

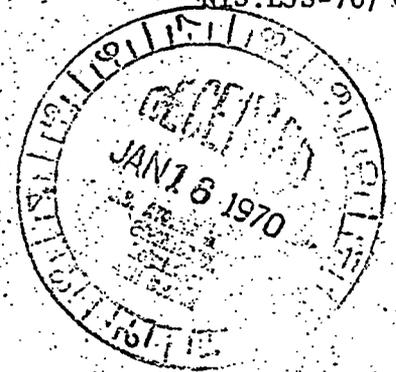
RECEIVED
GENERAL INVESTIGATIVE
DIVISION
JAN 14 1970



DOCKET NO. 70-36 (11)
-820

January 14, 1970

TELEPHONE 314-937-4691
314-296-5640
TWX 910-760-1760
NIS:LJS-70/641



Mr. Donald A. Nussbaumer, Chief
Source & Special Nuclear Materials Branch
Division of Material Licensing
4915 St. Elmo Place
Bethesda, Maryland 20014

Subject: Shipping Container Model UNC 1484

Reference: UNC Model 1483 approved under Special Nuclear Material Licenses:
SNM-33, Docket 70-36, Amendment 71-12
SNM-777, Docket 70-820, Amendment 71-12

Gentlemen:

United Nuclear Corporation respectfully requests amendment of its licenses SNM-33 and SNM-777 respectively to include the new shipping container model UNC 1484. This container will replace the model UNC 1483 when it's DOT special permit expires in February 1970.

The model UNC 1484 is similar to the DOT specification 6L package. However, the model 1484 is designed to ship up to 25.4 kg U-235 almost double the limit (14 kg U-235) on the 6L.

In support of this application, pages 1 through 3 dated January 14, 1970 of Subsection 703 are submitted. These provide a full description and safety evaluation of the container. The nuclear safety evaluation is based on calculations performed at the Research and Engineering Center of United Nuclear Corporation. The results of these calculations have been summarized in a TWX to permit an early submittal of this application. The formal complete report will be forwarded by January 26, 1970.

D-32

Mr. Donald A. Nussbaumer,
Page Two

January 14, 1970

To assist processing our request to the DOT for special permit, please forward copy of your approval to:

Secretary, Hazardous Material Regulation Board
Department of Transportation
400 Sixth Street SW
Washington, D.C. 20590

Respectfully yours,



L. J. Swallow, Manager
Nuclear & Industrial Safety

LJS:jb
Attachment

AEC (7)
DOT (1)

LICENSE: SNM-33, Docket: 70-36
 SNM-777, Docket: 70-820
 SECTION: 700 - TRANSPORTATION
 Subsection: 703 - Shipping Containers

Supersedes New

Approved

Amendment No.

703. Shipping Containers

1. Container Model UNC 1484

2. Description

Details of the package are shown on UNC Drawing 66008-401.

The package is similar to the DOT specification package 6L with the exception of the insulating material and flanged closure of the inner containment vessel. These differences are beneficial as demonstrated in the structural evaluation tests and experience with other containers with these same design features.

3. Description of Material and Quantity per Package

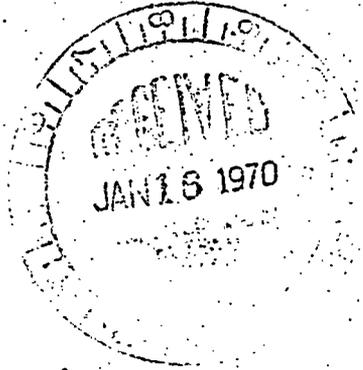
The material to be shipped is uranium as dry oxide and compounds of all U-235 enrichments and which do not decompose at temperatures up to 750°F. The radioactive thermal decay energy output does not exceed 10 watts. The material has a maximum bulk density of 5.3 kg U per liter.

Maximum quantity per package is:

- a) Fissile Class I - None.
- b) Fissile Class II and III
 Maximum net weight 29.5 kg
 Maximum U-235 content 25.4 kg

Number of containers per shipment:

- a) Fissile Class I - None.
- b) Fissile Class II
 Transport Index is 1.4 units per package. (Maximum of 36 packages for total of 50 Transport units per shipment.)
- c) Fissile Class III - 72 packages.



LICENSE: SNM-33, Docket: 70-36
 SNM-777, Docket: 70-820
 SECTION: 700 - TRANSPORTATION
 Subsection: 703 - Shipping Containers

Supersedes New

Approved

Amendment No.

4. Nuclear Criticality Safety Evaluation

a) Individual Container

The individual container is safe in the event of maximum credible water moderation and full water reflection. Reference NED-414.

b) Array of Containers

Normal Transportation:

Results of the hypothetical accident test permit assumption that no water inleakage occurs. Therefore, product is dry and interspersed moderation is only that provided by packaging materials. The maximum number of containers per array for an array K eff of .90 is 180. Reference NED-414.

Allowable number of containers per shipment is therefore:

Fissile Class II 36
 Fissile Class-III 72

Accident Conditions:

The hypothetical accident test demonstrated no water leakage in the inner container.

Assuming product is dry and maximum credible interspersed moderation, the maximum number of containers for an array K eff of .90 is 180. Reference NED-414.

Allowable number of containers per shipment is therefore:

Fissile Class II 90
 Fissile Class III 90

The normal transportation condition is the most restrictive case and will therefore be used to establish shipping limits.

LICENSE: SNM-33, Docket: 70-36
 SNM-777, Docket: 70-820
 SECTION: 700 - TRANSPORTATION
 Subsection: 703 - Shipping Containers

Supersedes New

Approved

Amendment No.

5. Structural Evaluation

A. Package

The package prepared as for shipment was subjected to the hypothetical accident test conditions in accordance with 10CFR 71.36 and 49CFR 173.398(c). The net weight of the contents was 65 pounds (29.5 kg). Pictures 1 and 2 show the package partially assembled.

B. Results of Test

1. 30 Foot Drop Test

This test is shown in pictures 3 and 4. The bottom of the outer container was dented but there was no damage to the inner components and no shifting of load.

2. Fire Test - 1475°F, 30 Minutes

Pictures 5, 6, 7, 8, 9, 10 and 11 show the test and results.

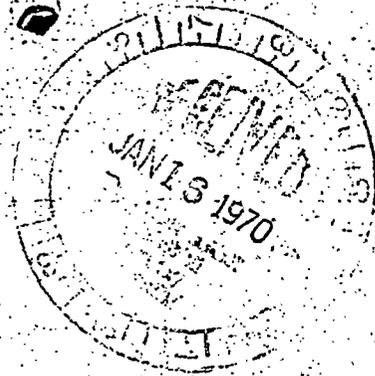
The outer 1/4" to 1/2" of insulation and the plywood discs on the ends were charred. "Temp-Plate" temperature indicators placed inside the inner container near the top and bottom indicated a maximum temperature of approximately 200°F. As can be seen from the pictures, the product containers in the inner container were not charred.

3. Water Immersion Test - 3 Feet for 8 Hours

There was no evidence of inleakage of water.

4. Puncture Test - 40" Drop on 6" Diameter Cylinder

There was no puncture of the outer container.



UNC HEMATITE

1N14N70

TO: L. J. SWALLOW - UNC HEMATITE
FROM: E. FASS - UNC ELMSFORD
SUB: CRITICALITY ANALYSIS - SHIPPING CONTAINER, UNC MODEL 1484

PER YOUR REQUEST, FOLLOWING IS SUMMARY OF CALCULATIONS TO BE REPORTED
IN DETAIL IN NED-414.

ASSUMPTIONS

1. CONTAINER AS PER DRAWING 66008-401.
2. FULL U-235 ENRICHMENT.
3. URANIUM BULK DENSITY
5.3 KG UNLITER (ITEM)
4.0 KG UNLITER (UO-2)
MAXIMUM THEORETICAL PARTICAL DENSITY IS 9.66 KG UNLITER
4. MAXIMUM LOADING - 29.6 KG PRODUCT.
5. PRODUCT AS PACKAGED IS DRY.
6. ARRAYs ARE FULLY REFLECTED BY WATER, AND A 30 CM THICK WATER REFLECTOR IS PLACED AROUND THE OUTER CONTAINER WALL OF THE INDIVIDUAL CONTAINER.

RESULTS

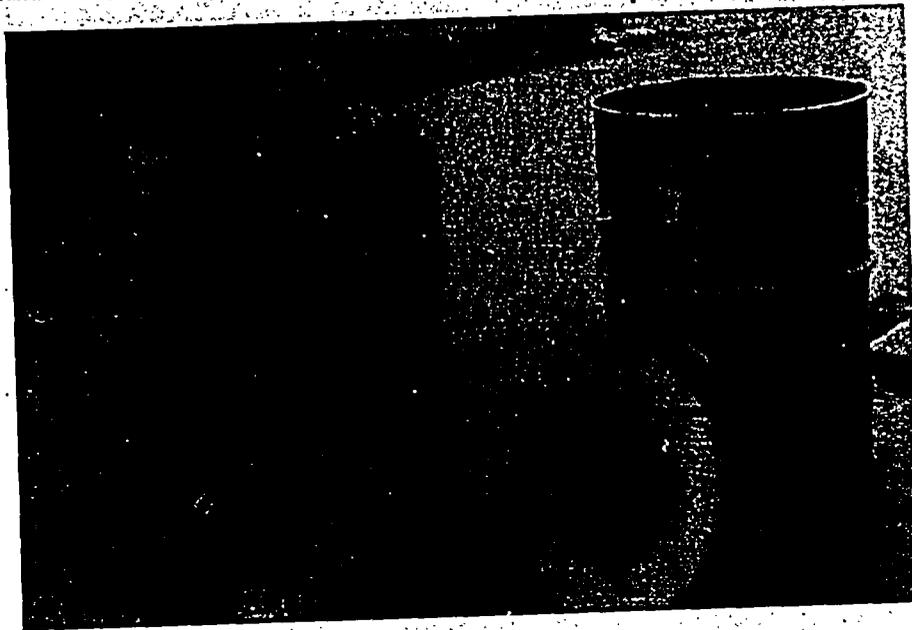
INDIVIDUAL CONTAINER

HNU == 0.
REFLECTOR = PROVIDED BY CONTAINER MATERIALS AND OUTER 30 CM
OF WATER
K INFINITE = 0.522
K EFF = 0.372
HNU = 3 (MAXIMUM POSSIBLE AT MAXIMUM BULK DENSITY)
REFLECTOR = OUTER CONTAINER WATER FLOODED AND OUTER 30 CM
OF WATER
K INFINITE = 0.954
K EFF = 0.680

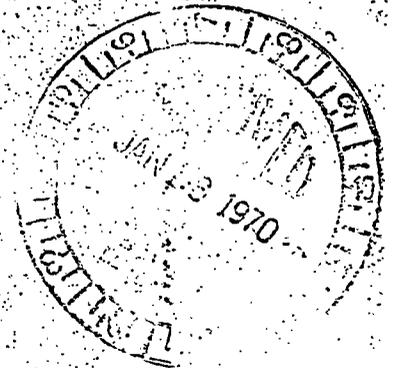
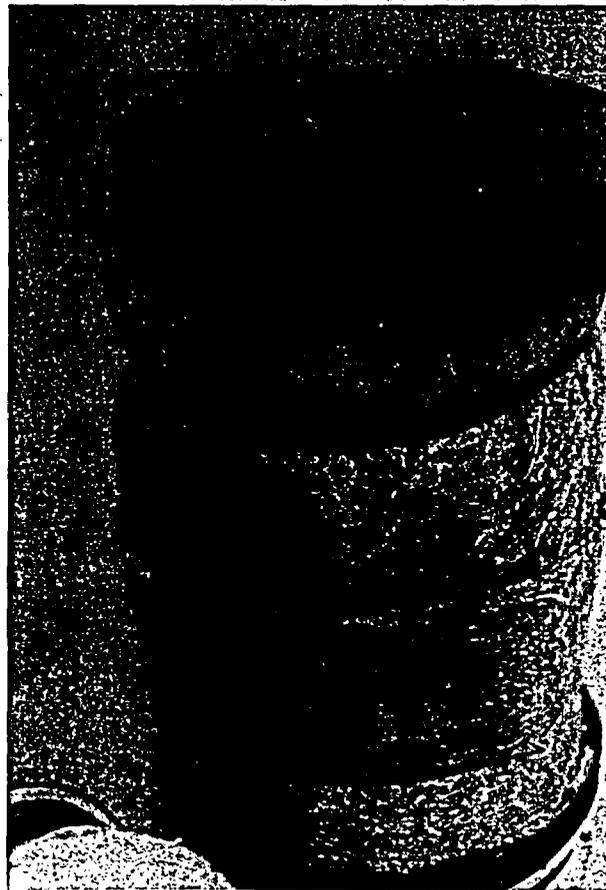
Continued on Page Two

Structural Evaluation Test Pictures

1



2

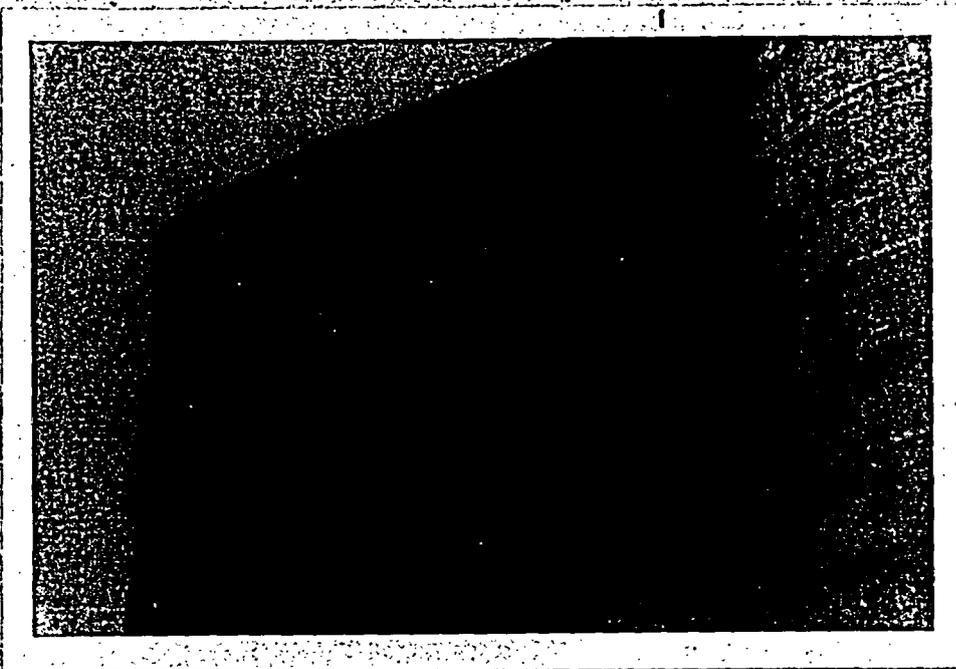


Package Components Prior to Test

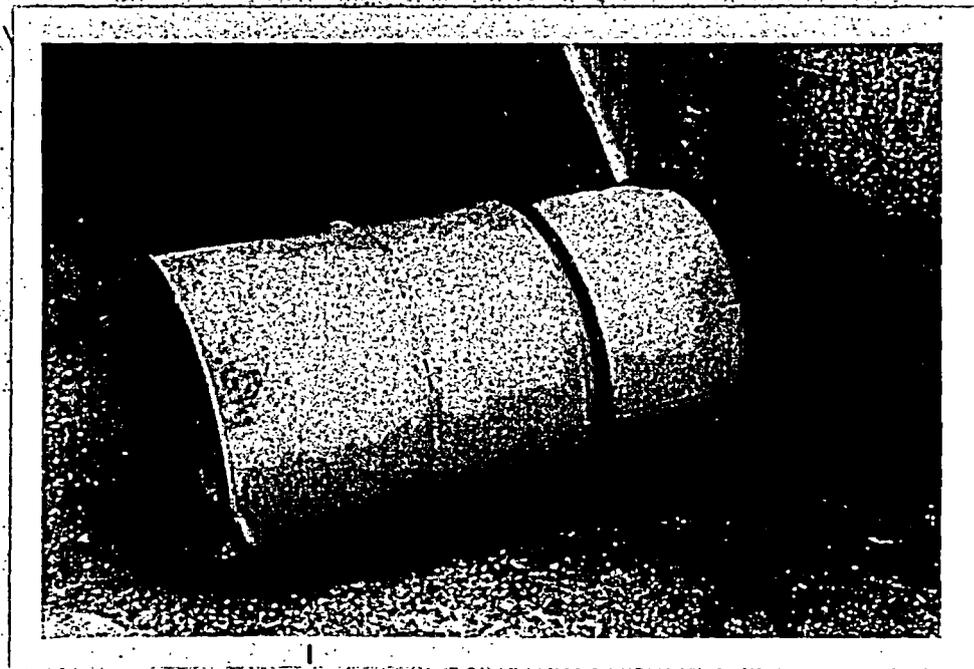
Package UNC 1484

Structural Evaluation Test Pictures

3

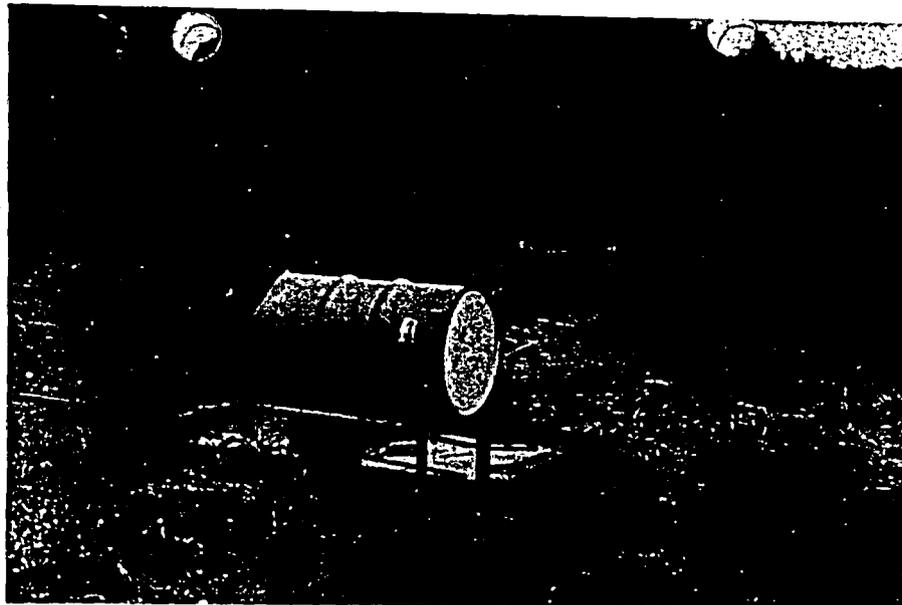


4



Package 30 Foot Drop Test

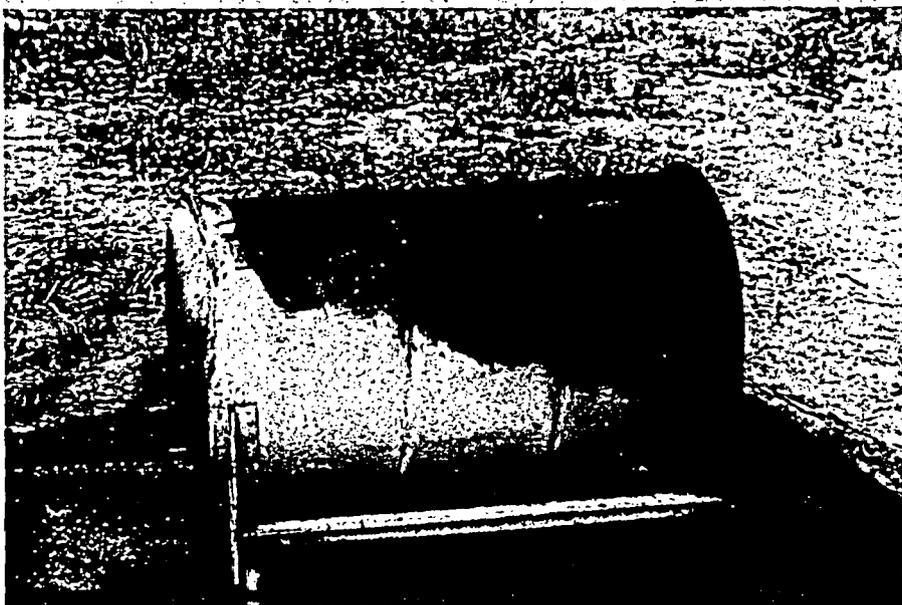
5



6



7

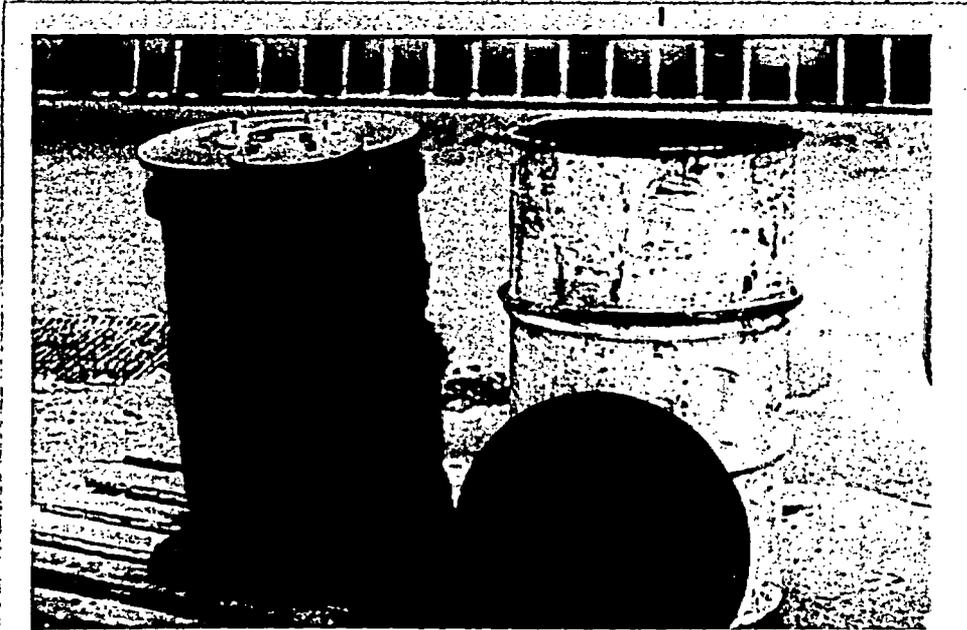


Fire Test

8



9



Package Components After Fire Test

Package UNC 1484

10



11



Package Components After Fire Test