UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

AUG 27 1976

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MEMORANDUM FOR: K. R. Goller, Assistant Director for Operating Reactors, DOR

FROM: D. Eisenhut, Assistant Director for Operational Technology, DOR

SUBJECT: ROUND ONE QUESTIONS - CASK DROP REPORT - THREE MILE ISLAND UNIT 1 - ORB-4-43

27435

Plant Name: Three Mile Island Unit 1
Docket No: 50-289
Responsible Branch: ORB-4
Contact: ~~D. N. Bridges~~ ZWETZIG GERALD B Rm 344 4/1/76
Requested Completion Date: October 1, 1976 (SER)
August 1, 1976 (Question Round One) (Verbal)
Necessary For Next Action: Response to staff concerns
Review Status: Awaiting Response

Enclosed are the first round questions regarding the Three Mile Island Unit 1 Report submitted February 17, 1976 entitled, Cask Drop Evaluation.

D.G. Eisenhut
D. G. Eisenhut, Assistant Director
for Operational Technology
Division of Operating Reactors

Contact:
Fred Clemenson, NRR
x28077

Attachment:
As stated

cc w/attachment:
V. Stello
W. Butler
~~F.~~ Clemenson
D. Bridges
R. Reid

Unit 2 limited to 70 ton cask
yoke orientation - - - -
vertical lift limited to 50'
why are they considering moving the decontamination pit

8201070103 810403
PDR FOIA
MADDEN80-515 PDR

REQUEST FOR ADDITIONAL INFORMATION THREE MILE ISLAND UNIT 1 CASK DROP ANALYSIS DOCKET 50-289

1. In regard to your letter, dated February 14, 1976 and the attached Cask Drop Evaluation Report, we find that your analysis and evaluation included small truck casks weighing 25 tons up to large rail casks weighing up to the rated capacity of the fuel handling crane of 110 tons. As you are aware, the shipping cask lifting trunnions and yoke are generally designed to withstand some design load in excess of the weight of the cask. However, we understand the cask handling crane has ~~generally is designed with two brakes,~~ (a mechanical load brake and a solenoid brake, each of which are sized ~~(each sized~~ with some margin to hold rated ~~a~~ load ~~equal to the rating of the crane)~~ and which are automatically set upon the loss of power.

You should assume, for the spectrum of the licensed shipping casks that you intend to handle over the life of the facility, including small casks such as the NFS-4 cask, that they are being lowered at the maximum speed allowed by the crane. If you also assume a loss of power is experienced, thereby causing both of the crane hoist's automatically actuated brakes to be set, the deceleration load experienced by the cask handling yoke and trunnions will exceed that needed to statically hold the load.

Accordingly, for each cask, provide the following information:

(a) the static factors of safety associated with the shipping cask handling yoke and trunnions and the corresponding weight of the cask,

(b) the maximum speed as defined by the crane controls when raising and lowering the casks; and

(c) the results of an analysis which demonstrates that the handling yoke and cask trunnions will have sufficient design margin to preclude their failure due to the deceleration loads created by the hoist brakes, assuming the cask is being lowered at the limiting speed (as defined by the crane controls) when a loss of power to the crane is experienced.

2. Your evaluation showed that during cask transfer to and from the transporter, "cask drops" could possibly result in unacceptable damage to engineered safeguards circuits. It is also stated, ~~You indicated~~ that you plan to relocate one of the engineered safeguards circuit tray as a corrective measure.

(a) Since the movement of the cask will generally take place when the reactor is at power, assume: (1) one of the engineered safeguards trays has been moved as you propose; (2) a cask drop occurs such as to disable one of the two separated engineered safeguards trays when the reactor is at power. Under the above assumptions, describe, discuss and demonstrate that the single event (cask drop) will not initiate another event that potentially could place the reactor in an unsafe condition. If such an event could occur it should also be assumed that a single failure may also occur in the systems associated with the remaining intact engineered safeguards tray.

(b) Describe, discuss and demonstrate that in the event of a cask drop, that the interconnections between redundant channels of systems associated with the separated redundant trays will not cause both systems to become non-functional if the cask drops on one of the two series of trays containing the two redundant channels.

(c) In reference to the following unclear or possibly contradictory statements found in ~~your~~ the February 14, 1976 submittal ~~report~~ we will require additional ~~more definitive statements and~~ clarification ~~where appropriate~~ before we can complete our review and evaluation.

(1) "Accordingly we plan to relocate one engineered safeguard circuit tray...". "The green engineered safeguard circuit tray T-52-54 will be moved from its present location below the rail car slot as shown in Figures IV-1 and IV-2 to run parallel and along with the green engineered safeguard circuit trays (166, 756 and 850) as shown in Figures IV-3 and IV-4."

(2) You "plan to revise the cask transfer path...". "The present cask transfer path to and from the cask loading pit will be changed to the revised path shown in Figure IV-6."

(3) Met Ed is currently evaluating poscible plant modifications and changes to operating procedures to correct"... cask drop accidents which could possibly result in unacceptable damage to engineered safeguard circuits, spent fuel pool cooling pipes and cooling water pipes to the spent fuel pool coolers".

(4) "Met Ed is currently evaluating the possibility of relocating the cask decontamination area." "When the location for such decontamination operations is selected, specific plant modifications and changes to operating procedures and technical specifications that are required will be described to NRC. Until such time the present cask decontamination pit will not be used."

3. In the, FSAR, Section 9.7.1, you state that when loads exceeding 15 tons are being handled, an administratively imposed automatic travel interlock system will limit the range of travel of the loads to that shown in the FSAR- Figure 9-18A. Assuming that: (a) the 110 ton crane main hook has no load on it when it passes over a recently discharged batch of spent fuel elements; and (b) two-blocking of the main hoist load blocks occurs, provide an analysis which demonstrates either of the following: (1) the resulting radiological release will be within acceptable limits should the lower load block and hook drop onto the stored spent fuel; or (2) the lower load block and hook will not drop should two-blocking occur (in the latter case the analysis should to take into account the peak stall torque of the hoist motor plus the kinetic energy of the hoist power train and motor when the hook is being raised at its maximum rated speed as allowed by the control system).

In addition, describe and discuss any future modifications you may wish to make regarding increasing the spent fuel pool storage capacity by reducing the 21-1/8 inch center-to-center spacing between fuel assemblies and how this could affect the radiological release when a load is dropped.

agreed strictly speaking this should not be asked until pool expansion is requested

4. Describe and discuss the following with the aid of legible drawings:

(a) the path of the spent fuel shipping cask as it travels between the following areas: (1) the spent fuel pool storage area; (2) the transporter; and (3) the decontamination pit;

(a) ~~(b)~~ the engineered safeguards equipment and other equipment that may be required for a safe operation or cold shutdown of the reactor and whose operation may potentially be threatened by a (spent fuel shipping cask) cask drop at any point along the travel ~~paths presented~~ as it travels between the following areas: (1) the transporter; (2) the decontamination pit; and the spent fuel pool storage pool cask loading pit ~~in item (a) above~~; and

(b) ~~(c)~~ assuming the most adverse combination of cask drop conditions, demonstrate by analysis that sufficient design margin exists to enable the staff to conclude that the resulting damage will not endanger safe reactor operation and/or the facility's ability to attain and maintain a controlled, cold, safe reactor shutdown following a cask drop event at any point along its path of travel.

5. ~~The information contained in Section 9.7.1.6 of the FSAR is insufficient to establish the~~ degree of compliance of the fuel handling crane to Part D-2-c of Regulatory Guide 1.104 "Overhead Crane Handling Systems For Nuclear Power Plants". Considering ~~Due to~~ your statements regarding the bottom of the "B" spent fuel pool, the bottom of the decontamination pit and the floor slabs at elevation 348'-0", 331'-0", 305'-1" and 301'-6" not having been designed to withstand the impact of a dropped cask, describe and discuss the 110 ton spent fuel shipping cask handling crane, ~~including~~ its performance requirements and its. Demonstrate that it is or will be upgraded to comply with Part D-2-c of Regulatory Guide 1.104, prior to

handling spent fuel shipping casks. Further, provide your schedule for the submittal of any required modifications to NRC for review and the schedule for completion of the modifications.

6. You state that the height of the cask will be administratively maintained at less than 1 foot above the top of the floor over which it is traveling. In regard to the above statement and the assumption of a cask drop, identify the particular spent fuel shipping casks (weights and their associated) for which the above statement applies. Describe and discuss the locations along in the proposed path of travel of the casks (shown in Figures IV-4 and IV-6) where the strength of the structures resisting the impact is the least; the margin of safety that precludes its failure at these locations; and the essential equipment, located within the sphere of influence of a cask drop at these locations (include the effects of spalled concrete), i.e., where ~~there may~~ be damage or degraded performance may be experienced.

7. When the relocation of the cable trays that may be imperiled following a cask drop accident has been determined, provide: (a) drawings showing the new location of the cable trays; (b) a list identifying each of the engineered safeguards and reactor protection system circuits associated with each of the relocated cable trays; and (c) a discussion which demonstrates the acceptability of the modifications assuming the loss of one of the redundant cable trays.

8. In reference to the criteria that will be followed in making the modifications, the following statement is made "Damage to multicolored circuits along with damage to circuits associated with one of those colors is acceptable since the multicolored

circuits are protected interconnections between two redundant channels." Provide further clarification which demonstrates the protected interconnections between two redundant channels will provide adequate protection in the event of: (a) any open circuit, (b) any short circuit and (c) any short circuit between any two conductors that could develop as a result of a cask drop accident and thereby provide assurance that no more than one channel of redundant engineered safeguards system, or reactor protection system could be degraded or disabled.

9. Figure IV-3, showing the modified cask transfer path and new location for engineered safeguards tray, indicates that the rail car is located partially inside and partially outside the building during those times when the cask is being lifted from and lowered onto the rail car. Describe and discuss what means will be provided to prevent the rail car position from being adversely altered during cask handling, such that it spans both the red and green cable trays, during a cask drop accident and thereby being in a position to cause damage to both redundant portions of engineered safeguards cable trays. Further, describe, discuss and demonstrate that there are no significant adverse safety consequences resulting from having the heavy rolling door, shown in FSAR Figure 1-8 Section E_1 - E_1, open during these operations should a cask handling accident occur. Should the open doors pose a potential hazard to public health and safety, describe and discuss the possibility of

extending the structure and relocating the rolling door such as to permit it to be closed during these operations.

10. On page III-1 your report, you state "The height of the cask lower surface is administratively maintained at less than 1 foot above the top of the spent fuel pool walls (elevation 348'-0")". On page IV-4, you state "Administrative procedures will be used to limit the height the cask lower surface is raised above the top of the "B" spent fuel pool to 6 inches maximum." Since the Figures in the FSAR and your proposal indicates the top of the spent fuel pool is at elevation 348'-0", clarify what will be the maximum carrying height and potential drop height as it moves across the floor between the spent fuel pool cask storage area, decontamination pit and the transporter. Should the carrying height of the casks change, resubmit the results of a cask drop analysis for the corrected carrying height above the floor.

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Clarify what will be the carrying height of the cask at all points along the path of travel of the spent fuel shipping cask, while it is within the building and what measures other than administrative controls will be taken to preclude drop heights exceeding this value.

11. In evaluating the consequences of a cask drop accident, indicate for each spent fuel shipping cask if your analysis has taken credit for the action of the impact limiting devices attached to the cask when in its transportation configuration.

12. The FSAR states the fuel handling crane is shared by Units 1 and 2. Further, "A Whiting automatic paddle-type limit switch is installed for upper hoist limit to prevent two-blocking situations." Assume: (1) that the switch and/or its associated activating mechanism becomes inoperative; and (2) the lower load block and hook are being raised at its maximum speed when

two-blocking occurs. Under the above situation, provide the following information:

(a) A description of what provisions or measures have been provided to alert the operator at all times as to the status and functional capability of the switch and associated actuating mechanism; and

(b) A demonstration by analysis that when taking the maximum peak torque of the hoist motor and the kinetic energy of the power train and motor rotor into account, a failure will not occur which could result in dropping the lower load block and hook.

13. Since the 110 ton fuel handling crane will be shared by Units 1 and 2, describe, discuss and evaluate all safety related facility design considerations of Unit 1 that will differ from those that will exist in Unit 2 as they relate to spent fuel cask drop accidents.

Harley Silver 2-78-31

Cask drop. Cracked conc. out flow?