

May 16, 2008

Mr. Thomas C. Houghton, Director
Strategic Regulatory Programs, Nuclear Generation Division
Nuclear Energy Institute
1776 I Street, NW, Suite 400
Washington, DC 20006-3708

SUBJECT: INDUSTRY INITIATIVE ON CONTROL OF HEAVY LOADS

Dear Mr. Houghton:

The U.S. Nuclear Regulatory Commission (NRC) staff appreciates the efforts the nuclear industry and the Nuclear Energy Institute (NEI) have devoted toward the industry initiative on heavy load handling. The staff has completed its preliminary evaluation of the draft guidance documents entitled "Industry Criteria for Reactor Vessel Head Load Drop and Consequence Analysis" and "Reactor Head Lift Single Failure Proof Crane Equivalence," which you provided as enclosures to letters dated April 17, 2008, and April 22, 2008, respectively. These documents are in the Agencywide Documents Access and Management System (ADAMS) as Accession Nos. ML081300340 and ML081300045.

The NRC staff's understanding of these guidance documents has benefited from public meetings held on December 13, 2007, February 1, 2008, April 8, 2008, and April 17, 2008. I am writing to inform you of the staff's position regarding endorsement of these guidelines as approaches acceptable to the NRC staff for implementation of the industry initiative and changes to plant licensing bases.

The guidance contained in the "Industry Criteria for Reactor Vessel Head Load Drop and Consequence Analysis" addresses: (1) general requirements for the analysis, (2) selection of material properties, (3) analytical modeling requirements, and (4) acceptance criteria when evaluating the effects of postulated heavy load drops. The modeling requirements and acceptance criteria contain guidelines that apply to both stress-based discrete component models and strain-based finite element analyses. The staff understands and appreciates that NEI has updated the guidance document in response to NRC staff concerns discussed during the previous public meetings. These concerns related to the uncertainty in the process used to establish material properties and the adequacy of the margin associated with the proposed acceptance criteria to compensate for uncertainty associated with the selected analytical methods.

With regard to the establishment of appropriate material properties, the draft industry guidelines specify that actual test data (e.g., certified material test reports (CMTRs)) may be used to establish material properties. During previous public meetings, the staff expressed concern that the CMTRs may provide unrealistically high values for these material properties without suitable controls on the quality and diversity of the information. In response, NEI modified the guidance to specify that the resultant data account for uncertainties caused by variations in properties throughout the material. The guidance also specifies that, where multiple test results are available, minimum values for both stress and strain be used. The staff considers application of this revised guidance acceptable for establishment of material properties.

The staff considers the American Society of Mechanical Engineers' Boiler and Pressure Vessel Code, Section III, Appendix F acceptance criteria for limiting events (i.e., Service Level D) acceptable for the analytical methods proposed in the draft guidance. For energy balance evaluations using the large-displacement finite element methods described in the guidance, the staff finds the criteria applied to pipe whip restraint evaluations (i.e., one-half of ultimate strain) acceptable for application to component support evaluations. In the guidance, NEI has proposed more relaxed strain-based criteria for application to large-displacement finite element evaluations of coolant retaining components and component supports. The staff will review for acceptance the proposed NEI strain-based criteria, if such criteria is developed in conjunction with accurate benchmarking to large displacement tests of similar material in similar configurations. Under such an approach, strain-based acceptance criteria proposed by NEI may be acceptable as a result of the reduced uncertainty provided by the benchmarking.

The staff finds the guidance contained in the "Reactor Head Lift Single Failure Proof Crane Equivalence" acceptable for classification of existing cranes used for reactor vessel head lifts as equivalent to single failure proof (i.e., a load drop need not be postulated due to the low frequency of handling system failure). The staff concluded that equivalence is appropriate for cranes used for this specific application because the reactor vessel is a robust structure and, thus, not vulnerable to drops from low heights. The proposed minimum hardware requirements (i.e., redundant hoist upper limit switches, a hoist over-speed sensor circuit, redundant holding brakes, and control stations that include spring-return-to-off switches and an emergency stop button) reduce the potential for control system failures or operator errors to result in a load drop. Enhancements to administrative controls governing crane maintenance, inspection, testing and operation further reduce the potential for failures that could result in load drops. In some cases, such as wire rope strength, enhanced administrative controls are used as an equivalence measure when physical changes to the crane are unreasonably expensive relative to the expected benefit. Therefore, the staff concludes that the proposed guidance for single failure proof crane equivalence is acceptable.

We believe reactor vessel head lifts beginning after July 1, 2008, can readily be performed consistent with appropriate load drop analyses or with cranes satisfying the guidelines described above for single failure proof crane equivalence. The staff recognizes that facility owners that ultimately intend to develop more detailed load drop analyses using energy balance methods or enhance the reliability of the handling system to single failure proof crane equivalence may need additional time to complete such efforts. Therefore, development of an interim analysis may be necessary and is an acceptable approach. Licensees would perform these interim analyses for reactor vessel head lifts over flooded refueling cavities that conform to the proposed analysis guidelines that we endorsed above. The staff expects that the margin provided by the water cushion would allow for timely completion of these analyses.

The NRC staff appreciates your continued interest in implementation of your initiative on heavy load handling. We intend to follow this letter with formal endorsement of the NEI guidance as indicated above through a Regulatory Issue Supplement (RIS) and an eventual update to the Standard Review Plan, NUREG-0800. The staff will provide opportunity for public comment in association with development of the RIS. Please contact Mr. Steven Jones of the NRC staff at (301) 415-2712 to discuss any other concerns.

Sincerely,

/RA/

William H. Ruland, Director
Division of Safety Systems
Office of Nuclear Reactor Regulation

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