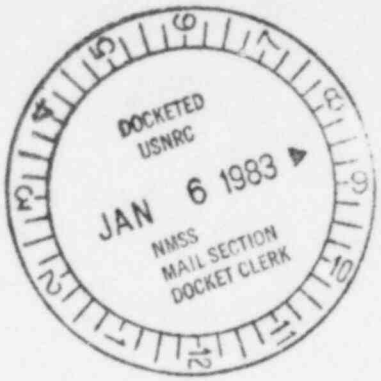
HITTMAN

**Hittman Nuclear & Development Corporation**
9190 Red Branch Road
Columbia, Maryland 21045
301/730-7800

71-9086
PDR
Return
+39655




Refer to:
HN-E661

December 30, 1982


Mr. Charles MacDonald, Chief
Transportation Certification Branch
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: HNDC HN-100 Series 1
Radioactive Materials Package
Certificate of Compliance No. 71-9086
Application for Renewal

Dear Mr. MacDonald:

Reference is made to your letter FCTC:CEW 71-9086, dated November 29, 1982, which requested additional information in connection with the renewal of the subject package. Attached are eight copies of the following:

(1) Attachment A, "Responses to Nuclear Regulatory Commission letter dated November 29, 1982"

(2) Attachment B and C, replacement pages for "Safety Analysis Report for the HN-100 Series 1 Radwaste Shipping Cask", STD-02-006, Revision 0

(3) Hittman Nuclear & Development Corporation Drawing Nos.: STD-02-028, Revision 5, STD-02-029, Revision 5, and STD-02-030, Revision 4.

The fee for the renewal of this application was forwarded by our letter of April 9, 1982. If you have questions or require additional information, please contact me.

Very truly yours,

Charles W. Mallory
Director, Engineering

lh
Attachments

FEE EXEMPT
FEE AMT
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ATTACHMENT A

Radioactive Materials Package
Certificate of Compliance No. 9086
HNDC Model HN-100 Series 1
Application for Renewal

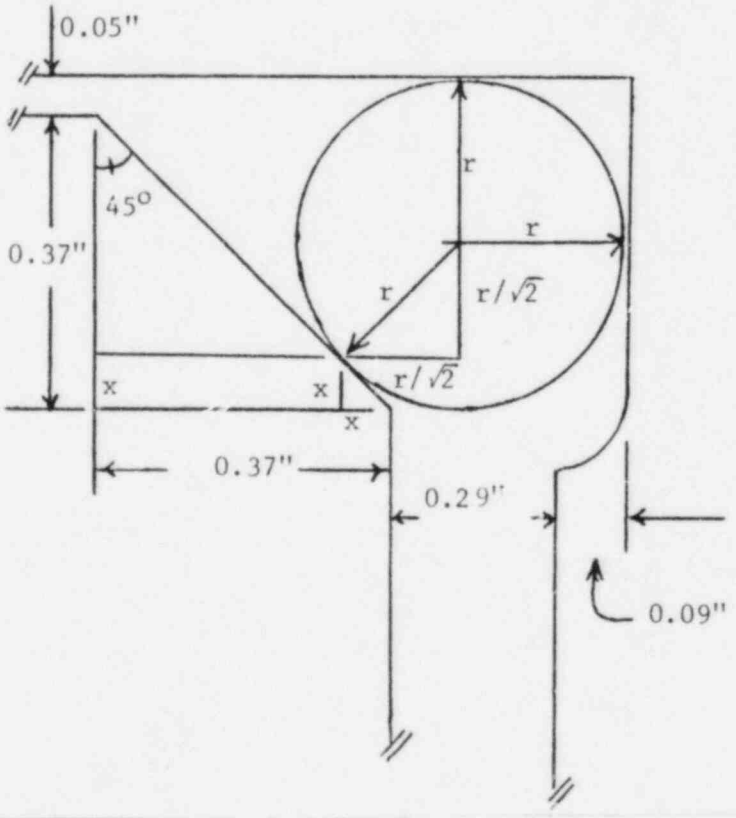
"Responses to Nuclear Regulatory Commission Letter
Dated November 29, 1982"

## A. GENERAL

The attached replacement pages to the "Safety Analysis Report for the HN-100 Series 1 Radwaste Shipping Cask", STD-R-02-006, Revision 0, and the following revised drawings are submitted in response to the Nuclear Regulatory Commission Letter, FCTC:CEW 71-9086, dated November 29, 1982:

Hittman Nuclear & Development Corporation Drawings Nos.:
STD-02-028, Revision 5, and STD-02-029, Revision 5

1a. Sealing of the cask during closure is accomplished by an O-ring gasket on the primary and secondary shield covers. The minimum offset of the lid which could cause ununiform seating on the gasket is the tolerance on the metal to metal contact of either the lid and cask body, or primary and secondary lid. The maximum opening on the primary lid is the difference in O.D. of lid and I.D. of body.




77.85 - 77.56 = 0.29"

Using geometry, calculate minimum r can be and still have contact on all three surfaces.

$$\begin{aligned} r + r/\sqrt{2} &= 0.38 + x \\ r + r/\sqrt{2} &= 0.05 + 0.37 - x \\ \hline 2r + 2r/\sqrt{2} &= 0.80 \end{aligned}$$

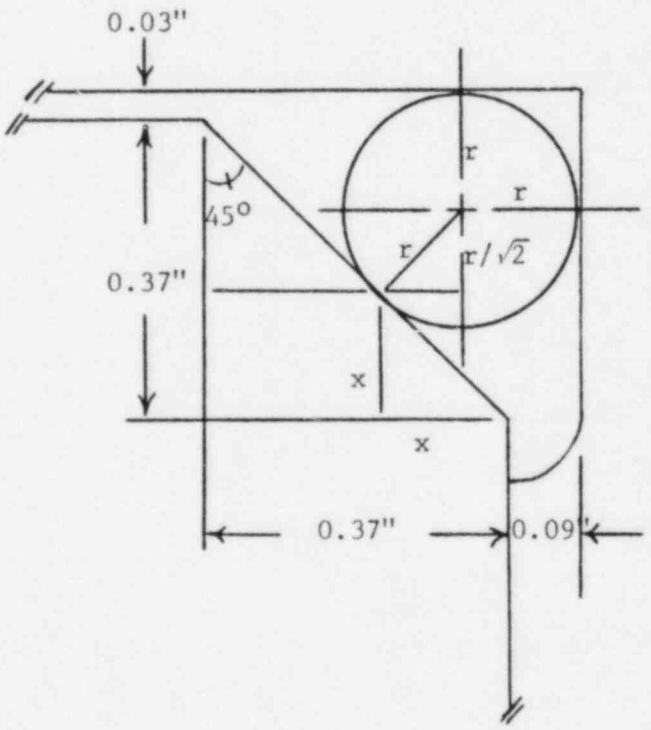
$$3.414\ r = 0.80$$

$$r = 0.234$$

diameter of gasket = 0.468 inches

The gasket used is 1/2 inch diameter; this would give a minimum compression of 6%.

Similarly, compression for the "tight" side:



$$\begin{aligned} r + r/\sqrt{2} &= 0.09 + x \\ r + r/\sqrt{2} &= 0.03 + 0.37 - x \\ \hline 2r + \sqrt{2}\, r &= 0.49 \end{aligned}$$

$$3.414\, r = 0.49$$

$$r = 0.1435$$

diameter = 0.287 inches

The gasket used is 1/2 inch diameter; this would give a maximum compression of 42%.

By tightening the 30 one inch studs from 190 to 210 ft-lbs, the compression ranges between 6% and 42%. These values are in the cask handling procedure which is part of the Rad Services Manual furnished to each user. This range between 6% and 42% compression assures maintaining a seal at the maximum displacement and does not excessively crush the O-ring and cause permanent damage.

The shield plug may be shifted as much as 1/32 inches in the stud holes. The compression ranges from a minimum 22% to a maximum 51%.

1b. Drawing STD-02-028, Revision 5, deletes the "2.000 Ref." dimension and adds a "2.000" associated dimension which is within tolerance.

1c. Paragraph 1.2.1, "Packaging" of the Safety Analysis Report page 1-2 (Attachment B) has been revised to reflect an 81.5 inch outside shell diameter.

1d. Drawing STD-02-029, Revision 5, deletes "Reference" labeling of dimensions pertinent to evaluating package performance in the following details:

View G-G: 6.5"
Plan View, Zone C-4: 2-1/8"
Section H-H: Lift Lug Dimension

1e. Drawing STD-02-030, Revision 4, deletes the optional drain plug. The drain plug shown on Drawing C001-5-9127, Revision 1, will be replaced by the drain plug within four months.

2. Section 2.10.2.13 of the Safety Analysis Report, "Restrictions on the Use of Unit 5", page 2-45, (Attachment C) has been revised to calculate the load reduction using consistent stress values. The payload for Unit 5 has been limited to 6911 pounds.

## B. REQUESTED CHANGES TO CERTIFICATE OF COMPLIANCE NO. 71-9086

It is requested that the following changes be made in Certificate of Compliance No. 9086:

Paragraph 1(b)

Revision No. 8.

Paragraph 5(a)(2)

A steel encased, lead shielded cask for low specific activity material. The cask is a right circular cylinder 82.5 inches high by 81.5 inches in diameter. The cask cavity is 74.5 inches high by 75.625 inches in diameter. The cask side wall consists of a 3/8 inch thick inner steel shell, a 1-3/4 inch lead shell, and a 7/8 inch thick outer steel shell. The base is a 4 inch thick steel plate which is welded to the inner and outer steel shells of the side wall. A steel flange is welded to the inner and outer stell shells of the side wall at the top. The lid is a 4 inch thick steel plate which is stepped to mate with the steel flange. The cask closure is sealed by a Viton or Buna-N O-ring gasket located between the lid and steel flange. Positive lid closure is accomplished by thirty, 1 inch studs. The lid contains a centrally located 4 inch stepped steel shield plug. The shield plug is sealed by a Viton or Buna-N O-ring gasket, and sixteen, 1/2 inch studs are used to provide positive closure.

Tie-down is accomplished by four tie-down lugs welded to the cask body. The tie-down lugs are constructed of A203 Grade E steel having a minimum yield strength of 61,000 psi. (Unit 5 has a minimum yield of 50,400 psi.) There are three cask lift lugs, three lid lift lugs and one shield plug lifting lug. The lift lugs are constructed of steel having a minimum yield strength of 43,900 psi. The shell of the cask is constructed of steel having a minimum yield strength of 42,000 psi. The package gross weight is 50,000 pounds.

Paragraph 5(a)(3)

The packaging is constructed in accordance with Hittman Nuclear & Development Drawings Nos.: STD-02-028, Revision 5; STD-02-029, Revision 5; and STD-02-030, Revision 4.

Paragraph 5(b)(1)

(1) Type and Form of Material

Process solids either dewatered, solid or solidified meeting the requirements for low specific activity radioactive materials, in secondary container. Materials may include by-product, source and transuranic materials of Type A quantities or greater than Type A quantities in the form of low specific activity material. Contents may include exempt quantities of fissile material (10 CFR 71.9).

Paragraph 5(b)(2)

(2) Maximum Quantity of Material per Package

Greater than Type A quantities of radioactive material with the weight of the contents, secondary containers and shoring not exceeding 14,500 pounds. (The maximum weight of contents for the HN-100 Series 1, Unit 5, is restricted to 6,911 pounds, unless modified to conform with the other units in this class.)

Paragraph 6

Shoring shall be placed between small secondary containers and the cask cavity to minimize movement during normal conditions of transport. Shoring is not required for containers or pallets designed to fit the cavity.

Paragraph 8

Prior to each shipment, the seal on the main cover and the seal on the shield plug cover, if opened, or if the security seal is broken, must be inspected. The seals must be replaced if the inspection shows any visable defects or every twelve (12) months, whichever occurs first.

The HN-100 Series 1 Shipping Cask is a primary containment vessel for radioactive materials. It consists of a cask body, cask lid, and a shield plug being basically a top-opening right circular cylinder which is on its vertical axis. Its principal dimensions are 81.5 inches outside shell diameter by 82.5 inches high with internal cavity of 75.625 inches inside diameter by 74.5 inches high.

1.2.1.1 Cask Body

The cask body is a steel-lead-steel annulus in the form of a vertical oriented, right circular cylinder closed on the bottom end. The cask is a right circular cylinder 82.5 inches high by 81.5 inches in diameter. The cask cavity is 74.5 inches high by 75.625 inches in diamater. The cask side wall consists of a 3/8-inch thick inner steel shell, a 1-3/4-inch lead shell, and a 7/8-inch thick outer steel shell. The base is a 4-inch thick steel plate which is welded to the inner and outer steel shells of the side wall. A steel flange is welded to the inner and outer steel shells of the side wall to the top. The lid is a 4-inch thick steel plate which is stepped to mate with the steel flange. The cask closure is sealed by a Viton or BUNA-N O-ring gasket located between the lid and steel flange. Positive lid closure is accomplished by thirty, 1-inch studs. The lid contains a centrally located 4-inch thick stepped steel shield plug. The shield plug is sealed by a Viton or BUNA-N O-ring gasket, and sixteen, 1/2-inch studs are used to provide positive closure. Tie-down is accomplished by four tie-down lugs welded to the cask body. There are two or three casks lifting lugs, three lid lugs, and one shield plug lifting lug.

1.2.1.2 Cask Lid

The cask lid is four inches thick which is stepped to mate with the upper flange of the cask body and its closure seal. Three steel lifting lugs are welded to the cask lid for handling. The cask lid also contains stepped opening for a shield plug at its center.

Calculated bearing stress in tiedown lugs under conditions specified in 10 CFR 71.31(d)(1): 53,476 psi.

Certified yield strength of tiedown lugs used on HN-100 Series 1, Unit 5: 50,400 psi. (0.9* 50,400 psi = 45,360 psi in bearing).

Reduction in load required to reduce stress in lift lugs to yield:

$$\frac{53,476 - 45,360}{53,476} = 15.17\%$$

Required reduction in package gross weight:

50,000 lbs x 15.17% = 7,588 pounds

Allowable weight of contents to avoid stresses in excess of yield:

14,500 lbs - 7,588 lbs = 6,911 lbs

2.10.2.14 Failure Under Excessive Load

The tiedown lugs are designed to fail first under excessive load and preclude damage to the package. Based on the ultimate strength of the shell material, the force required to cause extensive deformation of the shell would be:

$$F = 211,766 \times \frac{64,800}{34,000} = 403,600 \text{ lbs.}$$

The lugs would fail due to combination of bearing and tensile stresses. Based on the ultimate strength of the lug, failure would occur with force if: