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

FCTC:RHO
71-9081

OCT 02 1979

Chem-Nuclear Systems, Inc.
ATTN: Mr. J. Stewart Corbett
P.O. Box 1866
Bellevue, WA 98009

Gentlemen:

This refers to your application dated July 17, 1979, as amended, requesting an amendment to the Model No. CNSI-1600 packaging.

In connection with our review, please provide the information requested by the enclosure to this letter.

Please advise us within thirty (30) days from the date of this letter when this information will be provided. The additional information requested by this letter should be submitted in the form of revised pages to the consolidated safety analysis report in order to preserve the continuity of your application. If you have any questions regarding this matter, we will be pleased to meet with you and your staff.

Sincerely,

Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety

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Chem-Nuclear Systems, Inc.
Model No. CNSI-1600 Packaging

Encl to ltr dtd OCT 02 1979

General

1. Structural design criteria should be specified (cf. NRC Regulatory Guide 7.6 for containment vessel design and ASME Code III - NB for weldment and bolt designs).

2. Temperature effects on material strength and ductility properties should be considered in the analysis.

Package Description

Revise the drawings to clearly show all pertinent safety features, including all lid, plate, and shell dimensions, material types, weldments, solid cross sections, gaps, closure devices, etc.

General Standards for All Packaging

Tie-Down Devices - Provide justification for neglecting the shear force component in evaluating tie-down lug stress as the direction of cable tensile force may not coincide with that of the tie-down lug. Also the elevated temperature effect on lug yield strength should be considered in the evaluation.

Normal Conditions of Transport for a Single Package

Free Drop - Provide an analysis showing that the cask containment vessel design is adequate under the 2-foot free drop impact loading (cf. item General above).

30-Foot Free Drop

1. General (Applicable to Top and Bottom End, Side and Oblique Drop Impact Cases)

    a. Provide stress evaluation for the cask containment vessel components. If the quasi-static method of impact stress analysis is used, the dynamic amplification effects (if any) should be considered. Also static material strength (yield stress, ultimate strength, etc.) should be used in stress evaluation. Consider effects of multiple stress components and induced lead pressure loading (if any) in the stress evaluation.

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b. Provide data to show that strain rate and temperature have no significant effect on mechanical properties (shear and crush stresses and strains) of the overpack fill material (foam). Also describe the test specimen and test condition in obtaining the foam stress-strain relations and provide justification for use of the uniaxial test data in the g-load analysis of the cask impact problems as the strain state at the center section may approach a plane strain state.

2. Corner Drop

a. Bottom Corner Drop - Revised the g-load analysis to include the effect of direct (in-plane) and bending resistances of steel shells and end plate at the impacted region on g-load results. In the crush analysis at the impacted region either justify the following or revise the analysis if justification cannot be made: (i) use of 5 ksi lead flow stress in the analysis considering the elevated temperature effect, (ii) the analytical method used in accounting for steel shell/plate deformation effects and use of 45 ksi dynamic flow stress. Also evaluate containment shell/plate stresses in the impacted region (cf. Item 1 above).

b. Top Corner Drop - Show that the impact limiter would not be sheared off under various corner and oblique angle drop impact cases. Lid bolt stress evaluation should be revised to include the effects of nonlinear force distribution at the impacted surface on bolt stresses, combined direct and shear stress effects on the plastic flow (failure) condition, elevated temperature effects on material strength properties, possible dynamic amplification effects on bolt stresses, and impact orientation angle effects on bolt shear stress. Also see Item 1 above.

3. End and Side Drops - See Item 1 above. Both top and bottom end drop and side drop cases should be considered.

Puncture

The puncture evaluation should be extended to the bottom corner drop puncture case, in which the corner was damaged by the preceeding 30-foot free drop impact loading. Consider the following:

- Accumulated damage effects and reduction in lead thickness effects.

- Elevated temperature effects, which can reduce lead-backed plate puncture energy absorbing capacity by about 20% at 200°F temperature from that of room temperature.

- Test data scattering effects and other uncertainties, which should be accounted for by application of design safety factor in conjunction with use of empirical puncture analysis equation.

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- The existing cask shell or plate puncture equations such as Nelms' for the lead-backed case are developed on the basis of test data of single layer steel plate or shell backed-up by a thick layer of lead. The required cask shell thickness calculated by using such an empirical equation should not be compared with the total thickness of lead-backed laminated steel shell because it is outside the range of applicability of Nelms' equation (or its applicability in the present problem is yet to be demonstrated).

Leak Testing

Specify leak testing criteria and procedures prior to each shipment and periodically show that the sensitivities and testing schedules are adequate for safe use of the packages. Regulatory Guide 7.4 may be used for periodic testing. For assembly verification it is recommended that a test of sufficient sensitivity to limit the maximum release to a type A quantity in 10 days is used, however, a leak test sensitivity greater than $1x10^{-3}$ at-cm^3/sec, would not be required. The minimum sensitivity of $1x10^{-1}$ at-cm^3/sec (air at 1 atm and 25°C leaking to a 10^{-2} at ambient) as specified in ANSI N14.5 should be met.

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