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Bamford, Peter

From: Blumberg, Mark (NRR)
Sent: Wednesday, November 25, 2009 8:21 AM
To: Bamford, Peter (NRR)
Cc: Tate, Travis (NRR)
Subject: Emailing: Response to RAI dated August 31 2005.PDF
Attachments: Response to RAI dated August 31 2005.PDF

Peter,

I know that you are probably up to you neck in alligators right now, but I wanted to pass along some info that may be helpful to your situation with the TMI release. As a matter of defense in depth we asked many questions of TMI when they requested to be able to open their equipment hatch during refueling. In response to our questions regarding GDC 64 (see RAI question 5), TMI put in place several commitments regarding HVAC. While these RAI responses were for the FHA, I think the same controls should have been in place for a similar open containment situation with the potential for a release.

I hope this is helpful to you.

Response to RAI dated August 31 2005.PDF

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AmerGen
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10 CFR 50.90

September 19, 2005
5928-05-20253

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Three Mile Island, Unit 1 (TMI Unit 1)
Facility Operating License No. DPR-50
<u>NRC Docket No. 50-289</u>

Subject: Response To Request For Additional Information – Technical Specification Change Request No. 326: Elimination of Containment Equipment Hatch Closure During Refueling (TAC No. MC4904)

References:
1) AmerGen Energy Company, LLC letter to NRC dated October 20, 2004 (5928-04-20162), "Technical Specification Change Request No. 326 – Elimination of Containment Equipment Hatch Closure During Refueling."
2) AmerGen Energy Company, LLC letter to NRC dated August 17, 2005 (5928-05-20225), "Additional Information – Technical Specification Change Request No. 326: Elimination of Containment Equipment Hatch Closure During Refueling."

This letter provides additional information in response to the NRC draft request for additional information received via NRC email, dated August 31, 2005, regarding TMI Unit 1 Technical Specification Change Request No. 326, submitted to NRC for review on October 20, 2004 (Reference 1). The additional information is provided in Enclosure 1. As described in the attached responses, the proposed Technical Specification page markups have been revised to incorporate key commitments into Technical Specification 3.8.6, and to clarify a potential wording conflict in the Technical Specification 3.8.9 Bases. These changes only reflect incorporation of previously committed actions and administrative controls into the Technical Specification 3.8.6 action statement, and provide clarification of a potential conflict in Technical Specification 3.8.9 Bases wording, and have no impact on the conclusions of the original safety analysis or no significant hazards consideration evaluation provided in Reference 1. The revised Technical Specification pages provided in Enclosure 4 replace the proposed Technical Specification pages previously submitted in References 1 and 2.

Regulatory commitments established by this submittal are identified in Enclosure 3. If any additional information is needed, please contact David J. Distel at (610) 765-5517.

I declare under penalty of perjury that the foregoing is true and correct.

Respectfully,

09/19/05
Executed On

Pamela B. Cowan
Director - Licensing & Regulatory Affairs
AmerGen Energy Company, LLC

Enclosures:
1) Response to Request for Additional Information
2) TMI Unit 1 Calculation No. C-1101-900-E000-083, Rev. 3, "EAB, LPZ, and CR Doses Due to Fuel Handling Accident In Reactor Building With Hatch Doors Opened"
3) List of Commitments
4) Revised TS Page Markups

cc:
S. J. Collins, USNRC Administrator, Region I
P. S. Tam, USNRC Senior Project Manager, TMI Unit 1
D. M. Kern, USNRC Senior Resident Inspector, TMI Unit 1
File No. 04092

ENCLOSURE 1

TMI UNIT 1

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
TECHNICAL SPECIFICATION CHANGE REQUEST No. 326
ELIMINATION OF CONTAINMENT EQUIPMENT HATCH CLOSURE DURING REFUELING

1. **NRC Question**

A value of 5000 cubic feet per minute (cfm) (4000 cfm due to intake flow plus 1000 cfm for inleakage) is assumed for the value of unfiltered inleakage into the control room during the first 30 minutes of the postulated fuel handling accident.

a. Because the 1000 cfm value for unfiltered inleakage is not based upon a measurement during this mode of operation, justification should be provided to explain why this number is appropriate. Please provide details regarding your control room, design, maintenance and assessments to justify the use of and any plans to verify this number.

Response

The Control Room is located on elevation 355' of the Control Building and is part of the Control Building Envelope. The TMI-1 Control Room Emergency Ventilation System is conservatively assumed to initiate 30 minutes after the postulated accident. During this period neither the normal nor the emergency fans are operating and the Control Building Envelope (CBE) is isolated. Upon receiving a shutdown signal, the isolation dampers to 305' elevation of the Control Building will close. Under no circumstances is air from 305' elevation of the Control Building recirculated. The 1,000 cfm in-leakage value is the same as that assumed for in-leakage with the ventilation system in its emergency mode of operation. While a positive pressure cannot be maintained in the CBE without the fans running, there is also no large differential pressure that would drive in-leakage to the CBE. There is no contaminated ductwork passing through the CBE.

The components which make up the CBE are maintained as part of the plant Preventive Maintenance program. The isolation dampers to 305' elevation are tested as part of the monthly surveillance of the Emergency Ventilation system. A differential pressure test of the CBE is performed on a 2-year frequency to confirm the overall integrity of the CBE. Therefore, areas of potential vulnerabilities for unfiltered inleakage into the CBE have been addressed.

A sensitivity study was performed that varied the CBE unfiltered intake from the 5,000 cfm (4,000 plus 1,000 unfiltered inleakage) up to a value of 71,000 cfm. The results of this study indicate that the radioactivity inside the CBE becomes in equilibrium with the outside air at approximately 61,000 cfm. Therefore, the value of 61,000 cfm (60,000 cfm of unfiltered intake plus the 1,000 cfm assumed unfiltered inleakage) enters the CBE during the first 30 minutes of the accident. This makes the control room operator dose insensitive to additional unfiltered intake/inleakage such that a test to determine the actual unfiltered inleakage in the normal mode is not required. This sensitivity study (with resultant control room operator doses) has been included in the design analysis calculation (Enclosure 2). After the first 30 minutes, the control room emergency filtration system functions as designed. This is reflected in the total calculated dose to control room operators. The revised licensing basis control room operator dose consequences are tabulated below. The analyzed Exclusion Area Boundary (EAB) and Low Population Zone (LPZ) doses previously reported are not changed and are also tabulated below. All calculated dose consequence results remain below the acceptance criteria of 10 CFR 50.67 and General Design Criterion (GDC) 19.

	Fuel Handling Accident Inside Containment TEDE Dose (Rem)		
	Control Room	**EAB**	**LPZ**
Current Licensing Basis Dose	6.55E-01	4.20E+00	7.35E-01
Re-Calculated Licensing Basis Dose	2.52E+00	4.49E+00	7.87E-01
Allowable Dose	5.00E+00	6.30E+00	6.30E+00

b. **NRC Question**

Does the 1,000 cfm unfiltered inleakage include 10 cfm for ingress and egress into and out of the control room over the duration of the accident?

Response

Yes, the 1,000 cfm unfiltered inleakage assumed includes 10 cfm for ingress and egress into and out of the CBE over the duration of the accident.

c. **NRC Question**

The supplementary response dated July 29, 2005 states: "For conservatism, the 4000 cfm represents one half of the normal intake flow for the 30-minute period during which the normal HVAC shuts off due to the isolation signal, but before emergency ventilation is started." It also states that: "Several aspects of RMs (Radiation Monitors) can delay the isolation, including the delay for activity to build up to concentrations equivalent to the alarm setpoint and the effects of different radionuclide accident isotopic mixes on monitor response. To eliminate the effects of RM detection delays, the TMI-1 control room is conservatively assumed to be isolated manually by CR (Control Room) operator 30 minutes after the accident." UFSAR Section 9.8.1.1 appears to state that the normal intake flow is at least 4500 cfm. Section 9.8.1.1 states: "This is accomplished by permanently setting the manual balancing dampers in the outside air supply duct (AH-D-605 and AH-D-39) to provide at least 4500 cfm." No value appears to be given for the upper bounding normal flow rate (which typically yields the most limiting doses). The staff requests further clarification of the assumed operation of the control room heating ventilation and air conditioning (HVAC) during the Fuel Handling Accident in Containment.

Response

As described in the response to Question 1.a above, a control room intake value of 61,000 cfm is assumed. The design flow rate for the CBE intake is 8,000 cfm (+/- 10%). The CBE recirculation fan design flow rate is 40,000 cfm (+/- 10%). Since the recirculation fans are interlocked such that only one can operate at a time, the total CBE flow capacity (if added together with consideration of the tolerance bands) is less than the 61,000 cfm assumed in the design basis analysis for the first 30 minutes. Therefore, the assumed intake value of 61,000 cfm bounds both the normal and emergency operating mode. This value corresponds to that value which would produce equilibrium conditions between the control room and the outside air.

d. **NRC Question**

Justify the statement that the 4000 cfm represents one half of the normal intake flow. Does TMI-1 ever operate with two trains of normal intake operating simultaneously? If so please justify why this is not modeled.

Response

The normal and emergency ventilation fans are electrically interlocked to prevent operation of both trains simultaneously. Additionally, the assumption of 61,000 cfm of unfiltered intake into the control room during the first 30 minutes is bounding.

e. **NRC Question**

Justify why the 4000 cfm is representative of the operating condition before isolation at 30 minutes. Why wouldn't the normal intake flow be at least 4500 cfm during this 30 minutes or be representative of the potential upper bounding flow rate allowable by the system? If an upper bound is used please provide justification for the upper bounding flow rate.

Response

The assumption of 61,000 cfm of unfiltered intake during the first 30 minutes, as described in the response to Question 1.a above, is bounding. Further air intake into the control room would not result in additional operator dose.

2. **NRC Question**

The proposed Technical Specification changes specify that a "designated" crew is available to close the Equipment Hatch opening rather than a "dedicated" crew who would have no other duties. Specify what other duties the designated crew will have and where they will be stationed relative to the equipment hatch opening.

Response

Procedural controls will ensure that during the movement of irradiated fuel the Equipment Hatch/Missile Shield area will be manned 24 Hours/Day, 7 Days/Week in support of the outage unless the Equipment Hatch is closed and 4 bolts are installed. Each individuals' identified duties will be in support of the loading and unloading of outage equipment at the hatch area.

3. **NRC Question**

Please provide engineering drawings of the proposed change. A photograph of the equipment hatch would also be helpful in the review of this proposed change. Describe the steps taken to ensure any proposed flashing will not interfere with closure of the Equipment Hatch opening. What is the acceptable design clearance between any proposed flashing on the shield doors and the containment to ensure that the flow after the opening is closed is into containment?

Response

Photographs and drawings of the TMI Unit 1 equipment hatch missile shield barrier are attached. The proposed change permanently adds steel plate to the lower most missile shield carriage area. The added steel plate will cover the area where grating is currently installed. The added steel plate will not create an interference fit, which would interfere with equipment hatch missile shield closure. The equipment hatch missile shield has a 2-inch clearance above the existing asphalt grade. A 3-inch clearance along the vertical face of the missile shield exists at its interface with the extended concrete impact enclosure, which extends from containment. The total area of these clearances with the Reactor Building Purge Exhaust System operating and the missile shield installed, ensure that flow is into the Reactor Building.

4. **NRC Question**

Please provide the criterion used to decide if the Equipment Hatch opening is capable of being closed within 45-minutes.

Response

Station Maintenance personnel, experienced in opening and closing the equipment hatch missile shield, were surveyed to determine if closure of the equipment hatch missile shield is achievable within 45-minutes. Station Maintenance personnel, experienced in this activity, are confident that it is achievable with tooling/equipment readiness, and procedural instruction governing the evolution. The process of closing the missile shield barrier is not impacted by adverse weather conditions. The ability to close the missile shield barrier is not impacted by operation of the Reactor Building Purge Exhaust System.

TMI will perform Post Maintenance Testing and demonstrate that the 45-minute closure duration is achievable, after the Equipment Hatch Missile Shield is modified as discussed in response to Question No. 3, above.

5. **NRC Question**

General Design Criterion 64 of 10 CFR Part 50, Appendix A, states that means shall be provided for monitoring the reactor containment atmosphere, spaces containing components for recirculation of loss-of-coolant accident fluids, effluent discharge paths, and the plant environs for radioactivity that may be released from normal operations, including anticipated operational occurrences, and from postulated accidents. The proposed change should consider how Criterion 64 will be met in the event of an FHA with the Equipment Hatch open. Please provide the bases for meeting Criterion 64 for the proposed change.

1. Technical Specification 3.8.9 states that the reactor building purge isolation valves, and associated radiation monitors that initiate purge isolation, shall be tested and verified to be operable no more than 7 days prior to initial fuel movement in the reactor building. Page 3-45a of the proposed technical specification bases changes a description of the requirement to test the purge isolation system. Currently, the bases state that this "test is performed no more than 7 days prior to the start of fuel movement . . . to ensure that the monitors, purge valves, and associated interlocks are functioning prior to operations *that could result in a fuel handling accident within the reactor building.*" The proposed change is to remove the words in italic and replace them with "*when containment integrity is to be maintained.*" Since the proposed amendment to allow the equipment hatch to be open enables containment integrity to not be maintained, it appears that the proposed change to the bases may conflict with Technical Specification 3.8.9. The proposed change to the bases appears to limit the testing of the purge isolation system to ensure it is functioning only prior to operations when containment integrity is to be maintained. Technical Specification 3.8.9 does not limit the testing to when containment integrity is to be maintained. If the intent of the bases change is to decrease the frequency of testing of the system to only when containment integrity is to be maintained, please justify why the purge isolation system will not be tested if it is relied upon to meet General Design Criterion 64.

Response

The air flow through the open hatch will be controlled to ensure that air is flowing into the Reactor Building, through the purge exhaust fans and released through a filtered and monitored path (i.e., the purge exhaust stack). TMI Unit 1 procedures will include the following requirements to ensure that General Design Criterion (GDC) 64 requirements will continue to be met during the movement of irradiated fuel:

1) If the Reactor Building Equipment Hatch is removed (open), then place the purge system in operation and control the air flow at the hatch so that the prevailing continuous direction of air flow is into the Reactor Building.

2) If the condition, as described in Item 1 above, cannot be maintained, then fuel handling operations will be terminated until the Reactor Building Equipment Hatch is closed or purge is restored.

3) Whenever the purge system is operating, then ensure purge exhaust radiation monitor is operable or obtain periodic samples as currently specified in the Offsite Dose Calculation Manual (ODCM).

4) Whenever the hatch is open, position a portable radiation monitor at the Reactor Building Equipment Hatch opening.

5) If the purge system is operated with the Reactor Building Equipment Hatch open, then bypass the Reactor Building purge exhaust high radiation interlock. This ensures flow will continue in the proper direction if a radiological event occurs.

6) Prior to initiating irradiated fuel movement with the Reactor Building Equipment Hatch open, verify the purge system is operating.

Therefore, any effluent release will be adequately monitored in accordance with the requirements of GDC 64. In the event of simultaneous FHA and loss of the purge system, the radiation monitor positioned at the open hatch can be used to estimate the magnitude of the release.

The proposed changes to the TMI Unit 1 Technical Specification 3.8 Bases pages supporting this amendment request have been revised, as shown in Enclosure 4, to clarify the potential conflict with Technical Specification 3.8.9 requirements, regarding testing of the purge isolation system and purge isolation bypass interlock. Testing performed in accordance with Technical Specification 3.8.9, will verify the Reactor Building purge valves will automatically close when they receive initiation signals from the radiation detectors that monitor reactor building purge exhaust, and the valves remain open when the isolation system is bypassed.

6. NRC Question

Confirm that the limiting design basis radiological event during refueling when there are core alterations or movement of irradiated fuel inside containment is the Fuel Handling Accident Inside Containment.

Response

The TMI Unit 1 Updated Final Safety Analysis Report (UFSAR) Chapter 14 accident analyses have been reviewed and confirmed that no other design basis accidents would result in a higher potential radiological dose consequence beyond that analyzed for the Fuel Handling Accident Inside Containment.

7. **NRC Question**

Page 4 of 6 of the October 20, 2004 submittal states:

"The contingency temporary hatch cover provides an atmospheric ventilation barrier to enable ventilation systems to draw the release from a postulated fuel handling accident in the proper direction such that it can be treated and monitored."

The August 17, 2005 supplement proposes to add Insert B to page 3-45 of the bases. Insert B states:

"The Reactor Building purge valve high radiation interlock will be bypassed to ensure continued air flow into the Reactor Building in the event of a Fuel Handling Accident. The Reactor Building Purge Exhaust radiation monitor will be maintained operable. *There are no special requirements to achieve continuous air flow into the Building.*"

and,

"When a temporary equipment hatch cover (e.g. missile shield) is used in place of the equipment hatch, there are *no special requirements for sealing, pressure retention, or complete blocking of the opening for this cover. When the equipment hatch is rolled in place as the method of covering the hatch opening, it need not be bolted to the opening.*"

While continuous air flow into the building is not credited in the analysis, it is considered in the staffs review of this analysis as a defense-in-depth feature. This is consistent with the regulatory guide 1.183, (regulatory guidance in the TMI licensing bases) and TSTF-68 (which is for a penetration similar in size to the Equipment Hatch) as shown in Appendix 1.

In past reviews of amendments requesting to allow the Equipment Hatch to be open during refueling, the NRC has credited replacing the Equipment Hatch (and in one case the Equipment Hatch shield doors with defense-in-depth measures provided within the specification) as defense. The TMI proposed technical specification does not require either method of closure.

The proposed bases have the potential to conflict with the proposed intent of the specification. It allows the possibility of no closure with no assurance or justification that the flow is into the reactor building. The proposed specification and bases appear to conflict with the intent stated on page 4 of 6, October 20, 2004 submittal and cited above.

Explain how the proposed specification and bases provide assurance that the intent of closure as a defense-in-depth measure is accomplished and that the contingency temporary hatch cover provides an atmospheric ventilation barrier to enable ventilation systems to draw the release from a postulated fuel handling accident in the proper direction such that it can be treated and monitored.

Attachment 1
Regulatory Positions and Technical Specification Task Force 68 Reviewers Note

Regulatory Guide 1.183, Appendix B, Regulatory Position 5.3 states:

If the containment is open during fuel handling operations (e.g., personnel air lock or equipment hatch is open),[3] the radioactive material that escapes from the reactor cavity pool to the containment is released to the environment over a 2-hour time period.

Footnote 3:
The staff will generally require that technical specifications allowing such operations include administrative controls to close the airlock, hatch, or open penetrations within 30 minutes. Such administrative controls will generally require that a dedicated individual be present, with necessary equipment available, to restore containment closure should a fuel handling accident occur. Radiological analyses should generally not credit this manual isolation.

TSTF for containment penetration comparable in size to the Equipment Hatch

TSTF-68, Revision 2, Reviewers Note:

The allowance to have containment personnel airlock doors open and penetration flow paths with direct access from the containment atmosphere to the outside atmosphere to be unisolated during fuel movement and CORE ALTERATIONS is based upon (1) confirmatory dose calculations of a fuel handling accident as approved by the NRC staff which indicate acceptable radiological consequences and (2) commitments from the licensee to implement acceptable administrative procedures that ensure in the event of a refueling accident (even though the containment fission product control function is not required to meet acceptable dose consequences) that the open airlock can and will be promptly closed following containment evacuation and that the open penetration(s) can and will be promptly closed. The time to close such penetrations or combination of penetrations shall be included in the confirmatory dose calculations.

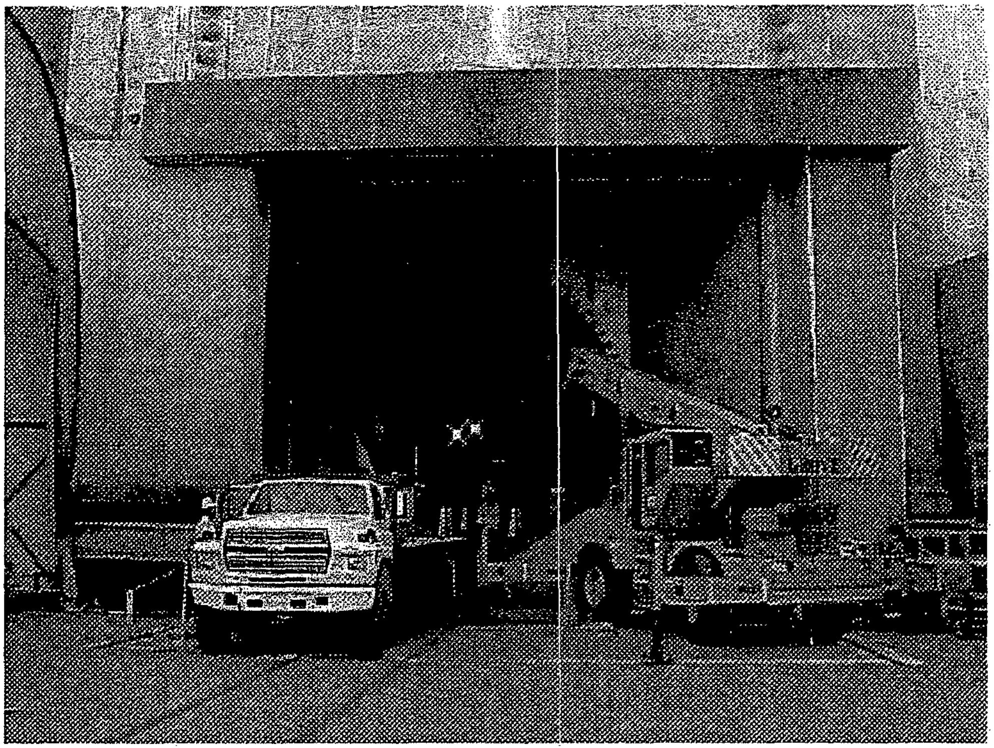
Response

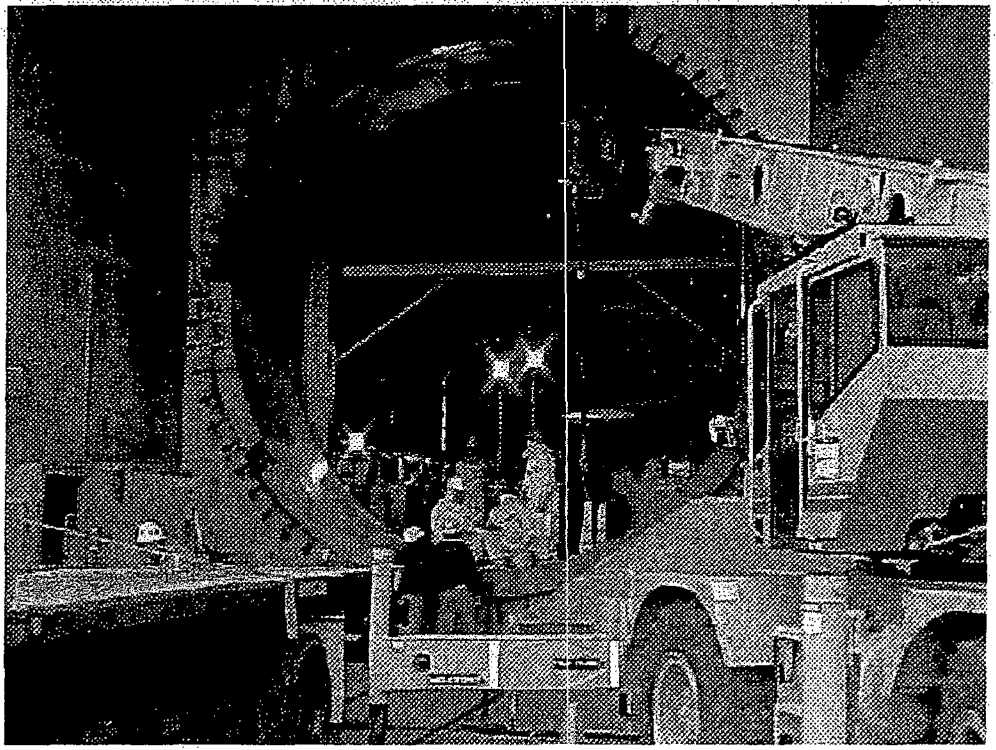
The proposed changes to the TMI Unit 1 Technical Specification pages supporting this amendment request have been revised, as shown in Enclosure 4, to incorporate within Technical Specification 3.8.6 the specification requirement that the equipment hatch may be open if all of the conditions specified in Technical Specification 3.8.6 are met during fuel loading and refueling operations. The conditions specified are that: 1) the Reactor Building Equipment Hatch Missile Shield Barrier is capable of being closed within 45 minutes, 2) A designated crew is available to close the Reactor Building Equipment Hatch Missile Shield Barrier, and 3) Reactor Building Purge Exhaust System is in service. Technical Specification 3.8 Bases have also been revised to be consistent with the change to Technical Specification 3.8.6. The proposed Technical Specification Bases include description of the steel plating permanently installed on the bottom of the shield structure, which acts to further block the opening and thus restrict a release of post-accident fission products.

Additional controls are provided by existing TMI Unit 1 Technical Specification 3.8.10, which restricts irradiated fuel movement from the reactor until the unit has been subcritical for at least 72 hours; and existing Technical Specification 3.8.11, which requires at least 23 feet of water be maintained above the level of the reactor pressure vessel flange during the handling of irradiated fuel in the Reactor Building, and specifies that if the water level is less than 23 feet above the reactor pressure vessel flange, then fuel handling is to cease until this water level is restored. These specifications are applicable to fuel handling in the Reactor Building independent of whether containment integrity is maintained.

The above described TMI Unit 1 Technical Specification revisions, along with existing Technical Specification controls, applicable during fuel loading and refueling operations, provide assurance that the intent of closure as a defense-in-depth measure is accomplished and that the Reactor Building Equipment Hatch Missile Shield Barrier provides an atmospheric ventilation barrier to enable ventilation systems to draw the release from a postulated fuel handling accident in the proper direction such that it can be treated and monitored.

Enclosure 1 Attachments





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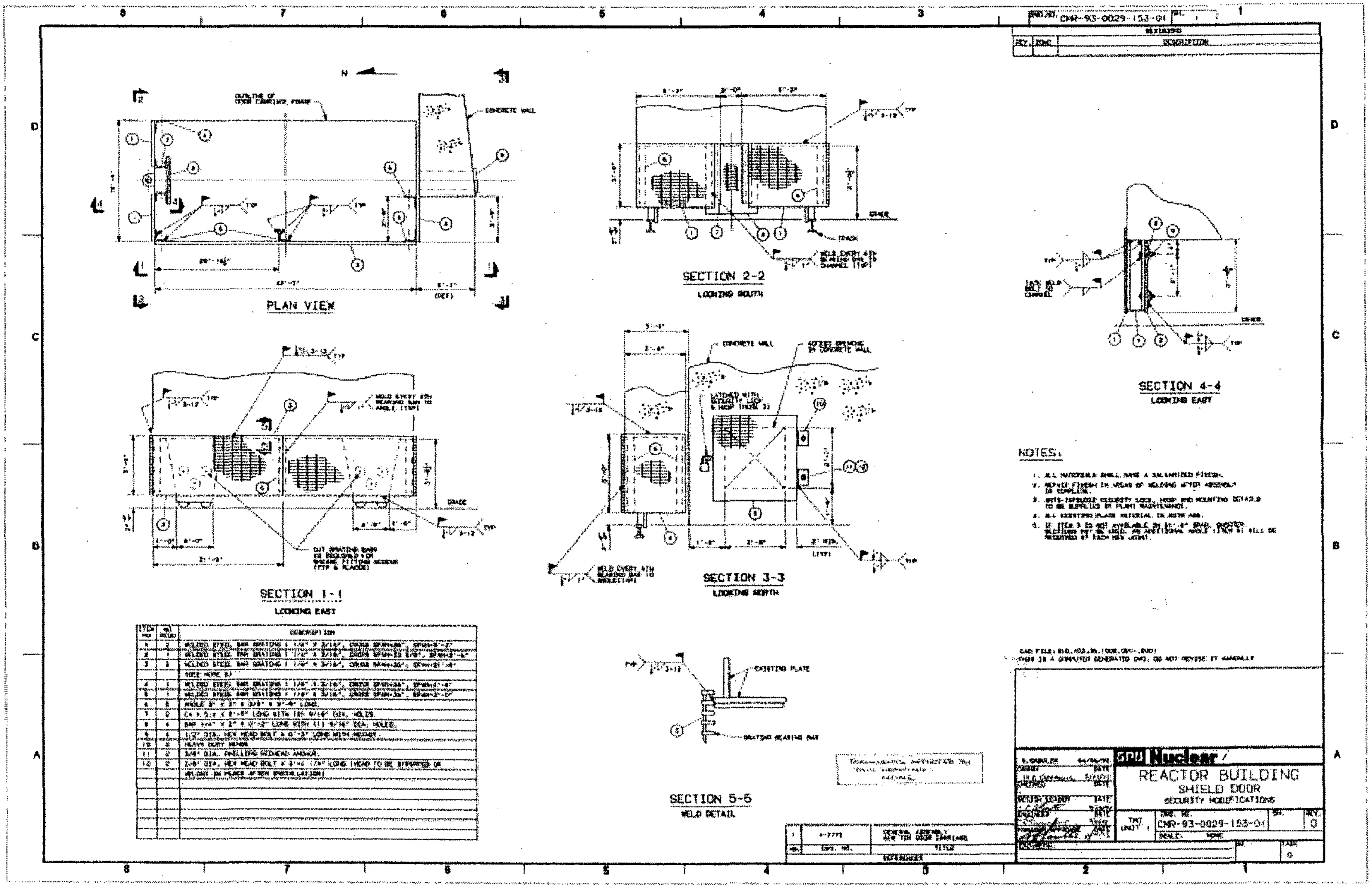

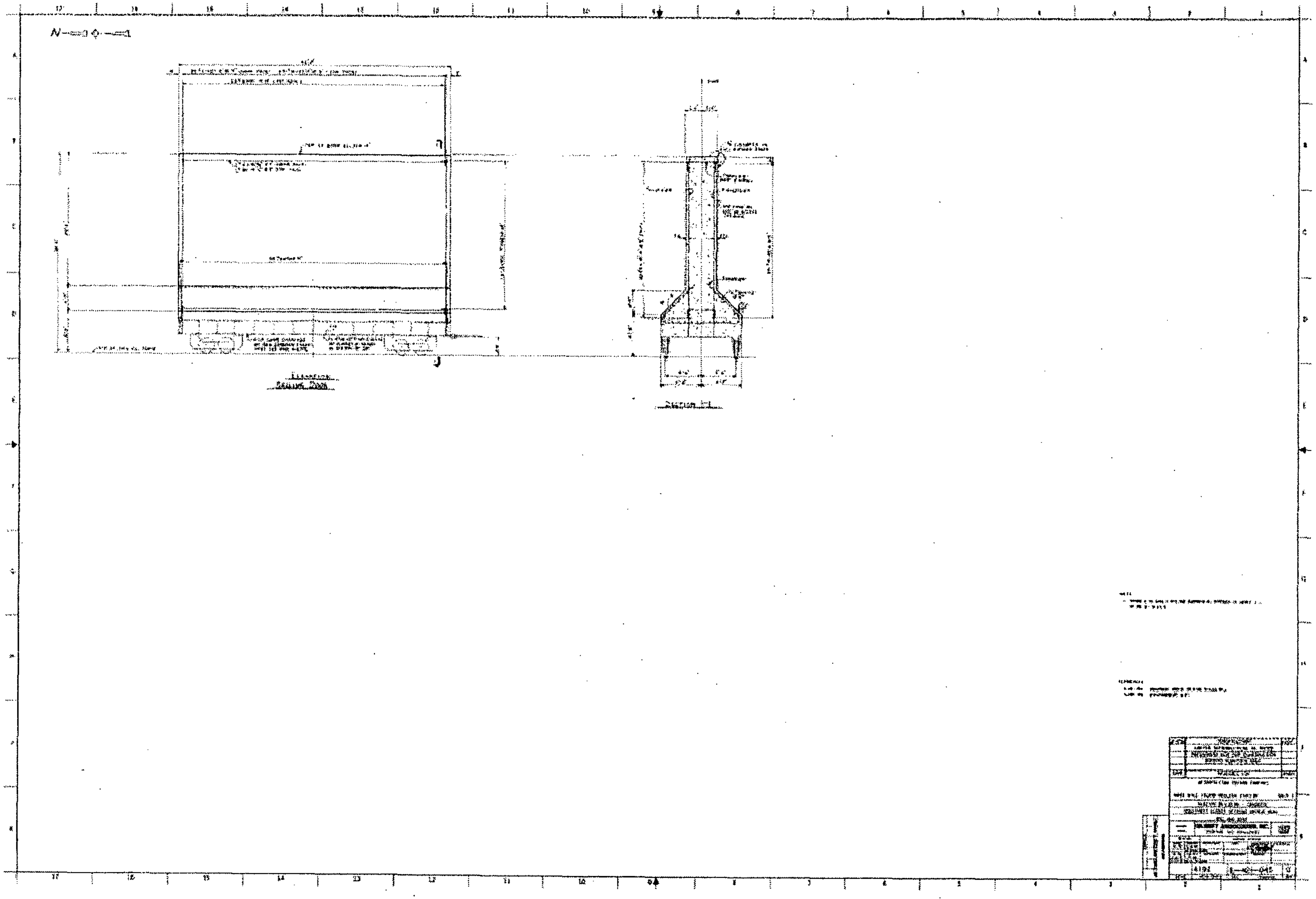

ENCLOSURE 2

TMI Unit 1 Calculation No. C-1101-900-E000-083
Revision 3

"EAB, LPZ, and CR Doses Due to Fuel Handling Accident In Reactor Building With Hatch Doors Opened"

ENCLOSURE 3

List of Commitments

SUMMARY OF AMERGEN COMMITMENTS

The following table identifies commitments made in this document by AmerGen. (Any other actions discussed in the submittal represent intended or planned actions by AmerGen. They are described to the NRC for the NRC's information and are not regulatory commitments.)

COMMITMENT	COMMITTED DATE OR "OUTAGE"
Procedural controls will ensure that during the movement of irradiated fuel the Equipment Hatch/Missile Shield area will be manned 24 Hours/Day, 7 Days/Week in support of the outage unless the Equipment Hatch is closed and 4 bolts are installed.	T1R16 (Fall 2005)
Complete permanent installation of steel plate to the lower most missile shield carriage area. The added steel plate will cover the area where grating is currently installed.	T1R16 (Fall 2005)
Prior to initial use of this Technical Specification, TMI will demonstrate that the 45-minute closure duration is achievable.	T1R16 (Fall 2005)
TMI Unit 1 procedures will include the following requirements to ensure that General Design Criterion (GDC) 64 requirements will continue to be met during the movement of irradiated fuel: 1) If the Reactor Building Equipment Hatch is removed (open), then place the purge system in operation and control the air flow at the hatch so that the prevailing continuous direction of air flow is into the Reactor Building. 2) If the condition, as described in Item 1 above, cannot be maintained, then fuel handling operations will be terminated until the Reactor Building Equipment Hatch is closed or purge is restored. 3) Whenever the purge system is operating, then ensure purge exhaust radiation monitor is operable or obtain periodic samples as currently specified in the Offsite Dose Calculation Manual (ODCM).	T1R16 (Fall 2005)

COMMITMENT	COMMITTED DATE OR "OUTAGE"
4) Whenever the hatch is open, position a portable radiation monitor at the Reactor Building Equipment Hatch opening. 5) If the purge system is operated with the Reactor Building Equipment Hatch open, then bypass the Reactor Building purge exhaust high radiation interlock. 6) Prior to initiating irradiated fuel movement with the Reactor Building Equipment Hatch open, verify the purge system is operating.	

ENCLOSURE 4

Revised TS Page Markups

Revised Technical Specification Pages

3-44
3-45
3-45a

3.8 FUEL LOADING AND REFUELING

Applicability: Applies to fuel loading and refueling operations.

Objective: To assure that fuel loading and refueling operations are performed in a responsible manner.

Specification

3.8.1 Radiation levels in the Reactor Building refueling area shall be monitored by RM-G6 and RM-G7. Radiation levels in the spent fuel storage area shall be monitored by RM-G9. If any of these instruments become inoperable, portable survey instrumentation, having the appropriate ranges and sensitivity to fully protect individuals involved in refueling operation, shall be used until the permanent instrumentation is returned to service.

3.8.2 Core subcritical neutron flux shall be continuously monitored by at least two neutron flux monitors, each with continuous indication available, whenever core geometry is being changed. When core geometry is not being changed, at least one neutron flux monitor shall be in service.

3.8.3 At least one decay heat removal pump and cooler shall be operable.

3.8.4 During reactor vessel head removal and while loading and unloading fuel from the reactor, the boron concentration shall be maintained at not less than that required for refueling shutdown.

3.8.5 Direct communications between the control room and the refueling personnel in the Reactor Building shall exist whenever changes in core geometry are taking place.

3.8.6 During the handling of irradiated fuel in the Reactor Building at least one door in each of the personnel and emergency air locks shall be capable of being closed.* The equipment hatch cover shall be in place with a minimum of four bolts securing the cover to the sealing surfaces.

INSERT "A"

3.8.7 During the handling of irradiated fuel in the Reactor Building, each penetration providing direct access from the containment atmosphere to the outside atmosphere shall be either:

1. Closed by an isolation valve, blind flange, manual valve, or equivalent, or capable of being closed,* or

2. Be capable of being closed by an operable automatic containment purge and exhaust isolation valve.

the Reactor Building Purge Exhaust System is in service,

*Administrative controls shall ensure, that appropriate personnel are aware that air lock doors and/or other penetrations are open, a specific individual(s) is designated and available to close the air lock doors and other penetrations as part of a required evacuation of containment. Any obstruction(s) (e.g., cable and hoses) that could prevent closure of an air lock door or other penetration will be capable of being quickly removed.

3.8.8 If any of the above specified limiting conditions for fuel loading and refueling are not met, movement of fuel into the reactor core shall cease; action shall be initiated to correct the conditions so that the specified limits are met, and no operations which may increase the reactivity of the core shall be made.

3.8.9 The reactor building purge isolation valves, and associated radiation monitors which initiate purge isolation, shall be tested and verified to be operable no more than 7 days prior to initial fuel movement in the reactor building.

3.8.10 Irradiated fuel shall not be removed from the reactor until the unit has been subcritical for at least 72 hours.

3.8.11 During the handling of irradiated fuel in the Reactor Building at least 23 feet of water shall be maintained above the level of the reactor pressure vessel flange, as determined by a shiftly check and a daily verification. If the water level is less than 23 feet above the reactor pressure vessel flange, place the fuel assembly(s) being handled into a safe position, then cease fuel handling until the water level has been restored to 23 feet or greater above the reactor pressure vessel flange.

Bases

Detailed written procedures will be available for use by refueling personnel. These procedures, the above specifications, and the design of the fuel handling equipment as described in Section 9.7 of the UFSAR incorporating built-in interlocks and safety features, provide assurance that no incident could occur during the refueling operations that would result in a hazard to public health and safety. If no change is being made in core geometry, one flux monitor is sufficient. This permits maintenance on the instrumentation. Continuous monitoring of radiation levels and neutron flux provides immediate indication of an unsafe condition. The decay heat removal pump is used to maintain a uniform boron concentration. The shutdown margin indicated in Specification 3.8.4 will keep the core subcritical, even with all control rods withdrawn from the core (Reference 1). The boron concentration will be sufficient to maintain the core $k_{eff} \le 0.99$ if all the control rods were removed from the core, however only a few control rods will be removed at any one time during fuel shuffling and replacement. The k_{eff} with all rods in the core and with refueling boron concentration is approximately 0.9. Specification 3.8.5 allows the control room operator to inform the reactor building personnel of any impending unsafe condition detected from the main control board indicators during fuel movement.

Per Specification 3.8.6 and 3.8.7, the personnel and emergency air lock doors, and penetrations may be open during movement of irradiated fuel in the containment provided a minimum of one door in each of the air locks, and penetrations are capable of being closed in the event of a fuel handling accident, and the plant is in REFUELING SHUTDOWN or REFUELING OPERATION with at least 23 feet of water above the fuel seated within the reactor pressure vessel. The minimum water level specified is the basis for the accident analysis assumption of a decontamination factor of 200 for the release to the containment atmosphere from the postulated damaged fuel rods located on top of the fuel core seated in the reactor vessel. Should a fuel handling accident occur inside containment, a minimum of one door in each personnel and emergency air lock, and the open penetrations will be closed following an evacuation of containment. Administrative controls will be in place to assure closure of at least one door in each air lock, as well as other open containment penetrations, following a containment evacuation.

INSERT B → ¶

Provisions for equivalent isolation methods in Technical Specification 3.8.7 include use of a material (e.g. temporary sealant) that can provide a temporary, atmospheric pressure ventilation barrier for other containment penetrations during fuel movements.

Specification 3.8.9 requires testing of the reactor building purge isolation system. This system consists of the four reactor building purge valves and the associated reactor building purge radiation monitor(s). The test verifies that the purge valves will automatically close when they receive initiation signals from the radiation detectors that monitor reactor building purge exhaust. The test is performed no more than 7 days prior to the start of fuel movement in the reactor building to ensure that the monitors, purge valves, and associated interlocks are functioning prior to operations that could result in a fuel handling accident within the reactor building. ~~For conservatism,~~ The Fuel Handling Accident analysis assumes that the four purge valves remain open~~.~~, and the valves remain open when the isolation system is bypassed.

Specification 3.8.10 is required as the safety analysis for the fuel handling accident was based on the assumption that the reactor had been shutdown for 72 hours (Reference 2).

REFERENCES

(1) UFSAR, Section 14.2.2.1 - "Fuel Handling Accident"

(2) UFSAR, Section 14.2.2.1(2) - "FHA Inside Containment"

TMI Unit 1 Technical Specification Page Markups

Insert "A" to Technical Specification 3.8.6 (TS Page 3-44)

-------------------------------- NOTE --------------------------------

The equipment hatch may be open if all of the following conditions are met:

1) The Reactor Building Equipment Hatch Missile Shield Barrier is capable of being closed within 45 minutes,
2) A designated crew is available to close the Reactor Building Equipment Hatch Missile Shield Barrier, and
3) Reactor Building Purge Exhaust System is in service.

Insert "B" to Technical Specification 3.8 Bases (TS Page 3-45)

Specification 3.8.6 is modified by a NOTE:

NOTE

The equipment hatch may be open if all of the following conditions are met:

1) The Reactor Building Equipment Hatch Missile Shield Barrier is capable of being closed within 45 minutes,
2) A designated crew is available to close the Reactor Building Equipment Hatch Missile Shield Barrier, and
3) Reactor Building Purge Exhaust System is in service.

These restrictions include administrative controls to allow the opening of the reactor building equipment hatch during the handling of irradiated fuel in the Reactor Building provided that 1) The Reactor Building Equipment Hatch Missile Shield Barrier is capable of being closed within 45 minutes, 2) A designated crew is available to close the Reactor Building Equipment Hatch Missile Shield Barrier, and 3) Reactor Building Purge Exhaust System is in service. The Reactor Building Equipment Hatch Missile Shield Barrier includes steel plating on the bottom of the shield structure, which acts to restrict a release of post-accident fission products. The capability to close the reactor building missile shield barrier includes requirements that the barrier is capable of being closed and that any cables or hoses across the opening have quick disconnects to ensure the barrier is capable of being closed within 45 minutes. The 45-minute closure time for the reactor building missile shield barrier starts when the control room communicates the need to shut the Reactor Building Equipment Hatch Missile Shield Barrier. This 45-minute requirement is significantly less than the fuel handling accident analysis assumption that the reactor building remains open to the outside environment for a two-hour period subsequent to the accident. Placing reactor building purge exhaust in service will ensure any release from the reactor building will be monitored, and ensure continued air flow into the Reactor Building in the event of a fuel handling accident. The Reactor Building purge valve high radiation interlock will be bypassed to ensure continued air flow into the Reactor Building in the event of a Fuel Handling Accident.

The administrative controls will also include the responsibility to be able to communicate with the control room, and the responsibility to ensure that the reactor building missile shield barrier is capable of being closed in the event of a fuel handling accident. These administrative controls will ensure reactor building closure would be established in the event of a fuel handling accident inside containment.