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NORTHERN STATES POWER COMPANY

MINNEAPOLIS, MINNESOTA 55401

February 13, 1978

Director of Nuclear Reactor Regulation
U S Nuclear Regulatory Commission
Washington, DC 20555

MONTICELLO NUCLEAR GENERATING PLANT
Docket No. 50-263 License No. DPR-22

Replacement of Spent Fuel Storage Racks - Supplement 4

On August 17, 1977 we submitted a document entitled, "Design Report and Safety Evaluation for Replacement of Spent Fuel Pool Storage Racks, August 1977". Attached is Supplement 4 to that report. Because of the number of supplements to the initial report, a record of current pages is provided as part of Supplement 4.

Supplement 4 documents the type of neutron absorber material verification test that will be done at the reactor site. The traditional neutron source and neutron detector technique replaces the statistical technique previously proposed. Wording changes are identified by side-lining.

As was done with previous supplements, please file Supplement 4 as follows:

1. Remove the cover page and Page 26 of the August 17, 1977 report (which should now be filed with Supplements 1 through 3 incorporated).

2. Insert the attached cover sheet, record of current pages and pages 26 and 26A which are identified as Supplement 4, February 1978. The record of current pages should immediately follow the cover sheet.

3. Pages removed in step 1 above should either be discarded or attached to the end of the updated report for future reference. If the latter option is exercised, mark each of the obsolete pages conspicuosuly with the words, "SUPERCEDED - FEBRUARY 13, 1978.

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4. Verify that the report is complete and up to date by comparing it to the record of current pages.

L. O. Mayer

L O Mayer, PE
Manager of Nuclear Support Services

LOM/MHV/deh

cc: J G Keppler
G Charnoff

MONTICELLO NUCLEAR GENERATING PLANT

Docket No. 50-263 License No. DPR-22

August 1977

DESIGN REPORT AND SAFETY EVALUATION

FOR

REPLACEMENT OF SPENT FUEL POOL STORAGE RACKS

Incorporating:

Supplement 4
February 1978

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4.4 Material Considerations

All structural material used in fabrication of the new HDFSS is type 304 stainless steel. This material was chosen due to its corrosion resistance and its ability to be formed and welded with consistent quality. Boral* plates, used as a neutron absorber, are an integral non-structural part of the basic fuel storage tube. These plates are sandwiched between the inner and outer wall of the storage tube and are not subject to dislocation, deterioration or removal, either deliberate or inadvertent. The inner and outer walls of the storage tube are welded together at each end, thereby isolating the Boral plates from direct contact with Spent Fuel Pool (SFP) water. At normal pool water operating temperature there is no significant deterioration or corrosion of stainless steel or Boral.

Specifications were developed specifically for the High Density Fuel Storage System which impose requirements to implement and follow accepted and proven industry standards during the design, procurement, fabrication, installation and testing of the storage system. Periodic audits of the various facilities and practices are performed by certified quality assurance personnel to ensure that these QA/QC requirements are being met. All welding and nondestructive examination (NDE) is done in accordance with ASME Boiler & Pressure Vessel Code and the American Society for Nondestructive Testing (ASNT) requirements.

Storage module components are assembled and welded into modules in special fixtures to maintain a tight dimensional tolerance. Each storage position is then checked with full length gauges to assure proper clearance between stored fuel bundles and storage tube walls.

To provide assurance that specification Boral sheet is utilized during tube fabrication, a quality control program is in effect at the manufacturer's facility. Samples of each Boral sheet are analyzed to determine the B^{10} content. These data are evaluated to verify that the samples are statistically representative of the entire area of the Boral plate and that B^{10} content, at a 95% confidence level, meets or exceeds specification requirements. Analyses are also performed to establish the correlation between the B^{10} content and the thickness of the Boral sample. The Boral sheets are dimensionally inspected and the thickness data are statistically analyzed to verify the sheet meets the minimum thickness requirement over its entire area at a 95% confidence level. These thickness data are also compared with the correlation data to provide additional assurance that the B^{10} content meets or exceeds specification requirements. Before each piece of Boral is inserted into a tube assembly it is verified that each inspection has been successfully performed.

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* Product of Brooks & Perkins, Inc. consisting of a layer of B_4C-Al matrix bonded between two layers of aluminum.

The presence of the neutron absorber material in the fabricated fuel storage module will be verified at the reactor storage-pool site by use of a neutron source and neutron detectors. There will be a permanent record of all test results that will provide a comparison between the test results for each Boral sheet and the neutron absorption rate taken where there is no Boral sheet. A significant increase in the neutron absorption rates will verify the presence of Boral. Module subcriticality calculations have demonstrated K_{eff} <0.90 at a 95% confidence level with any four complete Boral sheets missing. A module will be accepted unless measurements indicate that five or more Boral sheets are not present.

Boral has corrosion resistant properties similar to standard aluminum sheet. Corrosion data and industrial experience confirm that aluminum and Boral have acceptable corrosion resistant properties* for the proposed application. Although experience indicates that it is unnecessary, an inservice test program will be conducted. This program consists of periodically removing and examining samples of Boral plate which have been suspended in the storage pool.

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* USNRC Safety Evaluation for Yankee Rowe, dated 12/29/76 page 4, Structural and Material Considerations.