October 4, 2013

Mr. Terrence Alexander, Executive Director
Department of Occupational Safety
& Environmental Health
Campus Safety Services Building
1239 Kipke Drive
University of Michigan
Ann Arbor, MI 48109-1010

SUBJECT: NRC INSPECTION REPORT 05000002/2012002(DNMS) – FORD NUCLEAR REACTOR

Dear Mr. Alexander:

On September 11, 2013, the U.S. Nuclear Regulatory Commission (NRC) completed inspection activities at the Ford Nuclear Reactor. The purpose of the inspection was to determine whether the decommissioning activities were conducted safely and in accordance with NRC requirements. Specifically, during an onsite inspection on December 3 – 6, 2012, and subsequent in-office review through September 11, 2013, the inspector evaluated decommissioning performance and performed independent radiation surveys and sampling activities assisted by personnel from Oak Ridge Associated Universities (ORAU). At the conclusion of the on-site inspection, the inspector discussed the interim inspection results with you and members of your staff. A final report from ORAU with the results of the surveys and sampling was provided to the NRC on August 1, 2013. At the conclusion of the in-office review, a final telephone exit meeting was conducted on September 18, 2013, to discuss the final results with members of your staff.

This inspection consisted of an examination of decommissioning activities at the Ford Nuclear Reactor as they relate to safety and compliance with the Commission's rules and regulations. Areas examined during the inspection are identified in the enclosed report. Within these areas, the inspection consisted of a selective examination of procedures and representative records, and interviews with personnel.

Based on the results of this inspection, the NRC did not identify any violations.

In accordance with Title 10 of the *Code of Federal Regulations* (CFR) 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Documents Access and Management System (ADAMS), accessible from the NRC website at http://www.nrc.gov/reading-rm/adams.html.

We will gladly discuss any questions you may have regarding this inspection.

Sincerely,

/RA by Wayne J. Slawinski Acting For/

Robert J. Orlikowski, Chief
Materials Control, ISFSI,
and Decommissioning Branch
Division of Nuclear Materials Safety

Docket No. 050-00002
License No. R-28

Enclosure:
Inspection Report 05000002/2012002(DNMS)

cc w/encl: V. Sick, University of Michigan
M. Driscoll, University of Michigan
K. Yale, State of Michigan

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No.	050-00002
License No.	R-28
Report No.	05000002/2012002(DNMS)
Licensee:	University of Michigan
Facility:	Ford Nuclear Reactor
Location:	Ann Arbor, Michigan
Dates:	December 3 – 6, 2013 (on-site) through September 11, 2013 (in-office review)
Inspector:	Jeremy Tapp, Health Physicist
Observer:	Stephen Giebel, Health Physicist, FSME
Approved by:	Robert J. Orlikowski, Chief Materials Control, ISFSI, and Decommissioning Branch Division of Nuclear Materials Safety

Enclosure

EXECUTIVE SUMMARY

University of Michigan - Ford Nuclear Reactor
NRC Inspection Report 05000002/2012002(DNMS)

The University of Michigan Ford Nuclear Reactor (FNR) has completed all physical remediation work in the reactor building. The licensee was performing final status surveys during the on-site inspection to justify the building is suitable for unrestricted use. At the time of this report issuance, the licensee has completed all final status surveys. This decommissioning inspection included an assessment of the licensee's current performance related to decommissioning activities by observing the performance of final status surveys, interviewing site personnel, and performing independent confirmatory and in-process radiation surveys and sampling. The confirmatory and in-process surveys and associated sampling were performed with the assistance of personnel from Oak Ridge Associated Universities (ORAU) and were all located within the FNR building. In addition, an assessment was performed of the licensee's actions and FNR building condition from a flooding event on January 28, 2013, that resulted from a fire suppression line rupture on the second floor of the FNR building.

Inspection of Remedial and Final Surveys at Permanently Shutdown Reactors

- The inspector determined that the in-process final status surveys observed were performed adequately and in accordance with the Final Status Survey Plan (FSSP) requirements. Areas toured by the inspector where final status surveys had been completed were adequately posted and controlled.

  The results of the confirmatory surveys demonstrated that surface scans, surface activity measurements, and radionuclide concentrations in soil samples documented in the ORAU final report were all consistent with the licensee's and below the U.S. Nuclear Regulatory Commission (NRC) approved radiological criteria for unrestricted use of the site. For the survey units where release records were reviewed, all results were less than the NRC approved release criteria and were in accordance with Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) guidance and the requirements of the FSSP. (Section 1.1)

- The inspector determined that the licensee performed adequate surveys to show the radiological conditions of the FNR facility in the post-flood condition had not changed and the final status surveys performed were still applicable. The inspector also determined that the licensee implemented adequate corrective actions to prevent recurrence of this flooding event. (Section 1.2)

Report Details

1.0 Inspection of Remedial and Final Surveys at Permanently Shutdown Reactors (IP 83801)

1.1 In-Process and Confirmatory Surveys

a. Inspection Scope

The inspector, with the assistance of personnel from ORAU, toured and performed in-process and confirmatory surveys of the FNR facility, and reviewed radiological surveys and records for the site to determine the adequacy and accuracy of the licensee's final status surveys (FSS). In addition, the inspector interviewed licensee personnel and observed the licensee perform FSS activities.

The licensee had not completed all FSSs at the time of the on-site inspection so in-process surveys were performed in areas where the licensee was working and confirmatory surveys where FSSs were completed. The licensee's FNR facility was divided into five levels: Basement, 1st Floor, 2nd Floor, 3rd Floor, and 4th Floor. Since the licensee had completed some or all FSSs on the Basement and 3rd Floor levels, confirmatory surveys were performed for those locations. The licensee had just begun work on the 1st and 2nd Floors so in-process surveys were performed there. Only judgmental surface scans for gamma and beta activity were performed on the 4th Floor since the licensee had not yet performed FSSs there. All confirmatory surveys consisted of high-density gamma and beta surface scans, direct measurements for total beta activity at random locations, and smear samples at select direct measurement locations. All in-process surveys consisted of medium- to high-density gamma and beta surface scans with an additional side-by-side direct measurement comparison for beta activity of ten locations performed in Survey Unit 3-1, located in Corridor 3101 on the 3rd Floor. Two judgmental surface soil samples were collected from the Basement level based on the results of gamma scans and previously identified contamination that was present before the licensee performed cleanup or remediation activities. In addition, the licensee submitted five soil samples from the 1st Floor to ORAU for analysis to perform an inter-laboratory comparison to determine the adequacy and accuracy of the licensee's contract laboratory results.

The licensee's FSSP, which is located in the Decommissioning Plan, was reviewed to determine if it met current industry and Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) guidance, and survey unit release records were reviewed to determine if they were in accordance with the approved FSSP and MARSSIM guidance.

b. Observations and Findings

The inspector initially toured the FNR facility in areas that both FSSs had been and had not been completed. For areas that were complete or were in progress, they were adequately posted and controlled to prevent any cross contamination from other areas of the facility that could affect FSS results. For areas that FSSs had not been started, the inspector noted the conditions appeared suitable to perform FSS activities. During tours and observations performed throughout the on-site inspection, the inspector interviewed site personnel performing FSSs and they demonstrated an adequate understanding of FSS requirements.

During the ORAU review of the licensee's FSSP, they identified that a surface efficiency that was not in accordance with MARSSIM guidance was described to be used for calculating the total efficiency of radiological instruments. The licensee's FSSP stated that 0.37 would be applied. MARSSIM guidance prescribes that in the absence of site-specific data, 0.25 should be used for beta emitters with a maximum energy between 0.15 and 0.4 megaelectron volts (MeV) and 0.5 should be applied for maximum beta energies above 0.4 MeV. After discussions with ORAU and the NRC, which included a review of past industry practice and ORAU's survey results for the FNR facility, the licensee conservatively decided to assign a surface efficiency of 0.25 to all beta emitters and used that value for all applicable FSSs.

The inspector reviewed the ORAU final report (ML13254A171) of confirmatory and in-process surveys and sampling performed for the FNR facility. The inspector noted that ORAU surface scans had identified elevated activity in two areas when compared to the surrounding readings that were at or near background. The first area was on a wall outside Room 3103 and the second area was in the southwest section on the 1st Floor. The first area, even though it had elevated activity, was below the licensee's cleanup level or derived concentration guideline level (DCGL). The licensee remediated it to background levels. The second area was determined not to be from residual contamination in the FNR facility but due to gamma radiation shine from a neighboring source storage area. The inspector also noted that: (1) the total mean surface activity values from the licensee were within two standard deviations of the mean determined by ORAU, (2) all surface activity values were less than the required gross beta DCGL, and (3) the two judgmental soil samples taken from the Basement level were less than the required DCGLs. Lastly, the inspector noted that for the inter-lab comparison of five soil samples, ORAU determined for one sample that only the Cobalt (Co)-60 result was slightly below the 99% confidence level when comparing each laboratory's results, but overall, all sample results were consistent with the licensee's and well below the required DCGLs.

The inspector found that for the release records reviewed, all survey unit walkover scans, surface activity measurements, and soil sampling results were below the DCGLs and therefore, met the release criteria approved by the NRC. In addition, a retrospective analysis performed by ORAU determined that for the release records reviewed, the licensee met the requirements of the FSSP.

No findings of significance were identified.

c. Conclusions

The inspector determined that the in-process final status surveys observed were performed adequately and in accordance with the FSSP requirements. Areas toured by the inspector where final status surveys had been completed were adequately posted and controlled.

The results of the confirmatory surveys demonstrated that surface scans, surface activity measurements, and radionuclide concentrations in soil samples documented in the ORAU final report were all consistent with the licensee's and below the NRC approved radiological criteria for unrestricted use of the site. For the survey units where release

records were reviewed, all results were less than the NRC approved release criteria and were in accordance with MARSSIM guidance and the requirements of the FSSP.

1.2 FNR Flood

a. Inspection Scope

On January 28, 2013, a four inch fire water suppression line ruptured on the 2nd Floor of the FNR facility and caused flooding of portions of the 1st and Basement levels. In addition, a small portion of the water drained into an adjacent building's basement tunnel and eventually that building's sanitary sewer system and retention tank pit area. The inspector reviewed the circumstances surrounding the flooding event and the licensee's follow-up actions to determine if it had the potential to affect the applicability of the final status surveys already completed in the FNR facility, and that appropriate corrective actions were taken to prevent recurrence. This review consisted of interviews of licensee personnel, review of the licensee's event report, and analysis of five split samples collected by the licensee by the NRC's independent contractor, ORAU.

b. Observations and Findings

During the review of the licensee's event report, the inspector noted that most of the water flowed through cutout areas in the 1st Floor created by the removal of embedded piping and into the basement below. Most of the water escaped through the cutouts in the 1st Floor and basement where the soil beneath the building was exposed. Due to the 1st Floor cutouts being exposed to soil, soil and sediments were washed into the lower levels of the basement and the base of the reactor pool and hold-up tank area since that area is open to the 1st Floor above.

The licensee collected water and sediment/soil samples the day following the flooding event from the basement and reactor pool and hold-up tank area. These samples were analyzed for the contaminants of concern in the facility to determine if there had been migration and/or concentration of them. No contamination was identified in the water or soil/sediment samples. The licensee also performed a comprehensive radiological survey of the impacted areas of the flood by performing surface scans, surface activity measurements, and removable activity analyses. No detectable activity was found during the surveys. In addition, a contamination survey was performed in the impacted areas of the adjacent building to determine if any contaminated materials had migrated into those areas. All surveys revealed no contamination.

Because a large portion of the water escaped through the exposed soil beneath the FNR building, the licensee collected a ground water sample from a monitoring well down gradient from that area. The inspector noted that no contaminants of concern applicable to the FNR facility were detected.

The licensee collected five split soil samples to analyze in areas with the highest potential for residual contamination to remain after the flood waters had escaped, which were independently analyzed by NRC's contractor, ORAU. The results were documented in the ORAU final report referenced in Section 1.1 above and all results were below the applicable DCGLs and consistent with the licensee's.

The inspector noted that appropriate actions were taken to prevent recurrence that included turning off the water to the fire suppression line that ruptured and performing an extent of condition review for other piping remaining in the FNR building. It was determined that only one other active water line remained in the building in the 1st Floor stairwell. Since the licensee has determined the break occurred due to freeze/thaw weather and a lack of heat in the building, a temperature history review was performed for the 1st Floor stairwell. This review showed it has never dropped below 36 degrees Fahrenheit during the past four years in that area.

No findings of significance were identified.

c. Conclusions

The inspector determined that the licensee performed adequate surveys to show the radiological conditions of the FNR facility in the post-flood condition had not changed and the final status surveys performed were still applicable. The inspector also determined that the licensee implemented adequate corrective actions to prevent recurrence of this flooding event.

2.0 Exit Meeting Summary

The inspector presented the interim inspection results to licensee management at the conclusion of the onsite inspection on December 6, 2012. After an in-office review of the ORAU confirmatory and in-process survey final results was completed, a final exit teleconference was held on September 18, 2013. The licensee acknowledged the results presented.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

Licensee

M. Driscoll, Radiation Safety Officer
R. Blackburn, Assistant Manager of Laboratory Operations

INSPECTION PROCEDURES USED

IP 69013	Research and Test Reactor Decommissioning
IP 83801	Inspection of Final Surveys at Permanently Shutdown Reactors

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened	None
Closed	None
Discussed	None

LIST OF ACRONYMS USED

ADAMS	Agencywide Documents Access and Management System
CFR	Code of Federal Regulations
Co	Cobalt
DCGL	Derived Concentration Guideline Levels
DNMS	Division of Nuclear Material Safety
FNR	Ford Nuclear Reactor
FSS	Final Status Survey
FSSP	Final Status Survey Plan
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MeV	megaelectron volt
NRC	U.S. Nuclear Regulatory Commission
ORAU	Oak Ridge Associated Universities

DOCUMENTS REVIEWED

The following is a list of documents reviewed during the inspection. Inclusion on this list does not imply that the NRC inspectors reviewed the documents in their entirety, but rather, that selected sections of portions of the documents were evaluated as part of the overall inspection effort. Inclusion of a document on this list does not imply NRC acceptance of the document or any part of it, unless this is stated in the body of the inspection report.

ORAU; Independent Confirmatory Survey Summary and Results for the Ford Nuclear Reactor, Revision 1, Ann Arbor, Michigan; dated August 1, 2013 (ML13254A171)

Decommissioning Plan for the Ford Nuclear Reactor; dated November 2012

Reportable Occurrence # 24, Reactor Building Flood – Ruptured Fire Suppression Line; dated February 14, 2013

Final Status Survey Package, Survey Unit: Soil-2; dated December 17, 2012

Final Status Survey Package, Survey Unit: B-1; dated December 17, 2012

Final Status Survey Package, Survey Unit: B-2; dated December 17, 2012

Final Status Survey Package, Survey Unit: B-3; dated December 17, 2012

Final Status Survey Package, Survey Unit: B-4; dated December 17, 2012

Final Status Survey Package, Survey Unit: B-5; dated December 17, 2012

Final Status Survey Package, Survey Unit: B-6; dated December 17, 2012

Final Status Survey Package, Survey Unit: 3-3; dated December 18, 2012

Final Status Survey Package, Survey Unit: 3-4; dated December 18, 2012

Final Status Survey Package, Survey Unit: 3-5; dated December 18, 2012

Final Status Survey Package, Survey Unit: 3-6; dated December 18, 2012

Final Status Survey Package, Survey Unit: 3-7; dated December 18, 2012

Final Status Survey Package, Survey Unit: 3-8; dated December 18, 2012