SUPPLEMENT NO. 1

SAFETY ANALYSIS REPORT
T-2 Shipping Package

1.1 Introduction

This supplement to the April 1980 Safety Analysis Report (SARP) for the T-2 Shipping Package covers the addition of a stainless steel, sheet-metal liner inside the shipping case. The sheet-metal liner serves to protect the "Marinite" insulation from physical damage and contamination during normal loading and unloading operations.

1.2 Package Description

1.2.2 Packaging

1.2.2.1 Shipping Case

A 16-gauge (0.0625-in. thick) stainless steel, sheet-metal liner inside the shipping case protects the "Marinite" from physical damage and possible contamination during normal loading and unloading operations. A 1/8-in. clearance is maintained between the sheet-metal liner and the cask, except at the cone-shaped end plates. Fig. 1.2 shows the principal elements of the T-2 shipping case.

2.0 Structural Evaluation

2.1 Structural Design

2.1.1 Discussion

A sheet-metal liner inside the shipping case protects the "Marinite" from physical damage during normal loading and unloading operations. The thin sheet-metal liner will deform under severe impact conditions and allow the "Marinite" to absorb the impact energy.

2.6.1 HEAT

2.6.1.2 Differential Thermal Expansion

There is a minimum clearance of 1/8-in. between the sheet-metal liner of the shipping case and the cask at each end of the cart, which is sufficient to accommodate the 1/4-in. longitudinal elongation of the cask.

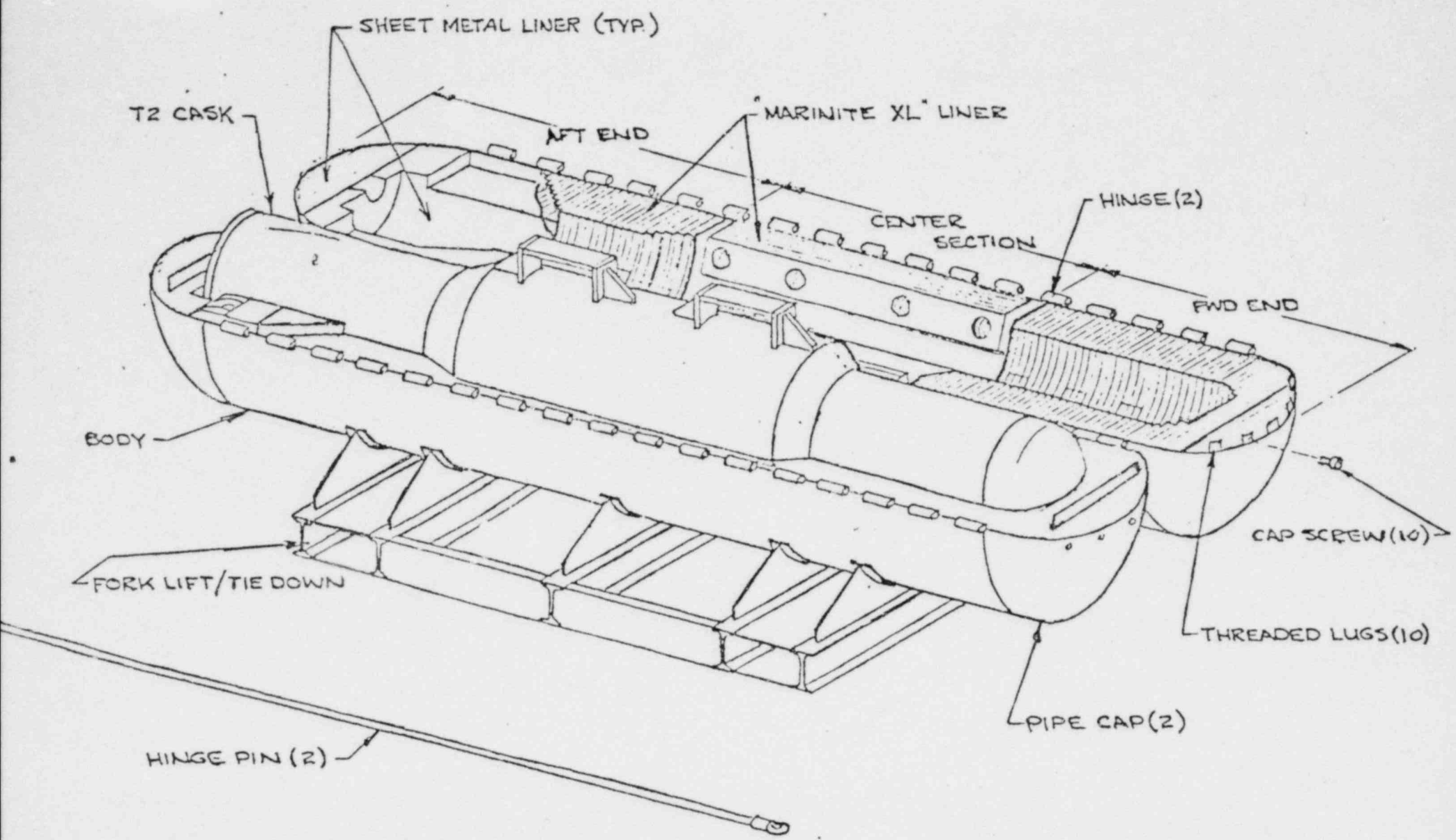

FIGURE 1.2 T2 SHIPPING CASE COMPONENTS

3.0 Thermal Evaluation

3.2 Summary of Thermal Properties

The shipping case is composed of Marinite XL encased in an A-516 steel shell with carbon steel support tubes and a stainless-steel sheet-metal liner.

3.5 Hypothetical Thermal Accident Evaluation

3.5.2 Package Conditions and Environment

Recognizing that the epoxy paint used on the"Marinite XL" surfaces is combustible, it was conservatively assumed that all the paint between the shipping case halves will burn during the fire. The actual possibility of conditions favorable for combustion of the paint, particularly since it is covered by a sheet-metal liner, are judged to be remote.

3.5.6 Evaluation of Package Performance for the Hypothetical Thermal Accident

As noted in the memo presented in Appendix 3.6.7, the 16-gage stainless-steel liner has no significant effect on the thermal analysis of the Hypothical Thermal Accident.

3.6.7 Memo, Shipping Case Liner

May 8, 1980

To: G. M. Teske

From: F. D. McGinnis F. D. McGinnis

Subject: Effect of Proposed T-2 Shipping Case Liner on Thermal Analysis

In the above reference, the temperature distribution in the T-2 shipping case during the hypothetical thermal accident was calculated using the HEATING finite difference conduction computer code. Figure 3.4 gives the lattice structure used for the HEATING code calculations. Pages 3-75 and 3-76 give the temperatures calculated with the code at 0.5 hours for the plane theta equals 1.571 radians (referring to Figure 3.4). This plane includes the vertical lifting lugs and the horizontal painted surfaces of insulation between the two halves of the shipping case. In the area of the vertical lifting lugs, where there is no insulation, the temperature varies from approximately 900°F at the outer part of the lug to 200°F at the inner part of the lug. In the rest of the shipping case, where there is painted insulation, the temperature is relatively even (530°F to 630°F). From the lack of a temperature gradient and the relatively high temperatures across the insulation, I infer that these temperatures are due to the burning epoxy paint.

The proposed 16-gage stainless steel liner represents a relatively small thermal path through the shipping case compared to the support rings and lifting lugs. I calculated the temperature gradient across the proposed liner using a 1-D model using 12 linear elements and 5 time steps of 0.1 hours. Without considering conduction away from the inner edge of the liner, the maximum inner edge temperature at 0.5 hours was calculated to be 689°F at the 1.0-ft. radius (0.5 ft. from the outside of the shipping case) and 289°F at the 0.667 ft. radius (0.833 ft. from the outside of the shipping case). This maximum calculated inner edge temperature is not much higher than the temperatures discussed above for the burning epoxy paint region (i.e.,660°F at 0.25 hours, 630°F at 0.5 hours).

The 16-gage stainless steel liner proposed for the T-2 shipping case does not have a significant affect on the thermal analysis of the hypothetical thermal accident presented in the Safety Analysis Report.

FDM:jb

DOE Evaluation Statement
Supplement No. 1 to Safety Analysis Report
T-2 Shipping Package

I. Introduction

A supplement to the Safety Analysis Report for Packaging (SARP) for the T-2 shipping container has been prepared. This describes and evaluates the installation of a thin sheet metal liner which covers the Marinite cushioning material in the outer shipping case. The evaluation shows adding this liner does not alter the shipping container's capability to meet the regulatory requirements. DOE Manual requirements of 0529 and 5201 and 10 CFR 71 continue to be complied with.

II. Reviews

The supplement was prepared by the HFEF organization of ANL-West Division. An independent review was made by the Radiological Engineering Department of the ANL-West Division.

The DOE review was made by R. I. Elder of the Chicago Operations and Regional Office's Operational and Environmental Safety Division. Mr. Elder made the review of the initial SARP.

III. Evaluation Results

The following summarizes the conclusions about the SARP Supplement resulting from the CORO review.

1.2 - Package Description

Words added to Section 1.2.2.1 Shipping Case adequately describe the inclusion of the stainless steel liner.

2.0 - Structural Evaluation

Words have been added which discuss the function of the liner to protect the Marinite and assesses the ability of the liner to accomodate differential thermal expansion. An adequate assessment was made.

3.0 - Thermal Evaluation

An evaluation was made to demonstrate the presence of the liner has no adverse impact on the impact of the shipping container to withstand the hypothetical thermal accident. The evaluation presents results of calculations made to determine temperatures the stainless steel liner would experience in the fire. The presence of the liner only slightly alters the temperature distribution radially across the shipping case, when compared to the evaluation made without the liner. Consequently, it can be correctly concluded the presence of the thin stainless steel liner does not have an impact on the thermal behavior shipping case.

DOE Form EV-618
(11-77)
10 CFR 71

U.S. DEPARTMENT OF ENERGY

CERTIFICATE OF COMPLIANCE

For Radioactive Materials Packages

1a. Certificate Number	1b. Revision No.	1c. Package Identification No.	1d. Page No.	1e. Total No. Pages.
5607	1	USA/5607/BF(DOE-CORO)	1	3

2. PREAMBLE

2a. This certificate is issued to satisfy Sections 173.393a, 173.394, 173.395, and 173.396 of the Department of Transportation Hazardous Materials Regulations (49 CFR 170-189).

2b. The packaging and contents described in item 5 below, meets the safety standards set forth in Subpart C of Title 10, Code of Federal Regulations, Part 71, "Packaging of Radioactive Material for Transport and Transportation of Radioactive Material Under Certain Conditions."

2c. This certificate does not relieve the consignor from compliance with any requirement of the regulations of the U.S. Department of Transportation or other applicable regulatory agencies, including the government of any country through or into which the package will be transported.

3. This certificate is issued on the basis of a safety analysis report of the package design or application—

(1) Prepared by *(Name and address)*:

E.I. du Pont de Nemours & Co.
Savannah River Laboratory
Aiken, South Carolina 29801

(2) Title and Identification of report or application:

1. T-2 Shipping Package Safety Analysis Report

2. Supplement No. 1 to Safety Analysis Report, T-2 Shipping Package

(3) Date:

April, 1980

4. CONDITIONS

This certificate is conditional upon the fulfilling of the requirements of Subpart D of 10 CFR 71, as applicable, and the conditions specified in item 5 below.

5. Description of Packaging and Authorized Contents, Model Number, Fissile Class, Other Conditions, and References:

a. Packaging

(1) Model No. GE T-2

(2) Description

An air cooled lead shielded shipping cask. The cask is a double-walled steel circular cylinder with thickened shielding in the center portion. The central cavity is 6.056 inches in diameter by 99 11/16 inches long. The lead shielding is 8.0 inches thick along a 45 inch center section which reduces to 4.188 inches thick at each 36 inch long end section. Cask closure is accomplished by a gasketed and bolted steel plug.

The cask is enclosed in a shipping case 36 inches in diameter by 133 inches long. The case is filled with Marimite which serves as an impact absorbing media to protect the cask.

The Marinite is covered with a 16-gauge stainless steel metal liner. The liner is welded to the shipping case and serves to protect the Marinite from physical damage and possible radioactive contamination. Four steel tubes located in the center of the shipping case support the cask in the case.

6a. Date of Issuance: May , 1980	6b. Expiration Date:

FOR THE U.S. DEPARTMENT OF ENERGY

7a. Address *(of DOE Issuing Office)*	7b. Signature, Name, and Title *(of DOE Approving Official)*
Chicago Operations and Regional Office 9800 South Cass Avenue Argonne, Illinois 60439	Fred C Mattmueller for Robert H. Bauer Manager/Regional Representative Chicago Operations & Regional Ofc.

16672

Contents are contained within either the ANL/HFEF insert or the TREAT vessel insert. The inserts fit within the cask's inner cavity.

(3) Drawings

G.E. Cask	ANL Insert
919D755 Rev.	W0147-0227-DD
135C5202	W0147-0228-DD
153F966	W0147-0229-DC
106D3721	W0147-0231-DD
DuPont Cask	W0147-0234-DC
W239534	W0147-312-DE
D147214	TREAT Insert
D147215	H-3-39082 Sheets 1 through 6
D147216	H-3-36134 Sheets 1 and 2
DuPont Case	H-3-36823 Shhets 1 through 4
W700344 D149173	
D149144 D149210	
D147218 W0195-0017-EE	
D147219	
D147220	
D149178	
W701184	

b. Contents

(1) Type and Form

(a) Experimental fuel pins in the form of solid metal, oxides, nitrides, and carbides of uranium, plutonium, or mixed uranium-plutonium.

(b) Irradiated assembly of structural components.

Fred C Matthews 6/1/88
CORO Approved Date

(2) Maximum Quantity of Material

(a) 1.71 kgm fissile material (U-233; U-235; Pu-239 + Pu-241 + Pu-242).

(b) 57,000 curies of mixed fission products, fission materials, and/or irradiated structural materials.

(3) Maxiumum Quantity of Radioactive Decay Heat Per Package

208 watts

c. Fissile Class

I

d. The cask is loaded and contents shipped dry.

Fred P. Mattmueller 6/2/80
CORO Approved Date

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