The University of Michigan
MICHIGAN MEMORIAL PHOENIX PROJECT

PHOENIX MEMORIAL LABORATORY
FORD NUCLEAR REACTOR
ANN ARBOR, MI 48109-2100

28 February 2006

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

Docket 50-2, License R-28

Subject: Ford Nuclear Reactor – Technical Specification Amendment Request, Revision 01

Dear Sir:

The University of Michigan's, Ford Nuclear Reactor is submitting a revision to the Reactor Building Confinement section of the Technical Specification Amendment: *Elimination and Relaxation of Specifications Following Permanent Cessation of Operations* date 8 September 2005. Only this section of the amendment request is being revised.

This revision is in response to the questions arising from the NRCs review of our previous submitted submissions as communicated from our NRC Project Manager. The changes that resulted are 1) maintaining the reactor building exhaust as Geiger Mueller detector vice a continuous air monitor, and 2) maintaining the requirement for the reactor building evacuation audible alarm which was accidentally omitted from the changed Technical Specifications.

If there are any questions regarding this information, please feel free to contact Christopher W. Becker at (734) 764-6224.

I declare under penalty of perjury that the foregoing is, to the best of my knowledge, true and correct.

Signature: _____ Executed on: 2/28/06

Steven L. Ceccio, Ph.D.
Director Michigan Memorial Phoenix Project

Enclosure: Reactor Building Confinement Section of the Analysis
Technical Specification: Amendment XX, revised.

Cc: Patrick Isaac

File: Correspondence 06-006
License Amendment – Elimination of Specifications following shutdown

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Reactor Building Confinement (Revised)

The reactor building is designed to restrict leakage and is equipped with a general ventilation system that provides the primary heating for the building and exhausts through a stack on the roof. Supply air and primary exhaust air are drawn through the air handling equipment room, where all supply air enters the building and most exhaust air is pushed to the stack on the roof. Both the supply and exhaust ducts can be isolated by dampers to establish confinement and utilize single pneumatic cylinder which holds the dampers open using the reactor building compressed air system. A signal from the building exhaust monitoring system described in the following section can cause the pneumatic cylinder to vent, closing both dampers. A smaller exhaust ventilation system in the reactor building is also connected to the a laboratory exhaust stack in the contiguous Phoenix Memorial Laboratory (PML). This system draws air from the reactor building via a bolted flange to two circular ducts that are sleeved through the north wall of PML and the south wall of the reactor building.

Previous evaluations of the potential radiation exposure to persons at the operations boundary (outside the reactor building) following an accidental release of fission products within the reactor building used a leakage rate from the reactor building of 10% of the building volume per day and concluded that the accident doses would be acceptable. To ensure the basis of this evaluation the Technical Specifications requires the following automatic actions upon the detection of a radiation level or release of radioactive materials from the reactor building exhaust system equal to or greater than the limits discussed in the following section: a) The reactor building ventilation supply and exhaust fans shall automatically turn off; b) The reactor building ventilation supply and exhaust dampers shall automatically close; c) Unless the duct is otherwise closed or sealed shut, the beam port exhaust damper to Stack 2 shall automatically close; and d) Unless the duct is otherwise closed or sealed shut, the room 3103 hood exhaust damper to Stack 2 shall automatically close. These conditions are continued from the previous license, except that the automatic closure of the dampers to stack 2 is not required if the duct is otherwise closed, i.e. the damper has been manually closed, or the penetrations through the reactor building wall have been mechanically sealed, i.e. permanently closed.

It is proposed that the operation of the required dampers be tested quarterly. Experience with testing these dampers for the past years of operation of the reactor shows that this interval is sufficient to ensure their ability to provide automatic isolation when the radiation level in the reactor building exhaust system is equal to or greater than the limits discussed in the following section. The proposed quarterly functional confinement closure test is also consistent with the recommendation of ANSI 15.1 (1990), *The Development of Technical Specifications for Research Reactors.*

Additionally, during the conduct of activities within the reactor building which could lead to the release of radioactivity from the facility the following conditions will continue to be administratively controlled: a) Personnel access doors will be closed except as necessary for the passage of personnel or equipment; b) The main equipment access door onto the beam port floor will be opened only long enough to permit the passage of equipment; c) The personnel door to the cooling tower area will remain closed except to permit the passage of personnel or equipment to the cooling tower area; d) The access hatch from grade level to the beam port floor will be sealed closed. and e) The personnel exit door located in the north wall of the building will be sealed.

The semiannual inspection of the gaskets for the building ventilation system intake and exhaust dampers, the personnel access doors, the equipment access doors, and cooling tower access door will continue.

To facilitate equipment access for decommissioning it is requested that the door located on the beamport floor which connects to the PML hot cave operating area also be allowed to be administratively controlled as closed except to permit the passage of personnel or equipment. This 4 foot 8 inch by 6 foot 8 inch opening on the east side of the reactor pool was administratively kept closed because it was not needed during reactor operation and it would have interfered with the operation of the north hot cell and the beam port experiments. However, the usage of this door for equipment during decommissioning is requested. This opening is only 44% of the opening for the main equipment access door onto the beam port floor, on the opposite side of the reactor pool, already controlled administratively under the Technical Specifications.

The applicability of the requirement for the building confinement and its surveillance is proposed until that point during decommissioning where the removal of radioactive materials from the facility reduces the quantity of radioactive

materials in unsealed form, on foils or plated sources, or sealed in glass contained in the reactor building to less than 1.5 x 10^{-2} times the quantity of materials listed in 10 CFR 30.72, *Schedule C.* A quantity of radioactive materials 1.5 x 10^{-2} times the quantity of materials listed in 10 CFR 30.72, *Schedule C*, was selected to account for the difference of the 1 rem limit in 10 CFR 30.32(i)(1)(i) and the 15 mrem limit for an Unusual Event (the lowest level of emergency for a non-power reactor). This facilitates increased equipment access for subsequent decommissioning activities and would allow the use of the access hatch from grade level through the beam port floor ceiling the west side of the first floor of the reactor building. This access hatch contains four removable slabs which, when lifted out, provide a 21 ½ foot by 6 foot opening to the parking area. These removable slabs will be needed to facilitate the removal of large sections of the reactor pool from the reactor building. The 129 square feet of opening provided by these removable slabs is 80% larger than the next largest opening in the reactor building. This also allows for the placement of holes in the roof of the reactor building through which an external crane can lift large items within the reactor building.

Building Exhaust Radiation Monitor

The building exhaust radiation monitor is a gamma radiation detector which utilizes a Geiger Mueller tube to measure the radiation level in the building air exhaust plenum. When the radiation levels measured by this detector exceed 1 mrem/hr, the building exhaust radiation monitor sounds an alarm in the control room and the building evacuation alarm is actuated. The building exhaust radiation monitor also scrams the reactor automatically, shuts down the reactor building supply and exhaust fans, and closes the reactor building supply and exhaust dampers.

With the permanent cessation of operations (Amendment 47 dated 29 January 2004) the requirement for an automatic scram to secure the reactor and eliminate the production of radiation is not required. Additionally the providing an alarm in the control room is no longer appropriate as personnel are not usually present in the control room.

A concentration of gamma emitting nuclides of10^{-3} to 10^{-4} micro curies per cubic centimeter in the exhaust plenum is estimated to produce a gamma exposure of 1.0 mrem/hr as measured by the Geiger Mueller tube in the building exhaust radiation monitor (taken from the current FNR licensing basis). This building exhaust gamma radiation monitor will continue to provide the automatic protective actions necessary for isolating the reactor building ventilation system as described above.

As a limiting condition for operation, the building exhaust radiation monitor shall be operable whenever the quantity of radioactive materials in unsealed form, on foils or plated sources, or sealed in glass contained in the reactor building exceeds the 1.5 x 10^{-2} times the quantities in 10 CFR 30.72, *Schedule C - Quantities of Radioactive Materials Requiring Consideration of the Need for an Emergency Plan for Responding to a Release* AND one or more of the following is open: 1) the reactor building supply damper, 2) the reactor building exhaust damper, 3) the beam port exhaust damper to Stack 2, or 4) the room 3103 hood exhaust dampers to Stack 2. Additionally, the building evacuation alarm is no longer required once the quantity of radioactive materials in unsealed form, on foils or plated sources, or sealed in glass contained in the reactor building is less than 1.5 x 10^{-2} times the quantities in 10 CFR 30.72, *Schedule C - Quantities of Radioactive Materials Requiring Consideration of the Need for an Emergency Plan for Responding to a Release*

It is proposed that the building exhaust radiation monitor may be out of service for one week, but no activities which could lead to the release of radioactivity from the facility may conducted within the reactor building during this period. This allows for repair, calibration or replacement of the instruments during periods where the probability of a release of radioactivity from the facility is minimal.

The applicability of the requirement for the building exhaust radiation monitor shall be maintained until that point where the removal of radioactive materials from the facility reduces the quantity of radioactive materials in unsealed form, on foils or plated sources, or sealed in glass contained in the reactor building to less than 1.5 x 10^{-2} times the quantity of materials listed in 10 CFR 30.72, *Schedule C* which require an Emergency Plan. The 1.5 x 10^{-2} times is to account for the difference between the 1 rem limit in 10 CFR 30.(i)(1)(i) and the lower 15 mrem limit for an Unusual Event (the lowest level of emergency for a non-power reactor). Once the quantity of radioactive materials in unsealed form, on foils or plated sources, or sealed in glass contained in the reactor building has been reduced to less than 1.5 x 10^{-2} times the quantity of materials listed in 10 CFR 30.72, *Schedule C,* then the removal of the need for the automatic protective actions associated with the reactor building exhaust radiation monitor or the continuous air monitor may be removed.

The parallel comes from byproduct material licensee decrease in quantity of radioactive materials below the requirement for an emergency plan. The licensee recognizes that the requirements of 10 CFR 20.1301, *Dose Limits for Individual Members of the Public* would continue to apply subject to the allowances of 10 CFR 20.1302, *Compliance with Dose Limits for Individual Members of the Public.*

If required to be operational, then the building exhaust radiation monitor shall be calibrated annually (same as in the current technical specifications). It is proposed that when required to be operational, the reactor building exhaust radiation monitor shall be tested quarterly while required to be operational. This periodicity is consistent with the testing of the confinement functions presented in the section above and recommendation of monthly to quarterly from ANSI 15.1 (1990).

The proposed Technical Specifications are:

3.3 FNR Confinement

Applicability:
This specification applies whenever the quantity of radioactive materials in unsealed form, on foils or plated sources, or sealed in glass contained in the reactor building exceeds 1.5 x 10^{-2} times the quantities in 10 CFR 30.72, *Schedule C - Quantities of Radioactive Materials Requiring Consideration of the Need for an Emergency Plan for Responding to a Release.*

Objective:
1. To assure that automatic protective action is initiated to limit the release of radioactive effluents from the reactor building when required.

2. To provide an audible alarm within the reactor building to initiate evacuation when required.

3. To assure that the FNR reactor building confinement integrity is maintained when required.

Specification
1. While the quantity of radioactive materials in unsealed form, on foils or plated sources, or sealed in glass contained in the reactor building exceeds 1.5 x 10-2 times the quantities in 10CFR30.72, Schedule C, AND whenever one or more of the following is open: 1) the reactor building supply damper, 2) the reactor building exhaust damper, 3) the beam port exhaust to Stack 2, or 4) the room 3103 hood exhaust to Stack 2 THEN:

   Gamma Radiation Detector

   a. A gamma radiation detector which utilizes a Geiger Mueller tube to measure the radiation level in the building air exhaust plenum shall be operating,
   b. When the radiation detector which utilizes a Geiger Mueller tube to measure the radiation level in the building air exhaust plenum indicates a dose rate equal to or greater than 1 mrem/hr, THEN
      i. The reactor building ventilation supply and exhaust fans shall automatically turn off;
      ii. The reactor building ventilation supply and exhaust dampers shall automatically close;
      iii. IF open, THEN the beam port exhaust damper to Stack 2 shall automatically close OR IF the penetration through the reactor building wall is mechanically sealed, THEN no action is required,
      iv. IF open, THEN the room 3103 hood exhaust damper to Stack 2 shall automatically close OR IF the penetration through the reactor building wall is mechanically sealed, THEN no action is required,

      AND

      v. An audible alarm is sounded in the reactor building to initiate evacuation.

The gamma radiation detector which utilizes a Geiger Mueller tube to measure the radiation level in the building

air exhaust plenum may be out of service, BUT during that period, no activities which could lead to the release of radioactivity from the facility may conducted within the reactor building. This restriction does not apply to activities required for restoring the monitoring system to service.

2. While the quantity of radioactive materials in unsealed form, on foils or plated sources, or sealed in glass contained in the reactor building exceeds 1.5×10^{-2} times the quantities in 10 CFR 30.72, *Schedule C*, THEN the following conditions shall be administratively controlled:

   a. Personnel access doors will be closed except as necessary for the passage of personnel and/or equipment;
   b. The main equipment access door onto the beam port floor will be opened only long enough to permit the passage of equipment;
   c. The personnel door to the cooling tower area will remain closed except to permit the passage of personnel and/or equipment to the cooling tower area;
   d. The door located on the beam port floor which connects to the Phoenix Memorial Laboratory hot cave operating area will remain closed except to permit the passage of personnel and/or equipment,

      AND

   e. The access hatch from grade level to the beam port floor AND the personnel exit door located in the north wall of the building will be sealed closed.

Bases:

The potential radiation exposure to persons at the operations boundary following an accident releasing fission products within the confinement building has been evaluated. The evaluation used a leakage rate from the confinement building of 10% of the building volume per day, and concluded that the accident doses would be acceptable. Conformance to Specifications 3.3.1 and 3.3.2 will assure that the building leak rate will not exceed the leak rate used in the evaluation.

The 1.0 mrem/hr set point for the facility exhaust radiation monitor provides a mechanism for isolating the building ventilation system in the event of a significant release of radioactive material into the reactor building. This setpoint, for the detector location involved, represents a gamma emitting nuclide concentration of 10-3 to 10-4 microcuries/cc of building air.

By requiring that the access doors and equipment hatch remain closed, except for brief, attended periods to permit personnel or equipment passage, the integrity of the confinement will be maintained at or above the level assumed in the Hazards Summary Report, and the release of radioactive material will be minimized.

4.3 FNR Confinement

Applicability:
These surveillance requirements apply whenever the quantity of radioactive materials in unsealed form, on foils or plated sources, or sealed in glass contained in the reactor building exceeds 1.5×10^{-2} times the quantities in 10 CFR 30.72, *Schedule C - Quantities of Radioactive Materials Requiring Consideration of the Need for an Emergency Plan for Responding to a Release.*

Objective:
1. To assure that automatic protective action is initiated to limit the release of radioactive effluents from the reactor building when required.

2. To assure that the audible alarm within the reactor building is available to initiate evacuation when required.

3. To assure that the FNR reactor building confinement integrity is maintained when required.

Specification

1. Gamma Radiation Detector
   a. The gamma radiation detector which utilizes a Geiger Mueller tube to measure the radiation level in the building air exhaust plenum shall be calibrated annually, AND
   b. The ability of the radiation detector which utilizes a Geiger Mueller tube to measure the radiation level in the building air exhaust plenum to initiate the automatic protective action required by 3.3.1.b shall be tested quarterly.

2. The condition of the following gaskets shall be inspected semiannually, and the gaskets shall be replaced whenever any evidence of deterioration is found:
   a. Building ventilation system intake and exhaust dampers;
   b. Personnel access doors;
   c. Equipment access doors;
   d. Cooling tower access door.

Basis

The gamma radiation detector which utilizes a Geiger Mueller tube to measure the radiation level in the building air exhaust plenum has been calibrate annually for most of the operating history of the FNR. This instrument has displayed excellent reliability over many years of operation. The semiannual inspection of the gasket materials has been occurring for most of the operating history of the FNR. These materials are not in a damaging environment and semiannual inspection has been found sufficient to assure that the gasket will perform their function of limiting leakage through these openings in the event of a release of airborne radioactivity within the reactor building.

5.3 Reactor Building

The reactor building is a windowless, four story, reinforced concrete building with 12 inch walls structurally integral with the footings and foundation mats. The building is approximately 69 feet wide x 68 feet long x 70 feet high with approximately 44 feet exposed above grade. The building has the following general features:

1. The reactor is housed in a closed room designed to restrict leakage.
2. The reactor room is equipped with a ventilation system designed to exhaust air or other gases present in the building atmosphere into an exhaust stack which exhausts a minimum of 54 feet above ground level.
3. The ventilation system provides ventilation for certain storage and experimental facilities and exhausts these a minimum of 54 feet above ground level.
4. The openings into the reactor building are an equipment access door, three personnel doors, an equipment access hatch, air intake and exhaust ducts, room 3103 fume hood exhaust duct, beam port ventilation duct, a sealed north wall door, a door between the hot cave operating face and the beam port floor, a sealed foundation tile drain to the cold sump, and a pneumatic tube system for sample transfer between the FNR and several laboratories in the Phoenix Memorial Laboratory.

These design features apply until the quantity of radioactive materials in unsealed form, on foils or plated sources, or sealed in glass contained in the reactor building is less than 1.5×10^{-2} times the quantities in 10 CFR 30.72, *Schedule C - Quantities of Radioactive Materials Requiring Consideration of the Need for an Emergency Plan for Responding to a Release*.