

10 CFR PART 72 SCREEN

11/18
12/21/08
Rev. 06

Screen No. 09-043

Facility Name: TMI-2

Change No.: N/A

Activity Description: The Horizontal Storage Modules (HSM's) include four bolts, one in each corner, that extend from the square base unit through a bolt hole in the roof slab. The roof slab rests on the base unit. At the roof slab top surface a 4 inch square plate steel washer and nut are attached to the bolt and the nut is tightened snug tight. The bolt hole is approximately 4 inches in diameter; the bolt is 1 5/8 inches in diameter. This configuration leaves a void, the volume of the bolt hole minus the bolt, around the bolt.

This activity includes the following work activities.

- The nut and square plate steel washer will be removed.
- The void created between the bolt and the bolt hole will be filled with polyurethane foam.
- A four inch square water-resistant polyurethane foam gasket will be placed over the bolt covering the foam filled bolt hole and lay in contact with the concrete roof slab.
- The plate steel washer will be placed over the bolt over the water-resistant polyurethane foam gasket and the nut will be attached.
- The nut will be tightened snug tight.
- This will leave a condition of the bolt hole void being filled with a polyurethane foam and a polyurethane foam gasket compressed between the plate steel washer and the concrete roof slab.

Use of this form must be in accordance with MCP-2925. Sufficient activity description, justifications, and documents reviewed must be provided to permit an independent reviewer to reach the same conclusions. The discussions in Appendix A should be used to develop all justifications documented below.

1. License Condition or Technical Specification: (Complete this section for all Part 72 screens.)

- 1a. Does the activity require any change, even editorial, to the license or technical specifications? Yes No
- 1b. Does the activity require an exemption to any NRC regulations? Yes No
- 1c. Is the activity a change to or require a change to FSV SAR Section 7.7, 9.3, or Chapter 11; or TMI-2 SAR Section 7.6, 9.3, or Chapter 11; or ISFF SAR Section 7.6.1.4, 9.3, or Chapter 11? Yes No

Justification: 1a. This activity does not require any change, even editorial to the license or technical specifications. This activity does not affect any functional and operating limits, any limiting conditions for operation, surveillance requirement applicability, design features or administrative controls.
 1b. This activity does not require an exemption to any NRC regulations.
 1c. This activity is not a change to or require a change to TMI-2 SAR Section 7.6, 9.3, or Chapter 11. This activity does not affect off-site collective dose, training program, or quality assurance program.

Documents Reviewed: Technical Specifications for Three Mile Island – Unit 2 Independent Spent Fuel Storage Installation; TMI-2 Safety Analysis Report.

If the answer to 1a or 1b is "Yes" the activity may not be implemented until NRC approval is obtained. If the answer to 1c is "Yes" a 72.44 Evaluation in accordance with MCP-2925 is required before the activity may be completed.

2. Facility Change: If the activity is a physical change (addition, modification, or removal) within a facility or to any equipment or structure, or to any design document (drawing, calculation, analysis, specification, design input or assumption, etc.), then complete this section. Also complete this section for changes to the SAR. Otherwise indicate N/A at the end of this section.

- 2a. Does the activity adversely affect a design function of equipment or structures described in the SAR or TS Bases? Yes No
- 2b. Does the activity adversely affect a method of performing or controlling a design function of equipment or structures described in the SAR or TS Bases? Yes No
- 2c. Does the activity adversely affect an evaluation which demonstrates the design functions of equipment or structures described in the SAR or TS Bases? Yes No

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2d. Does the activity result in a change to the Technical Specification Bases?

Yes No

Justification (include effects that are not adverse):

2a. This activity does not adversely affect a design function or equipment or structures described in the SAR or TS Bases. This activity has no affect upon the Dry Shielded Canister (DSC). The design functions of the HSMs are the normal and off normal design conditions for structural and mechanical capacity, thermal capacity, and radiation shielding and effects capacity. The addition of the polyurethane foam and gasket neither add to nor take away from the structural and mechanical load capacity of the bolt or bolt hole and does not adverse affect the structural and mechanical capacity of the HSMs. The addition of the polyurethane foam and gasket neither add to nor take away from the thermal capacity or the bolt or bolt hole nor adversely affect the thermal capacity of the HSMs. The addition of the polyurethane foam and gasket neither add to nor take away from the radiation shielding an effects capacity of the bolt or bolt hole nor adversely affect the radiation shielding and effects capacity of the HSMs.

2b. This activity does not adversely affect a method of performing or controlling a design function of equipment or structures described in the SAR or TS Bases. The addition of the polyurethane foam and gasket neither add to nor take away from any method of performing or controlling a design function of structural or mechanical capacity of the bolt or bolt hole, thermal capacity of the bolt or bolt hole, or radiation shielding and effects capacity of the bolt or bolt hole of the HSMs as described in the SAR or TS Bases.

2c. This activity does not adversely affect an evaluation which demonstrates the design function of equipment or structures described in the SAR or TS Bases. The addition of the polyurethane foam and gasket neither add to nor take away from any evaluation which demonstrates the design function of structural or mechanical capacity of the bolt or bolt hole, thermal capacity of the bolt or bolt hole, or radiation shielding and effects capacity of the bolt or bolt hole of the HSMs as described in the SAR or TS Bases.

2d. This activity does not result in any change to the Technical Specification Bases.

Documents Reviewed:

Technical Specification Bases for Three Mile Island Unit 2 Independent Spent Fuel Storage Installation; TMI-2 Safety Analysis Report Chapters 3, 4, and 8; Three Mile Island Facility CPP-1774 Structural Inspection of Horizontal Storage Modules and Pad prepared by Wiss, Janney, Elstner Associates, Inc. dated July 31, 2009.

If any answer in Section 2 is "Yes" then a **72.48 Evaluation** in accordance with MCP-2925 is required before the activity may be completed.

3. Procedure Change: If the activity is a change to facility operation, maintenance, transport, test, or experiment procedures, then complete this section. Also complete this section for changes to the SAR. Otherwise indicate **N/A** at the end of this section.

Is the activity a modification to, addition to, or removal from any procedure that adversely affects the operation and control of equipment or structures as described in the SAR or TS Bases?

Yes No

Justification (include effects that are not adverse): **N/A**

Documents Reviewed: **N/A**

If this answer is "Yes" then a **72.48 Evaluation** in accordance with MCP-2925 is required before the activity can be completed.

Conclusion:

If all the questions on this form are answered "No", then the signatures on this form will complete the 10 CFR Part 72 regulatory screen and the activity may proceed.

Assumptions & Limitations:

No unique assumptions or limitations.

APPROVALS (Signature signifies that screener/reviewer has confirmed with requester that change package was complete and accurate before performing/reviewing the screen.)

M. D. Wilberg
Completed By Qualified Screener
Print/Type Name


Qualified Screener
Signature

09/09/09
Date

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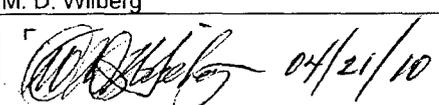
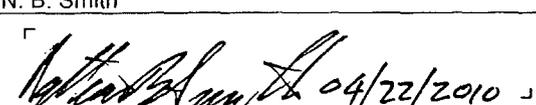
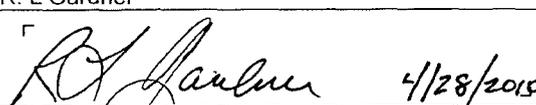
H. L. Lord
Independent Review By Qualified Evaluator
Print/Type Name

Nancy S. Sad
Qualified Evaluator
Signature

9 Sept 2009
Date

ENGINEERING DESIGN FILE

EDF No.: 9565 EDF Rev. No.: 0 Project No.: N/A FCF and/or FDC No.: FDC No. 6797

1. Title: TMI-2 ISFSI Horizontal Storage Module (HSM) Roof Slab Bolt Holes Filled with Polyurethane Foam		
2. Index Codes:	Building/Type CPP-1774	SSC ID HSM 01-30 Site Area 200/INTEC
3. Formal Calculation?	<input type="checkbox"/> Yes (MCP-2374) <input checked="" type="checkbox"/> No (MCP-2059)	Quality Level: 4 QLD Number: 3922
<i>Formal analyses and calculations require engineering management approval.</i>		
*4. NPH PC or SDC:	or <input checked="" type="checkbox"/> N/A	SSC Safety Category: or <input checked="" type="checkbox"/> N/A
*5. (a) Affects Safety Basis:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	(b) Affects SNF/HLW: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
6. Summary:		
<p>This Engineering Design File (EDF) is written to document the placement of sprayed polyurethane foam into bolt hole voids in the Horizontal Storage Module (HSM) roof slabs. The HSMs are located at the Three Mile Island Unit 2 (TMI-2) Independent Spent Fuel Storage Installation (ISFSI) at the Idaho Nuclear Technology and Engineering Center (INTEC). To preclude water from entering into the bolt hole void Tiger Foam sprayed polyurethane foam was sprayed into the bolt holes of every HSM roof slab in October, 2009.</p> <p>With the placement of the Tiger Foam sprayed polyurethane foam into the roof slab bolt hole voids and placement of a polyurethane foam material gasket over the sprayed foam and under the plate steel washer, it is expected that water will be precluded from entering the roof slab bolt hole voids thereby preventing freezing water from further cracking the HSM roof slab and base unit top corners. This action is the first repair recommended as a result of the Concrete Evaluation performed by Wiss, Janney, Elstner Associates, Inc. (WJE) to stop the concrete cracking and deterioration so the HSMs continue to perform their safety functions for the designed service life of 50 years.</p> <p>To ensure the cracking has been mitigated the HSM's will be inspected each summer to verify no additional cracking has occurred and that the polyurethane foam is performing as expected. This inspection will continue annually as part of the TMI-2 Maintenance Management Program.</p>		
7. Signatures: (See instructions for significance of signatures. Add or delete signatories as needed.)		
	Name (typed or printed)	Signatory Role Organization
	Signature and Date	Discipline
	M. D. Wilberg	ISFSI Mangement/ 8529
	 04/21/10	Author
		Design Agent
	N. B. Smith	Engineering Analysis & Modeling/ 8320
	 04/22/2010	Technical Checker
	K. E. Lombard	Engineering Analysis & Modeling/ 8320
	 5/12/2010	Approver
		Engineering Management
	R. L. Gardner	Shift Operations/ 8525
	 4/28/2010	Reviewer
		Nuclear Facility Manager

ENGINEERING DESIGN FILE

EDF No.: 9565 EDF Rev. No.: 0 Project No.: N/A FCF and/or FDC No.: FDC No. 6797

D. F. Barker		ISFSI Management/ 8529
<i>Donald F. Barker</i> 4-21-10	Reviewer	Facility Safety Officer
G. G. Hall		ISFSI Management/ 8529
<i>G. G. Hall</i> 4-21-10	Reviewer	Regulatory Compliance
D. D. Cochran		QA Systems & Ops Support/ 2510
<i>Danny Cochran</i> 4/22/10	Reviewer	* Quality Assurance
H. L. Lord		ISFSI Management/ 8529
<i>Nancy S. Lord</i> 21 April 2010	Reviewer	* Nuclear Safety
R. K. Elwood		ISFSI Management/ 8529
<i>R. K. Elwood</i> 4/26/10	Document Owner	Document Owner
8. Does document contain sensitive unclassified information? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, what category:		
9. Will document be externally distributed? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
10. Registered Professional Engineer's Stamp (if required) <input checked="" type="checkbox"/> N/A		
Registered Professional Engineer Stamp	<p>This Engineering Design File was prepared under the direction of the Registered Professional Engineer as indicated by the stamp and signature provided on this page. The Professional Engineer is registered in the State of Idaho to practice _____ Engineering.</p>	

* Not required for commercial level calculations.

Purpose

This Engineering Design File (EDF) documents the placement of polyurethane foam into the bolt hole voids in the Horizontal Storage Module (HSM) roof slabs and covering the sprayed foam with a polyurethane foam material gasket [1].

The function of the Dry Shielded Canister (DSC) and HSM is to provide radiological shielding and adverse natural phenomena protection to assure safe, controlled, interim storage of the TMI-2 Canisters. The standardized NUHOMS® dry spent fuel storage system has been adapted for storing TMI-2 Canisters and has been designated NUHOMS® - 12T. The TMI-2 Canisters are contained inside a metal DSC that is placed inside an HSM. The NUHOMS® is comprised of the DSC and HSM. The principle Design Criteria is contained in the TMI-2 Safety Analysis Report (SAR) Chapter 3 (latest revision) [2].

In July 2009 Wiss, Janney, Elstner (WJE) Associated, Inc. [3] completed a site investigation to determine the cause of the cracking being experienced in the HSMs. WJE concluded as a result of this investigation that water was getting into the bolt hole and in the cold months of the year this water would freeze and cause the HSM concrete roof slab and base unit to crack [4]. To preclude this cracking from continuing it was determined that the bolt hole void needed to be eliminated so no water could collect and freeze in the bolt hole void. This EDF documents the activity to fill the HSM roof slabs bolt holes with polyurethane foam to eliminate the bolt hole void and cover the Tiger Foam (polyurethane foam) with a polyurethane foam material gasket.

On July 23, 2009 WJE presented their findings and recommendations to members of the TMI-2 ISFSI Operational Safety Board and licensee. The findings and recommendations were concurred with by those present.

Assumptions

The major assumption is that implementation of the recommendations will preclude the concrete cracking and eliminate the concrete distress ensuring the HSMs will continue to perform their safety function for their design service life of 50 years.

The recommendations meet the principle Design Criteria contained in the TMI-2 SAR.

The bolt hole void has no impact on radiological shielding and protection from adverse natural phenomena provided by an HSM to assure safe, controlled, interim storage of the TMI-2 Canisters. Therefore, filling the void with polyurethane foam would also have no impact on an HSM's ability to provide radiological shielding and adverse natural phenomena protection. Tiger Foam is chemically inert and non-reactive and has no affect on the HSM concrete or bolts.

Calculation Inputs

Each HSM base unit includes four bolts, one in each corner, that extend vertically from the square base unit through a bolt hole sleeve in the roof slab (Figure 1). The roof slab rests on the base unit. At the roof slab top surface a 4 inch square plate steel washer and nut are attached to the bolt and the nut is tightened snug tight. The bolt hole is approximately 4 inches in diameter; the bolt is 1 5/8 inches in diameter. This configuration leaves a void, the volume of the bolt hole minus the bolt volume (Figure 2).

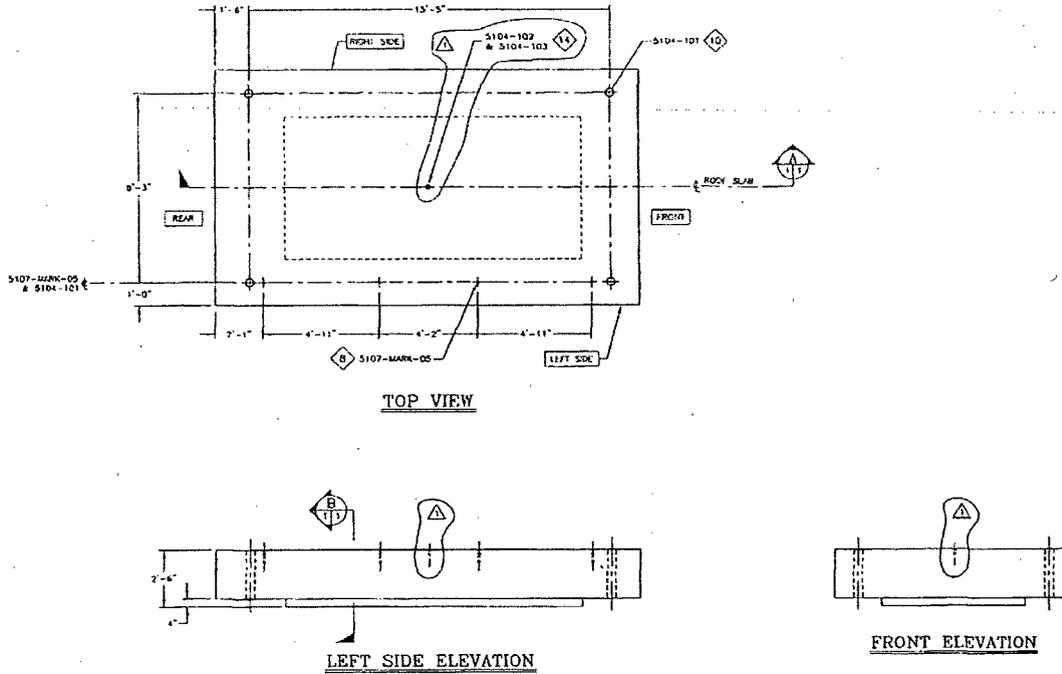


Figure 1. Drawing- Roof Slab

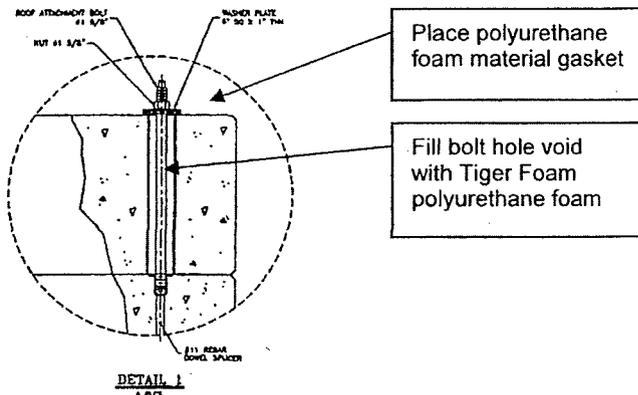


Figure 2. Drawing- Roof Sleeve, Bolt, Plate Steel Washer, and Nut

Sprayed polyurethane foam, commonly referred to as SPF, is a spray-applied insulating foam plastic that is installed as a liquid and then expands many times its original size to fill gaps, openings, and voids. Polyurethane sealants are used to fill gaps thereby preventing air and water leakage. Closed-cell SPF can provide an added barrier against water intrusion.

Tiger Foam Slow Rise Polyurethane Foam formula [5] was the SPF picked to fill the bolt hole void. Tiger Foam slow rise formulation fully expands and dries tack-free within 4-5 minutes. It fully cures within several hours. The portable, two component system foam expands with approximately an 8-to-1 ratio, and cures to a semi-rigid closed cell polyurethane.

The sprayed polyurethane foam has no impact on radiation protection capacity of the roof slab. The polyurethane has no impact on the structural strength of the roof slab concrete.

A water-resistant polyurethane foam material gasket [6] is placed on top of the sprayed polyurethane foam that has been cut flush with the top surface of the concrete roof slab, and under the plate steel washer. This polyurethane gasket material acts as an additional barrier that water has to penetrate to reach the polyurethane foam filled bolt hole.

Computer Hardware and Software

No computer hardware or software was used for the analysis.

Summary and Conclusions

Summary

In the WJE report of the concrete investigation it states:

"Cracking and spalling at the corners of the roof slabs appear primarily due to freezing of water trapped in the roof slab anchor bolt holes. Therefore, preventing water infiltration into these holes...should be a first priority."

The report further states:

"To address the anchor bolt holes, the following repair options should be considered:

- Fill the void within the anchor bolt blockout with polyurethane or silicone foam to prevent the accumulation of water within the holes.
- Seal the top surface of the roof slab, anchor bolt and washer plate to prevent water from entering the blockout void by applying...silicone sealant...."

Following the recommendations of WJE to preclude water from entering into the bolt hole void Tiger Foam sprayed polyurethane foam was sprayed into the roof slab bolt holes and a polyurethane foam material gasket was placed on top of the Tiger Foam and concrete roof surface and under the plate steel washer of every HSM in October, 2009.

Top ensure the cracking has been stopped the HSM's will be inspected each summer to verify no additional cracking has occurred and that the polyurethane foam is performing as expected. This inspection will continue annually as part of the TMI-2 Maintenance Management Program.

Conclusions

With the placement of the Tiger Foam sprayed polyurethane foam into the roof slab bolt hole voids and placement of the polyurethane foam material gasket over the sprayed foam and under

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(Use with MCP-2374 or MCP-
2059)

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the plate steel washer it is expected that water will be precluded from entering the roof slab bolt hole voids thereby preventing freezing water from further cracking an HSM roof slab or base unit top corners. Annual inspections and maintenance of the HSMs will ensure the concrete cracking and deterioration has been stopped.

References

1. Work Order Package 00627046 01, *TMI-2 HSM Roof Slab Bolt Hole Fill*, 10/15/2009 (10 CFR Part 72 Screen, Screen No.09-043)
2. TMI-2 ISFSI Safety Analysis Report (SAR), latest chapter revisions
3. Wiss, Janney, Elstner Associates, Inc., *Three Mile Island Facility CPP-1774 Structural Inspection of Horizontal Storage Modules and Pad*, WJE Northbrook, Illinois, 2009 [EDMS Document No., WJE NO.2008.1917]
4. EDF No. 9516, *TMI-2 Concrete Evaluation of Horizontal Storage Modules (HSMs) and Base Mat by WJE*, [R0]
5. Tiger Foam Insulation, Spring Lake, New Jersey 07762, www.tigerfoam.com
6. McMaster-Carr, *Water-Resistant Polyurethane Foam*, page 3533, (web site May 2010), www.mcmaster.com

ICP RECORDS TRANSMITTAL

1. RECORD INFORMATION

Document ID: EDF 9565 Revision ID: 0 Project Number: NA
 Title/Description: TMI-2 ISFSI Horizontal Storage Module (HSM) Roof Slab Bolt Holes Filled with Polyurethane Foam
 Alternate ID: _____ Date of Record: _____
 or Effective Date: 05/12/10
 Document Author(s)/Creator(s): Michael D. Wilberg Date Range From: _____
 (if applicable): To: _____
 Document Owner: Michael D. Wilberg
 Organization Name: ISFSI Management Charge No.: _____

2. RECORDS MANAGEMENT REQUIREMENTS

Uniform File Code(s): 7652 Disposition Authority: N1-434-01-3-2
 Keywords: _____

Controlled Unclassified Record (Sensitive)

3. QA RECORD VALIDATION

Only required for QA records where no other method of validation (signature, initials, etc.) is available on the record itself

<u>Broadhead BB 8/3/10</u>	<u>Bonnie Broadhead</u>	<u>78145</u>	<u>8/3/10 BB</u>
Validator Print/Type Name	Validator Signature	S Number	Date

4. SIGNATURES

Sign/Date as Sender:	<u>Broadhead BB 8/3/10</u>	<u>Bonnie Broadhead</u>	<u>8/3/10</u>
	Sender Print/Type Name	Sender Signature	Date
Acceptance/Receipt:	<u>TSA</u>	<u>Jay Stewart</u>	<u>8/4/10</u>
	Location of Receiving DRSC/SFL	Receiver Signature	Date