



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D. C. 20555-0001

May 18, 1994

Docket No. 52-003

Mr. Nicholas J. Liparulo  
Nuclear Safety and Regulatory Activities  
Westinghouse Electric Corporation  
P.O. Box 355  
Pittsburgh, Pennsylvania 15230

Dear Mr. Liparulo

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION ON THE AP600

As a result of its review of the June 1992, application for design certification of the AP600, and the review of Westinghouse's response to RAI 220.32, the staff has determined that it needs additional information in order to complete its review. The additional information is needed in the area of structural engineering (Q220.91)\*. Enclosed is the staff's question. Please respond to this request within 60 days of the date of this letter.

You have requested that portions of the information submitted in the June 1992, application for design certification be exempt from mandatory public disclosure. While the staff has not completed its review of your request in accordance with the requirements of 10 CFR 2.790, that portion of the submitted information is being withheld from public disclosure pending the staff's final determination. The staff concludes that this request for additional information does not contain those portions of the information for which exemption is sought. However, the staff will withhold this letter from public disclosure for 30 calendar days from the date of this letter to allow Westinghouse the opportunity to verify the staff's conclusions. If, after that time, you do not request that all or portions of the information in the enclosures be withheld from public disclosure in accordance with 10 CFR 2.790, this letter will be placed in the NRC's Public Document Room.

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\* The numbers in parenthesis designate the tracking numbers assigned to the questions.

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Mr. Nicholas J. Liparulo

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This request for additional information affects nine or fewer respondents, and therefore, is not subject to review by the Office of Management and Budget under P.L. 96-511.

If you have any questions regarding this matter, please contact me at (301) 504-1114.

Sincerely,

(Original signed by)

Kristine M. Shembarger, Project Manager  
Standardization Project Directorate  
Associate Directorate for Advanced Reactors  
and License Renewal  
Office of Nuclear Reactor Regulation

Enclosure:  
As stated

cc w/enclosure:  
See next page

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Mr. Nicholas J. Liparulo  
Westinghouse Electric Corporation

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AP600

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REQUEST FOR ADDITIONAL INFORMATION  
ON THE WESTINGHOUSE AP600 DESIGN

Design of Category I Structures

220.91 After reviewing Westinghouse's March 24, 1994 response to Q220.32, the staff has determined that it needs additional information pertaining to the following issues:

- a. Calculation of critical pressure (CP) of 161 psig for the 16-ft-diameter equipment hatch cover.

A critical pressure of 161 psig for the 16-ft-diameter equipment hatch cover was calculated by Westinghouse using the formula in Code Case N-284. This formula is based on a cylindrical shell. By using the formula from the Structural Analysis of Shells by Baker et al. (pp. 253-254, McGraw Hill, 1972), the CP is found to be 152.8 psig. The staff believes this formula is more appropriate for this application, since it is based only on the spherical cap covers (versus a cylindrical shell), which provides additional conservatism. Provide justification for the use of Code Case N-284 to determine the critical pressure.

- b. Application of Code Case N284 to the instability analysis of the 16-ft-diameter unstiffened equipment hatch cover.

The 16-ft-diameter unstiffened equipment hatch cover is subjected to external pressure. N284 is applicable to (1) local buckling of the shell plate between stiffening elements, (2) buckling between circumferential stiffeners of combined shell plate and attached meridional stiffeners, and (3) general instability or overall collapse of the combined shell and stiffening system. On the basis of the staff's interpretation of N284, the unstiffened shell for the general instability should be covered under NE-3222, unless justified otherwise. The attached table clarifies the staff position on the applicability of NE-3222 and Code Case N284. Provide justification for not using NE-3222.

In Section 10.2.5 of the AP600 PRA, the peak containment pressure is predicted to be 95 psia (80.3 psig). SECY-93-087, "Policy, Technical, and Licensing Issues Pertaining to Evolutionary and Advanced Light Water Reactor Designs," states that the containment stresses should not exceed ASME Service Level C limits for approximately 24 hours following the onset of core damage under the severe accident challenge. Based on the above discussion, the Level C Service Limit should be 61.1 psig (152.8 psig/2.5) for the 16-ft-diameter equipment hatch cover instead of the 96 psig (161 psig/1.67) value indicated in the March 24, 1994 response to this RAI. Address this issue.

Enclosure

Steel Containment Acceptance Criteria for Local and Global Bucklings

Global Buckling		Local Buckling
NE-3100, -3200	N-284	N-284
1. Unstiffened Shells (NE-3100) <ul style="list-style-type: none"> <li>a. External Pressure</li> <li>b. Axial Compression</li> </ul> 2. Factor of Safety** (NE-3200) <ul style="list-style-type: none"> <li>a. Level A: 3.0</li> <li>b. Level B: 3.0</li> <li>c. Level C: 2.5</li> <li>d. Level D: 2.0</li> </ul>	1. Stiffened Shells <ul style="list-style-type: none"> <li>a. External Pressure</li> <li>b. Axial Compression</li> <li>c. Dynamic loadings                             <ul style="list-style-type: none"> <li>• Symmetric</li> <li>• Unsymmetric</li> </ul> </li> <li>d. Reduction Factors*                             <ul style="list-style-type: none"> <li>• Capacity</li> <li>• Plasticity</li> </ul> </li> <li>e. Factor of Safety                             <ul style="list-style-type: none"> <li>• Level A: 2.4</li> <li>• Level B: 2.4</li> <li>• Level C: 2.0</li> <li>• Level D: 1.6</li> </ul> </li> </ul>	1. Unstiffened Shells <ul style="list-style-type: none"> <li>a. Internal Pressure</li> </ul> 2. Stiffened Shells <ul style="list-style-type: none"> <li>a. Internal Pressure</li> <li>b. Dynamic loadings                             <ul style="list-style-type: none"> <li>• Symmetric</li> <li>• Unsymmetric</li> </ul> </li> <li>c. Reduction Factors                             <ul style="list-style-type: none"> <li>• Capacity</li> <li>• Plasticity</li> </ul> </li> <li>d. Factor of Safety                             <ul style="list-style-type: none"> <li>• Level A: 2.0</li> <li>• Level B: 2.0</li> <li>• Level C: 1.67</li> <li>• Level D: 1.34</li> </ul> </li> </ul>

\* Definitions:

Capacity reduction factor: Accounts for the effects of imperfections and nonlinearity in geometry and boundary conditions.

Plasticity reduction factor: Accounts for the nonlinearity in material properties.

\*\* : To be applied after effects which can influence buckling are considered. See NE 3222.1 for detail.