71-9158

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Return to A. Madden 396-55

JUL 23 1982

FCTC:RHO
71-9158

Ridihalgh, Eggers, & Associates
ATTN: Ms. Patricia E. Parker
2219 Summit Street
Columbus, OH 43201

Gentlemen:

This refers to your application dated January 26, 1982, as supplemented June 17, 1982, requesting approval of the Model No. CNS 3-70 (GPU-80) packaging.

In connection with our review, we need the information identified in 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. If you have any questions regarding this matter, we would be pleased to meet with you and your staff.

Sincerely,

Original Signed by
CHARLES E. MACDONALD
Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety, NMSS

Enclosure: As stated

cc w/encl:
GPU Nuclear Corporation
ATTN: Mr. Ray E. Hahn
P.O. Box 480
Middletown, PA 17057

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Model No. CNS 3-70 Packaging
Docket No. 71-9158

Encl to ltr dtd: JUL 23 1982

STRUCTURAL (CHAPTER 2)

1. Provide an analysis of the cask for the free drop test under normal conditions of transport.

2. Provide an analysis of the cask for 30-foot drop test conditions on the top corner and the bottom corner. Provide a free body diagram of the impacted corner to show all forces acting on that corner and equilibrium condition is satisfied.

3. The evaluation of the side puncture from the 40-inch drop was based on elastic theory with an impact force equivalent to 3.4g's which is too low to satisfy the principal of conservation of energy. Provide an analysis to show that energy is balanced by the impact force and cask deformation.

4. Evaluate the cask for the 40-inch puncture test on: (a) the top closure, (b) the bottom end, and (c) the top and bottom corners.

5. Show that the cask closure system, including the flange at the top of the cask, has adequate rigidity to maintain a seal under the normal and accident tests in 10 CFR Part 71 and under excessive tie-down forces (§71.31(d)(3)).

6. The safety performance of the impact limiters has not been adequately substantiated for the following:

   a. The application does not address the force-deflection characteristics of the impact limiters to show that the impact limiters have adequate energy absorbing capability (i.e., that they do not "bottom out"). Provide load vs. displacement curves for all the materials used in the impact limiter (i.e., high and low density foams, corrugated steel cylinders, 0.06 inch thick steel cylinder).

   b. For the corner drop test condition the assumption that redwood will develop its full crush strength when foam and thin steel sheeting are behind the redwood and in line with the force applied has not been justified.

   c. The application does not justify the assumption that the dynamic crush stress of redwood is less than its static crush stress.

   d. The effective length of the bottom impact limiter used in the side drop analysis is too long.

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7. The evaluation assumes that the inertia load of the contents will offset the impact forces acting on the top cover (and bottom end). However, the application does not show that the two forces would act on the cover at the same instant (i.e., it appears there would be a time phase difference for these two loads). The application should also specify the minimum payload weight, the material properties of the content, the size and shape of the liner that contains the payload, and the rationale that the payload will be uniformly distributed on the top cover (and bottom end).

8. Evaluate the adequacy of the welds at the junction of base plate and the cask cylinder taking into account of the lateral force due to lead slump, the shear force and the edge moment due to end impact.

9. Provide an analysis to show that the impact limiter will remain an effective energy absorbing device even if the impact force is predominately shear force as in a near horizontal oblique drop case. Also, show that the impact limiter will remain in place to provide thermal protection for the fire test following the 30 foot drop.

10. The 30-foot side drop evaluation considered the cask as a simple beam even though the depth of the member is not small with respect to the length. The application does not consider ovaling effects of the cask.

11. The application does not justify the assumption that the energy absorbing capability of the steel plates provided at the voids of the top impact limiter is valid for plates that are not similarly supported as those of the experiments in the reference cited (e.g., both ends welded to 0.12 inch plates, cask not rigid, etc.).

12. The evaluation of the cover assembly under 30-foot bottom drop conditions ignored tangential stresses.

13. The vent and drain lines were not evaluated for 30-foot drop or puncture test conditions.

14. The application does not address the 13 psig internal pressure during the 30-foot drop nor the 30 psig pressure following the fire test condition.

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15. The tie-down analysis was based on old impact limiter dimensions. The analysis should be revised to agree with present dimensions. Also, it is seen from the analysis that large horizontal reaction force is needed at the base of the cask to satisfy equilibrium condition. Since the cask rests on the bottom impact limiter, an analysis should be presented to show that the impact limiter is capable of resisting and transmitting the reaction force to the cask.

16. Table 2.4. Maximum component temperature in cask during normal operation does not agree with Table 3.3. Similarly, Table 2-15. Maximum component temperatures in cask during accident does not agree with Table 3.5 in the thermal analysis section.

CONTAINMENT (CHAPTER 4)

1. The information provided in the application has a number of errors which should be corrected:

   (a) The value of 0.00277 cp used for absolute helium viscosity in equation 4.1 is low by about a factor of 10.

   (b) The leak rates identified in the discussion of sensitivities in Sections 4.2.1.1 and 4.2.1.2 are inconsistent.

   (c) The $A_2$ values for Cs-134 and Cs-137 in Table 4.5 are incorrect, resulting in errors in some of the calculated values.

2. A specific containment criteria should be identified (e.g., a leak test under specific conditions having some minimum sensitivity).

3. Tests proposed to satisfy the specified containment criteria should be shown to do so. Proposed tests should be identified, conditions and minimum sensitivities specified.

4. Provide assurance that bubble tests (Section 4.2.1), when and where used, are sufficiently reliable to achieve required test sensitivities. We note the use of bubble tests has not been included in Chapters 7 and 8. If these tests are not performed, they should be deleted from Chapter 4.

SHIELDING (CHAPTER 5)

1. Provide the coordinates (x,y,z) for all twelve dose points, at three feet from the surface of the cask, for the lead slump accident. Include the origin of coordinates for Figure 5.5.1.

2. List build-up factors used in QAD program in estimating gamma dose rates for normal and accident conditions.

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OPERATING PROCEDURES (CHAPTER 7)

1. In Section 7.1, Item 14, specify the penetrations to be tested, test conditions (i.e., T,p), and the acceptable leak rate at the test conditions.

2. Call out a radiation survey on the load package (add to Item 21, Section 7.1).

3. Provide operating procedures that will be followed and steps to be taken to ensure that radiolytic decomposition of water in the package will not result in excessive pressure or explosive mixtures present within the package.

ACCEPTANCE TESTS AND MAINTENANCE PROGRAM (CHAPTER 8

1. For Section 8.1.3.1, specify the penetrations to be tested and the temperature and pressure associated $1x6^{-6}$ atm-cc/sec helium test. For Section 8.2.2, specify the specific penetrations to be tested, test conditions (i.e., T, p), and the acceptable leak rate at the test conditions.

2. Specify a routine replacement schedule for the neoprene lid gaskets to account for aging under normal conditions (Section 8.2.4).

3. The acceptance criteria following the 30 psig pressure test (Section 8.1.2.3, p. 8-3) should be revised to be more specific. Any detectable deformation of the packaging following the test should require reevaluation by both the packaging designer and the NRC.

4. Lead pour procedure LP-100 states that, "a four inch diameter opening is the preferred size for adequate lead pour and dross removal." Will the 3 inch diameter holes called for on the Cask Body Weldment Drawing No. 1094-1329, provide adequate access to the surface (approximately five feet in diameter) during the final stages of the lead pour.

5. The acceptance criteria given in the Section 8.1.5 and Gamma Probe Procedure GP-200 implies that a 10% reduction in shielding over 100% of the cask surface is acceptable. Such a reduction in shield thickness should be considered in the lead slump analysis.

6. Liquid penetrant procedure PT-100 does not specify an acceptance criteria.

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7. Containment Boundary Leak and Pressure Test Procedure, REA LT-101-1 provides the option of leak testing the shielding cavity after lead pour. Discuss the method used to assure that helium introduced at a point on the outer shell will occupy the space between the inner shell (containment vessel) and the lead shield.

8. Fabrication Sequence and Identified Hold Points

   o Step 12 - Liquid penetrant inspection of welds is out of sequence. Weld inspection should be performed before leak testing.

   o Liquid penetrant procedure PT-100 calls for the root pass to be inspected. The fabrication sequence does not provide for this inspection.

   o Steps 13 through 15 - Fabrication of impact limiters. Installation of the foam material has not been mentioned nor has the liquid penetrant inspection of the welds.

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