, and experiments not described in the Safety Analysis Report must reviewed to determine whether NRC approval is required.	10 CFR 72.48	
2.3	The O-rings on one FSC per vault (six total) must be vacuum leak tested at least every five years (25% grace period does not apply).	SR 3.3.1.1	
2.4	The FSC to be tested must be specified by the FSV ISFSI Manager.	Best management practice	
2.5	The FSV ISFSI Manager must be notified immediately if the leak rate criteria specified in this procedure are <u>NOT</u> met.	Best management practice	
2.6	If the leak rate of an FSC exceeds 1×10^{-3} standard-cc/sec, ONE of the following must be done: The seal integrity of the FSC must be restored within 7 days <u>OR</u> The FSC must be transferred to a standby storage well AND the storage well integrity verified within 7 days.	LCO 3.3.1.A	

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Step	Basis	Source	Citation
2.7	If any FSC closure is found to have an unacceptable leakage the following must be done: Perform leak test on two additional FSCs from each vault within 30 days Submit report to NRC within 90 days describing condition, results of engineering evaluations and actions being taken.	LCO 3.3.1.A	
2.8	If seal leak rate limit is exceeded for three or more FSCs or storage wells, the NRC Operations Center must be notified within 24 hours.	LCO 3.3.1.B	
3.4.1	Ensure training requirements of Appendix B have been met.	Procedure hazard analysis	