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Docket Nos.: 50-443
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SEABROOK STATION

NUREG-0612

"CONTROL OF HEAVY LOADS"

ADDENDUM I TO REPORT NO.
9763.006-S-N-5 DATED MAY 1983

(RESOLUTION OF EG&G COMMENTS PER DRAFT
TECHNICAL EVALUATION REPORT DATED AUGUST 1983)

PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE

SEABROOK, NEW HAMPSHIRE

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1. INTRODUCTION

The revised response covering both Phase I and Phase II to the generic request for additional information on control of heavy loads was submitted to the NRC in May 1983 (Report No. 9763.006-S-N-5). In this issue of the report, comments on Phase I as contained in an earlier technical evaluation report dated November 1982 were also considered and incorporated as applicable.

Technical evaluation of the May 1983 submittal was performed by EG&G Idaho, and the draft technical evaluation report (TER) was issued on August 31, 1983. Subsequently, the comments and concerns raised in this TER were discussed in a conference call on October 14, 1983 between the NRC, EG&G Idaho, Yankee Atomic Electric Company and United Engineers & Constructors representatives. This Addendum reflects the resolution of these concerns as agreed, and provides additional information or commitment where required.

The concerns and recommendations resulting from the evaluation are addressed in detail in the following sections with the statement of the concern appearing first, followed by the relevant information already provided in the May '83 report and the additional information/clarification or commitments to complete the response in accordance with the NUREG-0612 requirements.

2. RESOLUTION OF EVALUATION COMMENTS

The comments and concerns identified in the TER fall in the following four categories:

- Spent-Fuel Pool Area (NUREG-0612, Article 5.1.2)
- Containment Building (NUREG-0612, Article 5.1.3)

- Other Areas (NUREG-0612, Article 5.1.5)
- Single-Failure-Proof Handling Systems (NUREG-0612, Article 5.1.6)

2.1 SPENT-FUEL POOL AREA (NUREG-0612, ARTICLE 5.1.2)

Areas of Concern - Page 10 of Draft TER

Concern No. 1

"The applicant states that the radiological consequences of a spent fuel cask drop accident are presented in the FSAR. Since this material was not provided to EG&G, we were unable to evaluate this item. NUREG 0612 suggests that doses be equal to or less than 1/4 of 10CFR100 limits. We were unable to determine if this requirement is met."

Relevant Information in the May '83 Response
Page 33

Radiological consequences of a spent fuel cask drop accident are presented in FSAR Section 15.7.5. The results of a conservative analysis and a realistic analysis are summarized in Table 15.7-28.

Resolution/Additional Information

The NRC will provide copies of FSAR Section 15.7.5 including tables to EG&G Idaho for their evaluation. (The offsite doses given in Table 15.7-28 are much less than 1/4 of 10CFR100 limits.)

Concern No. 2

"Mechanical stops used at Seabrook keep the main crane hook approximately 10 ft. - 0 in. from the storage pool. NUREG-0612 rquirements are that a 15 ft. - 0 in. distance be used. However an adequate justification of the 10 ft. - 0 in. distance is provided."

Resolution/Additional Information

No resolution or additional information is required.

Concern No. 3

"In the extreme position the auxiliary hooks are 8 ft. - 8 in. from the storage pool. If the loads carried by these hooks are precluded from rolling into the pool then the intent of the guideline seems to be met for this situation."

Relevant Information in the May '83 Response
Pages 30 and 31

The centerline of the two 5 ton auxiliary hooks, in the extreme position of the hoists, cannot move closer than 8'-8" to the storage pool boundary.

The auxiliary hook number 1 is normally used to handle single fuel elements. The new fuel containers, each weighing about 6,700 pounds, are normally handled by auxiliary hook number 2. The area in the fuel storage building allocated to storage and handling of the new fuel containers eliminates the need to carry the containers near the spent fuel storage area or the cask loading pool. In the unlikely event of inadvertent carrying of the new fuel containers near the spent fuel storage area and coincident failure of the load handling system, the container will fall in the cask loading pool only since the center of gravity of the load falls approximately 2'-8" from the outer edge (or 8'-8" from the inner edge) of the spent fuel storage pool wall.

Resolution/Additional Information

The loads carried by the auxiliary hooks will be prevented from rolling into the spent fuel storage pool following a load drop. With the current limits on the hook travel, total overall horizontal dimensions of the loads have to be greater than approximately 5 ft. to strike the 6 ft. thick storage pool wall. The only load longer than 5 ft. which is likely to impact the top of the pool wall would be the new fuel container. However, even if a load handling system failure occurs when the auxiliary hook is in the extreme position, the container will still drop into the cask loading pool without rolling as approximately two-thirds of the container length falls on the outside of the outer edge of the concrete separation wall. As stated above, the center of gravity of the new fuel container is 2 ft. - 8 in. away from the outer edge of this wall.

Therefore, in view of the sizes of the anticipated heavy loads and the limits imposed on the hook travel, it may be concluded that the loads handled by the two auxiliary hooks will not land or fall into the spent fuel storage pool.

Concern No. 4

"Procedures for installation and removal of mechanical stops are not discussed. The stops appear to be in place at all times however this is not clear. Discussion of who is designated to allow bypass of stops was not provided by the applicant."

Relevant Information in the May '83 Response

The mechanical stops are discussed on page 31.

PSNH takes exception, on the basis of plant specific design, to the 15 feet requirement for minimum distance of the hook centerline from the spent fuel pool boundary. The ten (10) feet separation presently allowed in the Seabrook Station design is more than sufficient, due to the physical layout, to ensure that the cask, if dropped, does not fall into the spent fuel storage pool or compromise its integrity. The limits imposed on the hook travel will again be reviewed, when the cask dimensions are finalized; and, if necessary, feasibility of moving the fixed mechanical stops to increase this distance will be examined.

Resolution/Additional Information

The mechanical stops provided to limit the hook travel are permanently fixed in place, and remain in place at all times. There is no provision in the crane design for adjustment of their positions. That is, a design change will be required to physically relocate these fixed mechanical stops. Therefore, no procedures for their installation and removal are required or discussed in the response.

Concern No. 5

"NUREG-0612 5.1.2 2c requires that casks be carried no higher than necessary and in no case more than six (6) in. above the floor level. No information was available from the applicant on this requirement."

Relevant Information in the May '83 Response
Page 17

The load paths identified on the layout drawings follow the safest and shortest routes with consideration given to maintaining safe distances from spent fuel and safe shutdown equipment. In general, a load will be moved as close to the floor as practical except to clear any equipment or other physical obstructions in the travel path. In addition,

appropriate notes of the precautionary nature are also included, as required, on the load path drawings. Any deviations from these safe load paths or written procedures governing the load handling operations will be handled per procedure AQ 1.002, Station Operating Procedures.

Resolution/Additional Information

The casks will be carried as close to the operating floor level as practical, and in no case will the cask be lifted higher than six (6) inches above the floor or any immobile object in the travel path.

2.2 CONTAINMENT BUILDING (NUREG-0612, ARTICLE 5.1.3)

Evaluation Comment (Page 12 of Draft TER)

"The applicant's statement that the stud tensioner hoist can be excluded is probably consistent with the intent of the guideline based on our opinion as to what the effects of a load drop from these hoists would be. However, without some sort of analysis this is just an opinion and is not backed up by any hard facts. A simple analysis of the effects of a load drop on the reactor or reactor head is recommended by EG&G."

Relevant Information in the May '83 Response
Page 77

The stud tensioner hoists are used for removal and installation of stud tensioners during reactor vessel head removal and installation. In normal operation, these hoists are not stored on the monorails attached to the underside of the head lifting device, and therefore do not pose any safety hazard. During refueling shutdowns, the hoists are suspended from the monorails and handle studs and stud tensioners. The heaviest load is the stud tensioner weighing about 2,500 pounds. Since these components are handled only when the head is still covering the reactor

vessel, no damage can be caused to the irradiated fuel or safety related equipment. When the head is removed to its storage location, the stud tensioner hoists are also removed along with the head lifting device.

Resolution/Additional Information

A confirmatory analysis of the effects of a load drop from the stud tensioner hoists is being performed. The stud tensioner, the heaviest load to be handled by these hoists, is assumed to land on the reactor vessel head in the worst possible orientation from the maximum drop height. The results of this analysis will be provided to the NRC.

2.3 OTHER AREAS (NUREG-0612, ARTICLE 5.1.5)

Evaluation Comment (Page 14 of Draft TER)

"The cranes and hoist systems which service only one piece of safety related equipment are probably consistent with the guideline. However, the applicant should confirm our assumption that during servicing no loads can be carried over other items needed for safe shutdown. Discussion of mechanical locks, electrical locks, and other procedures to prevent movement of loads over safety related equipment was inadequate in most cases. If the hoists and cranes are incapable of carrying loads over other safety related equipment then we feel that the four (4) types of handling systems mentioned are consistent with this guildeline."

Relevant Information in the May '83 Response

The four types of handling systems referred to in the technical evaluation are discussed on page numbers 82 and 83 of the May 1983 report. The following is of relevance here:

(1) Charging Pump Service Monorails (CS-CR-14A, 14B and 14C)

Three service hoists, each located in a separate room, are provided for maintenance of the charging pumps. A load drop can damage only a single pump which has already been taken out of service for repair or maintenance.

(2) Radioactive Pipe Tunnel Service Monorails (CBS-CR-18A and 18B)

A separate monorail-hoist is provided to service the sump isolation valve and associated encapsulation vessel in each of the two independent and fully redundant trains of the containment spray system. The two trains and monorail-hoists are separated by a 24-inch thick reinforced concrete wall. In the unlikely event of a load drop in one area, the redundant system would remain functional.

(3) Main Steam and Feedwater Pipe Chase Cranes (MS-CR-25A and 25B)

These cranes, 25A located in West Chase and 25B in East Chase, service the main steam and feedwater containment isolation valves and are used only after the reactor coolant system has been cooled down, with the residual heat removal system removing decay heat. Therefore, any potential damage to the main steam and feedwater systems resulting from a load drop cannot affect the decay heat removal process.

(4) Diesel Generator Service Cranes (DG-CR-28A and 28B)

The two redundant diesel generator units and their associated auxiliaries are located in separate and independent enclosures within a seismic Category I building. One service crane is provided in each enclosure for repair and maintenance of the diesel generator.

Resolution/Additional Information

For load handling systems listed under (1), (2) and (4) above, credit is taken for physical separation and redundancy of safety related equipment to eliminate all load impact area combinations. During servicing of equipment belonging to one train, the loads cannot be carried over redundant train or other items needed for safe shutdown because each load handling system along with the equipment it services is located in a separate and independent enclosure. The movement of loads during handling operations will be confined to only one room or enclosure.

Therefore, these cranes or monorails are incapable of carrying loads over redundant safety related equipment due to permanent physical barriers such as reinforced concrete walls. Furthermore, no reliance is placed on any mechanical or electrical interlocks or procedures to prevent the movement of the loads over equipment required for safe shutdown or decay heat removal.

For main steam and feedwater pipe chase cranes listed under (3) above, site specific considerations such as maintenance sequencing are credited in eliminating all load-impact area interactions. These cranes are used to handle heavy loads only during cold shutdown mode with the residual heat removal (RHR) system in operation. The RHR system equipment is located in a separate building and is not affected by a load drop in either of the two pipe chases. Therefore, a load drop in the east or west chase will not have any impact on the decay heat removal from the reactor core.

Furthermore, a load drop in one pipe chase could cause damage to main steam and feedwater piping associated with only two steam generators, and the other two steam generators will be still available, if required. The east and west pipe chases are physically separated by a

distance equal to the diameter of the containment building. Hence, an accidental load drop from either of these two underhung cranes will not impair the safe shutdown or decay heat removal capabilities.

2.4 SINGLE-FAILURE-PROOF HANDLING SYSTEMS (NUREG-0612, ARTICLE 5.1.6)

Evaluation Comment (Page 24 of Draft TER)

"EG&G concludes from the information provided that the polar crane is consistent with the intent of the guideline except for the handling equipment hatch cover. We recommend that an analysis of the effects of dropping the equipment hatch cover be performed."

Relevant Information in the May '83 Response
Page 48

The equipment hatch cover will be handled only when the reactor is in COLD SHUTDOWN with the residual heat removal system in operation. Technical Specifications also prohibit opening of the equipment hatch during refueling operations. In the unlikely event of a handling system failure resulting in a load drop, damage to the plant equipment will be limited, and will not affect the spent fuel or decay heat removal process. The Preventive Maintenance and Inspection Program to be implemented for all cranes will reveal any deterioration of the lifting equipment and allow for repairs prior to component failure.

Resolution/Additional Information

A detailed confirmatory analysis of the effects of dropping the equipment hatch cover is being performed. The safety related structures, systems and components that will be damaged by the hatch cover will be identified to determine the effect, if any, on the spent fuel or continued operation of the residual heat removal system. The

evaluation criteria given in Section 5.1 of NUREG-0612 will be used as a guideline to determine the acceptability of the load drop in this case.

It should, however, be noted that the RHR system equipment is located outside the containment in the equipment vault which is approximately diametrically opposite to the hatch cover handling area. The results will be submitted to the NRC upon completion of this analysis.

Evaluation Comment (Page 24 of Draft TER)

"The remaining hoists mentioned in this section do not appear to meet the requirements of the guideline . However, if safety factors of ten (10) can be demonstrated along with the other safety features mentioned by the applicant, then the intent of the guideline may be satisfied."

Relevant Information in the May '83 Response

The following five (5) monorails referred to above in the technical evaluation are discussed on page numbers 84, 85 and 86 of the May 1983 report:

(1) Boric Acid Batching Monorail (CS-CR-6)
(2) Emergency Feed Pump Monorail (FW-CR-27)
(3) CVCS Heat Exchanger Service Monorail (CS-CR-13)
(4) Filter Cask Monorail (CS-CR-5)
(5) Component Cooling Water Pump Service Monorails (CC-CR-15A and 15B)

The rated capacities of these monorails are such that the heaviest load carried by each does not exceed half the hoist capacity, thus ensuring twice the required design safety factors per applicable commercial standards. In addition, the standard lifting devices such as slings and associated fittings will maintain a minimum safety factor of 10, or

will be of dual or redundant design. Therefore, the reliability of the load handling systems will be enhanced because of increased safety margins; and consequently the likelihood of a load drop during load handling operations is considered to be extremely small.

Resolution/Additional Information

A review of the following applicable design standards indicates that the load bearing parts of the monorails including hoisting ropes are required to be designed so that the maximum stress, calculated for rated load, does not exceed 20 percent of the average ultimate material strength:

ANSI B30.11	Monorails and Underhung Cranes
ANSI B30.16	Overhead Hoists
HMI-100-74	Specifications for Electric Wire Rope Hoists
MMA (1973)	Specifications for Underhung Cranes and Monorail Systems

This design requirement applies to electric hoists and all monorail tracks including hanger rods and suspension fittings regardless of the type of hoist supported by the track. The only exception is the hand chain powered hoists for which the stress limit is specified to be 25 percent of the average ultimate strength of the material.

In our opinion, if a monorail system is designed for a certain rated load in accordance with the above standards and the maximum load actually handled by the hoist is only 50 percent of this rated load, the corresponding stresses in the load bearing parts will be approximately 10 percent of the average ultimate strength for rails and electric hoists, thereby assuring a safety factor of ten (10) with respect to ultimate strength. For hand chain hoists, the maximum stress will be 12.5 percent of the average ultimate strength, thus providing a safety

factor of eight (8). However, due to less severe duty cycle imposed on the manual hoists, a somewhat lower safety margin is considered to be adequate to guard against a load drop, which is still twice the value required by the applicable commercial design standards.

Furthermore, to preclude inadvertent handling of loads heavier than 50 percent of the rated capacity of the monorails, the derated capacities will be clearly marked on the monorail units along with the rated load actually used in the design per industry standards. Therefore, in view of these increased safety factors for the monorail sytems and the use of standard lifting devices with a safety factor of ten (10) or a redundant design, the likelihood of a load drop is considered to be extremely small.

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