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PDR

Department of Energy
Washington, D.C. 20545

Mr. C. E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
  Material Safety
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. MacDonald:

Enclosed are eight copies of revised pages to the SARP for the T-2 Shipping Package, USA/5607/BF (DOE-CORO). This supplements the information we forwarded to you June 20, 1980.

This packaging has a history of use by both licensees and contractors. Probable licensee use in the future will most likely mean an early schedule to complete your review. Please contact T. L. Dunckel if you have any questions.

Sincerely,

Donald M. Ross

Donald M. Ross, Chief
Occupational Safety Branch
Operational and Environmental
  Safety Division

Enclosures

cc: R. R. Rawl, DOT, w/Encl. cy
    R. I. Elder, CORO w/o Encl.

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U.S. Department of Energy
ARGONNE NATIONAL LABORATORY
ARGONNE-WEST P.O. Box 2528, Idaho Falls, Idaho 83401 Telephone 208/526-7106

January 26, 1981

Max E. Jackson, Director
Technology Management Division
Chicago Operations/Regional Office
U. S. Department of Energy
9800 South Cass Avenue
Argonne, Illinois 60439

Dear Sir:

Subject: Submittal of Revised Pages to the Safety Analysis Report (SAR) for the T-2 Shipping Package

References: 1) Letter, R. J. Teunis to M. E. Jackson, "Request for Revision and Request for Addition of Supplement No. 2 to the Safety Analysis Report for the T-2 Shipping Package", dated October 20, 1980
2) Letter, Robert H. Bauer to Dr. Walter E. Massey, "Revision and Supplement to the Safety Analysis Report (SAR) for the T-2 Shipping Package", dated November 5, 1980

Reference 1 requested approval of proposed revisions and Supplement No. 2 to the subject SAR. Reference 2 provided the approval and requested that the affected pages in the SAR be revised and copies of the revisions and supplement be submitted to your office for distribution to holders of the SAR.

Please find enclosed 14 copies of the revised pages and 24 copies of the Supplement No. 2. The pages affected in the SAR should be replaced with the enclosed revisions and the Supplement No. 2 added to the rear of the SAR to accompany a previous issue of Supplement No. 1. Also enclosed is a distribution list of the SAR holders.

If you have questions concerning this matter, contact E. M. Franklin at the Hot Fuel Examination Facility (HFEF) Complex on extension 7652.

Sincerely,

R. J. Teunis
Site Manager, ANL-West

RJT/EMF:cja

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Enclosures

DISTRIBUTION OF THE SAFETY ANALYSIS REPORT FOR

THE T-2 SHIPPING PACKAGE

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4.0b CONTAINMENT - ANL INSERT

4.1b Containment Boundary

The containment boundary of the ANL insert consists of the T-2 cask liner.

4.1b.1 Containment Vessel

The T-2 cask liner is a 4.5-in. ID, 5-in. OD, stainless-steel pipe about 91 in. long. Within this vessel is a container holding the fuel pins.

Drawing W0147-0312-DE-02 (see drawings in back) shows the containment vessel with related structure. Drawings W0147-0234-DC-03, W0147-0227-DD-05, W0147-0228-DD-06, and W0147-0229-DC-03 show the details.

4.1b.2 Containment Penetrations

There are no penetrations in the T-2 cask liner.

4.1b.3 Seals and Welds

There is one seal and two welds on the T-2 cask liner. The bottom cap is welded onto the bottom of the tube and the heavy upper section is welded on the other end. A viton O-ring seal, having a maximum operating temperature of 500°F, is contained in this heavy upper section. The welds on the cask liner are fillet type with a backup shoulder.

4.1b.4 Closure

The T-2 cask liner is sealed with a Viton O-ring by screwing a cap against a shoulder in the body.

4.2b Requirements for Normal Conditions of Transport

The effects of normal transport are:

- Heat: +130°F ambient plus decay heat load results in a maximum temperature of the T-2 cask liner of less than 500°F. The elastomeric O-ring is rated for 500°F.
- Cold: -40°F ambient in still air will not adversely affect the Viton O-ring seal.
- Free Drop: The T-2 cask liner was drop-tested with a 30-ft drop onto a flat, unyielding surface without the protection of the cask or carrying case and found to remain leak-tight. See summary of drop tests in Appendix 4.4a.

4.2b.1 Release of Radioactive Material

The contents consist of fuel pins which may have failed cladding. However, these pins are encapsulated in a liner which has been shown to remain leak-tight under accident conditions.

4.2b.2 Pressurization of Containment Vessels

The T-2 cask liners were leak-tested at 1×10^{-7} atm·cc/sec of air (see Appendix 4.4.4b and 7.3.6). This test is at a pressure greater than the internal pressure that results from all the fuel pins rupturing and the contents heating up to normal operating temperatures. The loaded T-2 cask liner, prior to each off-site shipment, is also demonstrated to be leak-tight to a maximum leakage rate equivalent to 1×10^{-3} atm·cc/sec of air at a pressure differential of one atmosphere or greater. Leak testing an empty liner to be shipped in the T-2 cask is required when the minimum conditions of 10 CFR 71.35 are exceeded.

4.2b.3 Coolant Contamination

The stagnant air inside the T-2 cask liner is the only coolant used. As demonstrated in Section 4.2.2, the air will not escape from the T-2 cask liner during normal transportation. Therefore, outside contamination will not occur.

4.2b.4 Coolant Loss

As described in Section 4.2.1, the containment reseal is leak-tight and remains intact during normal transport conditions. There is no provision for venting into the atmosphere.

4.3b Containment Requirements for the Hypothetical Accident Conditions

Drop tests described in Appendix 4.41b were performed by dropping the T-2 cask liner 30 ft onto a flat, unyielding surface without any benefit of the T-2 cask or carrying case. Results of these drop tests indicate that the liner remains leak-tight. The temperature of the O-seal was calculated in Chapter 3 as being below 500°F, which is the maximum operating temperature for this seal.

4.3b.1 Fission Gas Products

As presented in Chapter 1, the maximum total fission product activity in 19 EBR-II fuel pins is 57,000 Ci (see Table 3.12).

The fraction of this amount available for release also depends on the cladding condition. Since the purpose of the fuel-pin irradiation test program is to investigate the behavior of fuel pins under various reactor environments, it is possible that some of the pin cladding will have failed. In any event, any activity that does escape the fuel pins must overcome a security can, a demonstrated containment barrier, and a cask seal before exposure to the environment is possible.

4.3b.2 Release of Contents

The fuel pins are enclosed by a containment vessel and other barriers in addition to the cask structure itself. It has been shown in this chapter that the containment remains leak-tight during the postulated accident conditions. Consequently, any possible breakup of radioactive material is easily confined by the containment and no release of contents will occur.

7.0 OPERATING PROCEDURES

7.1 Procedures for Loading the Package

7.1.1 General

Each user site provides detailed written procedures for the safe, effective handling of a T-2 cask and/or insert under conditions specific to the site. Examples of procedures in use prior to 1980 are given in Appendix 7.3 for illustrative purposes only. (Note that current procedures may differ from these examples.) The detailed procedures cover supplemental operations (such as preparation of contents for shipment) as well as operations performed directly with the cask. In general, loading or unloading of a cask takes place in a controlled environment to ensure that the cask system package is properly protected.

The T-2 cask is designed to interface directly with a hot cell facility (see Appendix 7.3.1). It is intended to be loaded and unloaded dry, and it is unsuited for water basin loading. The shape of the cask normally requires that specifically designed stands, carts, and adapters be provided for effective handling. Only qualified personnel using appropriate equipment will handle a T-2 cask package. All operations shall be conducted such that contamination does not spread to the internal surfaces of the cask.

7.1.2 Loading

Although the details of handling the T-2 cask are dictated by the configuration of the facilities at a specific user site, much of the procedure is typical for all sites to ensure compliance with physical and regulatory requirements. Some specific pre-1980 procedures for HFEF at ANL-W, for Los Alamos Scientific Laboratory, and for HEDL are included in Appendix 7.3. The order of inserting the cask liner contents into the cask is represented in Fig. 1.5. For the typical procedure given below, it is assumed that the cask has been received tied down to the transport vehicle in the horizontal position.

1. Review the shiping papers to determine the conditions of transport and to confirm the cask contents.

2. Perform a radiation and contamination survey and inspect the package to determine if conditions have changed during transport. Record the results of this inspection on a referable document, and initiate appropriate action to correct any deficiencies found.

3. Position the transport vehicle in the unloading area such that it is accessible by crane and/or other designated equipment for material handling.

4. Detach the tiedowns used to secure the cask package to the transport vehicle.

5. Lift the cask package from the transport vehicle with the designated lifting equipment and place it in an accessible position on the floor.

6. Remove the covers that block the shipping case top fittings to prevent their use in lifting the entire package.

7. Remove the hinge pin from one side of the shipping case and remove the 18 cap screws from both ends of the case.

8. Attach hoisting equipment to the lifting lugs on the same side of the shipping case top from which the hinge pin was removed, and rotate the top half of the case 180° around the remaining hinge pin.

   <u>NOTE</u>: Alternatively, both hinge pins can be removed and the top half of the shipping case can then be completely lifted from the bottom half.

9. Again perform a radiation and contamination survey of the case lining and the exposed cask to confirm that conditions are as expected. Record the results in a referable document.

10. Verify that the top shield plug and bottom screw closures are correctly installed and not damaged.

11. Engage the horizontal lifting lugs at the top of the exposed cask with appropriate lifting equipment (rated 7 tons or more) and remove the cask, oriented horizontally, from the shipping case. Place the cask on the floor, cart, or table provided, and make certain it is blocked to prevent rolling.

12. Using the lifting bars at the upper end of the cask, raise the cask to the vertical position by rotating the cask about its rounded lower end. Use care that the lifting force remains in the vertical plane.

    NOTE: The cask is loaded and unloaded in the horizontal position at LASL and HEDL.

13. Place the cask, using specialized adapter, if needed, on a stand or transfer cart.

14. Remove the hex head bolts (4) securing the shield plug in the top of the cask. Remove the shielding plug with an appropriate lifting device and remove the neoprene gasket. Monitor radiation during this operation to prevent unwarranted personnel exposure.

15. Survey the shield plug and cask interior for radiation and contamination and record the results in a referable document. Perform decontamination as necessary.

16. Insert appropriate filler blocks or rings in the cask cavity to prevent the loaded cask contents from moving in transit.

17. Confirm that the contents to be loaded have been packaged according to approved procedures and are properly prepared for loading into the cask.

    NOTE: Before off-site shipment, a loaded T-2 cask liner must be demonstrated to be leak-tight to a maximum leakage rate equivalent to 1×10^{-3} atm·cc/sec of air at a pressure differential of one atmosphere or greater. Before off-site shipment of a loaded TREAT vessel, if the sealed metal O-ring cap has been removed or conditions exceeding the maximum operating temperature (1500°) of the metal O-ring have occurred, the vessel must be dmonstrated to be leak-tight to a maximum leakage rate equivalent to $1x10^{-3}$ atm•cc/sec of air at a pressure differential of one atmopshere or greater. Leak-testing an empty T-2 liner or TREAT vessel to be shipped off-site in the T-2 cask is required when the minimum conditions of 10 CFR 71.35 are exceeded.

18. Complete the interface between the T-2 cask and the dry cell or special transfer cask according to the appropriate procedure.

19. Load the cask with the contents to be shipped. Insert spacers on the top of the inner container as required.

    NOTE: Specific procedures for loading and unloading the cask liner container and the 2R container are given in Appendix 7.3.1. Procedures for handling the TREAT vessel are given in Appendixes 7.3.4 and 7.3.5.

20. Inspect the neoprene gasket for the shield plug, and replace if needed. Insert the shield plug.

21. Separate the cask from the dry cell or transfer cask.

    NOTE: It may be necessary to complete step 21 prior to step 20.

22. Install the hex head bolts in the shield plug and tighten securely.

23. If applicable (e.g., for the TREAT vessel), adjust the bolt in the bottom of the cask to hold the contents securely in place. If provided, replace the cap over the bottom bolt.

24. Decontaminate the top and bottom of the cask as necessary and survey for contamination. Record the survey results in a referable document.

25. Engage the vertical lift bars at the top of the cask with the proper lifting equipment and lift the cask from the stand or cart.

26. Return the cask to the horizontal position by lowering the cask to the floor as it rotates about the rounded bottom end. Maintain the lifting forces in the vertical plane. Do not allow the cask to become slack in the lifting device until it rests horizontally on the floor. Block the cask to prevent it from rotating.

27. Inspect the cask shipping case and perform repairs or preventive maintenance as needed.

28. Using proper lifting equipment engaged in the horizontal lift lugs in the side of the cask, pick up the cask horizontally and move it to the shipping case. Lower the cask into the shipping case after making certain it is properly oriented and aligned with respect to the cutout recesses in the Marinite of the case.

29. Connect to the lifting lugs on the shipping case top and rotate the top 180° around the fixed hinge pin to the closed position.

30. Install the other hinge pin in the shipping case, and replace and tighten the 18 cap screws on both ends of the case.

31. Replace the covers that block the shipping case lifting lugs to prevent their use in lifting the entire package.

32. Perform a preshipment radiological survey, and decontaminate as required. Record the results of this final survey on the shipping papers.

33. Lift the shipping package with the designated equipment and place it on the transport vehicle. Install tiedowns.

34. Place labels and placards on the shipping package and vehicle according to regulatory requirements.

35. Add remaining data to complete the shipping papers for this specific shipment.

36. Release the transport vehicle to the carrier for shipment.

7.2 Procedures for Unloading the Package

It is assumed that the cask has been received in the horizontal position tied down to the transport vehicle.

1. to 13. The first 13 steps for unloading the cask are identical to those given in Section 7.1.1, because this portion of the procedure is independent of cask content.

14. Loosen the hex head bolts (4) holding the shield plug in the top of the cask. If available, use remote manipulators to remove the bolts. Otherwise, remove the bolts by hand under continuous radiation monitoring.

15. Complete the T-2 cask interface with the dry cell or with the transfer cask according to procedure.

16. If available, remove the shield plug with remote equipment provided at the transfer station. Otherwise, maintain constant radiation minitoring for personnel removing the plug. These personnel should position themselves to take advantage of the cask wall shielding during removal of the shield plug.

    NOTE: It may be necessary for step 16 to precede step 15.

17. Remove any filler plugs and withdraw the inner container (either cask liner container or TREAT vessel) from the cask.

    NOTE: Specific procedures for handling the inner containers are given in Appendices 7.3.1, 7.3.4, and 7.3.5. The cask may be reloaded with another inner container at this time.

18. Inspect the neoprene gasket for the shield plug and replace if needed.

19. Either replace the shield plug with remote handling equipment and then move the cask from the transfer station, or move the cask from the transfer station and then replace the shield plug with direct handling equipment.

20. Install the hex head bolts in the shield plug and tighten securely.

21. Survey the cask for radiation and contamination, and decontaminate as required. Record the results of the survey in a referable document.

22. to 33. The final 12 steps for unloading the cask are the same as steps 25 through 33 in Section 7.1.1 because this portion of the procedure is independent of cask content.

CHAPTER 8.0 - ACCEPTANCE TESTS AND MAINTENANCE PROGRAM

8.1 Acceptance Tests

Inspection and acceptance testing requirements for the original T-2 casks, the new cask liner containers, and the new shipping cases are described in Chapter 9.0 of this SARP as part of the Quality Assurance Program. The casks have been used since fabrication (cask T-2-1 in 1968 and cask T-2-2 in 1972) and are actively in use at present. The acceptability of both casks has been fully demonstrated for normal transportation. There have been no failures nor apparent loss of effectiveness.

8.2 Maintenance Program

Inspection and preventive maintenance of the casks are conducted in accordance with RDT Standard E12-7, "Inspection and Preventive Maintenance of Fuel Shipping Containers."

8.2.1 Preusage Inspection and Maintenance

8.2.1.1 Visual

Before each use of a T-2 cask, it will be inspected by the user to ensure there has been no material deviation from its design configuration. This inspection will include a visual survey to be certain that no surface penetrations have occurred, that the painted surfaces remain protected, that all components are in place, that no visually observable weld cracks have taken place, that the trunnions have not been deformed, and that bolts and screws are not missing, deformed or galled. Moving components, such as the hinge pins, shall slide or turn freely.

8.2.1.2 Leak Tests

Before off-site shipment of either empty or loaded containment vessels, they are leak tested according to Section 7.1.2, item 17 (page 7.3).

As described in Section 7.3.4, the TREAT vessel is leak tested upon initial assembly or prior to reuse (following removal of inner components), with helium, at 20 $\pm {}^{5}_{0}$ psig, and leaks greater than 1×10^{-6} atm·cc/sec are corrected. As described in Appendix 7.3.6, the T-2 cask liner, prior to initial use, is demonstrated to be leak tight to a maximum leakage equivalent to 1×10^{-3} atm·cc/sec of air at a pressure differential of one atmosphere or greater.

8.2.1.3 Gaskets

A new metal "O" ring is used each time the TREAT vessel is loaded (see Appendix 7.3.5). The neoprene gasket on the cask shield plus is inspected prior to each loading. If the gasket is nicked or shows signs of wear, it is replaced.

8.2.1.4 Shielding

Shielding integrity is verified before each shipment by a radiation survey of the loaded cask.

8.2.1.5 Thermal

As confirmed in Chapter 3.0, the normal operating temperatures of the shipping case outer shell are only slightly above ambient temperatures. No thermal tests are therefore needed. The "Marinite XL", covered with white epoxy paint, is inspected to ensure that the lining of the cask shipping case has not been damaged to the extent that it will no longer serve its cushioning and insulating functions adequately.

8.2.1.6 Repairs

Any minor discrepancies found during a preusage inspection are corrected by the user before shipment. Major repairs and nonroutine replacement of parts and components are performed by the cask owner or by the user with the prior approval of the cask owner.

8.2.2 Periodic Inspections and Maintenance

The cask package is visually inspected annually to be certain that design specifications continue to be met (see RDT Standard E12-7). Surfaces shall be free of corrosion, cracks, gouges, or other deformations. The paint on the surfaces of the cask and shipping case and the Marinite XL insulation shall be inspected and evaluated once every year. Minor defects in painted surfaces may be corrected with spot painting. Where extensive defects exist in the painted surfaces, the old finish will be removed and a new finish applied. The annual inspection shall also include verification that: (1) sealing surfaces are free of pits, corrosion, and other imperfections; (2) sliding surfaces have not worn excessively; (3) welds are visually sound; (4) bolts and nuts are not bent or deformed; (5) lifting lugs and trunnions are not misaligned or worn enough to significantly affect strength; (6) the lid gasket is not deformed or deteriorated; and (7) the containment vessels (i.e., the TREAT vessels and T-2 cask liners in service) will meet the leak tightness requirements for shipment in accordance with the guidance of ANSI Standard N14.5.

Welds subjected to stress, such as those at the lifting lugs, shall receive a dye penetrant inspection biennially to be certain they remain sound.

Durable metal tags indicating the expiration of the inspection period will be affixed to the cask and shipping case at each annual (or biennial) inspection. The periodic inspection records will be retained in the Quality Assurance File.

All deficiencies found during these periodic inspections will be corrected by repair or replacement before the inspected cask is returned to service.

8.2.3 Postincident Inspection

In the event that a T-2 cask is involved in an incident capable of subjecting the cask to unusual stresses such as those that might occur in a fire, impact, vehicle accident, or explosion, the cask shall be inspected as necessary before returning to service to ascertain that the cask package components remain within the tolerances of the design specifications. These inspections will verify that the shielding, strength, closure, containment, and other functioning characteristics of the affected components have not been compromised.

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.

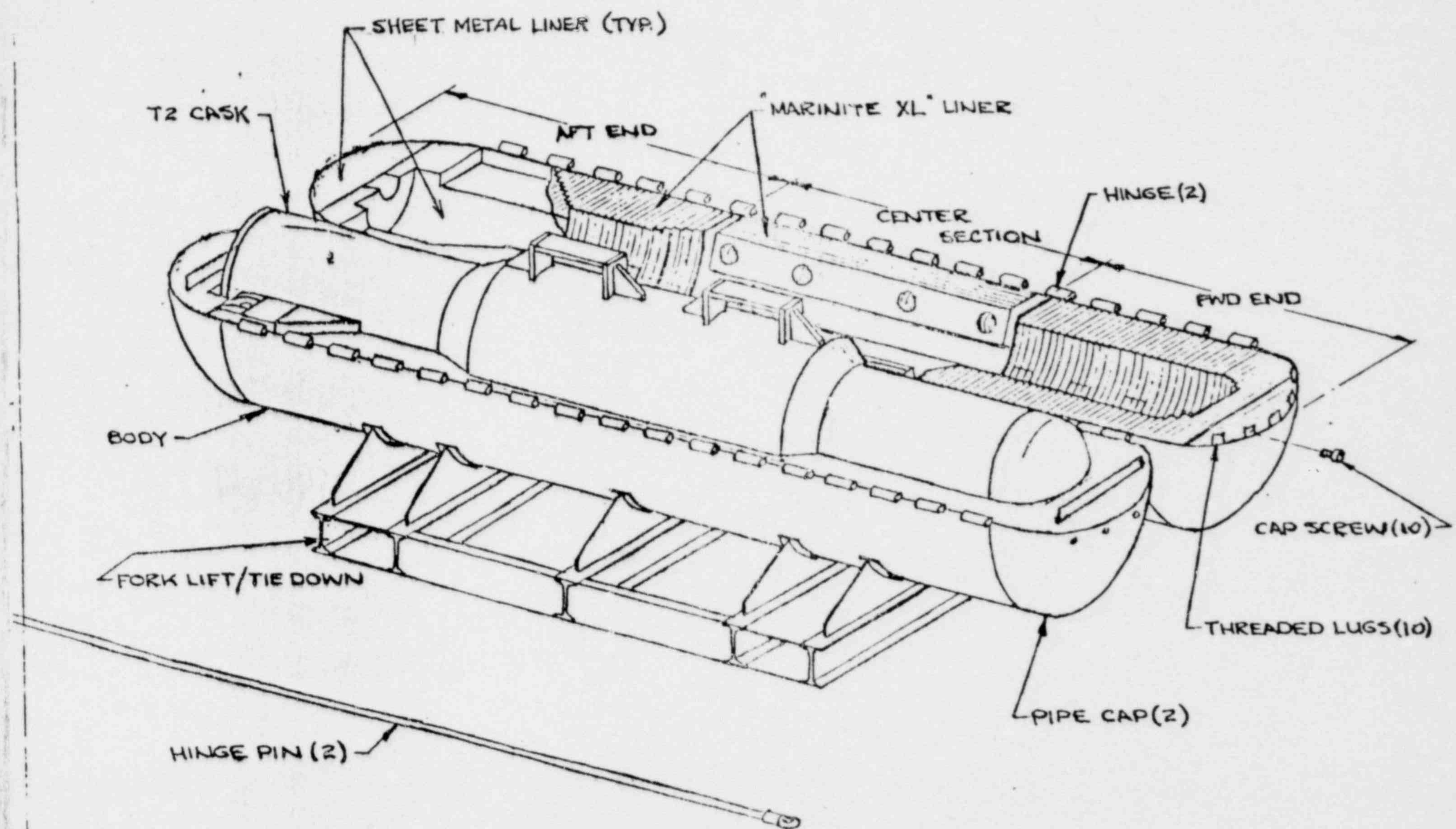

FIGURE 1.2 T2 SHIPPING CASE COMPONENTS

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 000°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

SUPPLEMENT NO. 2

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 stainless-steel rub pads to the top exterior surface of the shipping case. The rub pads prevent damage to the shipping case exterior caused by the tie-down cables used during normal shipping conditions.

1.2 Package Description

1.2.2 Packaging

1.2.2.1 Shipping Case

Two stainless-steel rub pads are tack-welded to the top surface of the case and are designed to protect the painted case from being scratched by the cable tie-downs. One pad is located at each end of the case. The rub pads are 24 in. by 36 in. by 0.029-in. thick stainless-steel (304) sheets.

2.0 Structural Evaluation

2.1 Structural Design

2.1.1 Discussion

The stainless-steel rub sheets protect the painted surface of the shipping case from persistent scratching caused by tie-down cables used to secure the case to the transport vehicle. The rub pads are tack-welded to the 3/8-in. carbon-steel case shell and do not compromise the mechanical or fire-protection capabilities of the case during normal or accident conditions of transport.

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