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D. L. Ziemann, Chief, Operating Reactors Branch #2, DOR

REVIEW OF MONTICELLO SPENT FUEL SHIPPING CASK HANDLING REPORT DATED JANUARY 13, 1976

Plant Name: Monticello Nuclear Generating Plant
License Number: DPR-22
Docket Number: 50-263
Responsible Branch: ORB-2
Project Manager: R. Snaider
TAR Number:
Requested Completion Date: February 27, 1976
Review Status: Awaiting information from licensee

In response to your request, we have reviewed the Monticello Nuclear Generating Plant Licensing Report LS&R-NOR-0150-06 entitled, "An Analysis And Safety Evaluation of Spent Fuel Shipping Cask Handling at the Monticello Nuclear Generating Plant." Since the report did not contain sufficient information for us to perform our review, we also reviewed (a) letter to D. L. Ziemann dated May 30, 1975, (b) letter to D. L. Ziemann dated February 17, 1975, (c) Preliminary Report of Fuel Cask Drop Analysis dated October 1, 1974 and (d) applicable portions of Reference 5 (a report entitled Safety Analysis Report For Nuclear Fuel Services Inc. Spent Fuel Shipping Cask Model NFS-4 dated September 29, 1972).

Following a review of the above information we find that our review and evaluation cannot be completed until a response is received to the attached request for additional information.

Original Signed By
A Schwencer
A. Schwencer, Chief
Plant Systems Branch
Division of Operating Reactors

Attachment:
As stated

cc w/attachment:
F. Clemenson
R. Snaider
V. Stello
D. Eisenhut

OFFICE ▶	DOR:PSB	DOR:C/PSB				
SURNAME ▶	FClemenson:ph	ASchwencer				
DATE ▶	2/17/76	2/17/76				

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Additional Information Required To Complete
The Review of Monticello Nuclear Generating Plant
Report LS&R-NOR-0150-06 Docket 50-263

To complete our review of your January 13, 1976 report entitled, "An Analysis & Safety Evaluation of Spent Fuel Shipping Cask Handling at the Monticello Nuclear Generating Plant", we will require the following additional information.

1. The letter to D. L. Ziemann dated May 30, 1975 indicates that approximately three years will be required to back fit the existing crane. As an interim measure it is proposed to use the 25 ton NFS-4 shipping cask rather than the 35 ton IF-300 cask. On this basis your January 13, 1976 report presents the bases for this proposal. From the FSAR it appears that in order to refuel during this three year period the crane will be required to handle reactor vessel components such as the reactor vessel head that weighs on the order of 70,000 pounds. Therefore, it is necessary that you (a) identify and provide the weight and frequency of all lifts that will approximate or exceed the weight of the NFS-4 cask during this interim period, (b) for each item identified in (a) above with the aid of legible building drawings indicate the maximum allowable drop height over its range of travel, (c) indicate the maximum possible drop height of the object during its travel, (d) expand Table 4-1 to show the equivalent factors of safety for these other loads and (e) provide a description, discussion and safety evaluation of each of these lifts if the load should drop.

2. In your letter dated February 17, 1975, you stated (a) the Monticello Plant structures cannot withstand the impact of a dropped spent fuel shipping cask in all cases, (b) modifications to increase the strength of plant structures are not feasible, (c) a report on your intended modifications to improve the reliability of the reactor building crane would be submitted by May 30, 1975. It is not apparent from your January 13, 1976 report what modifications you have or intend to carry out in order to increase the reliability of the reactor building crane. Provide this information.

3. In your October 1, 1974 report Table 1 indicates that the 85 ton rated capacity hoist drive system will have full load speed of 5 FPM and an empty hook speed of 16 FPM. What will be the maximum drum speed (as defined by the drive system) when handling the 25 ton NFS-4 cask?

4. Using the General Electric maxspeed 320 hoist drive system, described in your October 1, 1974 report, describe and discuss the crane operators ability to accurately position the NFS-4 cask a given distance above the operating floor. Since Tables 3-1 and 3-2 establishes the upper limit on this distance to be six inches indicate the minimum acceptable height of the cask above the operating floor without the cask hitting the floor due to swinging of the load during transport. In the discussion relate the operators ability to accurately elevate the cask to the proper height to the allowable band established above.

5. Assume a hard stop is encountered when the NFS-4 cask is being raised at its maximum lift speed (as established in Request 3 above) from the transporter to the operating floor. Indicate how the factors of safety presented in Table 4-1 would change if such a situation were to occur, taking into account the maximum short term stall torque of the drive motor and the kinetic energy stored in the 139 to 1 speed reduction power train and drive motor.

6. Considering that (a) the overhead handling system has not been designed single failure proof, (b) the hoist has a rating of 85 tons and (c) you propose to use the 25 ton NFS-4 cask as an interim solution, describe and discuss what interim modifications are possible that will reduce the loading conditions postulated in Request 5 above (such as reducing the lift speed (Request 3) and the drive motor maximum short term torque capacity.

7. Section 2 of your January 13, 1976 report states "A strictly enforced cask travel path will be employed...........". Section 6.1 states "To ensure movement of the shipping cask along the designated path, floor markings will be made with a bright color as indicated in Figure 6-1 to guide the crane operator and plant personnel during cask handling."

Describe and discuss the possible modifications that could be made to physically limit the cask motions to that depicted in Figure 6.1. Further, indicate the allowable path width under which your analysis of a cask drop remains valid.

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8. Your report, dated October 1, 1974, states the main hoist will have two upper hoist travel limit switches. One of the two is located on the top block assembly and the other is directly coupled to the hoist drum and will be activated by drum rotation. We will require two independent upper hoist travel limit switches located on the top block assembly. Confirm that this requirement will be met. Further describe the methods available to the crane operator to detect the condition should any one of the upper hoist travel limit switches lose its functional capability.

9. Section 4.2.1 and Appendix B of your January 13, 1976 report indicates that the failure of the equalizer sheave pin will result in dropping of the load. Modify Table 4-1 by showing the corresponding factors of safety for the equalizer sheave pin at the three indicated loads.

10. A review of the Safety Analysis Report for the NFS-4 Shipping Cask (reference 5 of your January 13, 1976 report) and your report dated January 13, 1976 does not contain sufficient information on the handling yoke as it applies to its onsite use, to enable us to complete our review. Provide the following additional information.

a. Provide a legible individual drawings of (a) the shipping cask showing the lifting trunions, (b) the handling yoke and (c) the twin sister hook and shackle hook.

b. Describe and discuss the load carrying capabilities of (1) the shipping cask lifting trunions (2) the handling yoke and (3)

the point of attachment of the handling yoke to the main hoist twin sister hook.

c. Modify Table 4-1 by adding the factors of safety for the items identified in (b) above.

d. Describe and discuss what modifications or means are possible for devising redundant load paths from the shipping cask to the main hoist hook.

11. Your October 1974 report indicates that the hoist has two solenoid operated brakes, each capable of holding 150% of the rated full load (85 ton) hoist torque at base speed. Further both of these brakes are spring loaded and automatically set whenever electrical power is removed. Assume the NFS-4 cask is being lowered at its maximum speed (as established in Request 3) when a loss of power is experienced by the hoist. Indicate the magnitude of the deceleration forces developed by the two automatically spring set brakes on the handling yoke and cask trunions in such an event and the factors of safety that exists at these points as well as the point of attachment of the handling yoke to the hoist hook.

12. In the October 1, 1974 re[illegible] it is stated "A cask drop from the maximum drop height in the equipment hatch area could cause structural and possibly cask damage. Cask handling procedures are being evaluated to provide adequate protection to plant structures and equipment in this area." The FSAR reactor building drawings indicate that the suppression pool torus and a corner compartment housing engineered safety feature equipment is below and in close proximity to the equipment hatch shown in your January 13, 1976 report. Describe and discuss (a) the potential of damaging the torus to an extent that would result in the loss of suppression pool water and the primary containment barrier and (b) the potential of damage to the engineered safety feature equipment housed in the corner compartment should the 25 ton NFS-4 cask be dropped from its maximum drop height (93'-2") and (c) cask handling procedures that have been developed to provide adequate protection to plant structures and equipment in this area.

13. Appendix B, Failure Mode and Effects Analyses, has a column titled Method of Detection. For all failures considered, the entry in this column is "Self Annuciating". Is this phrase intended to indicate that an annunciator will alert the operators that a failure is imminent, or that the actual failure will serve as the annunciator notifying the operator that a failure has occurred? Clarify.

14. Section 5.2 of your January 13, 1976 report appears to conclude, with the aid of Figure 5-1, that a tipped cask type drop at the pool edge would not result in damage to spent fuel since the fuel would be located in the north end of the pool. Figure 5-1 shows the area of influence for a tipped cask covers the area where empty fuel storage racks and control rod racks are located. With the aid of drawings of these structures describe and discuss the reasons why they will not in turn tip and/or collapse against the stored spent fuel located in the north end of the pool as a result of the tipped cask drop.

15. Taking the characteristics of the NFS-4 impact limiter into account and the possibility of one side of the handling yoke failing when the cask's center of gravity is just over the edge of the pool, provide further information to support the statement "Moreover, if the cask were dropped on the pool edge, its impact would cause the pool edge to spall and force the cask into the fuel pool in a nearly vertical attitude."

16. In your interim program using the two fuel element, 25 ton NFS-4 shipping cask, it is stated your analysis indicates that a six inch drop height is permissible for the operating floor. Also, the resulting calculated impact loads are based on the deformation and/or energy absorbing characteristics of the impact limiting device (utilizing dry balsa wood encased in a stainless steel container) that is attached to the cask. From reference 5 "Safety Analysis Report for Nuclear

Services Inc. Spent Fuel Shipping Case Model No. NFS-4" the crushing strength for the various pieces of balsa is assumed to be either 1,600 psi or 2,100 psi.

a. Page A-3 of reference 5 shows that the crushing strength of dry balsa wood varies from 650 psi to 3,000 psi depending on its density. Tables 3-1 and 3-2 of your report shows the Factors of Safety for the various assumed NFS-4 cask drops. Indicate the limiting range in density of the various pieces of dry balsa (i.e., crushing strength) that would be allowable without causing the Factors of Safety for the floor slab shown in Tables 3-1 and 3-2 to become less. Further, indicate the tolerance on the density of the balsa wood (i.e., crushing strength for dry balsa wood) used by the cask manufacturer in the fabrication of the attached impact limiting devices.

b. During the loading of the cask the impact limiting devices will be submersed in the spent fuel storage pool water, assume the stainless steel water barrier encasing the balsa wood develops a leak as the cask is being lowered and placed on the pool bottom and thereby allowing the balsa wood to become water logged. Indicate how the energy absorbing characteristics of the impact limiting device changes when the balsa wood becomes water logged. Assuming the most adverse combination of balsa wood densities and water logging indicate for each case analyzed in Tables 3-1 and 3-2 what the new allowable cask drop height would be assuming the factors of safety presented in Tables 3-1 and 3-2 were unchanged.

c. Describe how it is possible to detect if the stainless steel water barrier encasing material developed a leak as a result of the cask being lowered and placed on the pool bottom. Further provide information which demonstrates a rupture of the encasing material will not occur taking into account its rate of descent as it contacts the pool bottom.

d. Assuming the balsa wood becomes water logged while the cask is in the spent fuel pool and its crushing strength changes to such an extent as to be unacceptable for safe handling, describe the measures which will be taken to assure safe cask handling during (i) the lift from the pool, (ii) movement above the operating floor and (iii) lowering the cask through the equipment hatch to its transporter.