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BENEFICIAL USES SHIPPING SYSTEM CASK

BUSS

OPERATIONS MANUAL

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OPERATIONS MANUAL FOR THE BENEFICIAL USES SHIPPING SYSTEM CASK

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Abstract

This document is the Operations Manual for the Beneficial Uses Shipping System (BUSS) cask. These operating instructions address requirements for loading, shipping, and unloading, supplementing general operational information found in the BUSS Safety Analysis Report for Packaging (SARP), SAND 83-0698. Use of the BUSS cask is authorized by Department of Energy (DOE) and Nuclear Regulatory Commission (NRC) for the shipment of special form cesium chloride or strontium flouride capsules.

* A United States Department of Energy Facility

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1.0 INTRODUCTION AND DESCRIPTION

1.1 Introduction

This Operations Manual contains instructions for the use of the Beneficial Uses Shipping System (BUSS). This manual supplements the BUSS Safety Analysis Report for Packaging (SARP) that provides general operational information. The BUSS system consists of the cask assembly and impact limiters, ancillary equipment, and the transportation skid. The use of the BUSS cask is authorized by Department of Energy (DOE) Certificate of Compliance No. 9511, dated February 1991, for shipment of special form cesium chloride and strontium flouride capsules, through compliance with the appropriate federal regulations.

BUSS repair and maintenance instructions are contained in a separate manual, "Maintenance Manual for the Beneficial Uses Shipping System Cask", SAND92-0967.

1.2 Scope and Purpose

This manual is divided into eight sections. Section 1 contains the introduction and description of the BUSS cask. Section 2 contains the general operating instructions that are used by the system caretaker for cask configuration. Section 3 is the operating instructions common to both loading and unloading facilities. Section 4 addresses wet and dry loading operations. Section 5 addresses wet and dry unloading operations. Section 6 is the operating instructions for assembly of the cask at both loading and unloading facilities. Section 7 addresses in-transit operations. Section 8 consists of appendices containing example operational checklists, reference assembly drawings, and a copy of the BUSS cask certificate of compliance.

These operating instructions address the fundamental requirements for loading, shipping, and unloading the BUSS cask. However, differences between facilities preclude the provision of complete procedures. Personnel at each facility should generate site-specific handling procedures based on information contained herein. It is expected that only slight modifications to these instructions will be necessary. Review of such procedures by the BUSS owner/caretaker and the user is required prior to use.

All personnel should have proper training in all phases of cask and facility operations. This training should include "hands on" experience with an empty cask system.

1.3 Safety Precautions

All personnel using this manual should be thoroughly familiar with the safety precautions and handling procedures established at the loading or unloading facility, as appropriate, for handling the BUSS cask and its associated equipment; this includes the operation of facility equipment such as cranes and forklifts. The following general precautions are provided to supplement specific site safety procedures and to advise personnel of the inherent hazards involved.

The following apply to all cask-handling operations:

- The cask, ancillary equipment, and handling fixtures are heavy; many pinch-point hazards exist.

- Even the slow swing of the cask when suspended from a crane can transfer a large amount of energy upon impact. This could result in severe injury to personnel and damage to equipment.

- Improper rigging can cause the cask or ancillary equipment to drop, possibly resulting in injury to personnel or damage to equipment.

- All hoisting equipment should be inspected and tested in accordance with applicable specifications, e.g., American Society of Mechanical Engineers (ASME) or the Occupational Safety and Health Administration (OSHA) standards. All hoisting equipment as well as all cask-handling equipment should be clearly marked with the maximum working load rating.

- All cask hoisting and rotating operations should be performed by personnel who have been specifically trained in BUSS handling.

- Handling personnel should be informed that the surface of the loaded cask at thermal equilibrium may constitute a burn hazard. Handling should be done with protective apparel.

In addition to the general precautions described above and the safety precautions established at the loading or unloading facility, specific warnings and cautions (see samples below) are provided in these instructions in the section that describes the actions or situations that could result in a hazardous condition.

WARNING

A WARNING is provided where industrial hazards to personnel exist.

WARNING
RADIATION HAZARD

A WARNING - RADIATION HAZARD is provided where a radiation hazard could exist.

CAUTION

A CAUTION is provided where a condition or situation may exist in which equipment could be damaged.

In addition to the above, a NOTE may be placed in the text to provide information of a non-safety nature.

NOTE

A NOTE is provided when additional information is considered useful. Notes usually follow the pertinent paragraph.

1.4 Description

The BUSS cask consists of a sealable monolithic steel cask, a series of interchangeable capsule holders (baskets), a pair of removable impact limiters, a structural steel transport skid, a personnel barrier, and ancillary equipment for lifting, handling, and shipment preparation. Approximate weights for the various components are given in Table 1.1.

The system is designed to safely transport radioactive cesium or radioactive strontium in doubly contained capsules. The outside dimensions of the capsules are approximately 2.625 inches in diameter and 20.775 inches in length.

TABLE 1.1
Component Weights

Component	Weight, lbs.
Body and lifting attachments	20,500
Lid	1,500
Basket	1,600
Impact limiters (2)	3,000 each
Personnel barrier	300
Shipping skid assembly	3,500
Contents (maximum)	400
Total system (loaded)	33,800

The system is designed to be transported by legal weight truck with a gross vehicle weight of less than 80,000 pounds.

1.4.1 Cask

The BUSS cask, shown schematically in Figure 1.1, is comprised of: the cask body, lid and fasteners, port covers and fasteners, seals, interchangeable capsule baskets, trunnions and hardware, lifting lugs and hardware, and impact limiters with mounting hardware.

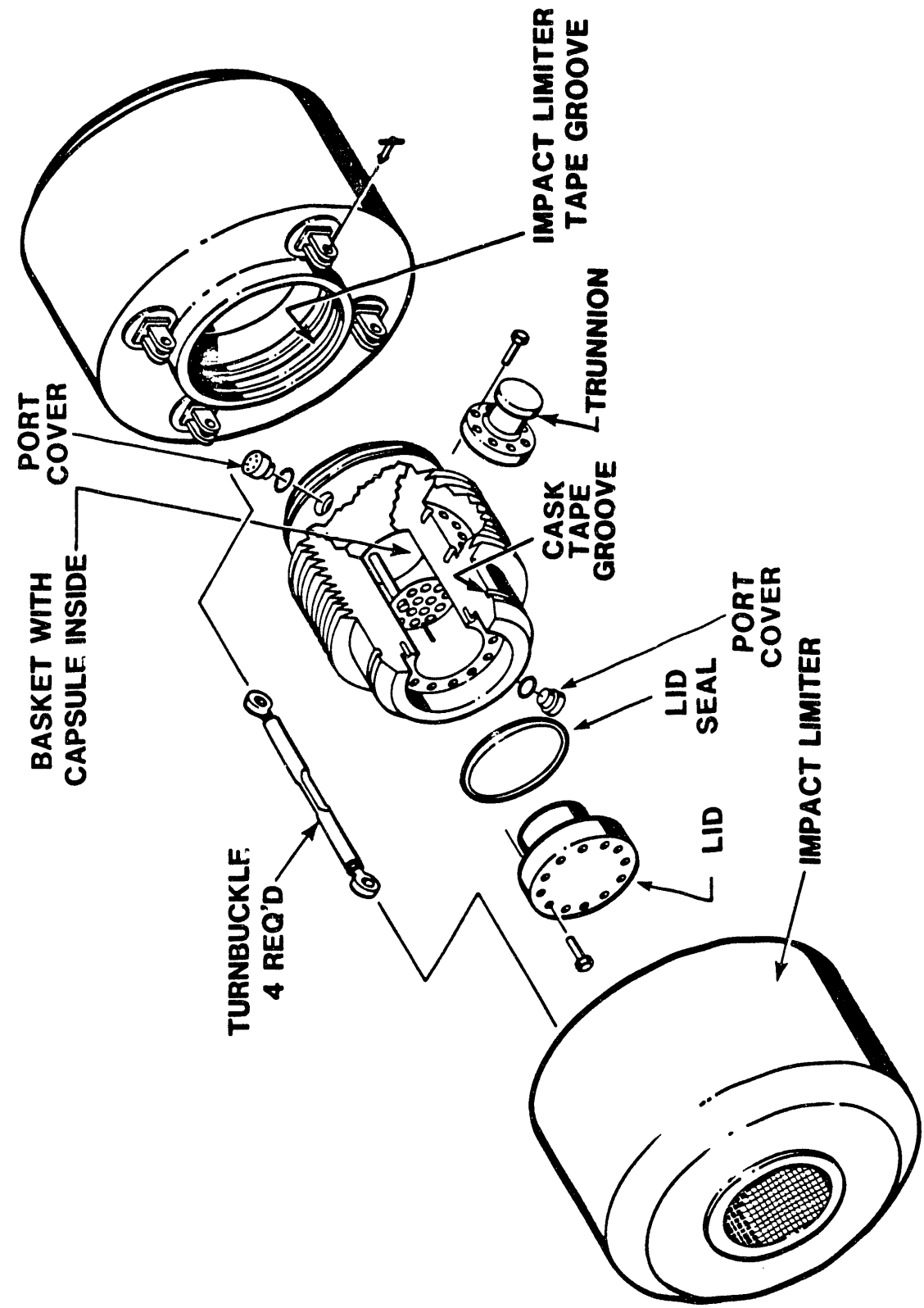


Figure 1.1
BUSS Cask

1.4.1.1 Cask Body

The BUSS cask body is a one-piece cylindrical stainless steel forging with outside dimensions of 54.25 inches in diameter and 49.0 inches high. Eleven 4-inch-high circumferential cooling fins are positioned symmetrically about the axial mid-plane of the cask body. The body has a cylindrical cavity that is 20.25 inches in diameter and 23.0 inches in height (with the closure head in place). The minimum steel shielding thickness is 13.0 inches. The body wall is penetrated near the top of the cavity for a vent line and at the bottom of the cavity for a drain line and quick-connect valve. External features are provided for the mounting of lifting, tiedown, and impact-limiting hardware.

1.4.1.2 Closures

The cavity is closed by a plug-type lid of forged stainless steel. The structure is secured by twelve 1.5-12UNF AMS 5735 (A286) steel special bolts with 12-point external drive heads. A Helicoflex seal mounts to the underside of the lid. To prevent seal damage during head seating, three jacking screws are incorporated onto the lid. Holes are provided at the periphery for the mounting bolts and three body-mounted guide pins. Two seal leak test penetrations extend through the head near the bolt circle and intersect the space between the two O-rings. The portion of the lid that extends into the cask cavity has been machined to provide flow channels for water distribution should have to be cooled using internal water flow.

Each of the two body penetrations has a recessed plug-type port cover that is secured by six 0.5-20UNF x 1.12 inch ASME SA 687 Grade 718 bolts. A quick-connect fitting is mounted on the bottom penetration. Helicoflex seals are on each port cover. Each cover contains a seal leak test port. A thermal shield protects each port cover and is installed after the cover is in place. The shield is secured by four twist-lock fasteners.

1.4.1.3 Seals

Containment of contents and cavity gases is achieved through the use of Helicoflex seals on the lid and each port cover. The Helicoflex design incorporates two sealing elements: an inner elastomeric (Viton) O-ring and an outer metallic (copper) O-ring. Both rings are captured in a stainless steel holder that also functions as a compression limiter. The metallic portion of the seal "coins" itself to the body and closure seal surfaces when it is made up; thus the Helicoflex unit is not reusable for loaded shipments.

1.4.1.4 Baskets

The cesium or strontium capsules are positioned within the cask by a holder or basket. The basket design is a solid stainless-steel cylinder with axial holes to accept the capsules. Four types of baskets are provided, two for cesium and two for strontium. Each basket has a different capsule capacity; the four- and six-capsule baskets are for strontium while the twelve- and sixteen-capsule baskets are for cesium. Basket selection is based on the heat load of the capsules to be shipped. Each basket has a centrally mounted lifting handle that raises for grappling when the cask lid is removed; the handle is spring actuated.

1.4.1.5 Lifting/Tiedown Hardware

To lift the cask when it is in the horizontal position, two lifting lugs are used which are mounted on the cask. A horizontal lifting fixture engages the two lugs and connects to the facility crane hook. These same lifting components are used to rotate the cask to or from the vertical position during in-facility handling (along with the trunnions and a handling frame).

Two stainless-steel trunnions are bolted to opposite sides of the cask body; sixteen 1-inch bolts are used for each trunnion mounting. The cask is tied down to its structural steel shipping skid by two steel weldments (tiedown yokes) that are attached by turnbuckles. These yolks have a "keyhole" engagement and fit around the trunnions. The trunnions also act as the pivot points for rotating the cask to and from the vertical position and are additionally used to lift and move the cask when in the vertical position. A separate lifting fixture is used for movement of the cask while in a horizontal orientation. (See section 1.4.2 for ancillary equipment details.)

1.4.1.6 Impact Limiters and Hardware

The BUSS cask is protected from impact damage by impact limiters mounted on each end of the body and extending radially outward and axially downward to function in all drop orientations. These structures consist of organic foam encased in a sealed thin-walled stainless-steel weldment. Attachment to the cask body is achieved by two independent systems. The first system is four equally spaced turnbuckle assemblies that connect the lid-end limiter to the bottom-end limiter. The second system is a tape joint, an attachment method where a flexible metallic element (tape) is inserted into two mating circumferential grooves, half of which is part of the cask and half of which is part of the limiter. This latter system is intended to function only under accident conditions.

1.4.1.7 Shipping Skid/Personnel Barrier

The BUSS cask is shipped in the horizontal position on a welded steel skid (Figure 1.2). The cask rests on a box structure that is designed to crush under conditions where high vertical decelerations occur with the cask and skid in the normal shipping orientation. The cask is held to the skid by the turnbuckles described in section 1.4.1.5. The bottom surface of the skid is designed to accommodate fork lift movement of the package when it is removed from the transporter. Mounting plate features are used to secure the cask/skid to the transporter. A personnel barrier covers the center section of the cask body to prevent physical contact with the potentially hot surface.

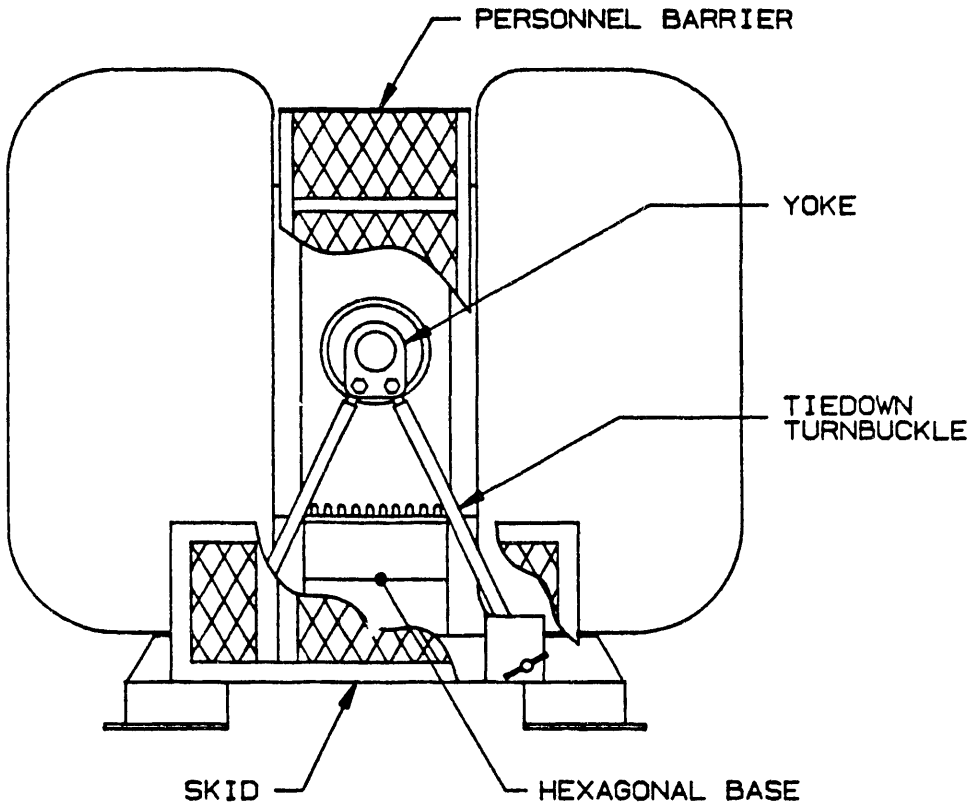


Figure 1.2
Shipping Skid

1.4.2 Ancillary Equipment

Ancillary equipment items include: the cask lifting fixtures, the lid-lifting fixture, the lid guide pins, the basket guide, the cask-handling frame, tape joint removal tool, and the backfilling/containment testing apparatus.

1.4.2.1 Cask-Lifting Fixtures

The BUSS cask is lifted by two types of structures depending on the cask orientation. The horizontal lifting fixture, i.e. a fixture to lift the cask when horizontal, is a Y-shaped stainless-steel weldment that accepts a crane hook or clevis in its central hole and connects to the cask-lifting lugs via its two arms (Figure 1.3). The connection is made with two quick-release pins. This fixture lifts the assembled cask and its skid or the cask alone.

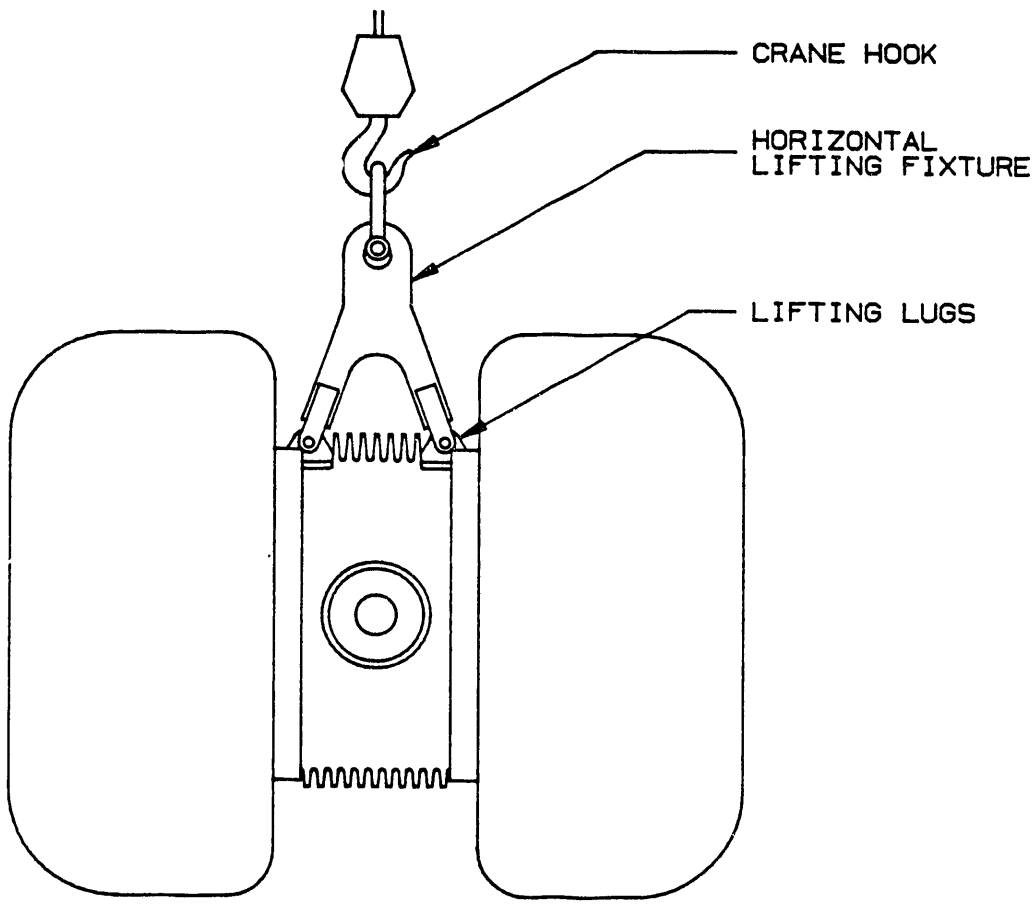


Figure 1.3
Horizontal Lifting Fixture

The vertical lifting fixture, i.e. a fixture to lift the cask when horizontal, consists of two arms and a cross-bar. The free end of each arm terminates in a J-hook that engages a cask trunnion (Figure 1.4). The arms are bolted and welded to the cross-bar that is designed to accept a crane hook. Bolted to one side of the cross bar is a support leg that provides clearance to engage or disengage a crane hook when the fixture is stored in a horizontal orientation. This fixture is used to lift only the cask body assembly, i.e. with the transport skid and impact limiters removed. The assembly is painted for corrosion protection.

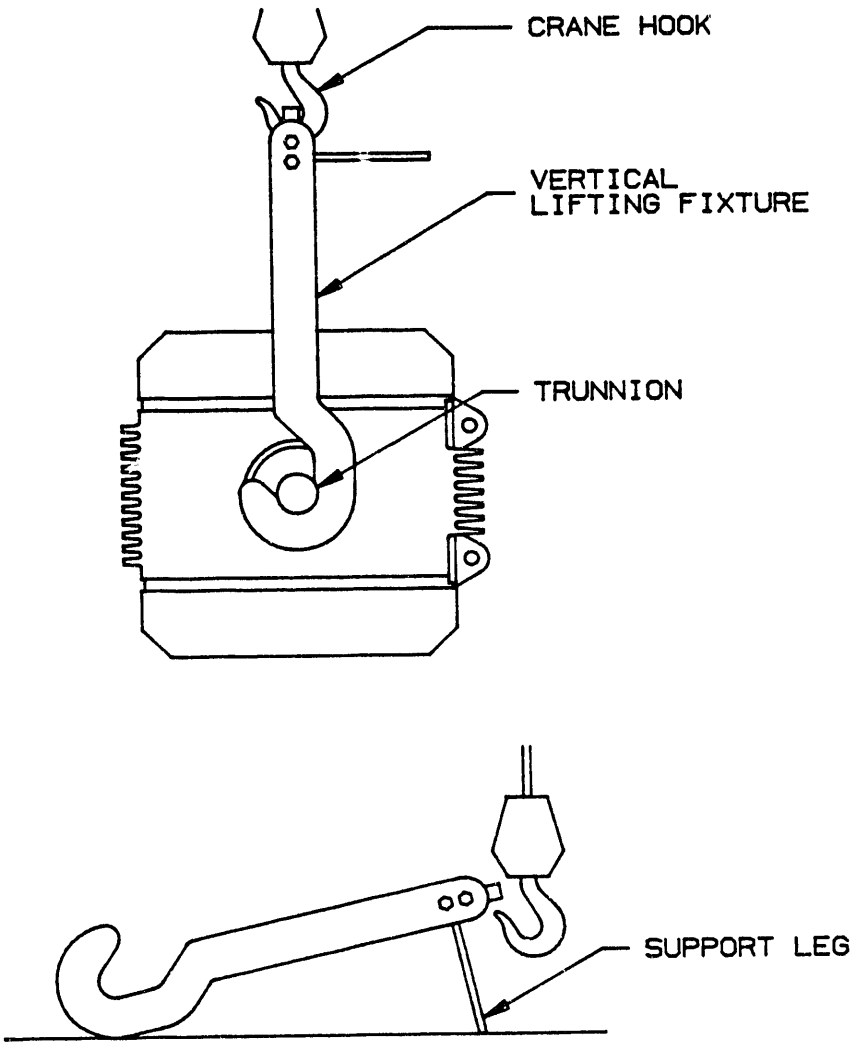


Figure 1.4
Vertical Lifting Fixture

1.4.2.2 Lid-Lifting Fixture

The lid-lifting fixture is a flat stainless-steel plate with an inverted U-shaped bail that is attached to the cask lid for lid-lifting operations (Figure 1.5). The plate has four holes through which the four mounting bolts pass; these bolts connect the fixture to the top of the lid.

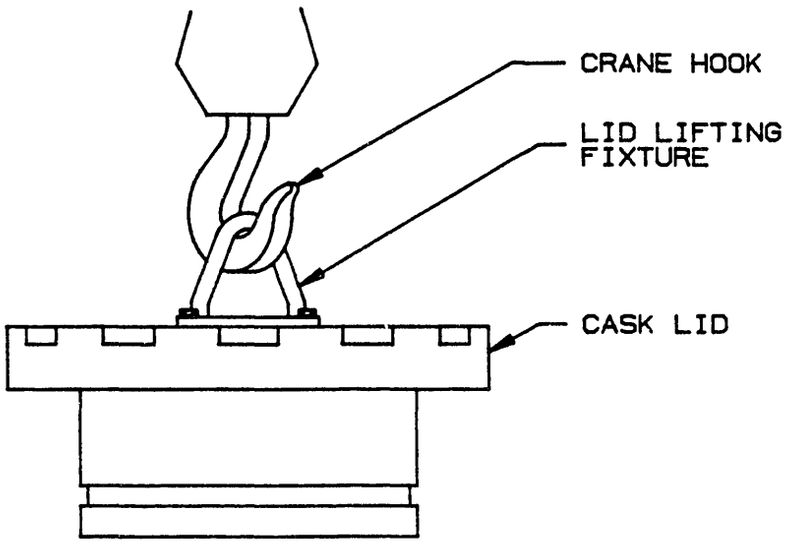


Figure 1.5
Lid-Lifting Fixture

1.4.2.3 Lid Guide Pins

The lid guide pins are stainless steel bars with a threaded end for attachment to the cask body (Figure 1.6). On the opposite end of each is a brass cone-shaped tip. Each of the three pins has a wrench flat near its center for installation and removal. The pins guide the lid into the body recess, preventing seal surface damage.

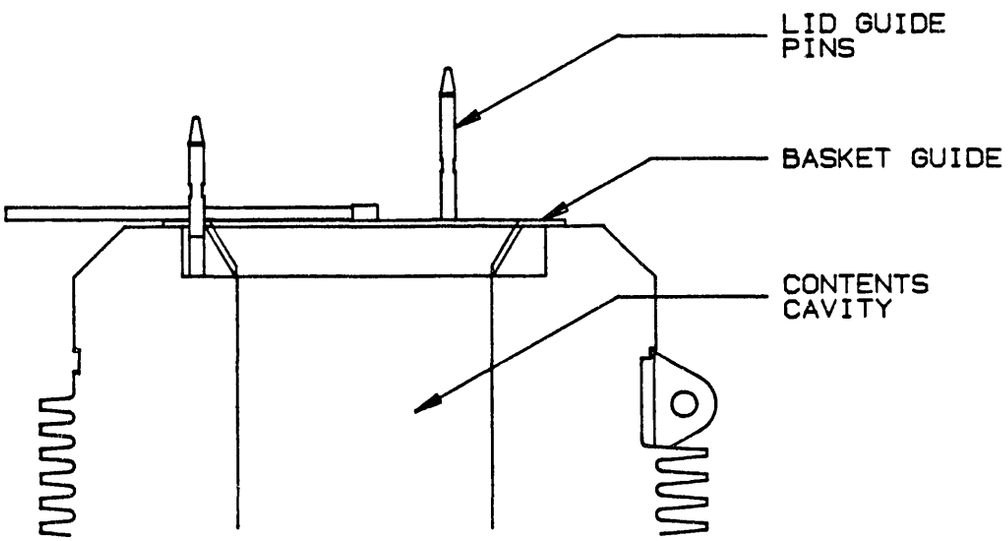


Figure 1.6
Lid Guide Pins/Basket Guide

1.4.2.4 Basket Guide

The basket guide is a stainless-steel circular structure that is set on the cask flange when the lid is off to provide guidance for the insertion of the basket and protection to the seal seating surface (Figure 1.6). The guide is placed on the cask using its bail, which folds out of the way to provide clearance for basket movement.

1.4.2.5 Cask-Handling Frame

The cask-handling frame is a painted steel weldment for holding the cask in the vertical position while removing the impact limiters (Figure 1.7). The frame has a screw-actuated platform upon which the lower limiter sits. This platform may be lowered and raised to position the limiter for cask engagement.

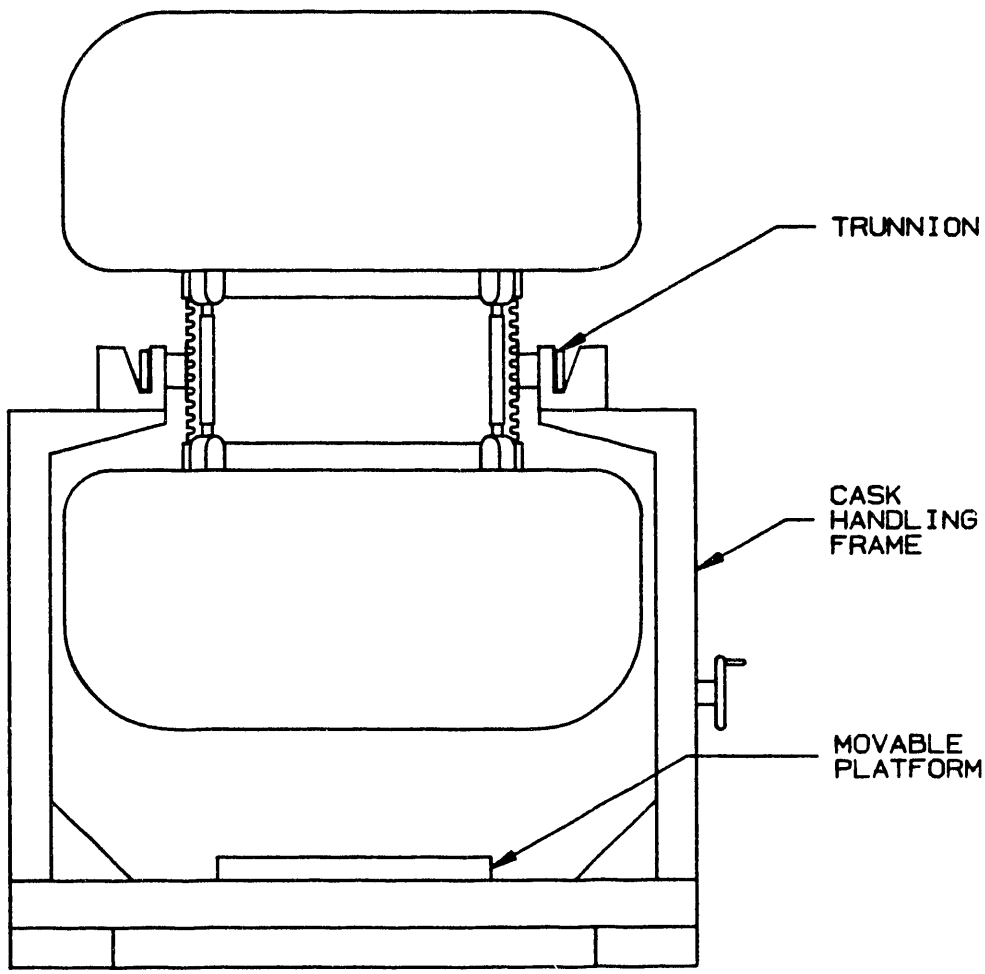


Figure 1.7
Cask-Handling Frame

1.4.2.6 Tape Joint Removal Tool

The tape joint removal tool is a bar threaded on one end and a tee-handle on the other end used for the engagement and removal of the impact limiter tape joints.

1.4.2.7 Backfill and Leak Test Plumbing Assemblies

The BUSS cask is shipped with a helium atmosphere. The gas is introduced by evacuating the cavity air and then backfilling with helium. The apparatus consists of a manifold system that permits the valving in of the helium supply following evacuation (Figure 1.8).

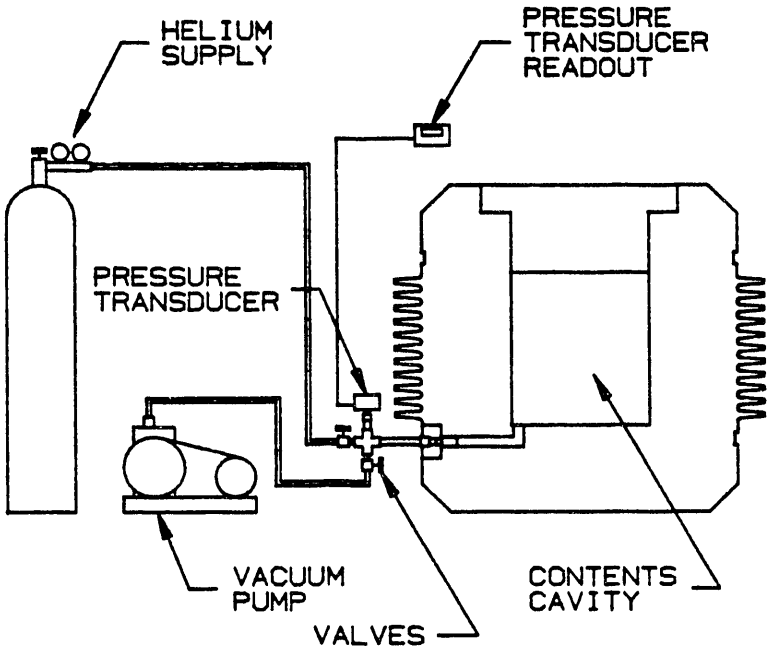


Figure 1.8
Helium Backfill System

The preshipment containment verification test uses the vacuum-pressure rise method applied to the three Helicoflex seals. This method calls for evacuating the seal O-ring interspace and measuring the pressure increase. The leak test plumbing assemblies consist of a manifold and valve that is used in conjunction with a vacuum pump and pressure transducer. The lid seal leak test configuration, shown in Figure 1.9, is typical of the configuration of all three closure seal tests.

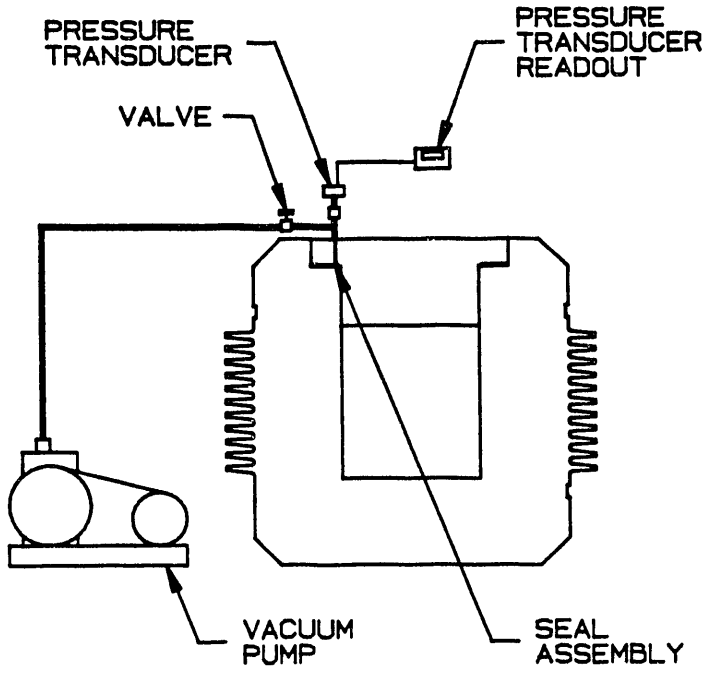


Figure 1.9
Leak Test System (Typical)

1.4.3 Transport Trailer and Skid to Trailer Attachment

A designated double drop style trailer is used to transport the BUSS cask. It is an eight foot wide, stepped bed trailer designed to carry the concentrated load of the cask assembly at the center of it's approximate 42 foot span (Figure 1.10). Attachment of the transportation skid to the trailer is made by 2 bolts at each corner of the skid that attach to specially designed mounting points in the trailer. Ancillary equipment (handling and lifting fixtures, spare parts box, etc.) may be transported on the trailer with the cask.

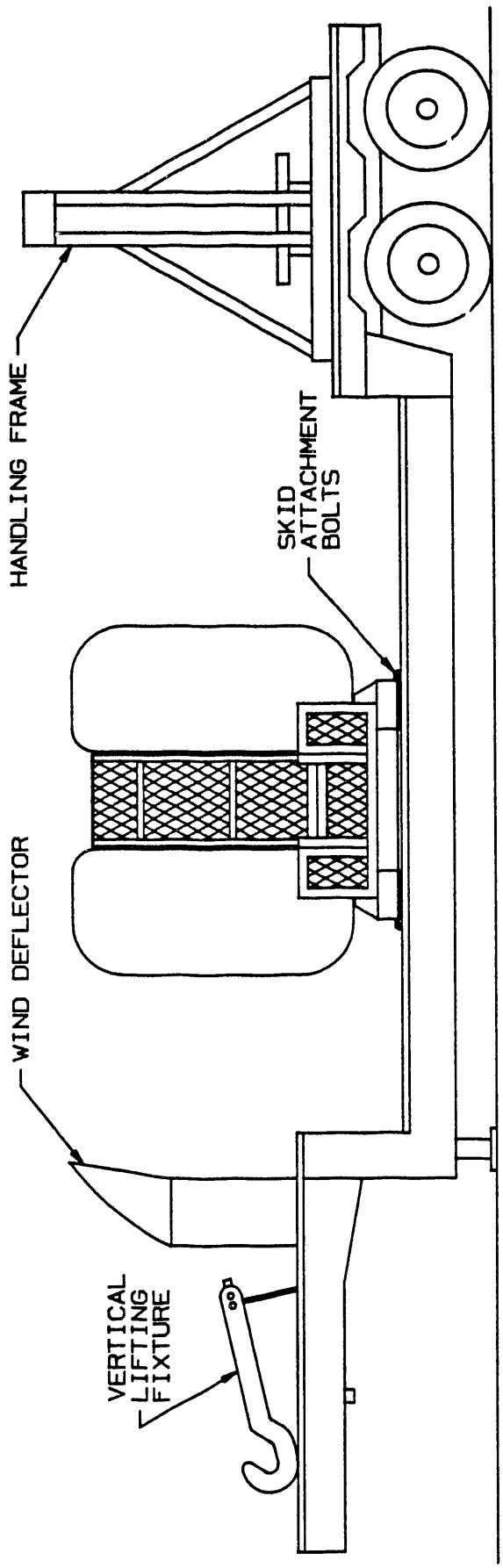


Figure 1.10
BUSS Trailer and Skid Tiedown

2.0 GENERAL OPERATING INSTRUCTIONS

2.1 Introduction

This section contains general instructions for the preparation of the BUSS cask for use in a single shipment or series of shipments (a "campaign"). Shipping and receiving facilities may be dry (i.e., a hot cell) or wet (i.e., a water-filled pool); consequently, instructions are provided for both possibilities.

All required maintenance and repair of the BUSS cask shall be performed in accordance with the maintenance manual.

2.2 Authorizing Use of the Cask

2.2.1 NRC regulations require that the user of the BUSS cask shall have in its possession the following:

2.2.1.1 A copy of the most current BUSS Certificate of Compliance.

2.2.1.2 A copy of the BUSS Operations Manual (this manual or a facility approved alternate.

2.2.1.3 An approved Quality Assurance Plan.

2.2.1.4 Authorization to possess and transfer the radioactive material being shipped.

2.3 Cask Preparation for Use

2.3.1 Configuration Control

2.3.1.1 The cask basket configuration is defined in terms of the type and heat load of the capsules being shipped. Table 2.1 shows the maximum capsule heat loads permitted for each basket type.

Table 2.1
Capsule Configuration Requirements

Capsule Type	Basket Capacity (capsules)	Max. Per Capsule Heat Load (w)	Max. Per Cask Heat Load (kw)
Cesium	12	333	4.0
	16	250	4.0
Strontium	4	850	3.4
	6	650	3.9

NOTE
For shipment with a quantity of capsules less than the maximum configuration, the capsules should be arranged symmetrically in the basket.

2.3.1.2 Cavity reconfiguration is accomplished through a simple installation of the desired basket. Follow the procedures in Section 4 for lid removal. Remove the existing basket, install the basket guide, and insert the new basket. Follow the procedures in Section 4 for lid replacement.

2.3.2 Cask Lid Seal

The BUSS cask design calls for a new lid seal on each loaded shipment. Empty return shipments will be made with a used seal.

Refer to section 4.5 of this manual for instructions for cask lid seal replacement.

2.3.3 Port Cover Seals

The BUSS cask design calls for a new seal whenever a port cover is removed prior to a loaded shipment. The empty return shipment will be made with used seals.

Refer to section 4.3 of this manual for instructions for port cover seal replacement.

2.4 Applicable Regulations

The following regulations apply to BUSS operations:

2.4.1 Title 10 CFR 71, Packaging and Transportation of Radioactive Materials. U.S. Nuclear Regulatory Commission.

2.4.2 Title 49 CFR 171 through 177, as applicable, Hazardous Materials Regulations, U.S. Department of Transportation.

2.5 Tools, Equipment, and Supplies

The following tools and equipment are required to perform the maintenance and testing activities defined in this manual. The list is divided into three parts. Section 1.10.1 lists equipment and tools to be supplied by the facility performing routine (annual requirement) tasks. Section 1.10.2 lists equipment and tools that are supplied by the cask owner. Section 1.10.3 lists expendable supplies (cleaners, lubricants, etc.) which are to be supplied by the maintenance facility.

2.5.1 Facility Supplied Tools and Equipment

Overhead crane, 40,000-pound minimum capacity
Beta-gamma radiation survey meter
Torque wrench, 1/4" drive, 50-100 in-lb capacity
Torque wrench, 1/2" drive, 100-150 ft-lb capacity
Torque wrench, 1" drive, 1500-2000 ft-lb capacity
Helium supply w/regulator
Vacuum pump
Miscellaneous vacuum hoses and fittings
Step ladders, 5-6 foot and 10-12 foot
Hand tools:
- Socket wrench set, 1/2" drive
- Socket set, 1" drive, 12 point, 1" to 1-3/4"
- Allen wrench set, Allen/hex drive socket set
- Slotted and Phillips screwdrivers
- Open end wrenches, 1-1/2", 2-1/4" (or large cresent wrench)
- Small adjustable wrench
- Tamper seal crimping tool

2.5.2 Cask Owner Supplied Tools and Equipment

BUSS cask horizontal lifting fixture, Part No. S49072
BUSS cask vertical lifting fixture, Part No. S49069
BUSS cask handling fixture, Part No. S48501
Lid guide pin #1, Part No. S48955
Lid guide pin #2, Part No. S48956 (2 each)
Guide pin nose, Part No. S51100 (3 each)
Basket guide assembly, Part No. S49073
Lid lifting fixture, Part No. S48590
Lid lifting fixture bolts, 1/2"-20UNF x 1.125" long
Tape joint removal tool, Part No. S94963
Limiter eye-bolts, 3/4"-10 x 2.00 forged, w/jam nut (3 each)
Helium backfill plumbing assembly, Part No. R35032-000
Lid leak test plumbing assembly, Part No. R35032-200
Port cover leak test plumbing assembly, Part No. R35032-300
Surface temperature measurement apparatus
Pressure transducer and readout, 0 to 10 torr range
Pressure transducer and readout, 0 to 1000 torr range

NOTE
Both the loading and unloading facilities must have administrative controls in place to assure current calibration of the test and measurement equipment listed in sections 2.5.1 and 2.5.2.

2.5.3 Supplies

Alcohol, ethyl or denatured
Neverseez lubricant or equivalent
Lintfree wipers
Cotton tipped applicators
Biodegradable cleaners (Turco products or equivalent)
Neolube dry film lubricant or equivalent
Plastic sheet
Tape, duct or equivalent
High vacuum grease (Apiezon Type L or equivalent)

2.6 Reference Drawings

Drawings of the cask and ancillary equipment assemblies are contained in Section 8.4 of this procedure. Fabrication drawings of individual cask and shipping skid components may be found in Volume II of the BUSS SARP. Fabrication drawings of ancillary equipment components are located in the BUSS Cask Maintenance Manual, SAND 92-0967.

3.0 DISASSEMBLY OPERATIONS: LOADING AND UNLOADING FACILITIES

3.1 Introduction

3.1.1 This section contains general instructions for handling the BUSS cask at "dry" loading and unloading facilities (i.e., hot cells), and "wet" loading and unloading facilities (i.e., water-filled pools). These instructions cover receiving and inspection, package removal from the transport skid, and impact limiter removal.

NOTE
These instructions assume that the BUSS is shipped empty to the loading facility. In some cases the cask will be stored at the loading facility and thus the first shipment will not have a receiving and inspection step.

3.1.2 Each loading facility should provide fully trained personnel and site-specific operating procedures. It is recommended that these procedures be reviewed by the BUSS cask owner or caretaker prior to the first use of the cask. Refer to Section 8.1 for sample checklists and worksheets to be completed and signed as the defined actions are accomplished.

3.1.3 Each loading facility should have, as a minimum, the tools and equipment listed in Section 2.6, and a supply of lid and port seals listed in Section 2.7. Safety related parts must be identified, segregated, and controlled under a Quality Assurance Plan.

3.1.4 All cranes and rigging equipment should be checked for operativeness, integrity, and capacity before the start of cask-handling operations.

3.2 Receiving Inspection

3.2.1 Spot the trailer at the designated unloading area. Brake and chock as needed.

3.2.2 Inspect for signs of damage to the package (i.e., personnel barrier, impact limiters). Record inspection results and notify the owner/caretaker if damage is observed. Record the orientation of the skid relative to the trailer and the cask relative to the skid. The cask should be transported with the lid facing to the rear.

NOTE
Some components such as the impact limiters are safety related. The continued use of the package with damaged safety related components must be discussed with the owner/caretaker.

3.2.3 Inspect for signs of skid-to-trailer fastener loosening or damage. Record inspection results and notify the owner/caretaker if loosening or damage is observed.

3.2.4 Check the shipping papers. Verify that the serial number on the received cask matches the shipping papers. The cask identification plate is located adjacent to the lifting lug nearest the lid end of the cask.

3.2.5.1 For loading facilities, observe that an **EMPTY** label is on the cask. Contact the shipper if a discrepancy exists.

3.2.6.1 Perform a beta-gamma survey of the exterior to confirm that the cask is empty.

3.2.5.2 For unloading facilities, observe that a **YELLOW III** label is on the cask. Contact the shipper if a discrepancy exists.

3.2.6.2 The loaded cask presents a source of ionizing radiation for workers. Cask operations should be such that worker exposure is kept to a minimum; the ALARA principle should be applied in the planning for cask unloading.

WARNING
RADIATION HAZARD

If the survey indicates the presence of a higher than normal radiation source within or on the surface of the cask, do not remove the package from the vehicle. Contact the shipper for immediate instructions.

3.2.7 Perform a beta-gamma survey of the cask exterior. Record the results. Compare the readings with the departure readings recorded on the shipping papers. If there is a significant discrepancy, notify the shipper. If the dose rate exceeds 200 mrem/hr on the surface of of the cask or exceeds 10 rmem/hr at 2 meters from the surface, isolate the shipment and notify the shipper.

3.2.8 Prepare the upper (narrow) section of the personnel barrier for removal by loosening and removing the four socket-head cap-screws on each side of the barrier assembly using a 5/16 inch Allen wrench or hex socket (Figure 3.1). Rig the upper section of barrier for lifting using appropriate sized slings and shackles, attaching them to the barrier lift lugs.

NOTE
The upper section of the personnel barrier weighs approximately 100 pounds.

Remove the barrier using the crane and set down on the rear section of the trailer or on the ground. Replace the eight barrier assembly screws in the upper barrier for storage.

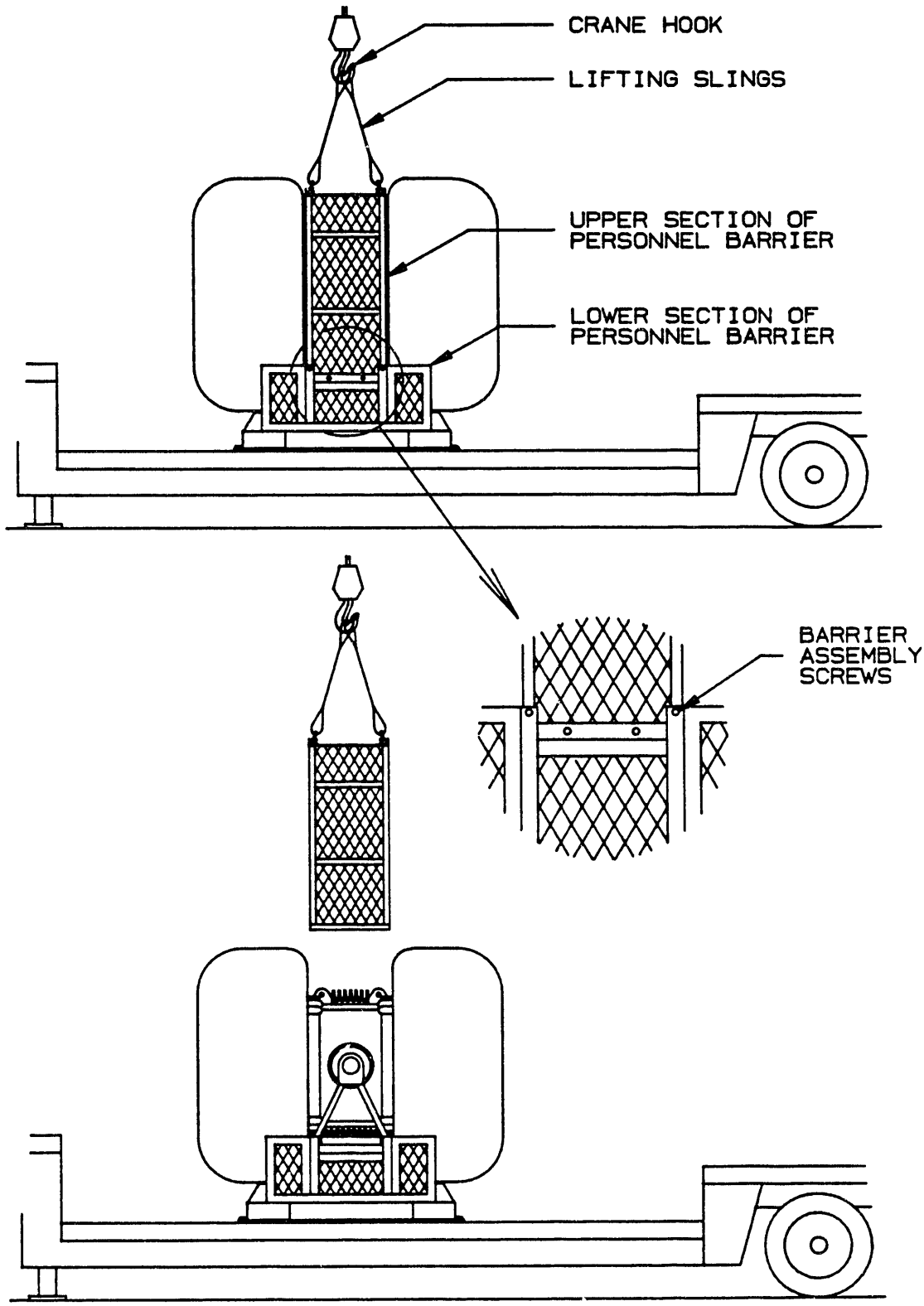


Figure 3.1
Personnel Barrier Removal

3.2.9 Perform multiple swipe tests at random locations on the cask surface for indications of removable radioactive contamination. Refer to NRC regulation 10 CFR 71.87i and DOT regulation 49 CFR 173.443 for allowable removable contamination.

WARNING
RADIATION HAZARD
Surface contamination, although not anticipated, may exist; therefore radiological monitoring and special work procedures should be observed. For loading facilities, the absence of a measurable dose rate in the beta-gamma survey (see Section 3.2.5) does not mean that the surface is clean. Low concentrations of radioactive contaminants could still be present.

If surface contamination is present, refer to NRC regulation 10 CFR 20, 20.205(b)(2) for information concerning reportable levels. Record all readings on the appropriate documents (i.e., shipping papers, incoming shipment records).

3.2.10 Remove 3 hex head capscrews from the outer end of both impact limiters (6 capscrews total). Store the screws.

3.3 Package Removal from Vehicle

The package may be removed from the trailer by either of two methods. Site facilities will determine which method of removal should be used.

Method A removes only the cask while leaving the skid in place on the trailer. The site must have the capability to move the trailer inside the assembly building. Once inside, the cask is removed from the skid and placed onto the handling frame. Section 3.3.1 details Method A removal.

Method B removes the cask and the skid from the trailer and places it on the ground for subsequent movement into the assembly building by forklift. Once inside, the cask is removed from the skid and placed onto the handling frame. Section 3.3.2 details Method B removal.

WARNING
Under no circumstances should the package be placed onto the handling frame and then moved. Attempting to move it in such a way could result in injury to personnel and damage to equipment. This is a top-heavy and potentially unstable condition during an attempted move.

3.3.1 Package Removal From Trailer - Method A

3.3.1.1 Check the bolt tightness on the two horizontal lifting lugs located on the top of the horizontal cask; torque should be 250 ft-lb. Attach the horizontal lifting fixture to the overhead crane and connect the two arms to the two lifting lugs using the 1" quick release pins provided (Figure 3.2).

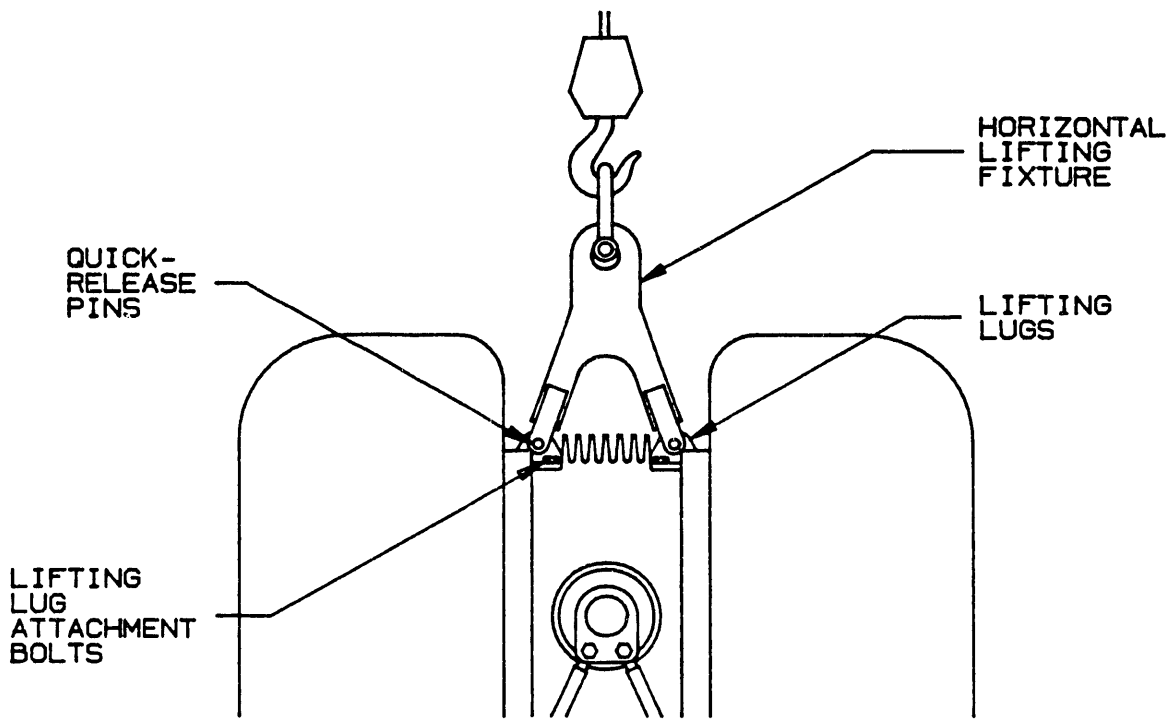


Figure 3.2
Horizontal Lifting Fixture Attachment

3.3.1.2 Prepare the BUSS cask for removal from the trailer and skid by detaching the tiedown structures that engage the cask trunnions. Remove the lock wire from the pair of tiedown turnbuckle jam nuts on one of the tiedown assemblies. Loosen the jam nuts using a 2" open end or adjustable wrench. Loosen the turnbuckle bodies using a wrench on the 1.50" flats. Actuate the pair of turnbuckles, raising the tiedown yoke off of the trunnion. When the keyhole feature of the tiedown yoke clears the trunnion, swing the tiedown assembly outboard and set against the stops on the skid. The turnbuckles may have to be actuated during the outboard movement to generate the necessary clearance for removal. Repeat the operation of the other tiedown assembly. The cask is now free from the transport skid (Figure 3.3).

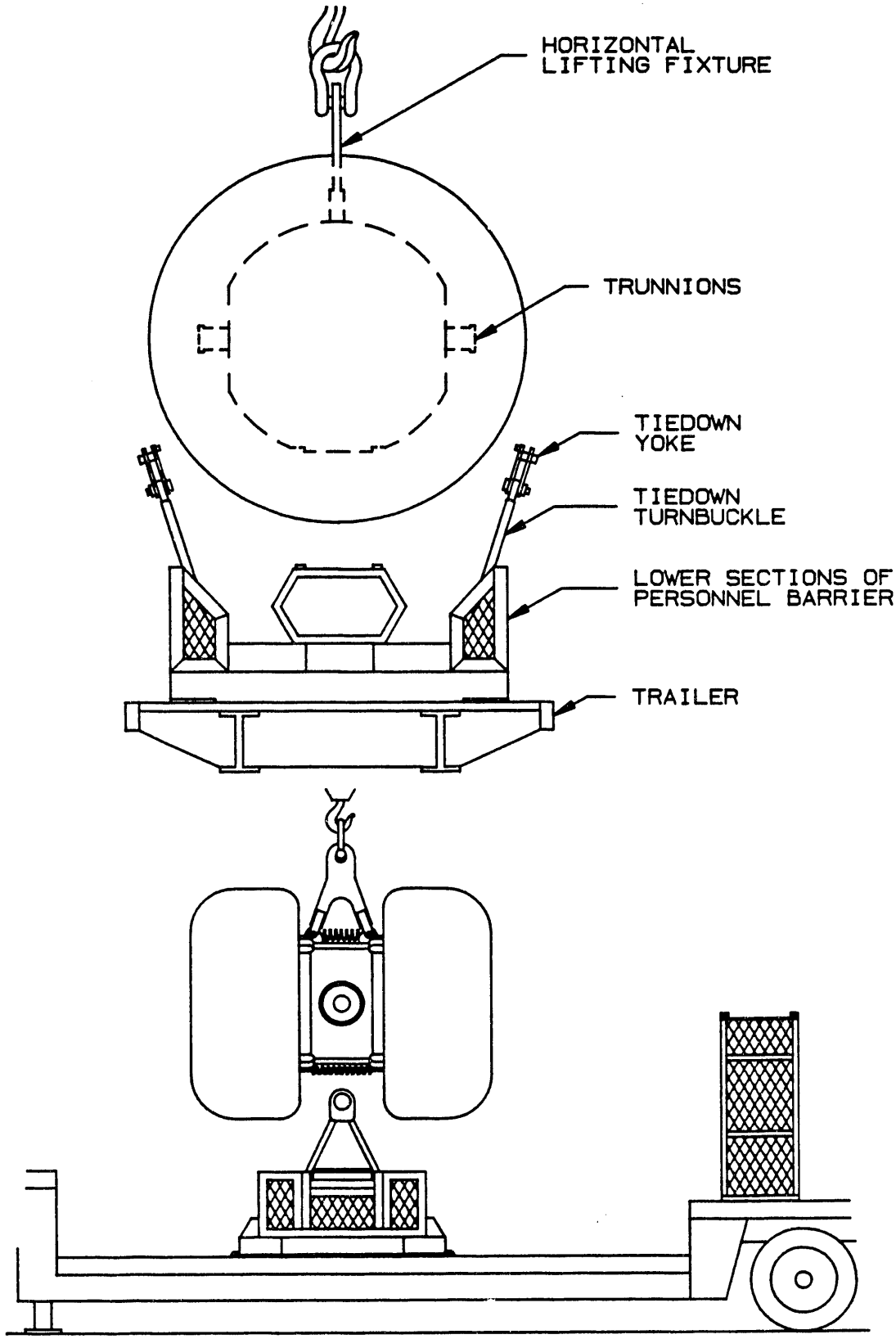


Figure 3.3
Cask Removal - Method A

3.3.1.3 Prepare to separate the cask from its skid by double checking the connections between the horizontal lifting fixture and the cask-lifting lugs.

WARNING

Under no circumstances should the package be lifted by the side-mounted trunnions. These are used to move the cask when in the vertical position without the skid or impact limiters. Lifting the package by the cask trunnions could result in injury to personnel or damage to equipment, as the package may rotate towards the vertical position.

3.3.1.4 Put a momentary load on the lifting gear and check for irregularities. If none, slowly lift the cask free of its skid and move it to the cask-handling frame.

3.3.2 Package Removal from Trailer - Method B

3.3.2.1 Check the bolt tightness on the two horizontal lifting lugs located on the top of the horizontal cask; torque should be 250 ft-lb. Attach the horizontal lifting fixture to the overhead crane and connect the two arms to the two lifting lugs using the 1" quick-release pins provided (Figure 3.2).

3.3.2.2 Disconnect the skid-to-trailer tiedowns by removing the eight bolts that connect the skid to the tiedown plates (Figure 3.4). Store the hardware where it will not become damaged or lost.

3.3.2.3 The package is removed from the vehicle by an appropriately sized overhead crane that is to be used in conjunction with the BUSS horizontal lifting fixture; the package weight, including the lifting fixture, is approximately 33,800 pounds (16.9 tons).

WARNING

Under no circumstances should the package be lifted by the side-mounted trunnions. These are used to move the cask when in the vertical position without the skid or impact limiters. Lifting the package by the cask trunnions could result in injury to personnel or damage to equipment, as the package may rotate toward the vertical position.

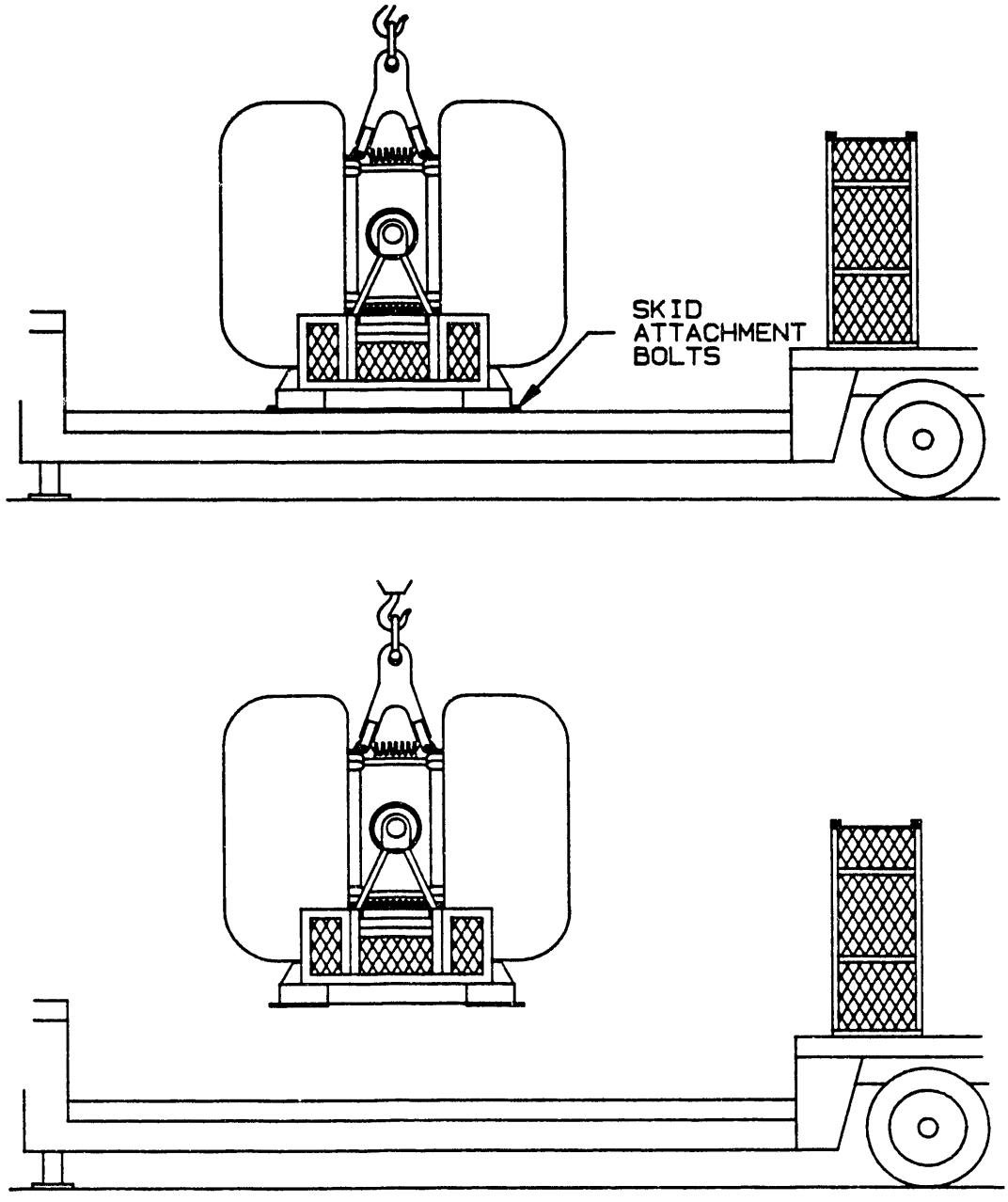


Figure 3.4
Cask Removal - Method B

3.3.2.4 Before moving the package, put a load on the lifting gear and observe for irregularities. Slowly lift the package, move and set it on the ground. After detaching the crane hook from the lifting fixture, the package may be moved by a suitable forklift to its preparation area.

CAUTION
For movement by forklift, the package should be accessed from the side only, not from the impact-limiter ends.

3.3.2.5 Prepare the BUSS cask for removal from its transport skid by detaching the tiedown structures that engage the cask trunnions. Remove the lock wire from the pair of tiedown turnbuckle jam nuts on one of the tiedown assemblies. Loosen the jam nuts using a 2" open end or adjustable wrench. Loosen the turnbuckle bodies using a wrench on the 1.50" flats. Actuate the pair of turnbuckles, raising the tiedown yoke off of the trunnion. When the keyhole feature of the yoke clears the trunnion, swing the tiedown assembly outboard and set against the stops on the skid. The turnbuckles may have to be actuated during the outboard movement to generate the necessary clearance for removal. Repeat the operation of the other tiedown assembly. The cask is now free from the skid (Figure 3.5).

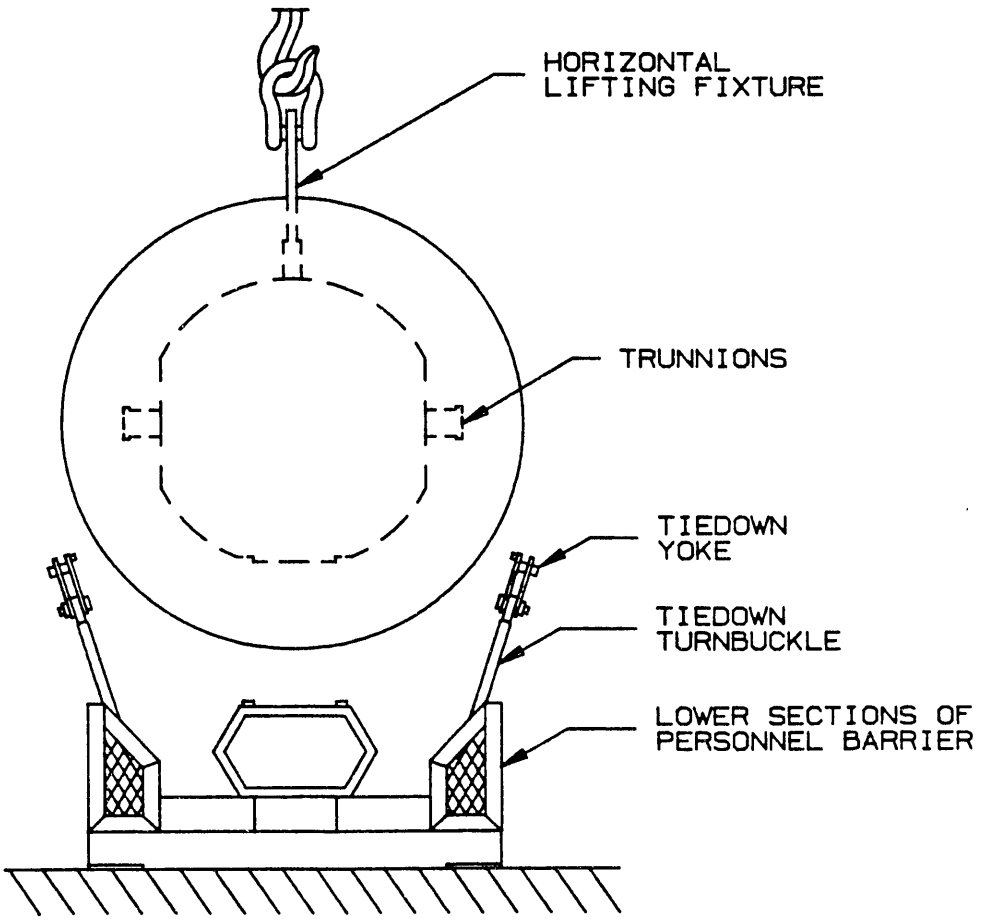


Figure 3.5
Cask Removal from Skid - Method B

3.3.2.6 Prepare to separate the cask from its skid by double checking the connections between the horizontal lifting fixture and the cask-lifting lugs.

WARNING

Under no circumstances should the cask be lifted by the side-mounted trunnions. These are used to move the cask when in the vertical position without the skid or impact limiters. Lifting the package by the trunnions could result in damage to equipment, as the package may rotate toward the vertical position.

3.3.2.7 Put a momentary strain on the lifting gear and check for irregularities. If none, slowly lift the cask free of its skid and move it to the cask-handling frame.

3.4 Cask Preparation for Loading or Unloading

3.4.1 Place the cask in the handling frame by slowly lowering it such that the trunnions contact the corresponding frame uprights. Lower only to the point of initial contact with the frame (Figure 3.6A).

WARNING

If too much load is transferred to the handling frame, the cask may begin to rotate to the vertical position.

3.4.2 Before rotating the cask to the upright position, be certain that the impact-limiter platform of the handling frame is in the lowered position. Also, confirm that there is sufficient lateral movement of the crane to permit the 90-degree rotation of the horizontal lifting fixture (Figure 3.6 sequence).

3.4.3 Identify the lid end of the cask. The words "LID END" are stamped on the edge of the fin near each trunnion. Also the word "LID" and four lifting fixture attachment holes may be seen through the expanded metal screen on the lid end impact limiter. Slowly lower and traverse the crane such that the cask pivots about the trunnions into the vertical position with the lid up. The center of gravity is slightly offset towards the bottom to aid in the rotation (Figures 3.6B and 3.6C).

WARNING

Traverse the crane to keep the cables vertical and avoid cable contact with the upper impact limiter.

3.4.4 When the cask is stabilized in the vertical position raise the impact-limiter platform such that it contacts the bottom of the unit. Remove the crane hook from the horizontal lifting fixture (Figure 3.6D).

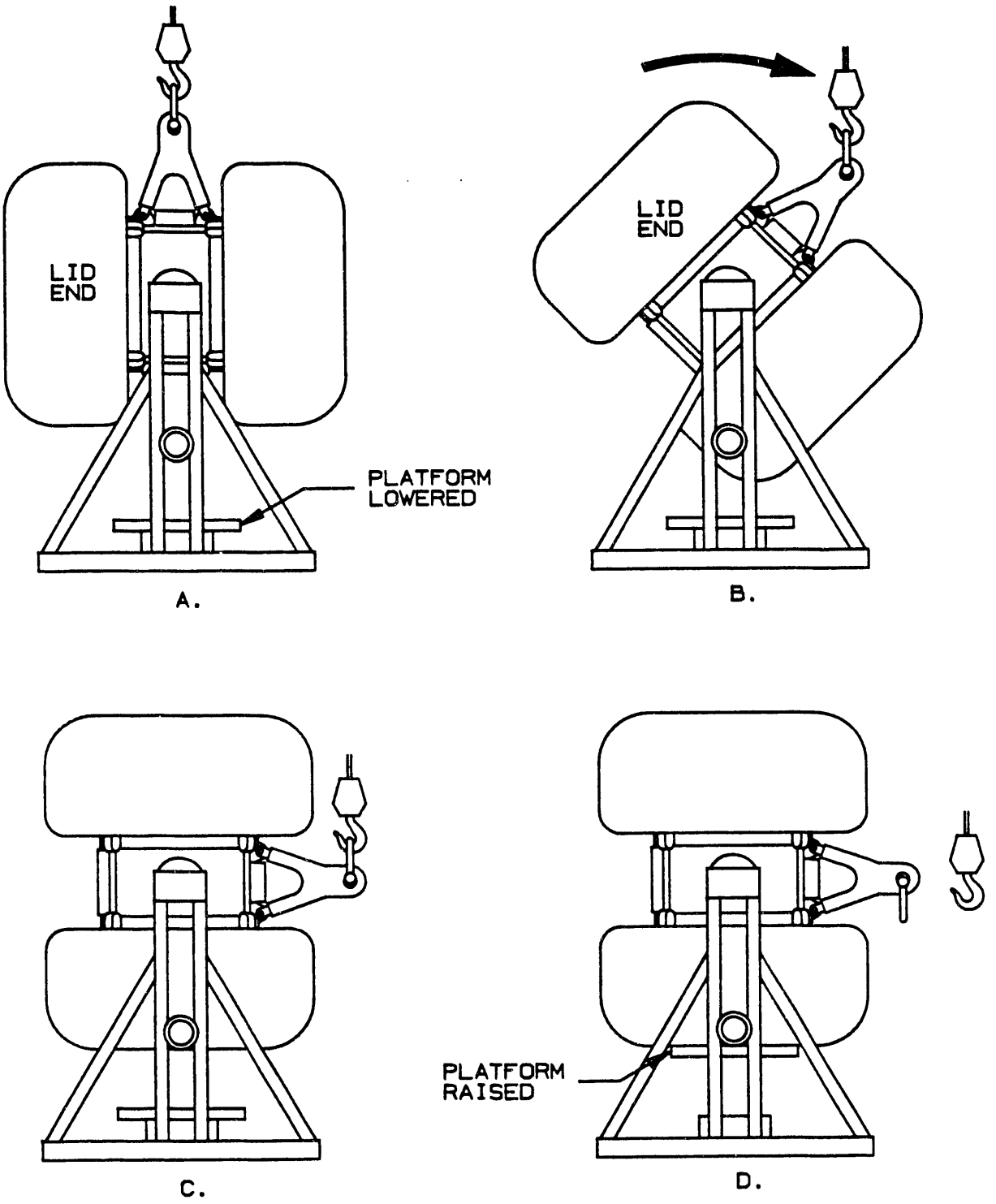


Figure 3.6
Cask Placement and Rotation Operation

3.4.5 Removal of the impact limiter begins by manually removing the upper limiter tapes. First remove the tape-locking plug by loosening and removing the large center eyebolt from the plug. The plug will have a tamper seal if the cask is loaded. Store the plug and eyebolt where they will not be lost (Figure 3.7).

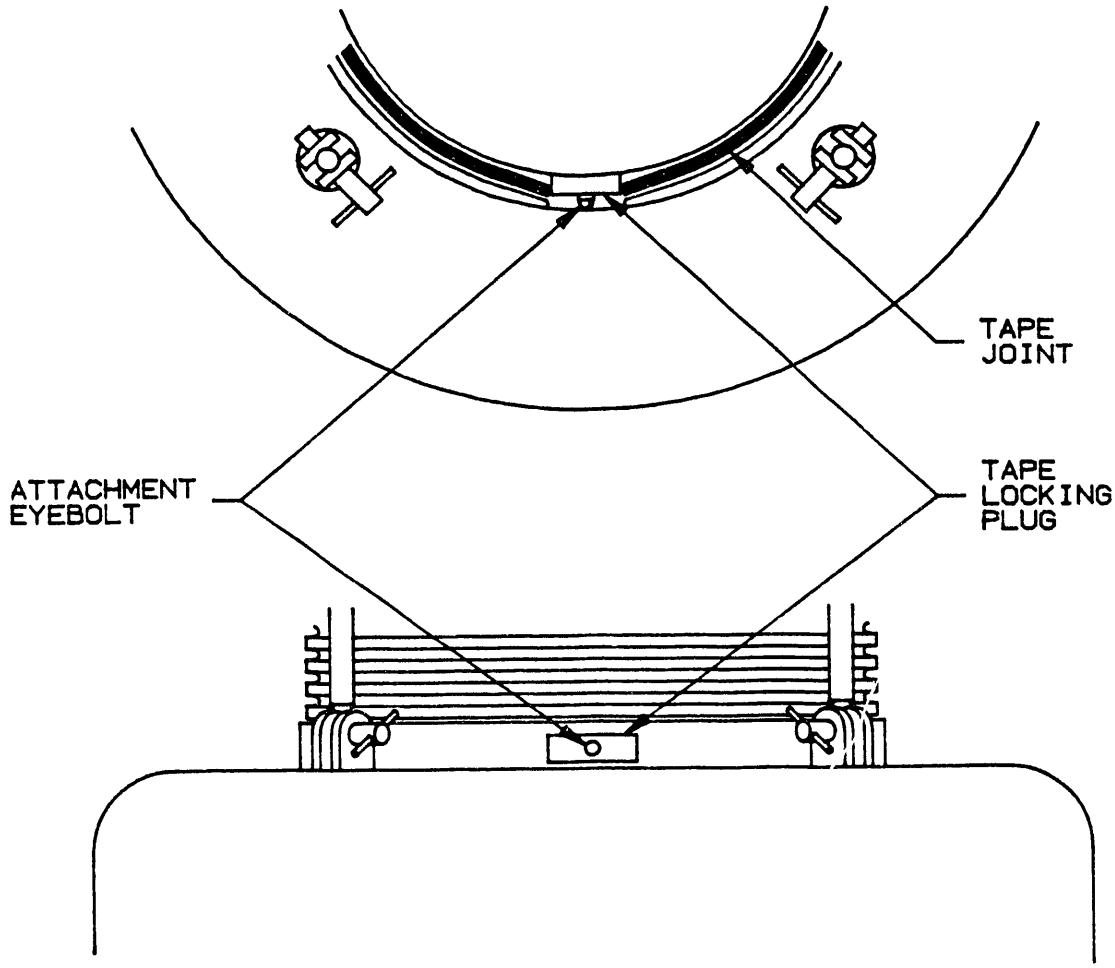


Figure 3.7
Locking Plug and Tape

3.4.6 Attach the tape removal tool by threading it into the hole at the end of the tape. Remove the tape by pulling it out of the groove (Figure 3.8).

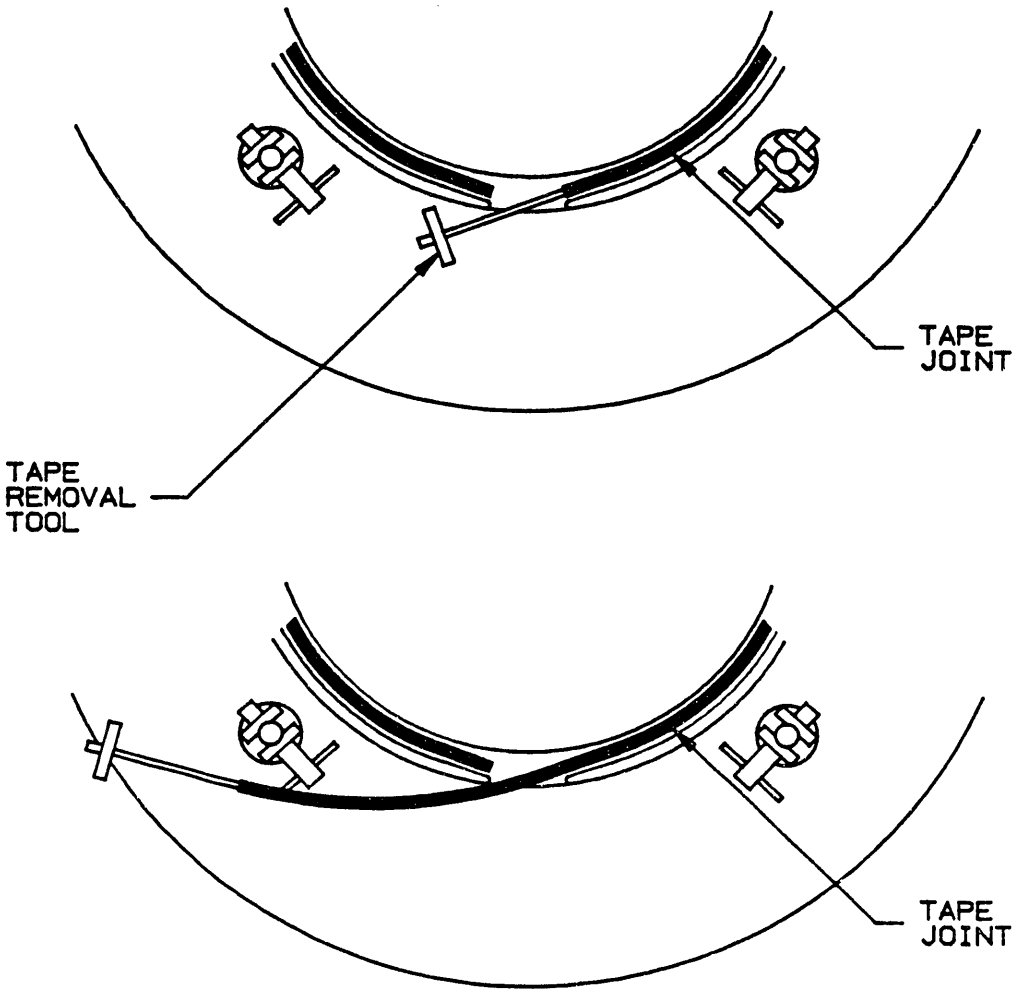


Figure 3.8
Tape Engagement and Removal

NOTE
Each tape should extract with ease. The tapes should remain curved while being removed; it is not necessary to straighten them. Care should be taken once the tape is extracted to prevent excessive bending, which could cause breakage.

Place the extracted tapes where they will not become damaged. Do not remove the lower limiter tape joints until the upper limiter is removed from the cask.

3.4.7 Loosen the four limiter connecting turnbuckles by first backing off the locking nuts using a 2-1/4" open end wrench. Loosen the four turnbuckle bodies using a wrench on the 1.50" flats of the bodies. Loosen sufficiently to permit the removal of the attachment pins on the upper limiter. Rotate the turnbuckles outward and lay on the lower limiter (Figure 3.9).

NOTE

The turnbuckle locking nuts have right-hand threads. This will also identify which end of the turnbuckle assembly is right-hand threaded.

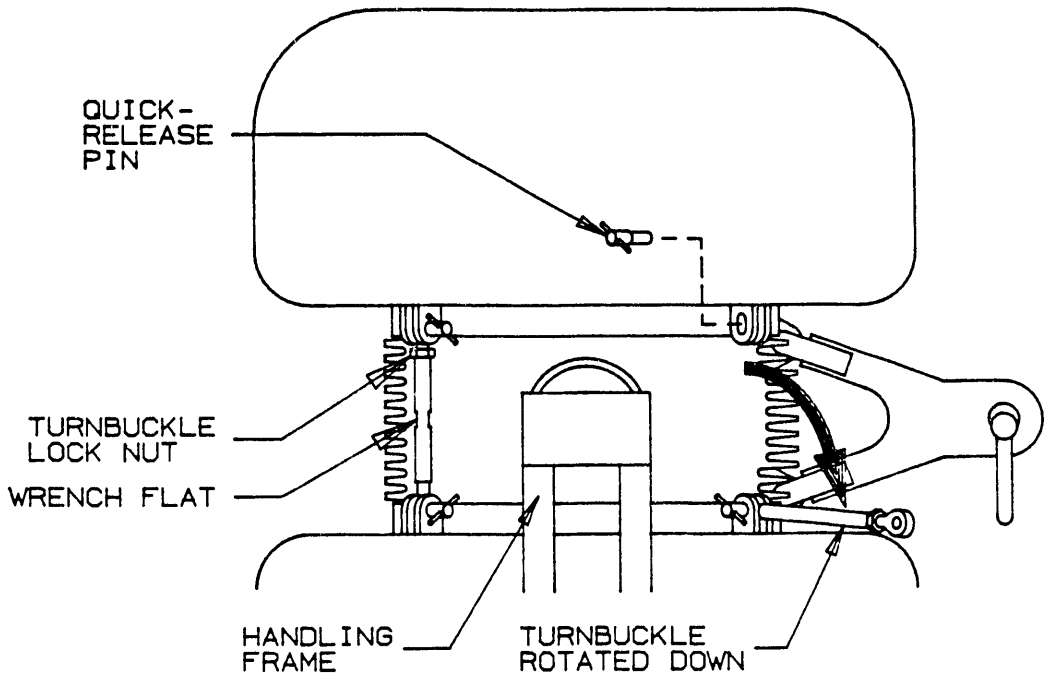


Figure 3.9
Turnbuckle Removal

3.4.8 Attach the three supplied eyebolts to the end of the upper limiter by threading each into the limiter as far as possible. Next loosen each eyebolt so that the plane of the eye aligns with the centerline of the limiter (Figure 3.10). Tighten the locking nuts with a 1-1/8 inch wrench.

3.4.9 Rig the limiter to the overhead crane using three equal-length slings with a minimum vertical rating of 2000 pounds and minimum length of 36 inches (Figure 3.10).

WARNING

Slings must be of the minimum rating and length noted above. The 36-inch length is required to maintain a sling angle with respect to vertical that does not exceed 30 degrees. Sling angles in excess of 30 degrees will severely reduce the capacity of both the slings and eyebolts.

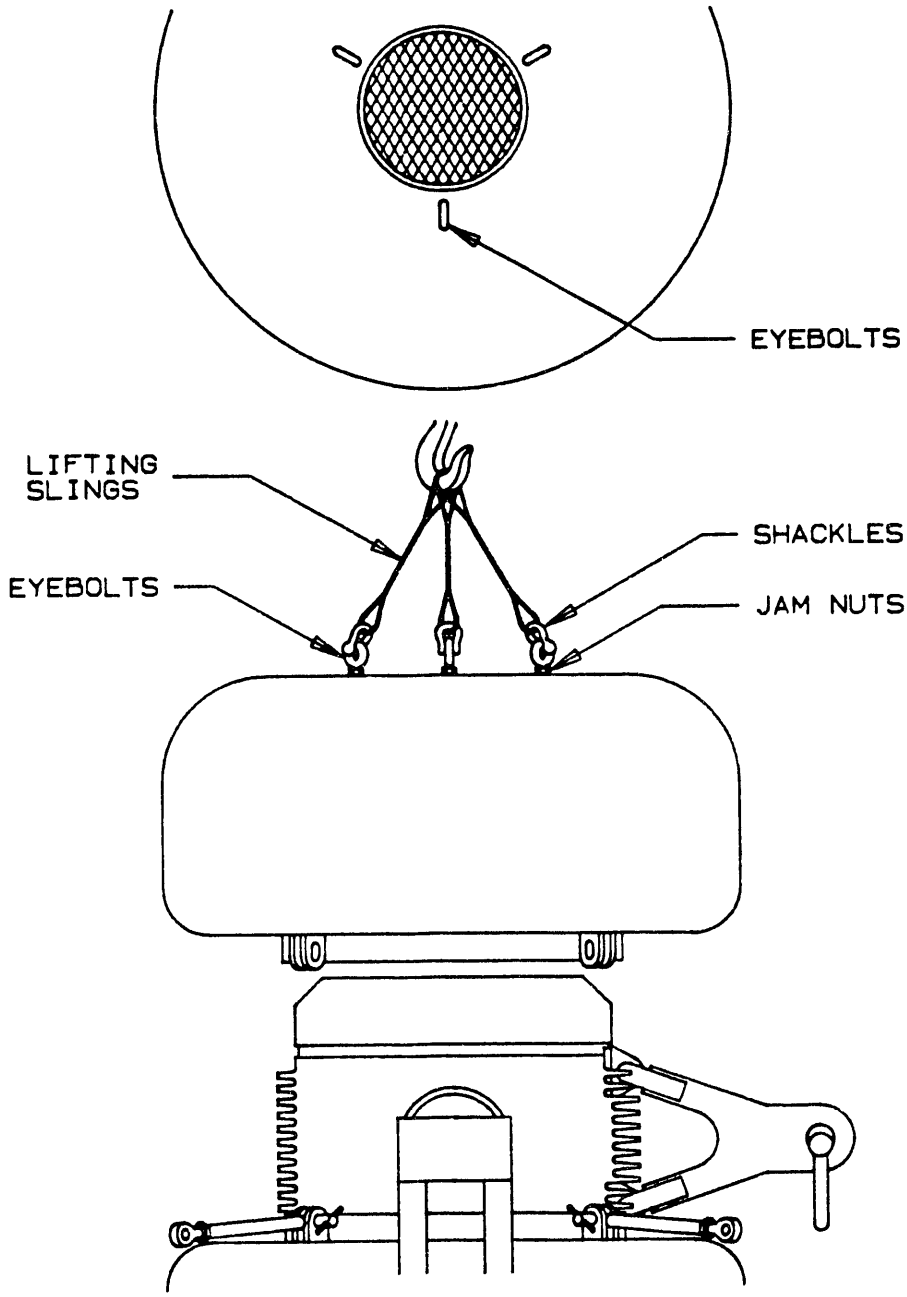


Figure 3.10
Upper Limiter Rigging and Removal

3.4.10 Slowly lift the limiter free from the cask while observing for indications of binding. Place the upper limiter out of the immediate work area. Be careful not to damage the cask engagement/ tape joint area of the limiter when setting down.

3.4.11 Attach the crane hook to the horizontal lifting fixture. Raise the crane to lift the fixture slightly.

CAUTION

Exercise extreme caution to lift the horizontal lifting fixture only; do not transfer load to the cask as this will tend to rotate the cask and damage the lower limiter.

With the weight of the lifting fixture removed from the lower quick-release pin, remove the pin (Figure 3.11).

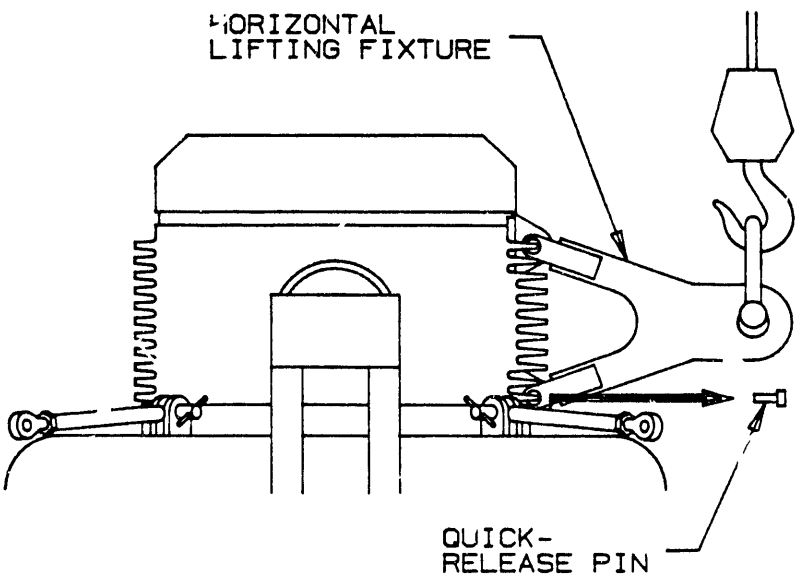


Figure 3.11
Lifting Fixture Removal

3.4.12 Operate the crane to raise the horizontal lifting fixture to a hanging orientation. Remove the upper quick-release pin and remove the fixture. Replace the pins in the fixture (Figure 3.12).

CAUTION

Exercise extreme caution to lift the horizontal lifting fixture only; do not transfer load to the cask as this will tend to rotate the cask and damage the lower limiter.

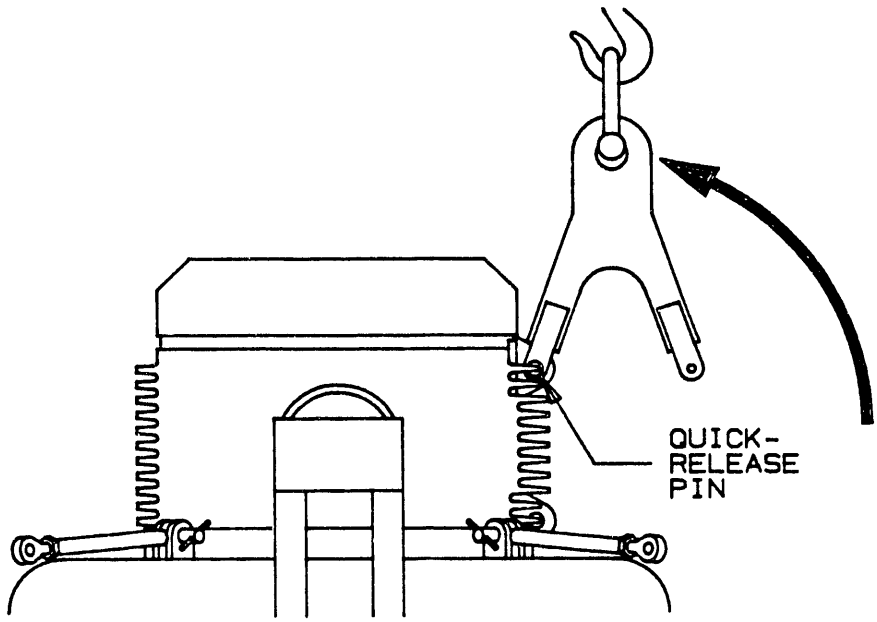


Figure 3.12
Final Lifting Fixture Removal

3.4.13 Remove the tapes from the lower impact limiter tape joint as performed for the upper limiter (see Section 3.4.6). Place the extracted tapes with the upper limiter tapes. Observe the note on avoiding tape bending (Figure 3.13).

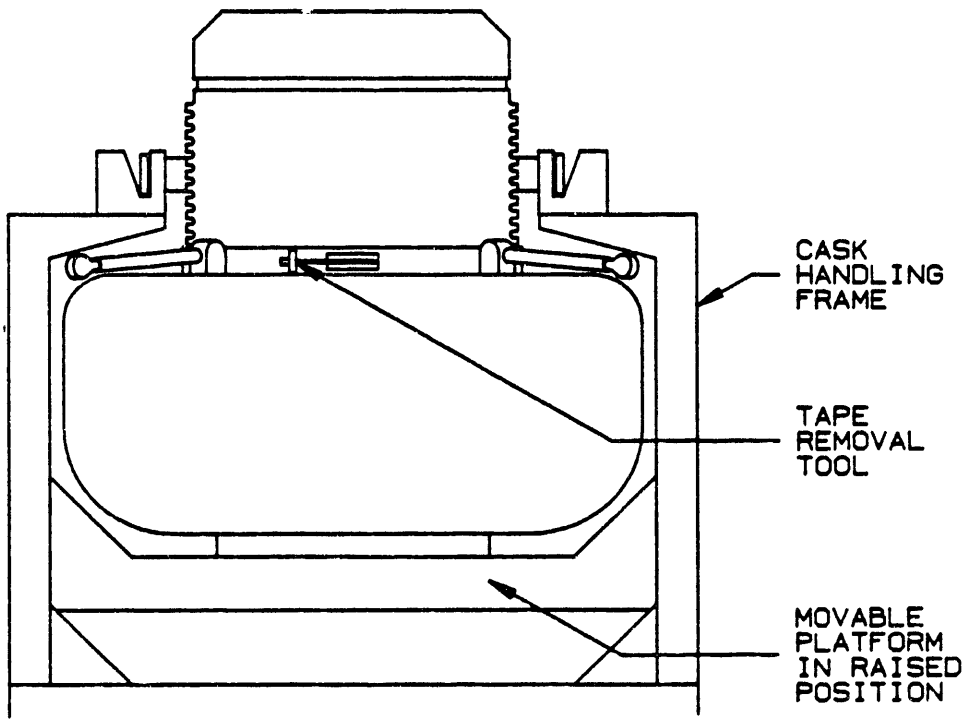


Figure 3.13
Lower Limiter Tape Removal

3.4.14 Lower the impact limiter platform to assure that the limiter is a minimum of 6 inches below the bottom surface of the cask (Figure 3.14).

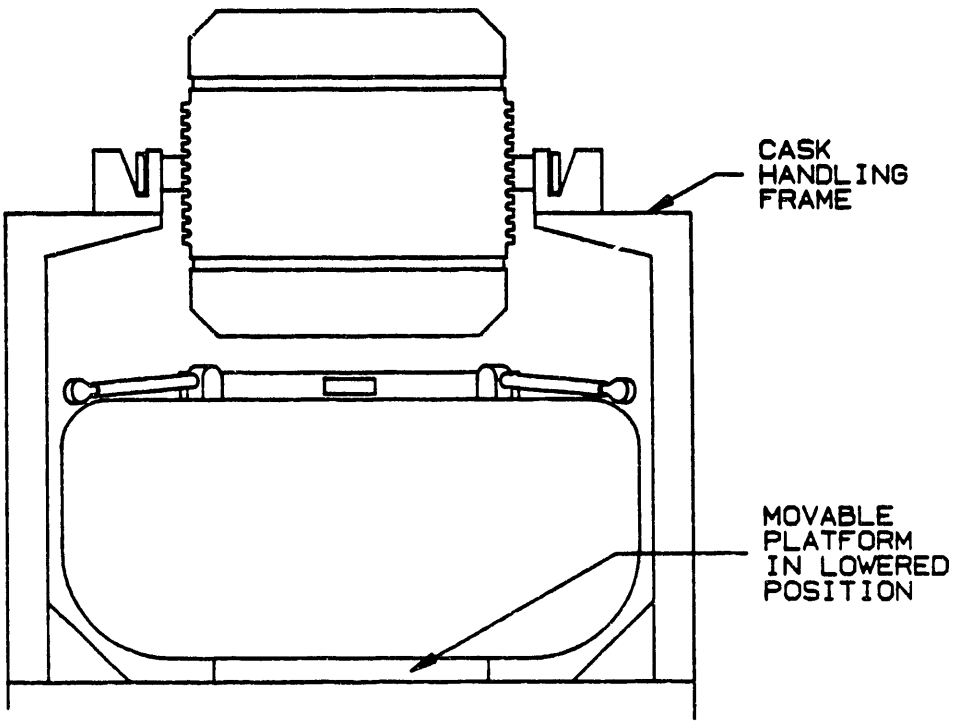


Figure 3.14
Lower Limiter Removal

3.4.15 Engage the cask vertical handling fixture with the overhead crane. Move the fixture over the cask and lower and engage the two trunnions inboard of their attachment points on the handling frame. Slowly lift the cask vertically leaving the lower limiter on the frame (Figure 3.15).

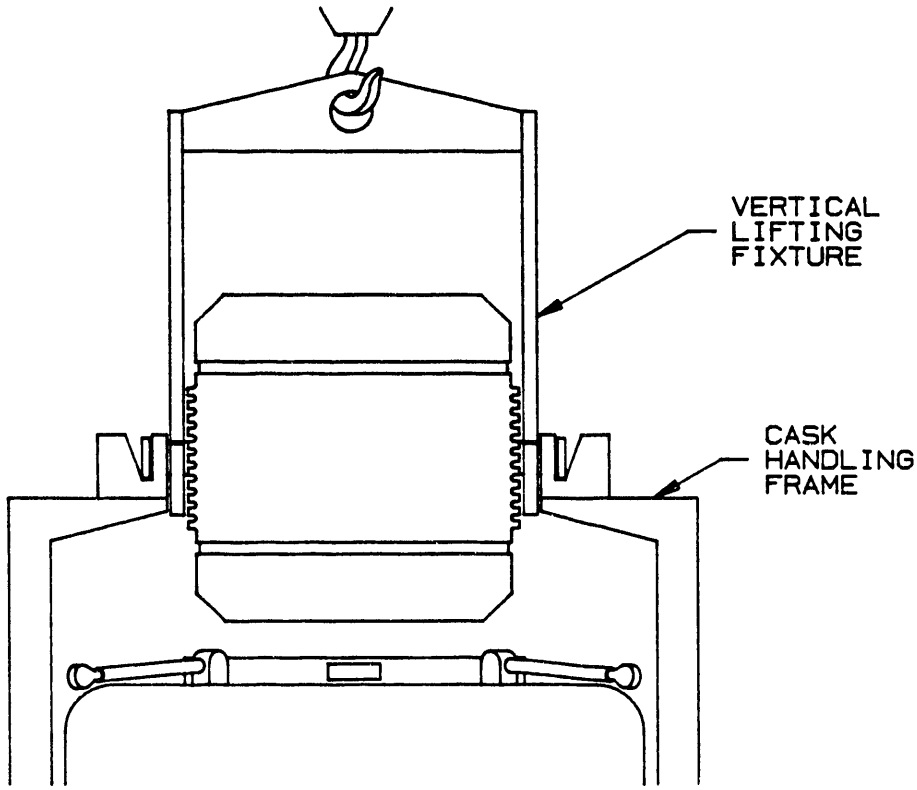


Figure 3.15
Cask Removal from Frame

3.4.16 Place the cask on a piece of plywood on a flat floor surface that is suitable for the weight. Disengage the lifting fixture. At this time the cask should be cleaned of any road dirt and oil that might have accumulated on the surface.

4.0 WET AND DRY LOADING OPERATIONS

4.1 Introduction

4.1.1 This section contains general instructions for handling and loading the BUSS cask at "wet" facilities (i.e., water-filled pools) and "dry" facilities (i.e., hot cells). These instructions cover lid and port cover removal, seal replacement, capsule loading, cask reassembly, and preparation of the loaded cask for shipment. Refer to Appendix 8.1 for sample checklists to be completed and signed as the defined actions are accomplished.

4.1.2 The operating instructions for loading the cask are similar for wet and dry facilities. Special notes are made where notable differences exist. A two-column format is used to isolate instructions specific to the different facilities.

4.2 Port Cover Removal

4.2.1 Remove both lower and upper port thermal shields by depressing and turning the twist-lock fasteners (Figure 4.1). Using a 3/4-inch socket, remove the lower port cover by loosening and removing the 6 bolts. Verify the presence of the quick-connect valve. Note that the seal assembly is captive to the port cover.

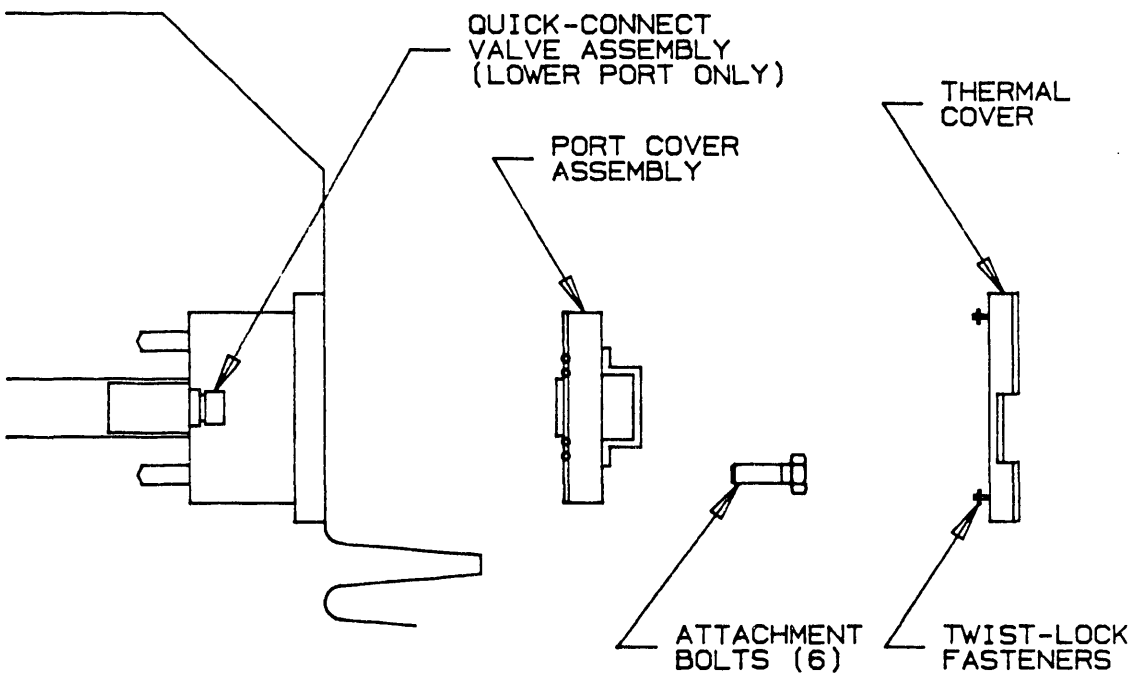


Figure 4.1
Typical Port Assembly

4.2.2 Remove the upper port cover by loosening and removing the 6 bolts. Note that there is no valve on this penetration. Survey the port areas for radioactive contamination.

NOTE
The cask has been returned empty using old Helicoflex seals in the ports and lid. These must be replaced with new units before the loaded cask can be shipped.

4.2.3 Clean the port areas of the cask body. Inspect the mounting-hole threads for signs of wear or damage. These are threaded inserts; inspect them for looseness. If any damage or looseness is found, replace the insert following procedures in the Maintenance Manual, Section 9. Clean the seal surface using lint-free cloths and solvent. Use a solvent approved by the facility for use on stainless steel.

4.3 Port Cover Seal Replacement

4.3.1 Place the port cover on a clean, well-lighted work surface with the seal facing up. The operation for seal replacement for the upper and lower port covers is identical. The port cover, seal assembly, and retention system are detailed in Figure 4.2.

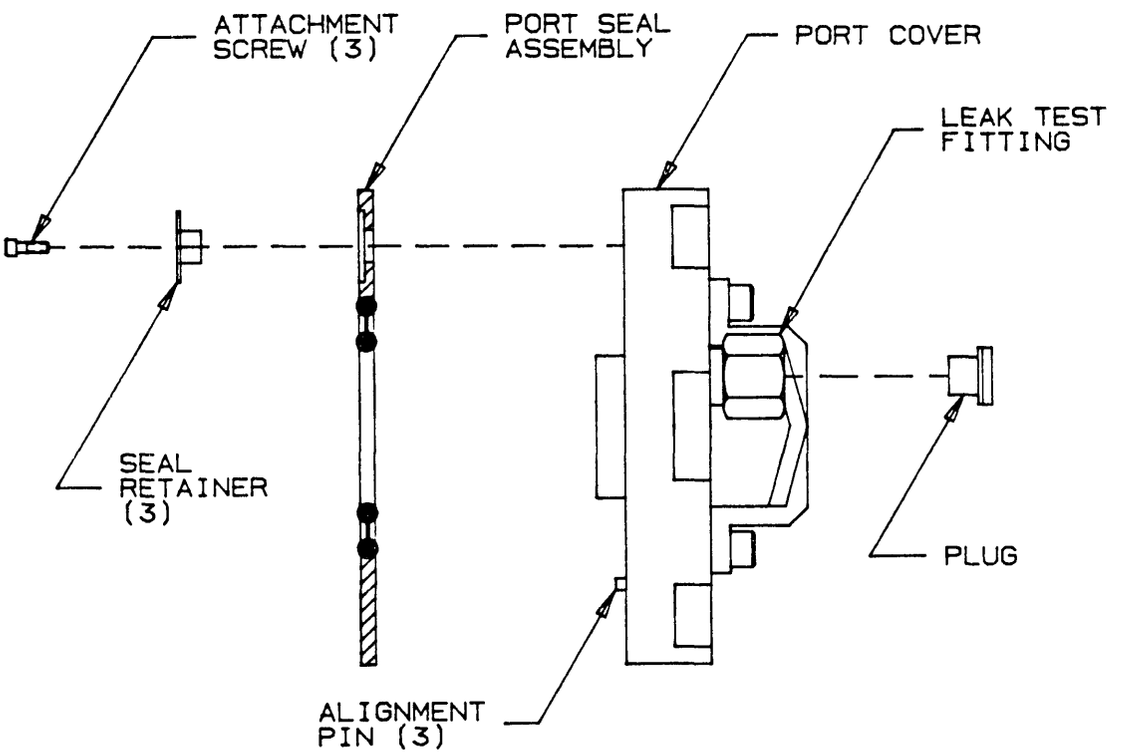


Figure 4.2
Port Cover and Seal Detail

4.3.2 Using a 3/32" Allen wrench, loosen the three cap screws securing the seal assembly to the port cover.

4.3.3 While manually holding the seal assembly from sliding on the port cover, remove the screws and their accompanying seal retainers.

CAUTION
Exercise extreme caution during seal removal and replacement operations to prevent damage to the sealing surface of the port cover.

4.3.4 Lift the seal assembly from the cover. If the assembly should bind on the locating pins, gently pry loose using a small screwdriver at the outer circumference.

4.3.5 Clean the seal surface with a lint-free cloth and solvent.

4.3.6 Inspect the mounting-hole threads for signs of wear or damage. These are threaded inserts; inspect them for looseness. If any damage or looseness is found, replace the insert following procedures in the Maintenance Manual, Section 9.

4.3.7 Remove the seal assembly from the stainless steel spacer. The metallic seal portion is held in place by the elastomeric O-ring. Seal removal is accomplished by holding the assembly such that the thumbs are located on the replaceable seal assembly. Exert thumb pressure until the seal assembly pops loose from the spacer (Figure 4.3). Tag the removed metallic seal and O-ring for disposal.

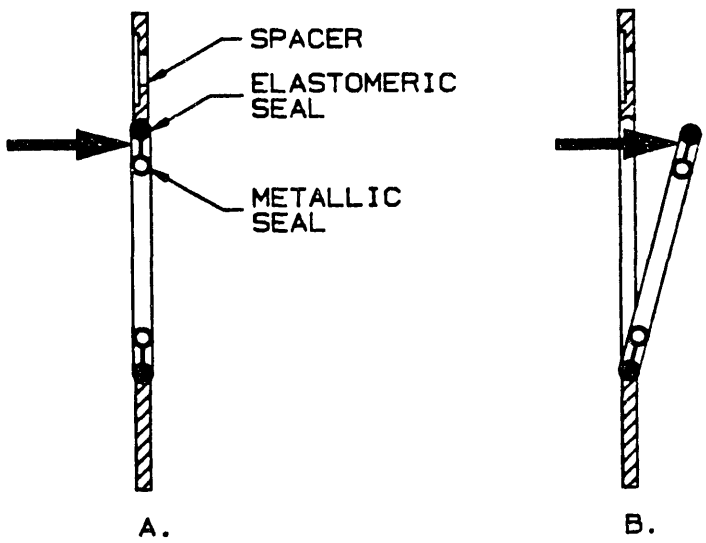


Figure 4.3
Port Cover Helicoflex Seal Removal

4.3.8 Unpackage a new port seal assembly. Remove the elastomeric O-ring from the Helicoflex component and set aside. Visually inspect the outer surfaces of the copper jacket for dings or scratches. Do not use the seal if damaged. Clean the Helicoflex seal using lint-free wipes dampened with alcohol.

4.3.9 Lubricate the elastomeric O-ring with a small amount of vacuum grease. Wipe the O-ring with a lint-free wiper to remove the excess grease. Reinstall the O-ring to the Helicoflex component.

NOTE

Elastomeric O-rings have a limited shelf life. Administrative controls must be in place to assure that out-of-date O-rings are not used. Five years from date of manufacture (cure date) is recommended as the maximum shelf life.

4.3.10 Install a new seal assembly in the spacer ring. To install the seal assembly in the spacer ring, first position one side of the seal assembly into the groove in the inside diameter of the spacer (Figure 4.4). Using the thumbs and forefingers of both hands, use a "pinching" pressure around the assembly to seat the O-ring in the spacer groove. Feel around the full circumference of the O-ring on both sides of the assembly to assure that the O-ring is fully and evenly set. Any "waviness" between the exposed surface of the O-ring and the spacer indicates that the O-ring is not properly set in the spacer groove. Use thumb pressure on "high" spots to correct any misalignment.

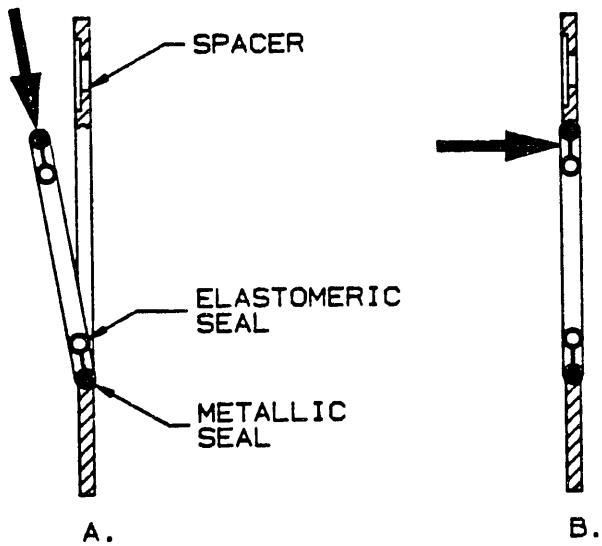


Figure 4.4
Port Cover Helicoflex Seal Replacement

4.3.11 Reclean the Helicoflex component of the assembly again, using a lint-free wipe dampened with solvent. Wipe following the arc of the seal. Avoid wetting the elastomeric seal with solvent.

NOTE
Use of solvents on the elastomeric seal will remove the applied grease. This could adversely affect the performance of the seal assembly when leak tested.

4.3.12 Orient the seal assembly above the cover such that the countersunk features for the retainers are facing away from the cover. Carefully place the seal assembly onto the port cover, engaging the three locating pins. Hold the assembly in position and loosely install the three retainers and mounting screws.

4.3.13 Continue to hold the seal assembly in place and progressively tighten the three attachment screws. Assure that the seal is evenly drawn towards the cover and does not bind on the locating pins.

4.3.14 Using an appropriate-size torque wrench and a 3/32" Allen drive socket, tighten the mounting screws to 10 in-lb.

4.3.15 Repeat steps 4.3.1 through 4.3.14 for the other port cover.

4.3.16 Document the completion of the seal removal and replacement operations on the loading checklist.

4.4 Lid Removal

4.4.1 Remove the twelve bolts fastening the lid. Use a 12-point, 1-5/8" socket on the 12-point bolts. Place the bolts where they will not become lost or damaged. Probable torque on the bolts is approximately 50 ft-lb.

NOTE
The lid bolts are high-strength steel of a special design. The only permitted replacements are those supplied as spare parts by the cask owner/caretaker.

4.4.2 Fasten the lid-lifting fixture to the lid with the four 1/2-20 x 1.125 bolts and washers provided. Tighten to 50 ft-lb. Install the three guide pins in the cask body. Note there are two short pins and one long pin: install at the locations shown in Figure 4.5. Tighten the pins by hand until snug.

4.3.11 Reclean the Helicoflex component of the assembly again, using a lint-free wipe dampened with solvent. Wipe following the arc of the seal. Avoid wetting the elastomeric seal with solvent.

NOTE
Use of solvents on the elastomeric seal will remove the applied grease. This could adversely affect the performance of the seal assembly when leak tested.

4.3.12 Orient the seal assembly above the cover such that the countersunk features for the retainers are facing away from the cover. Carefully place the seal assembly onto the port cover, engaging the three locating pins. Hold the assembly in position and loosely install the three retainers and mounting screws.

4.3.13 Continue to hold the seal assembly in place and progressively tighten the three attachment screws. Assure that the seal is evenly drawn towards the cover and does not bind on the locating pins.

4.3.14 Using an appropriate-size torque wrench and a 3/32" Allen drive socket, tighten the mounting screws to 12 in-lb.

4.3.15 Repeat steps 4.3.1 through 4.3.14 for the other port cover.

4.3.16 Document the completion of the seal removal and replacement operations on the loading checklist.

4.4 Lid Removal

4.4.1 Remove the twelve bolts fastening the lid. Use a 12-point, 1-5/8" socket on the 12-point bolts. Place the bolts where they will not become lost or damaged. Probable torque on the bolts is approximately 50 ft-lb.

NOTE
The lid bolts are high-strength steel of a special design. The only permitted replacements are those supplied as spare parts by the cask owner/caretaker.

4.4.2 Fasten the lid-lifting fixture to the lid with the four 1/2-20 x 1.125 bolts and washers provided. Tighten to 50 ft-lb. Install the three guide pins in the cask body. Note there are two short pins and one long pin: install at the locations shown in Figure 4.5. Tighten the pins by hand until snug.

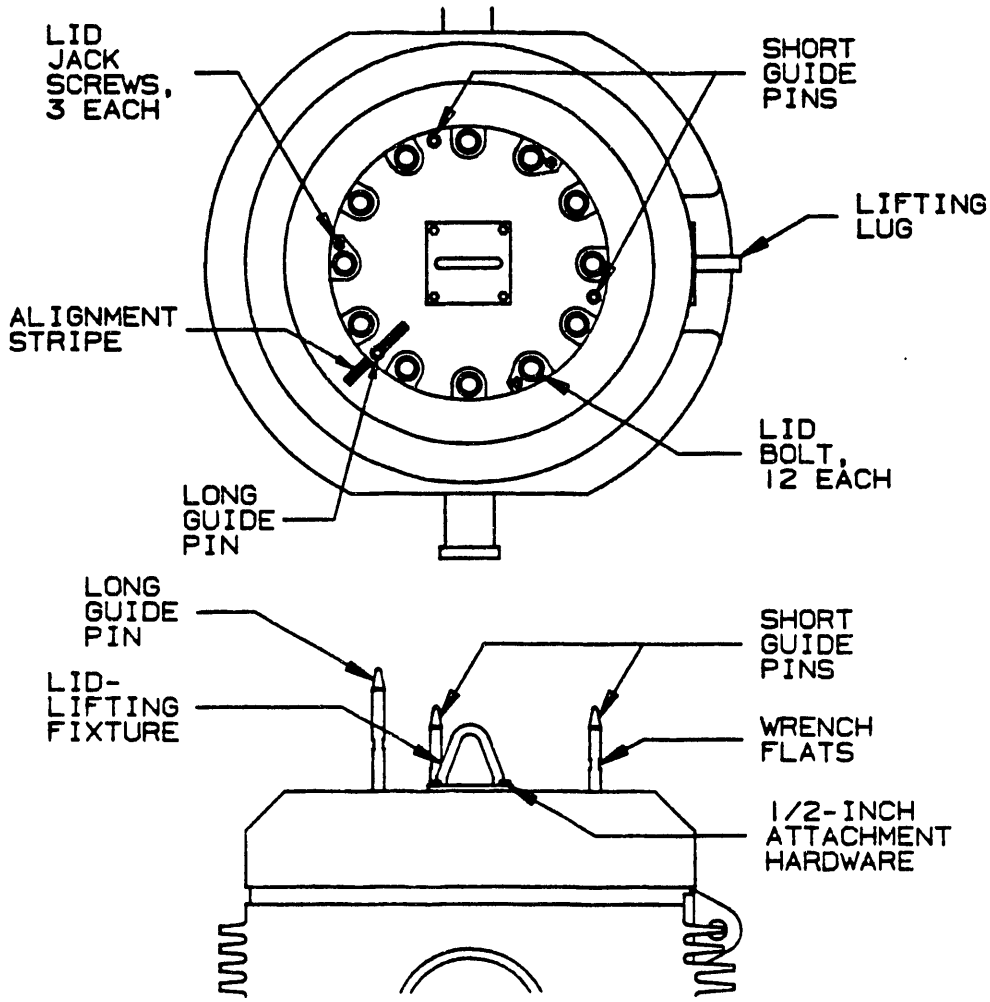


Figure 4.5
Lid-Lifting Fixture and Guide Pin Installation

4.4.3 Attach the crane hook to the lid-lifting fixture and align the crane for a vertical lift.

WARNING
RADIATION HAZARD
There is a possibility that a source of radioactivity exists within the cask. Lid lifting should be done slowly with a remote radiation monitoring device placed at the periphery of the lid. Return the lid to its seated position if there is any indication of activity and investigate the source with the shipper.

4.4.4 Slowly raise the cask lid, monitoring as instructed, until the lid is clear of the guide pins as shown in Figure 4.6. Note that the seal assembly is captive to the lid.

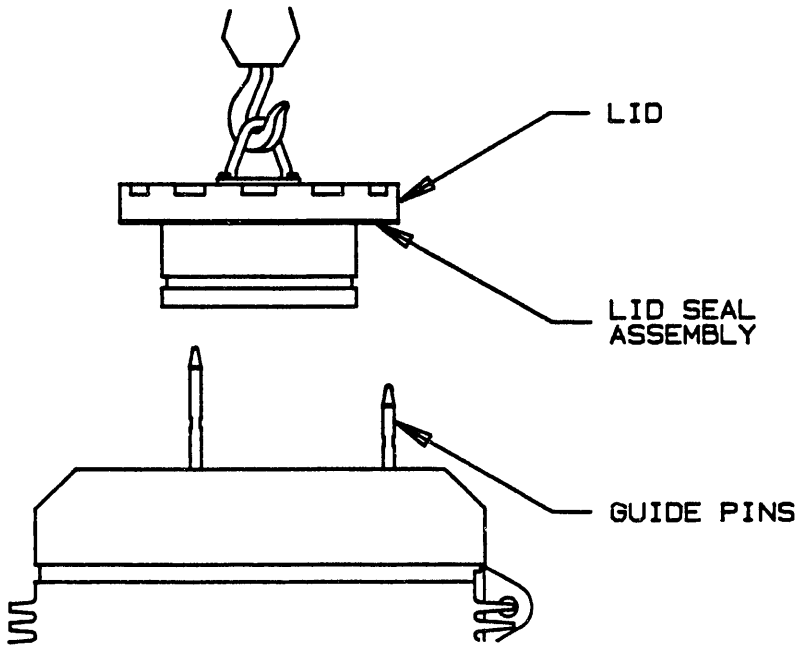


Figure 4.6
Lid Removal

4.4.5 Perform swipe tests of the underside of the lid and the cask interior for removable contamination. Decontaminate as required.

4.4.6 Move the lid to a work location and replace the seal assembly following the procedure in Section 4.5

4.5 Lid Seal Replacement

4.5.1 Suspend the lid such that the underside is accessible.

WARNING
The lid weighs approximately 1500 pounds; appropriate safety precautions must be taken to preclude swinging or dropping the lid while seal replacement is performed.

As an alternative, the lid may be inverted and placed on a suitable work surface, following good rigging practice. A non-marring (i.e. nylon) sling may be used through a lid attachment bolt hole to perform this operation. The lid, seal assembly, and retention system are detailed in Figure 4.7.

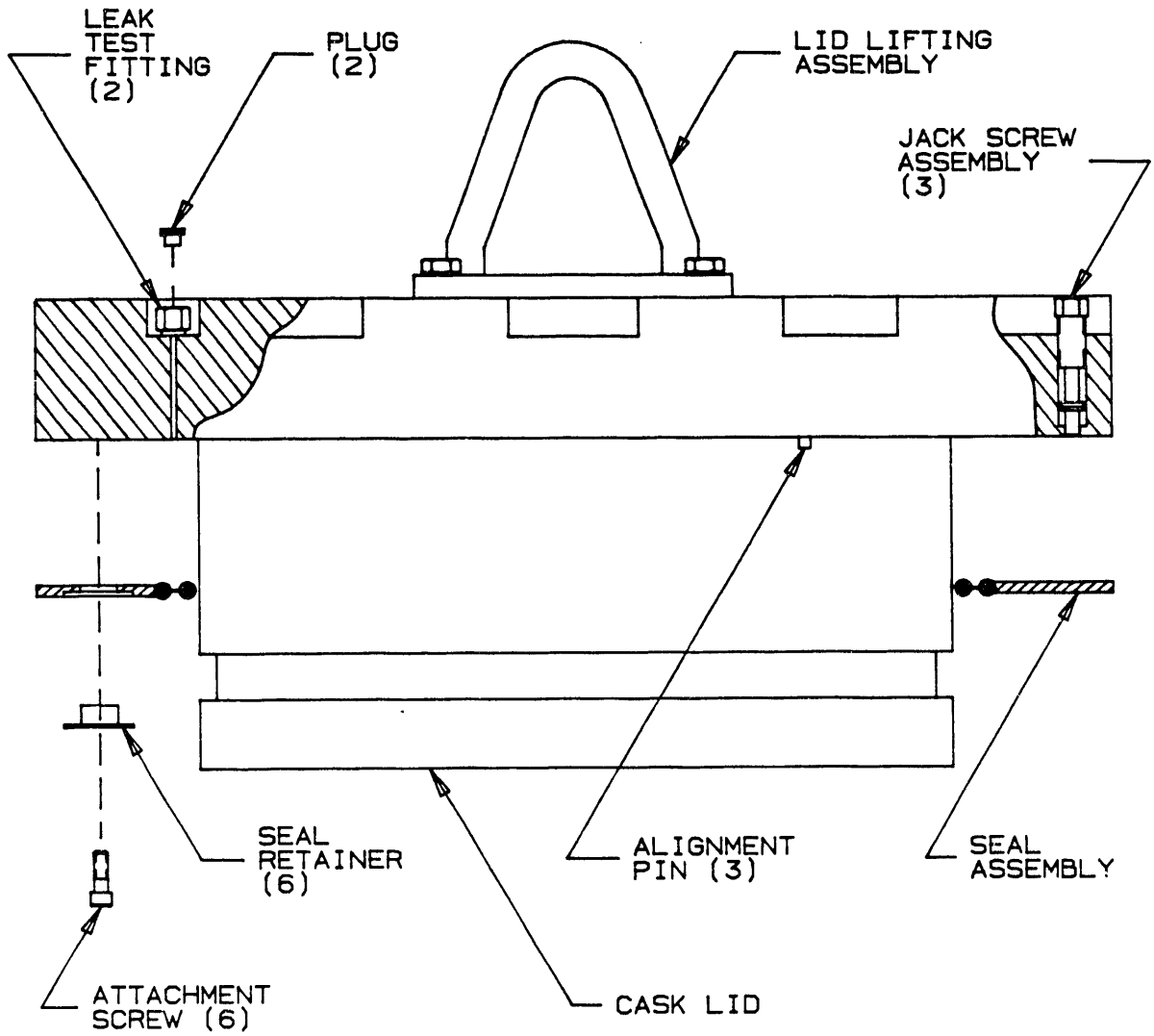


Figure 4.7
Lid and Seal Detail

4.5.2 Using a 3/16" Allen wrench, loosen the six cap screws attaching the seal assembly to the flange of the lid.

4.5.3 While manually holding the seal in place (i.e. from sliding on or bumping against the lid), remove the screws and associated retainers. This is a two-person operation. Place the screws and retainers where they will not become lost or damaged.

CAUTION

Exercise extreme caution during seal removal and replacement operations to prevent damage to the sealing surface of the lid.

4.5.4 Lift the seal assembly from the lid flange. If the assembly should bind on the locating pins, gently pry loose using a small screwdriver at the outer circumference.

4.5.5 Clean the seal surface with a lint-free cloth and solvent.

4.5.6 Inspect the six mounting-hole threads for signs of wear or damage. These are threaded inserts; inspect them for looseness. If any damage or looseness is found, replace the insert following procedures in the Maintenance Manual, Section 9.

4.5.7 Remove the seal assembly from the stainless-steel spacer. The metallic seal portion is held in place by the elastomeric O-ring. Seal removal is accomplished by holding the assembly such that the thumbs are located on the replaceable seal assembly. Exert thumb pressure until the seal assembly pops loose from the spacer (Figure 4.8). Tag the removed metallic seal and O-ring for disposal.

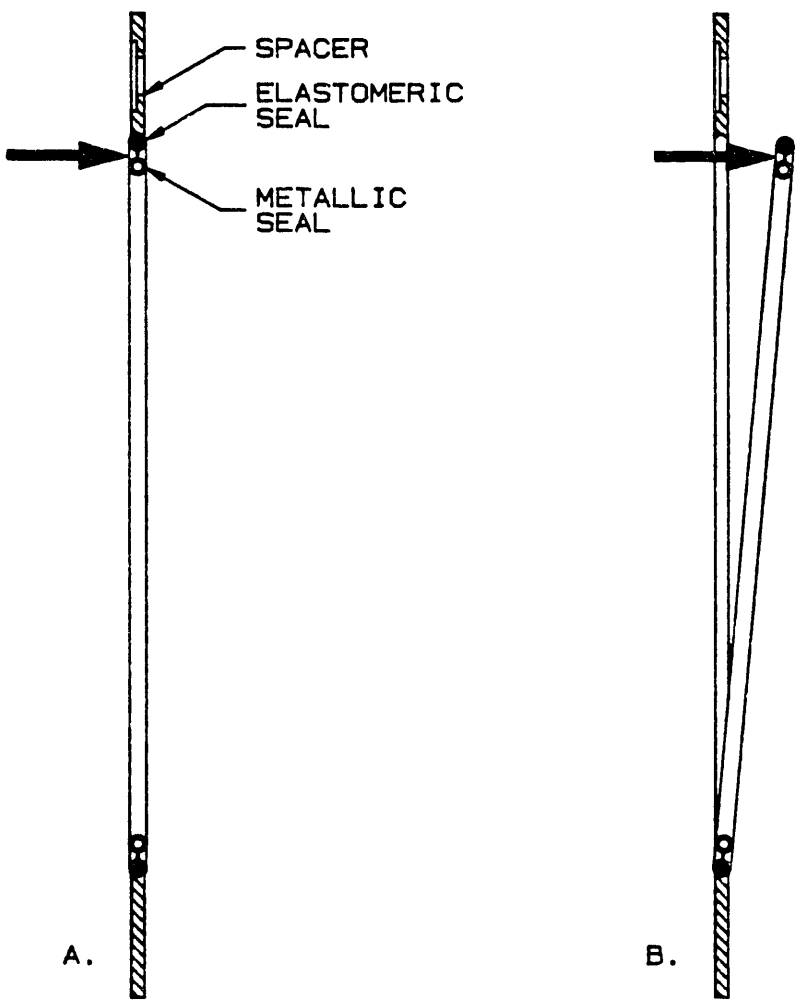


Figure 4.8
Lid Helicoflex Seal Removal

4.5.8 Unpackage a new lid seal assembly. Remove the elastomeric O-ring from the Helicoflex component and set aside. Visually inspect the outer surfaces of the copper jacket for dings or scratches. Do not use the seal if damaged. Clean the Helicoflex seal using lint-free wipes dampened with alcohol.

4.5.9 Lubricate the elastomeric O-ring with a small amount of vacuum grease. Wipe the O-ring with a lint-free wiper to remove the excess grease. Reinstall the O-ring to the Helicoflex component.

NOTE

Elastomeric O-rings have a limited shelf life. Administrative controls must be in place to assure that out-of-date O-rings are not used. Five years from date of manufacture (cure date) is recommended as the maximum shelf life.

4.5.10 Install the new seal assembly in the spacer ring. To install the seal assembly in the spacer ring, first position one side of the seal assembly into the groove in the inside diameter of the spacer. (Figure 4.9). Using the thumbs and forefingers of both hands, use a "pinching" pressure around the assembly to seat the O-ring in the spacer groove. Feel around the full circumference of the O-ring on both sides of the assembly to assure that the O-ring is fully and evenly set. Any "waviness" between the exposed surface of the O-ring and the spacer indicates that the O-ring is not properly set in the spacer groove. Use thumb pressure on "high" spots to correct any misalignment.

4.5.11 Reclean the Helicoflex component of the assembly again, using a lint-free wipe dampened with solvent. Wipe following the arc of the seal. Avoid wetting the elastomeric seal with solvent.

NOTE

Use of solvents on the elastomeric seal will remove the applied grease. This could adversely affect the performance of the seal assembly when leak tested.

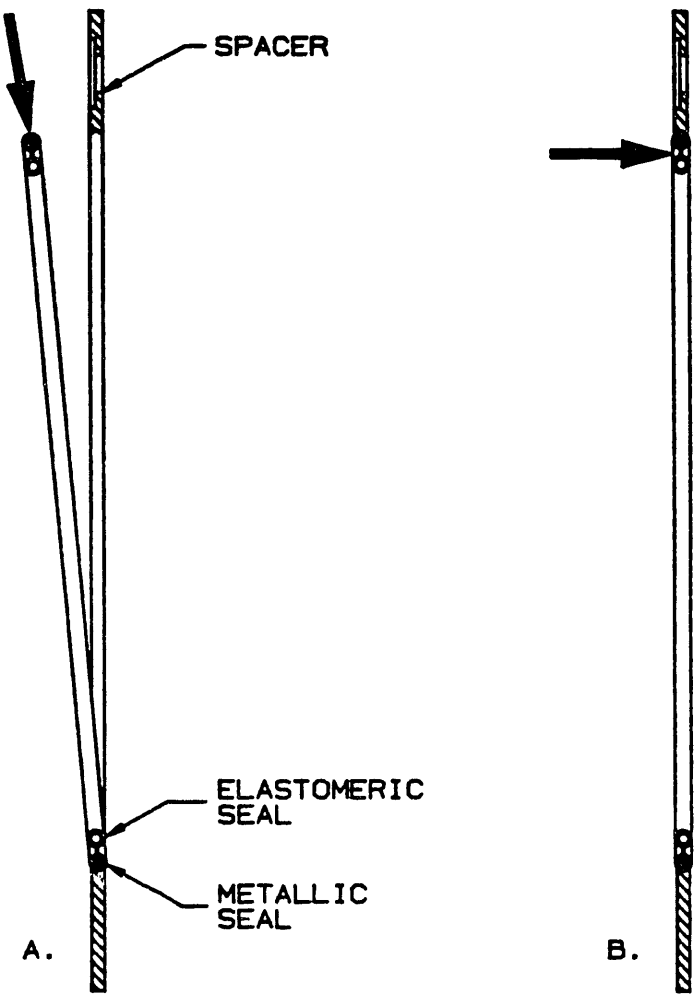


Figure 4.9
Lid Helicoflex Seal Replacement

4.5.12 Orient the seal assembly above the lid flange such that the countersunk features for the retainers are facing away from the lid. This is a two-person operation. Carefully place the seal assembly onto the lid fl nge, engaging the three locating pins. Hold the assembly in position and install the six retainers and mounting screws.

4.5.13 Continue to hold the seal assembly in place and progressively tighten the mounting screws. Be certain that the seal is evenly drawn toward the cover and does not bind on the locating pins.

4.5.14 Using an appropriate torque wrench and a 3/16" Allen drive socket, tighten the mounting screws to 75 in-lb.

4.5.15 Document the completion of the lid seal removal and replacement operations on the loading checklist.

4.6 Final Preparation for Loading

4.6.1 For wet loading, do not reinstall the port covers at this time. Place the covers and related hardware where they will not become damaged or lost, or contaminated with dust or dirt.

4.6.1.1 Install the quick-connect fitting supplied with the cask to the matching quick-connect valve in the lower port by inserting and pressing inward until it snaps in place (Figure 4.10) Document installation of this fitting on the loading checklist.

4.6.2 For dry loading, install the upper port cover only.

4.6.2.1 Lubricate the six bolts with thin coating of Neolube #1 on the threads. Carefully center the cover over the port in the cask body, aligning the six mounting holes. Hold the cover in place while installing the mounting bolts and washers.

4.6.2.2 Using an appropriate torque wrench and a 3/4" socket, incrementally tighten the bolts in a crossing pattern to 10, 30, and then 60 ft-lb. Torque the pattern again at 60 ft-lb. Document on the checklist.

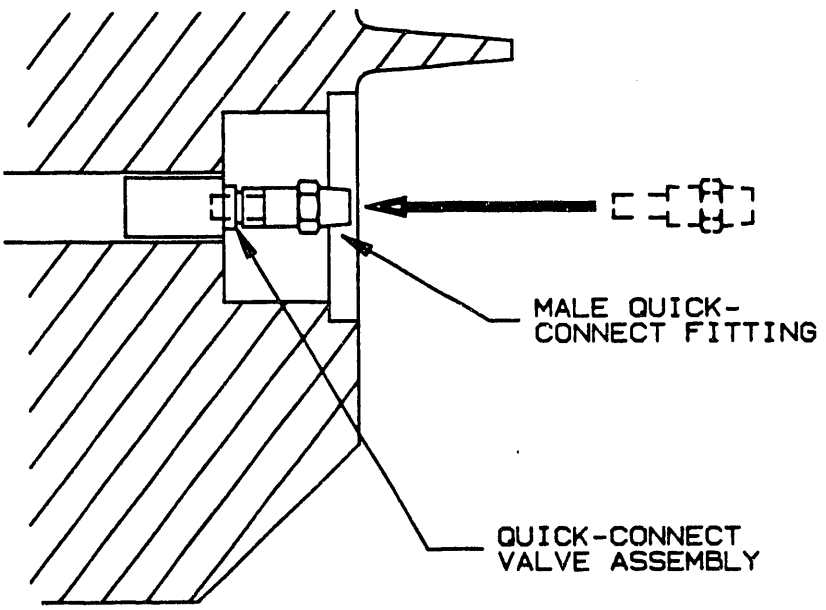


Figure 4.10
Quick Connect Fitting (wet loading only)

4.6.3 Clean the lid seal surface of the cask body using lint-free cloths and solvent.

4.6.4 Completely extend the three lid jack-screws by turning them clockwise with a 3/4" socket wrench such that the brass tips extend through the seal spacer. Do not confuse the brass tip with the spring-loaded indicator pin (Figure 4.11) Document completion of this operation on the loading checklist.

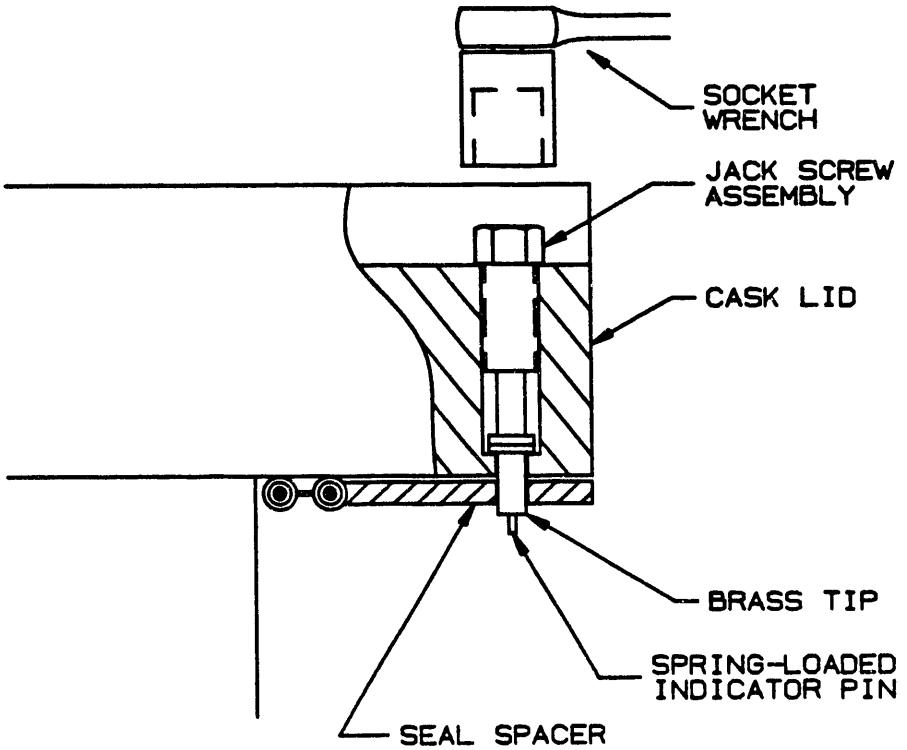


Figure 4.11
Lid Jack-Screw Extension

4.6.5 Clean any debris or excess dry lubricant from the twelve lid attachment bolts. Inspect the bolts for visual damage.

NOTE
The lid bolts are high-strength steel of a special design. The only permitted replacements are those supplied as spare parts by the cask owner/caretaker.

4.6.6 Lubricate the lid and port cover bolts with Neolube #1 lubricant, applying with a small brush. Brush a thin layer of lubricant on the threads. Additionally, apply on the bearing area under the head of the lid bolts. Allow lubricant to dry.

4.6.7.1 For wet loading, engage the lid by its lifting fixture and move the lid to a convenient position near the loading pool.

4.6.7.2 For dry loading, engage the lid by its lifting fixture and move into the hot cell. Locate where it can be remotely engaged with the cell-handling hoist.

4.6.8 Check to see that the basket-lifting handle has extended itself. The handle is spring loaded and the top of the handle should be approximately 12 inches above the top surface of the basket (Figure 4.12).

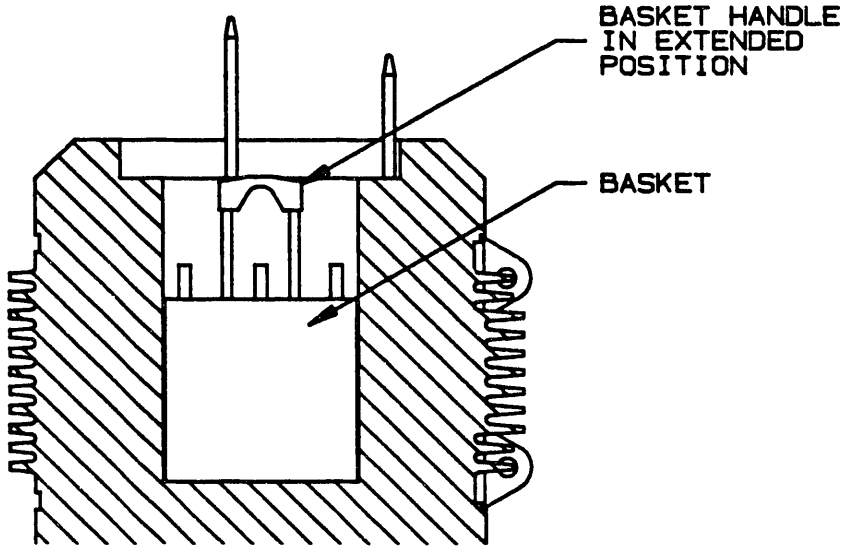


Figure 4.12
Basket Handle Extension

4.6.9 Engage the basket guide with the hoist and position over the cask body such that the basket handle aligns with the cask trunnions, i.e., in the same plane (Figure 4.13). Install the basket by lowering over the three lid guide pins. Manipulate the hoist to lay the basket handle aside in the direction of the cask lift lugs (opposite the long guide pin). Disengage the hoist from the basket handle. Document installation on the loading checklist.

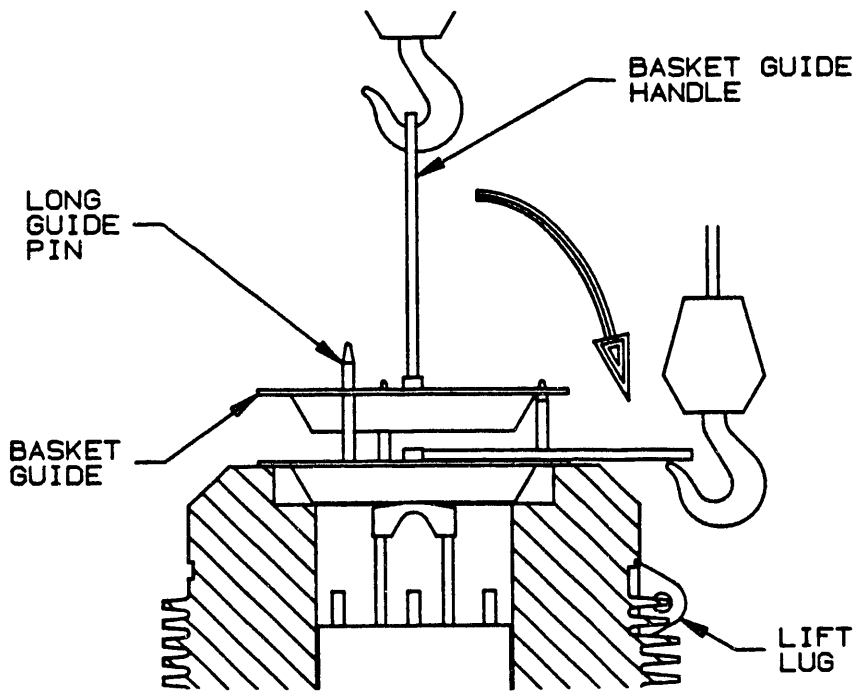


Figure 4.13
Basket Guide Installation

4.6.10 Engage the basket-lifting handle with the hoist. Slowly lift the basket out of the cask, avoiding contact of the basket with the lid guide pins (Figure 4.14).

NOTE
The basket may be left in place in the cask for capsule loading if so desired by the facility. The basket guide must still be installed to protect the seal surfaces.

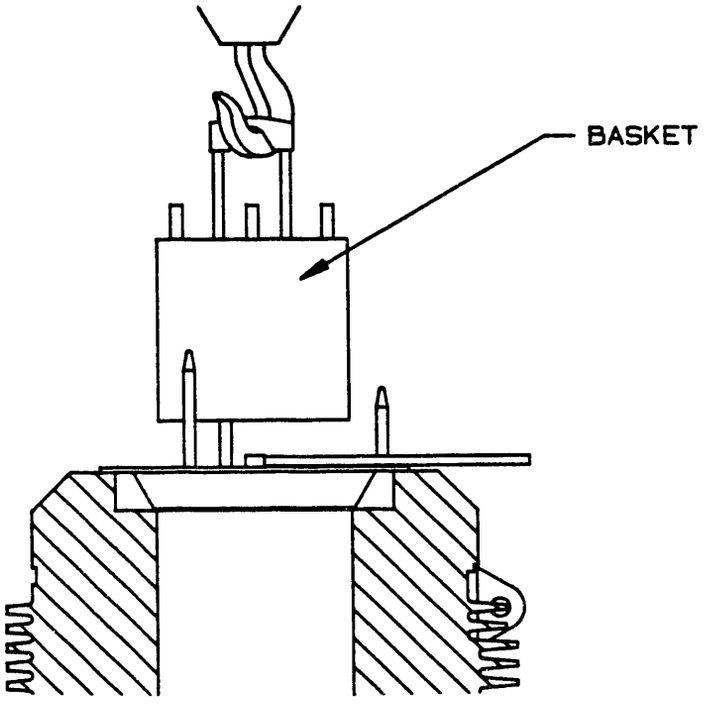


Figure 4.14
Basket Removal

4.6.11.1 For wet loading, position the basket over the pool and wet with clean rinse water. Place the basket on the pool bottom.

4.6.11.2 For dry loading, place the basket in the cell.

4.6.12.1 For wet loading, engage the cask with the vertical-lifting fixture and suspend it over the loading pool. Wet the cask with clean rinse water and submerge in the pool.

4.6.12.2 For dry loading, engage the cask with the vertical-lifting fixture and transport it to the hot cell. Alternately, the cask may be placed on a cart designed for its weight and moved into the cell.

4.7 Loading the Cask

4.7.1.1 For wet loading, be certain pool has adequate lighting and proper viewing aids. Slowly lower the cask into the pool, placing it in the designated location. Use the lowest crane speed to avoid impact with the bottom of the pool. Disengage the lifting fixture from the cask and bring it out of the pool.

4.7.1.2 For dry loading, move the cask into the cell, positioning it in the work location. **AT THIS TIME ALL PERSONNEL MUST EXIT THE CELL.** Close and secure the cell.

NOTE
The cask exterior may be covered with plastic sheet if there is the possibility of airborne contamination in the cell.

4.7.2 Proceed to load the proper number, type, and heat load capsules into the basket following the standard operating procedure for the facility (Figure 4.15). Refer to Section 2.4.1 for maximum capsule heat loads allowed in a particular basket configuration. Record the capsule serial numbers and the basket spaces into which they are placed per the standard operating procedure for the facility. Also document the basket used and capsule type and quantity on the loading checklist.

NOTE
For shipments with less than a full capacity load, i.e., only a few capsules, the capsules should be positioned in the basket symmetrically to maintain balance.

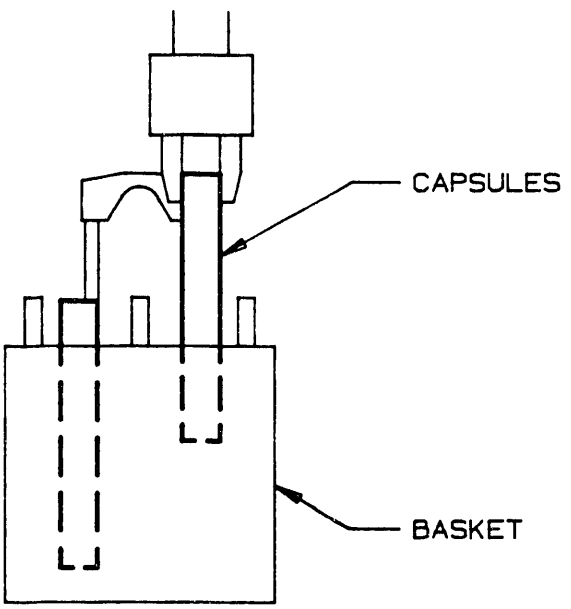


Figure 4.15
Capsule Loading

4.7.3 Lift the loaded basket with the hoist and return to the cask.

WARNING
RADIATION HAZARD
For wet loading, do not bring the basket near the pool surface during movement.

4.7.4 Align the basket over the basket guide and slowly lower the basket into the cask cavity. Watch the hoist cables for slack as an indication that the basket is seated.

NOTE
The lid should be placed on the cask body within 1 hour of the placement of the basket in the cavity. If not placed within 1 hour, additional delays may be encountered as cask component temperatures are allowed to stabilize.

4.7.5 Remove the hoist hook from the basket and engage the basket guide. Remove and store the guide.

4.7.6 Engage the cask lid with the hoist crane hook, then lift and position it over the cask.

4.7.7 Identify the three guide pin alignment holes in the lid. The alignment holes are not recessed in the lid like the 12 attachment bolt holes (Figure 4.16). The alignment stripe on the lid and cask body will aid in this alignment.

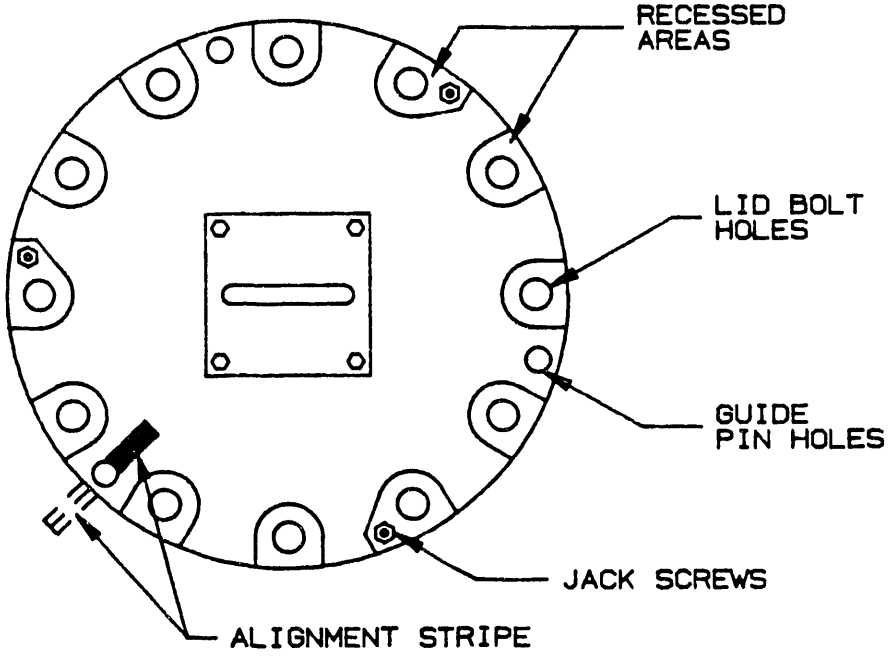


Figure 4.16
Lid Guide Pin Hole Identification

CAUTION

Be certain that a guide pin hole and not an attachment bolt hole has been identified for alignment and engagement with the guide pin. Lowering the lid while improperly aligned could result in damage to the seal, the cask seal surface, or the guide pins.

4.7.8 Align the appropriate guide pin hole in the lid over the long guide pin by aligning the alignment stripes. Lower the lid to engage on this pin. Align the remaining two guide pin holes over the short guide pins and lower the lid to engage them. The long guide pin may be used as a pivot point to aid in alignment. Slowly lower the lid until it contacts the cask body.

NOTE

The extended jack screws prevent the compression of the seal and thus prevent the lid from sitting flush with the top of the cask body.

4.7.9 Remove the crane hook from the lid-lifting bail. Record the time of lid placement on the worksheet.

4.7.10.1 For wet loading, engage the vertical lifting fixture, lower it into the pool and engage the cask. Put a slight strain on the crane and check for proper matching of the fixture and trunnions. Lift the cask until the lid is near the pool surface for observation. Verify that the lid is seated.

4.7.10.2 For dry loading, be certain that the lid is fully seated. It will protrude slightly above the body due to the jacking screws. At this time, **IF IT IS SAFE TO DO SO**, personnel may enter the cell to lower the lid using the jack screws. Monitor the radiation levels when entering.

4.7.11.1 Raise the cask until the lid is slightly above the pool surface. Monitor the radiation level near the cask. **IF IT IS SAFE TO DO SO**, personnel may approach the cask. Install three of the lubricated lid bolts at equally spaced locations around the lid.

4.7.11.2 Using a 3/4" socket wrench, turn each jack screw one quarter turn counterclockwise. Continue around the screw pattern until the indicator pins are flush with the jack screw top (Figure 4.17). This signifies that the lid is supported only by the seal and is ready for bolt tightening. Document on the checklist.

4.7.12.1 Raise the cask and allow to hang over the pool until the water in the cask cavity has drained from the lower port. Rinse the cask exterior surfaces and then move to the work area. Dry with composite padding or cloth rags.

4.7.12.2 Install three lubricated lid bolts at uniformly spaced locations around the lid. Hand tighten the three bolts.

4.7.13.1 Lower the lid using the jack screws. Using a 3/4" socket wrench, turn each jack screw one quarter turn counterclockwise. Continue around the screw pattern until the indicator pins are flush with the top of the jack screw (Figure 4.17). This signifies that the lid is supported only by the seal and is ready for bolt tightening. Hand tighten the three bolts. Document this operation on the loading checklist.

4.7.13.2 Move the cask from the hot cell to a work area, using the same method that was used for movement into the cell (i.e., crane or cart).

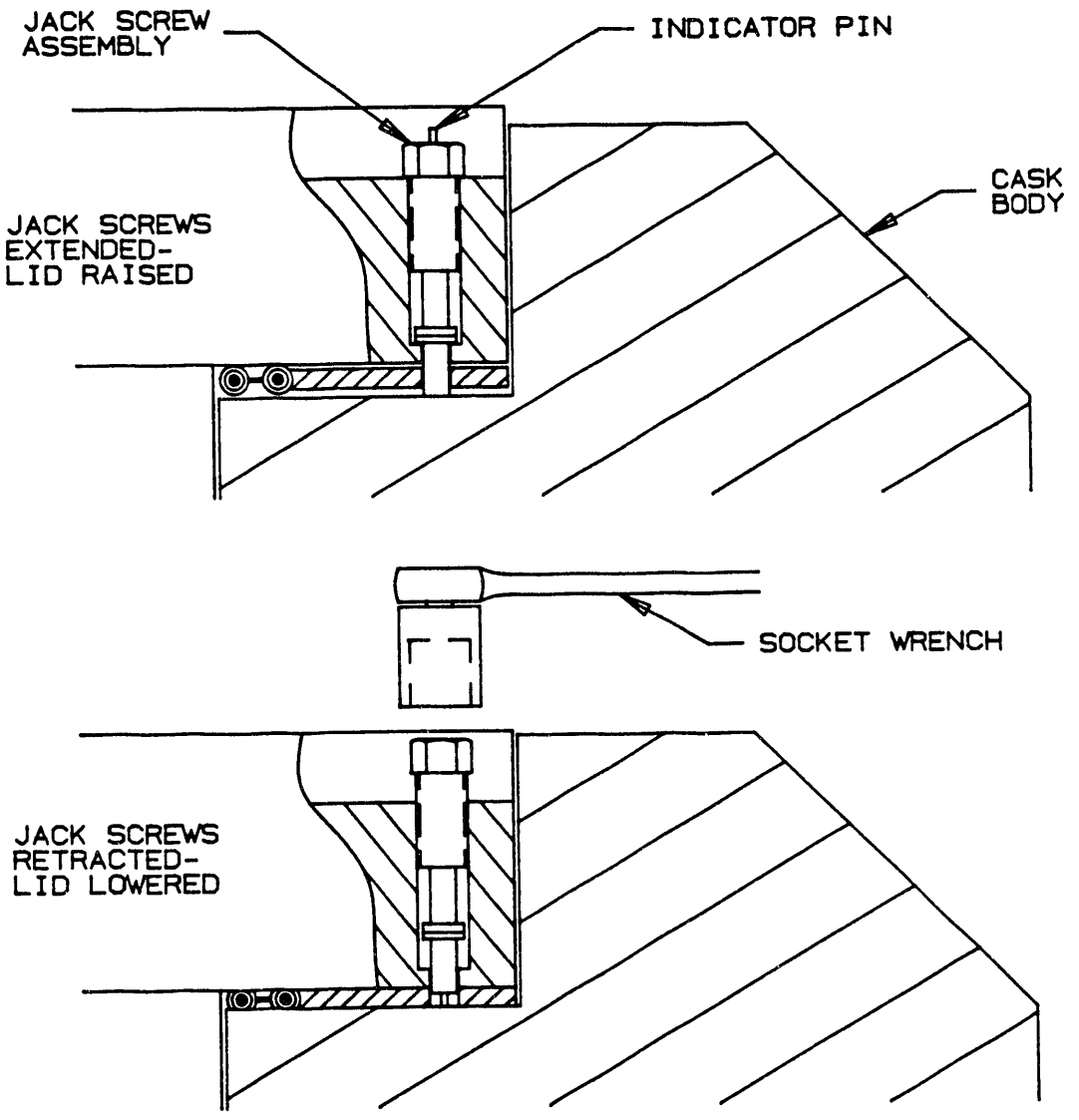


Figure 4.17
Lid Jack-Screw Retraction

4.8 Lid Securement

4.8.1 Perform a radiation survey of the cask. If the dose rate exceeds 200 mrem on the cask surface or 10 mrem at a distance of two meters from the cask surface, the cask must be returned to the hot cell or loading pool for an exchange of capsules. Mark the cask exterior to identify the location of the excessive dose rate. Record the dose rates on the work sheet.

4.8.2 Survey the cask exterior for non-fixed radioactive contamination. Follow the procedure in 49 CFR 173.443 for taking the smears: Each smear should cover a 300-square-centimeter area and sufficient smears should be taken to yield a representative assessment of the surface contamination levels. Concentrate on areas near the lid and ports. Measure radioactivity on each swipe and average it on a unit basis over the 300-square-centimeter smeared area. The permissible shipping limits will be 10 percent of the maximum permissible limits in the regulations. The shipping limits are 2.2 dpm/cm^2 for beta-gamma radioactivity and 0.22 dpm/cm^2 for alpha radioactivity. If repeated decontamination cannot reduce the values to the shipping limits but the values remain less than the maximum permissible limits (173.443, Table 10), contact the cask owner or caretaker for instructions. The operation should be contamination-free. Attach the survey results to the checklist.

4.8.3 Remove the three guide pins and the lid-lifting fixture. Store this hardware.

4.8.4 Install the remaining nine lid bolts hand tight. Using an appropriately sized torque wrench and a 12 point, 1-5/8 inch socket, torque the bolts initially to 50 ft-lb in the following sequence:

1, 7, 4, 10, 2, 8, 5, 11, 3, 9, 6, 12

NOTE

The bolt numbers are stamped on the lid surface adjacent to each bolt hole.

4.8.5 Measure the temperature of the lid and the cask near the lid using a surface thermometer. If the two surfaces are within 40°F (22°C) proceed with lid bolt torquing. If the temperature differential exceeds 40°F (22°C), allow the component temperatures to equalize before proceeding with lid bolt torquing.

NOTE

The lid and cask body must be at approximately the same temperature prior to the torquing operation to assure proper seating of the lid and seal. An excessive temperature differential may lead to a seal that does not pass a preshipment leakage test.

4.8.6 Increase the lid bolt torque to 100 ft-lb, following the sequence above. Increase to 200 ft-lb, 600 ft-lb, and then a final torque of 1,250 ft-lb, following the sequence at each torque increment. Make two additional passes at 1,250 ft-lb value repeating the above torquing pattern. Document this operation on the loading checklist.

4.8.7.1 For wet loading, remove the quick-connect fitting from the lower port.

4.8.7.2 To dry the cask cavity, a dry air supply may be connected to the lower port fitting and a flow of air allowed to pass through the cavity and exit the upper port. If contamination in the pool water is suspected, the discharged air should be routed to an appropriate filtering system.

4.8.7.3 Install the upper port cover. Verify that a new Helicoflex seal is in place. Inspect and clean the cask sealing surface. Carefully center the cover over the port in the cask body, aligning the six mounting holes. Hold the cover in place while installing the mounting bolts and washers. Using an appropriate torque wrench with a 3/4" socket, incrementally tighten the bolts in a crossing pattern to 10, 30, and then 60 ft-lb. Torque the pattern again at 60 ft-lb. Document this operation on the loading checklist.

4.9 Helium Fill of Payload Cavity

4.9.1 Connect the helium backfill plumbing assembly (part no. R35032-000) to the lower port quick-connect valve by pressing the 1/2-inch-diameter male fitting into the valve until it snaps (Figure 4.18).

4.9.2 Loosen the ring on the O-ring sealed fitting near the butterfly valve of the plumbing assembly (Figure 4.18). Install the flexible tubing to this fitting by slowly inserting into the fitting and pushing past the O-ring seal. Tighten the ring finger tight. Attach the other end of the flexible tube to a vacuum pump.

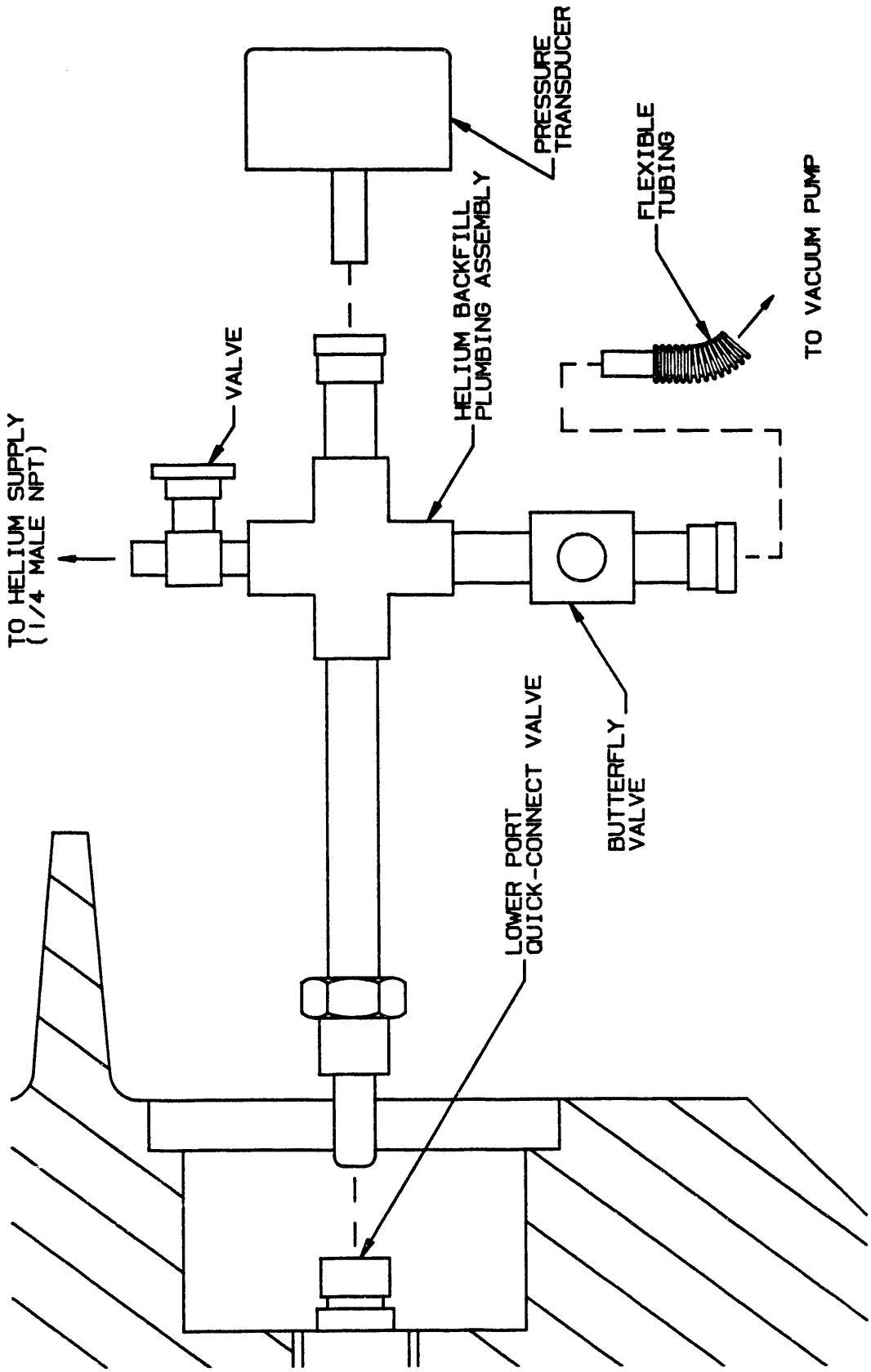


Figure 4.18
Helium Backfill System

4.9.3 Loosen the ring on the other O-ring sealed fitting (adjacent to the "cross" of the plumbing assembly). Install the **0 to 1000 torr range** pressure transducer to this fitting and tighten the ring finger tight (Figure 4.18).

4.9.4 Connect a helium supply to the vacuum valve of the plumbing assembly (Figure 4.18).

NOTE
Technical grade helium (99.5% purity) is sufficient quality for the backfill gas.

4.9.5 Evacuate the test cavity with the vacuum pump to a pressure of 5 torr or less.

NOTE
Pumping time should be minimal if the cask was dry loaded. If the cask was wet loaded, evacuation times may vary from 15 to 30 minutes, depending on pump size and thermal output of the capsules.

4.9.6 Close the valve to the vacuum pump, isolating the containment cavity, and monitor the pressure gauge. There should be a pressure increase of no more than 2 torr in 15 minutes. If the cavity pressure increase is greater than 2 torr, moisture may still be present and additional vacuum drying and a retest is required. Document the test on the loading checklist.

NOTE
A repeated test that yields improved results indicates the presence of water in the cavity. If the test results do not show an improvement, a leaking lid or upper port seal should be suspected.

4.9.7 After a successful pressure rise check, open the valve to the helium supply and backfill the cavity to 1 atmosphere of pressure (760±10 torr). Disconnect the purge/backfill system at the quick-connect fitting. Remove and store the flexible lines and pressure transducer. Document the test on the loading checklist.

4.9.8 Install the lower port cover. Verify that a new Helicoflex seal is in place. Inspect and clean the cask-sealing surface before cover installation. Carefully center the cover over the port in the cask body, aligning the six mounting holes. Hold the cover in place while installing the mounting bolts and washers. Using an appropriate torque wrench with a 3/4" socket, incrementally tighten the bolts in a crossing pattern to 10, 30, and then 60 ft-lb. Torque the pattern again at 60 ft-lb. Do not replace the thermal shield. Document the port cover installation of the checklist.

4.10 Acceptance Testing

If the maximum calculated thermal heat load for the cesium chloride capsules is less than 3.6 kW based upon the capsule manufacturer's data, a surface temperature test is not required. For shipments of cesuim chloride capsule with calculated thermal heat load in excess of 3.6 kW, the following surface temperature measurement test shall be performed. Surface temperature measurements are not required for strontium flouride shipments.

4.10.1 If required, measure the cask temperature using a surface thermocouple and indicator at the location shown in Figure 4.19.

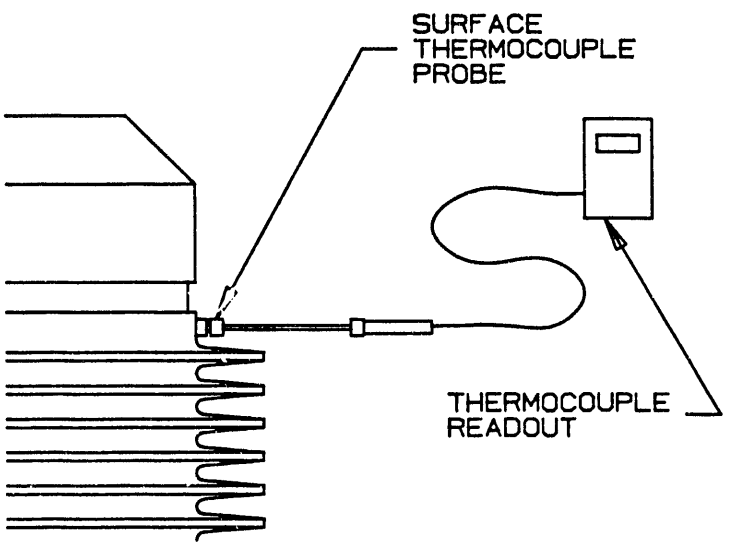


Figure 4.19
Cask Temperature Measurement

4.10.2 Record the cask surface temperature (T_{cask}) and time (τ). Using the equation below with the shipment heat source value (Q) and ambient temperature (T_∞), plot the calculated cask surface temperature (T) as a function of time (τ). Next plot the measured cask surface temperatures (T_{cask}) on the graph. The plot of the measured temperatures **MUST** show values less than those derived from the equation, and the slope of the measured curve **MUST** be decreasing at a rate faster than the slope of the curved based on the equation. Document this test on the loading checklist (attach data).

$$T_{(\tau)} = QR\,[1 - \exp\,(-\tau/\omega] + T_\infty$$

where: Q is the total cask heat load (watts)
1/R is 43.2 watts/°C
ω is 11.7 hr
τ is elapsed time (hr)
T_∞ is the ambient temperature (°C)

If measured temperatures exceed the calculated values, further evaluation is required to determine if cask limits have been exceeded.

Recommended steps to be taken if thermal overloading is suspected are (1) verify the plot trend by continuing to record and plot cask temperatures vs. time; (2) verify the thermal load of the capsules installed (Q value); and (3) and verify the ambient temperature in the vicinity of the cask. If no error is found which corrects the curves, contact the facility manager; the cask may have to be unloaded. If the capsules require removal, refer to the unloading procedures in section 5.0.

4.10.3 Remove the plug from one of the two test port fittings on the lid, using a 3/16" Allen wrench. Check to see that the remaining plug is fully seated and tight (Figure 4.20).

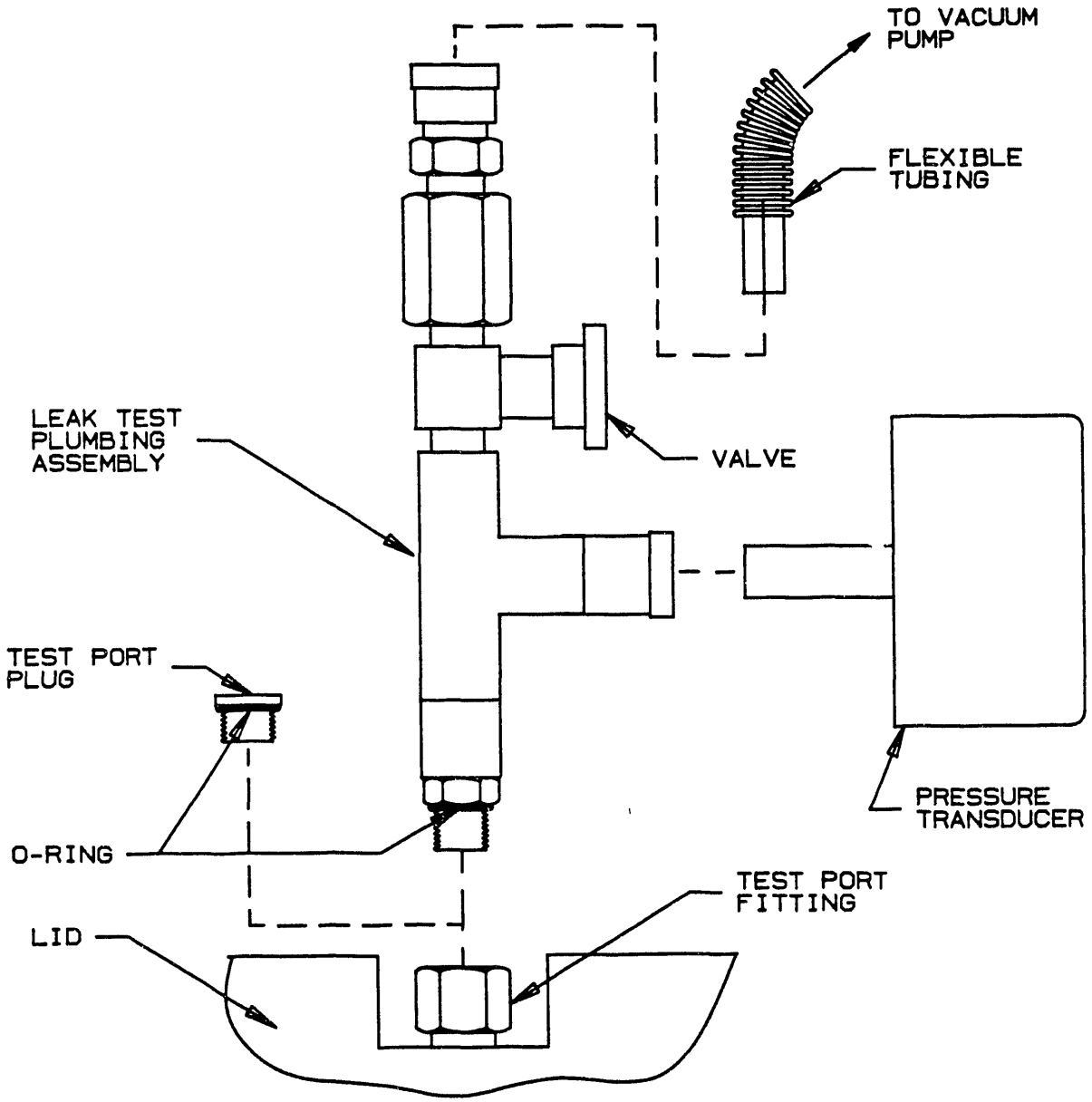


Figure 4.20
Lid Leak Test Fitting and Plumbing Assembly

NOTE

If the cask was wet loaded, there will be significant moisture trapped in the lid seal test cavity. Excessive moisture may be removed by removing both test port fitting plugs and connecting a dry air purge to one fitting. If contamination in the pool water is suspected, the purge line should be routed to an appropriate filtering system. After purging, remove the purge line and reinstall one of the test port fitting plugs.

4.10.4 Install the lid seal leak-test plumbing assembly (part no. R35032-300) to the leak-test fitting as shown in Figure 4.20. Install the plumbing assembly hand tight, verifying that the O-ring fitting is properly seated in the leak-test fitting.

NOTE

The leak rate equation in Section 4.10.9 is valid only when the supplied plumbing assembly, part no. R35032-300, is used. Use of any other plumbing assembly will require pressure-rise calculations per ANSI N14.5. See Appendix 8.2 for leak rate equation information.

4.10.5 Loosen the ring on the O-ring sealed (Ultra-torr) fitting near the valve of the plumbing assembly (Figure 4.20) Install the flexible tubing to this fitting by slowly inserting into the fitting and pushing past the O-ring seal. Tighten the ring finger tight. Attach the other end of the flexible tube to a vacuum pump.

4.10.6 Loosen the ring on the other O-ring sealed fitting (adjacent to the "tee" of the plumbing assembly). Install the **0 to 10 torr range** pressure transducer to this fitting and tighten the ring finger tight. (Figure 4.20).

4.10.7 Evacuate the test cavity with the vacuum pump to a pressure of 5 torr or less.

NOTE

Excessive pumping time (>15 minutes) to obtain a pressure of 5 torr may indicate the presence of moisture in the test cavity or a leak in the seal. If the pressure gradually decreases, continue pumping, as this indicates the presence of moisture. If the background reading is high and shows no improvement over time, a leak in the seal assembly is indicated and the seal will have to be replaced. Refer to Section 5.0 for Unloading Procedures.

4.10.8 Close the valve to the vacuum pump, isolating the test cavity, and allow the system to stabilize for approximately 10 minutes. Monitoring the pressure, record a start time and pressure on a leak-test checklist (example in Appendix 8.1). Continue to monitor for a period of exactly 5 minutes. Record the end time and pressure.

NOTE

Personnel involved in leak testing the cask should be thoroughly familiar with pressure rise leak detection systems and with the standards and practices defined in ANSI N14.5.

4.10.9 Calculate the indicated leakage rate using the following equation:

$$L = 0.0915 \times \frac{\Delta P}{T}$$

where: L = atm-cm^3/sec of air at 25°C

ΔP = Pressure at end of test minus pressure at start of test (torr)

T = Temperature of cask body in °K (temp °C + 273)

4.10.10 Record the calculated rate. Repeat the leak test following steps 4.10.7 through 4.10.9, and record the results. The calculated leak rates must be less than 1.0×10^{-4} cm^3/second. Additional tests are permitted. If subsequent leak rates also exceed this value, the lid must be removed and the seal replaced. See Section 5.0 for lid removal and seal replacement instructions. Document this test on a closure seal leak test data sheet.

NOTE

A repeated test that yields improved results indicates the presence of water or other outgassing in the seal test cavity. If the test results do not show an improvement, a leaking lid seal should be suspected.

NOTE

It is desirable to obtain a reading as low as reasonably possible since this measurement will be summed with the two measurements for the port seals. The sum of these three measurements must be under 1.0×10^{-4} cc/sec.

4.10.11 After a successful pressure-rise check, remove the flexible tubing and pressure transducer from the plumbing assembly.

4.10.12 Remove the lid leak test plumbing assembly from the leak-test fitting. Inspect the O-ring on the test port fitting plug for damage. Install the plug in the test fitting and hand tighten using a 3/16" Allen wrench.

4.10.13 Remove the plug from the leak test port fittings on the upper cask port cover using a 3/16" Allen wrench (Figure 4.21).

4.10.14 Install the port seal leak-test plumbing assembly to the leak-test fitting as shown in Figure 4.21. Install the plumbing assembly hand tight, verifying that the O-ring fitting is properly seated in the leak-test fitting.

NOTE

The leak rate equation in Section 4.10.19 is valid only when the supplied plumbing assembly, part no. R35032-300, is used. Use of any other plumbing assembly will require pressure-rise calculations per ANSI N14.5. See Appendix 8.2 for leak rate equation information.

4.10.15 Loosen the ring on the O-ring sealed (Ultra-torr) fitting near the valve of the plumbing assembly (Figure 4.21). Install the flexible tubing to this fitting by slowly inserting into the fitting and pushing past the O-ring seal. Tighten the ring finger tight. Attach the other end of the flexible tube to a vacuum pump.

4.10.16 Loosen the ring on the other O-ring sealed fitting (adjacent directly to the "tee" of the plumbing assembly). Install the pressure transducer to this fitting and tighten the ring finger tight (Figure 4.21).

4.10.17 Evacuate the test cavity with the vacuum pump to a pressure 5 torr or less.

4.10.18 Close the valve to the vacuum pump, isolating the test cavity, and allow the system to stabilize for a period for approximately 10 minutes. Monitoring the pressure, record a start time and pressure. Continue to monitor for a period of exactly 5 minutes. Record the end time and pressure.

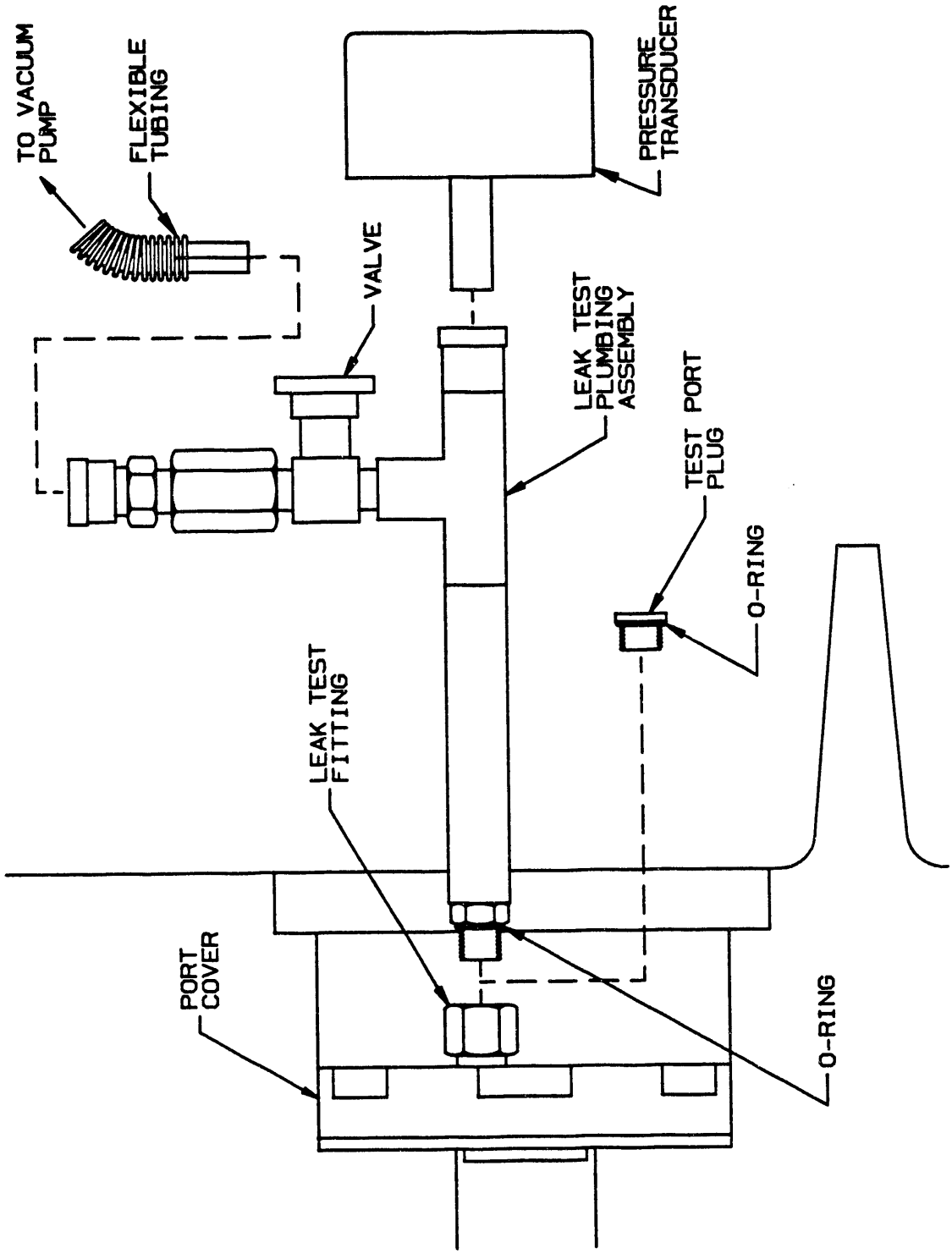


Figure 4.21
Port Leak Test Fitting and Plumbing Assembly

4.10.19 Calculate the indicated leakage rate using the following equation:

$$L = 0.0510 \times \frac{\Delta P}{T}$$

where: L = atm-cm^3/sec of air at 25°C

ΔP = Pressure at end of test minus pressure at start of test in torr.

T = Temperature of cask body in K (temp °C + 273)

4.10.20 Record the calculated rate. Repeat the leak test following steps 4.10.17 through 4.10.19, and record the results. The calculated leak rates must be less than 1.0×10^{-4} cm^3/second. Additional tests are permitted. If subsequent leak rates also exceed this value, the port cover must be removed and the seal replaced. See Section 4.2 and 4.3 for port cover removal and seal replacement instructions. Document this test on a closure seal leak test data sheet.

NOTE

A repeated test that yields improved results indicates the presence of water or other outgassing in the test cavity. If repeated test results do not show an improvement, a leaking port seal should be suspected.

NOTE

It is desirable to obtain a reading as low as reasonably possible since this measurement will be summed with the two measurements for the lid and other port seals. The sum of these three measurements must be under 1.0×10^{-4} cc/sec.

4.10.21 After a successful pressure-rise check, remove the flexible tubing and pressure transducer from the plumbing assembly.

4.10.22 Remove the leak test plumbing assembly from the leak-test fitting. Inspect the O-ring on the test port fitting plug for damage. Install the plug in the test fitting and hand tighten using a 3/16" Allen wrench.

4.10.23 Repeat the leak-test sequence for the lower port following sections 4.10.13 through 4.10.22 above. Document this test on a closure seal leak test data sheet.

4.10.24 Sum the final measured leakage rate for three closure seals. Record the total leak rate on the data sheet. This value must be less than 1.0×10^{-4} cm^3/sec. If the total leakage rate is in excess of this value, at least one of the seals will need replacement. Identify the seal with the highest leakage rate. If retests on this seal do not yield acceptable results, perform the operations necessary to remove and replace the closure per Section 4.4 and 4.5, after returning the cask the to pool or hot cell. After replacement, retest the closure following the applicable parts of this section. Record all information on a new data sheet.

NOTE

The lid seal is likely to have the highest leak rate. Determine if replacing one of the port seals might improve the total leakage rate to an acceptable level. Port-seal replacement should be given preference over lid-seal replacement since replacing the lid seal necessitates capsule removal.

4.10.25 Replace each of the thermal shields by holding in place against the cask body and operating the twist-lock fasteners. Note that the two covers differ slightly from each other in regards to location of the groove. Check for proper alignment of this groove with the groove in the cask body. Document this operation on the loading checklist.

NOTE

Tape-joint installation will not be possible if the thermal shields are not installed in the correct location and orientation.

4.10.26 Store the leak-test plumbing and pressure transducer.

5.0 WET AND DRY UNLOADING OPERATIONS

5.1 Introduction

5.1.1 This section contains general instructions for unloading the BUSS cask at "dry" facilities (i.e., hot cells), and "wet" facilities (i.e., water-filled pools). These instructions cover lid and port cover removal, capsule unloading, cask re-assembly, and preparation for shipment or storage of the empty cask. Refer to Appendix 8.1 for sample checklists to be completed and signed as the defined actions are accomplished.

5.1.2 The operating instructions for unloading the cask are similar for wet and dry facilities. Special notes are made where notable differences exist. A two-column format is used to isolate instructions specific to the different facilities.

5.2 Cooling Procedure

WARNING

The exterior surfaces of the loaded cask may be very hot. Care must be taken to avoid unnecessary contact with these surfaces. Gloves should be worn while performing the required disassembly operations.

5.2.1.1 For <u>wet unloading</u>, measure and record the surface temperature of the cask using a surface thermocouple placed at the location shown in Figure 5.1. If the temperature is over 85°C, the cask should be cooled prior to unloading. The pool will be used for this operation.

NOTE

Although not mandatory, cooling before start of disassembly is recommended to minimize the cooling reaction and consequent steam generation when the cask is later immersed with open ports. While not harmful to the cask or capsules, the initial reaction may produce local boiling.

5.2.1.2 For <u>dry unloading</u>, no cooling is required prior to opening or unloading the cask.

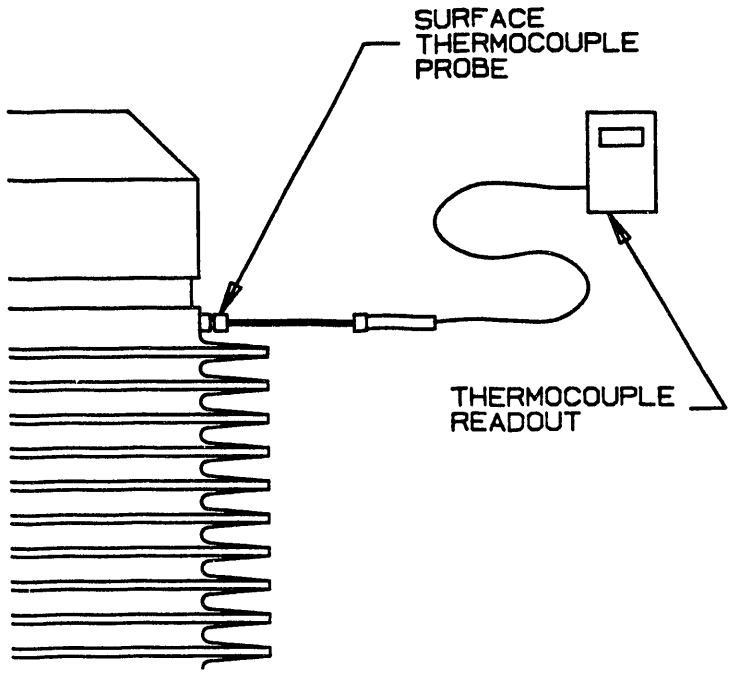


Figure 5.1
Cask Temperature Measurement

5.2.2 For <u>wet unloading:</u> Remove the thermocouple from the cask. Engage the cask with the vertical lifting fixture, raise it and slowly lower it into the pool.

NOTE
Under some circumstances steam will be produced as the cask is immersed. This operation should be done slowly.

5.2.3 Place the cask on the pool bottom. Estimate the cooling time required from Figure 5.2 based on measured cask temperature. Record temperature and immersion times on the unloading checklist. Alternative cooling methods that do not require immersion may be used if approved by the cask owner or caretaker.

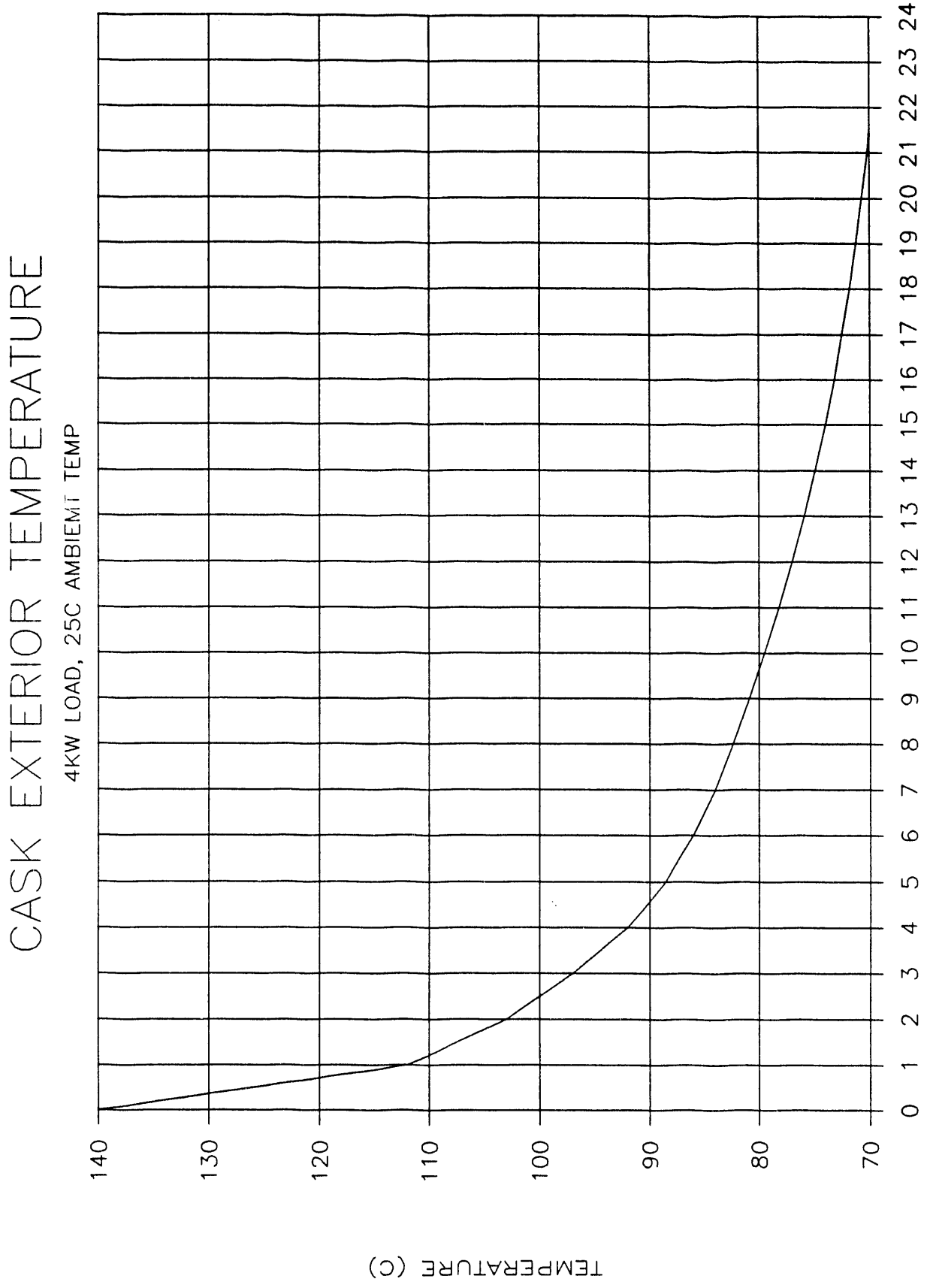


Figure 5.2
Cask Cool Down Curve

For wet unloading:

NOTE
Figure 5.2 is based on a maximum, 4-kw heat load. Shorter cooling times may be estimated from the figure based on actual heat load.

5.2.4 When the cooling time has elapsed, remove the cask from the pool and place it on a level floor location and remove the lifting fixture.

5.3 Port Cover Removal

5.3.1 Remove the two port cover thermal shields by depressing and rotating the twist-lock fasteners (Figure 5.3).

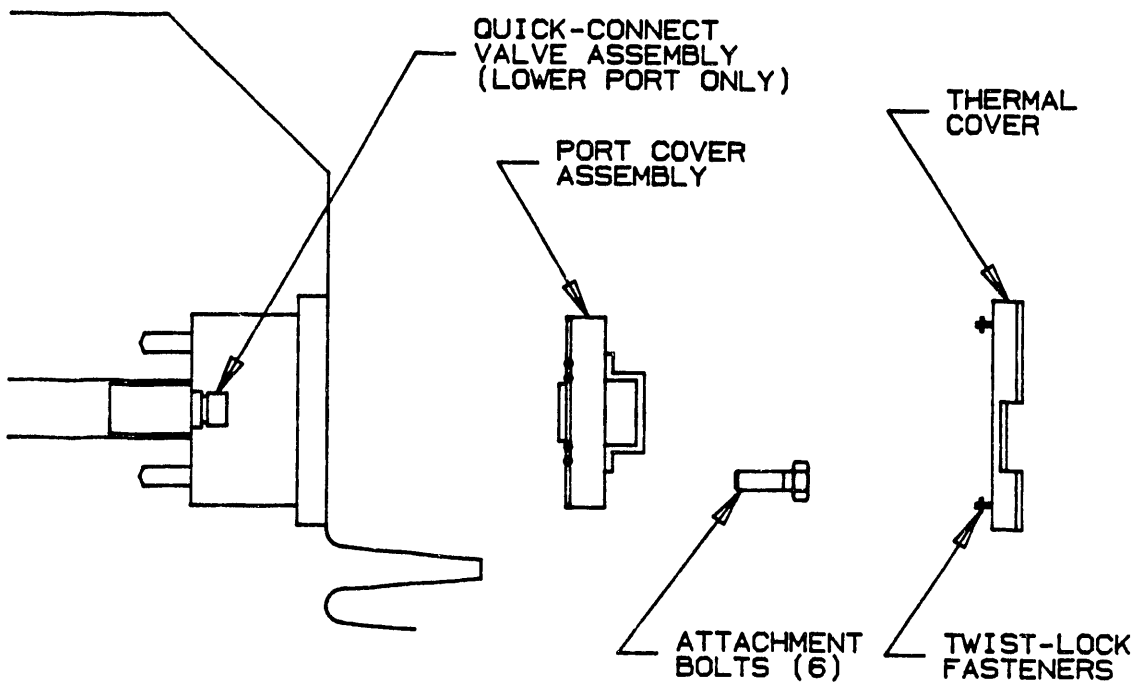


Figure 5.3
Typical Port Assembly

5.3.2 Remove the lower port cover (Figure 5.3). Loosen and remove the 6 attachment bolts using a 3/4" socket. Note the presence of the quick connect valve assembly, and that the seal assembly is captive to the port cover. Store the cover and hardware where it will not become damaged or lost. Document this operation on the unloading checklist.

NOTE
The used seal assembly will be retained for shipping or storage of the empty cask. Protect the seal assembly from damage.

5.3.3 Connect a radiation analyzer sampling line to the quick-connect valve in the lower port. The sampling line must have a mating quick-connect fitting (supplied part no. SS-8QC-S-8PM) attached to make this connection (Figure 5.4). Sample the gas in the cask payload cavity. Document this test on the unloading checklist.

WARNING
RADIATION HAZARD
The cask cavity will be pressurized (35 psia maximum); a minute quantity of gas may escape when the quick-connect fittings are mated. Treat this operation as if the gas were radioactive. If the sample shows any presence of radioactivity, remove the sampling line and reinstall the lower port cover. Notify the shipper of the situation. There should be no radioactive gases or particulates present.

NOTE
For wet unloading, the sampling and pre-unloading operations should be done expediently to minimize the reheating of the cask and contents after cooldown.

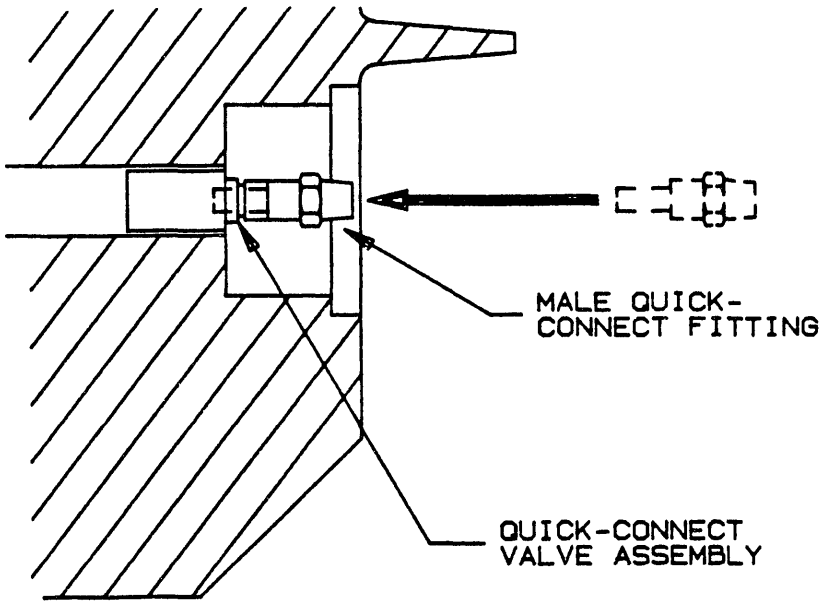


Figure 5.4
Lower Port Quick-Connect Valve

5.3.4 After sampling, remove the analyzer sampling line from the lower port quick-connect valve.

5.3.5 Remove the upper port cover by loosening and removing the 6 bolts using a 3/4 inch socket. See Figure 5.3. Note that the seal assembly is captive to the cover. Store the cover and hardware. Document this operation on the unloading checklist.

NOTE
The used seal assembly will be retained for shipping or storage of the empty cask. Protect the seal assembly from damage to avoid having to replace with a new seal.

5.3.6.1 For <u>wet unloading</u>, insert a mating quick-connect fitting (supplied part no. SS-8QC-S-8PM) to the lower port quick-connect valve to keep the valve open during immersion. See Figure 5.4. Document this operation on the unloading checklist.

5.4 Final Preparation For Unloading

5.4.1 Loosen the twelve bolts fastening the cask lid using a 12 point, 1-5/8 inch socket and an appropriate handle (i.e. breaker bar). Torque on these bolts will be approximately 1200 ft-lb. Remove nine of them, leaving the remaining three bolts at evenly spaced locations. Store the bolts where they will not become lost or damaged.

NOTE
The lid bolts are high-strength steel of a special design. The only permitted replacements are those supplied as spare parts by the owner/caretaker.

5.4.2 Fasten the lid lifting fixture to the lid with the four 1/2-20UNF x 1.12 in. bolts and washers provided in the accessory box. Tighten to to 50 ft-lb. Install the three tapered lid guide-pin extensions in the cask body. Use a suitable wrench on the "flats" to tighten. Note there are two long pins and one short pin: install at the locations shown in Figure 5.5. Document this operation on the unloading checklist.

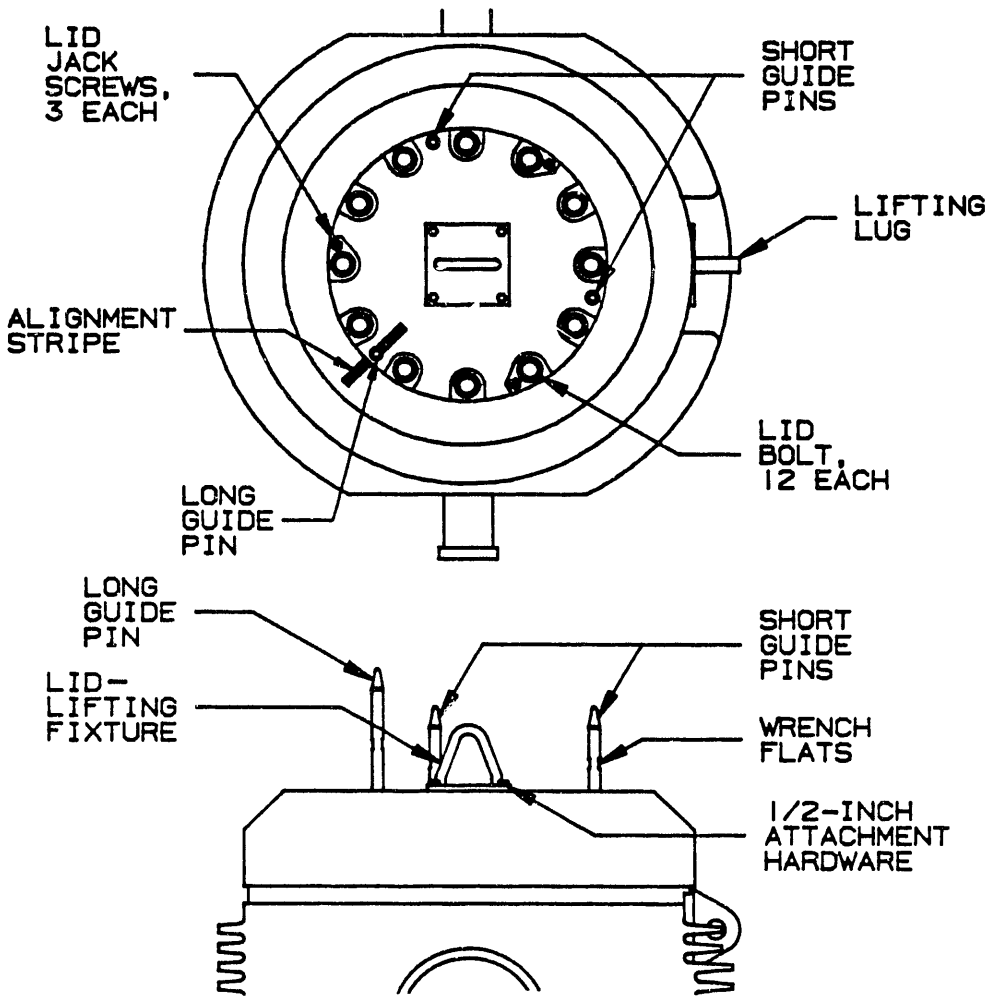


Figure 5.5
Lid Lifting Fixture and Guide Pin Installation

5.4.3.1 For wet unloading, be certain that the pool is equipped with adequate lighting, pool tools, and viewing aids. Engage the cask with the vertical lifting fixture, lift over the pool and slowly lower it into the water. Lower the cask until the lower port is approximately 6 inches under the surface and hold at this level.

NOTE
The cask interior is likely to be above the boiling point of water. Steam will vent from the upper port during immersion of the cask.

5.4.3.2 For dry unloading, engage the cask with the vertical lifting fixture and transport it to the hot cell. Alternately, the cask may be placed on a cart designed for its weight and moved into the cell.

For wet unloading:

When the steaming ceases, continue to lower the cask, stopping periodically to allow for venting. Stop the cask with the lid slightly above the water surface and hold until all venting ceases.

5.4.4.1 Remove and store the three remaining lid bolts.

5.4.5.1 Lower the cask to the designated location on the pool bottom. Use the slowest speed on the crane to prevent impact with the pool bottom. When on the pool bottom, remove the vertical lifting fixture from the cask.

5.4.4.2 For dry unloading, move the cask into the cell, positioning it in the work location. Also place the basket guide in the cell where it can be remotely engaged.

NOTE
The cask exterior may be covered with plastic sheet if there is the possibility of airborne contamination in the cell.

5.4.5.2 Remove and store the three remaining lid bolts. **AT THIS TIME ALL PERSONNEL MUST EXIT THE CELL.** Close and secure the cell.

5.5 Unloading the Cask

5.5.1.1 For wet unloading, engage the lid lifting fixture with the crane hook and slowly remove the lid from the cask (Figure 5.6). Be certain that the lift is vertical to prevent binding on the guide pins. Remove the lid from the pool.

NOTE
Air and/or steam may emerge from the cask cavity when the lid is removed. This is a normal event.

5.5.1.2 For dry unloading, engage the lid lifting fixture with the crane hook and slowly remove the lid from the cask (Figure 5.6). Be certain that the lift is vertical to prevent binding on the guide pins. Set the lid down, locating in such a way that it can be remotely re-engaged.

5.5.2 Observe that the basket handle has extended itself (Figure 5.6).

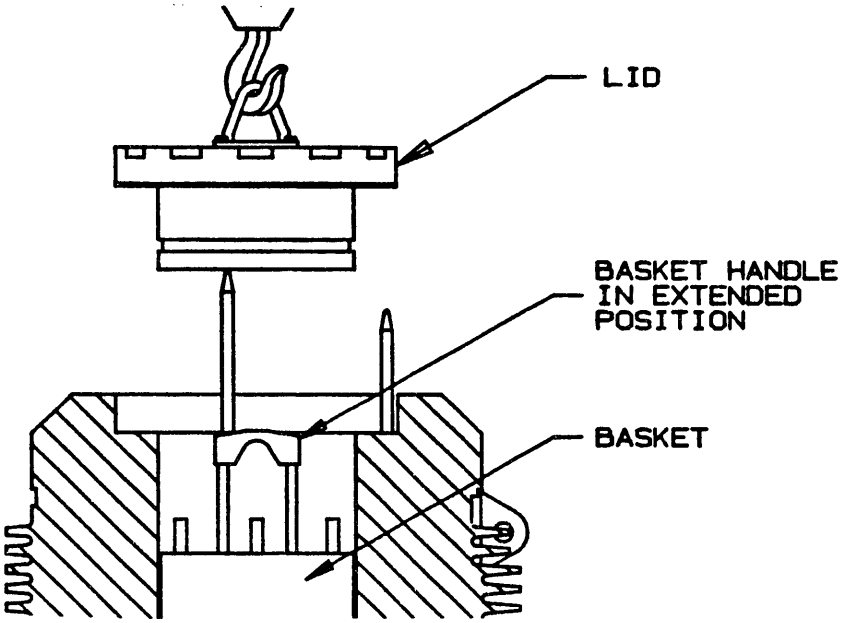


Figure 5.6
Lid Removal

5.5.3 Engage the basket guide with the hoist and position over the cask body such that the basket handle aligns with the cask trunnions, i.e., in the same plane (Figure 5.7). Install the basket by lowering over the three lid guide pins. Manipulate the hoist to lay the basket handle aside in the direction of the cask lift lugs (opposite the long guide pin). Document this operation on the unloading checklist.

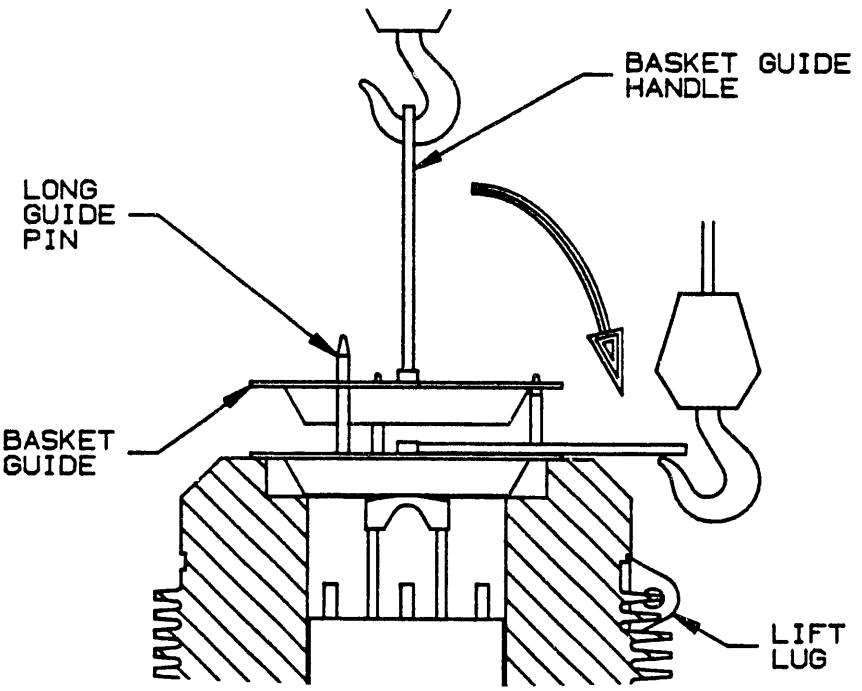


Figure 5.7
Basket Guide Installation

5.5.4 Disengage the hoist from the basket guide and engage the basket handle. Slowly lift the basket until clear of the cask and guide pins and move it to the unloading location (Figure 5.8).

WARNING
RADIATION HAZARD
For wet loading, do not bring the basket near the pool surface during movement.

NOTE
The basket may be left in place in the cask for capsule unloading if so desired by the facility. The basket guide must still be installed to protect the seal surfaces.

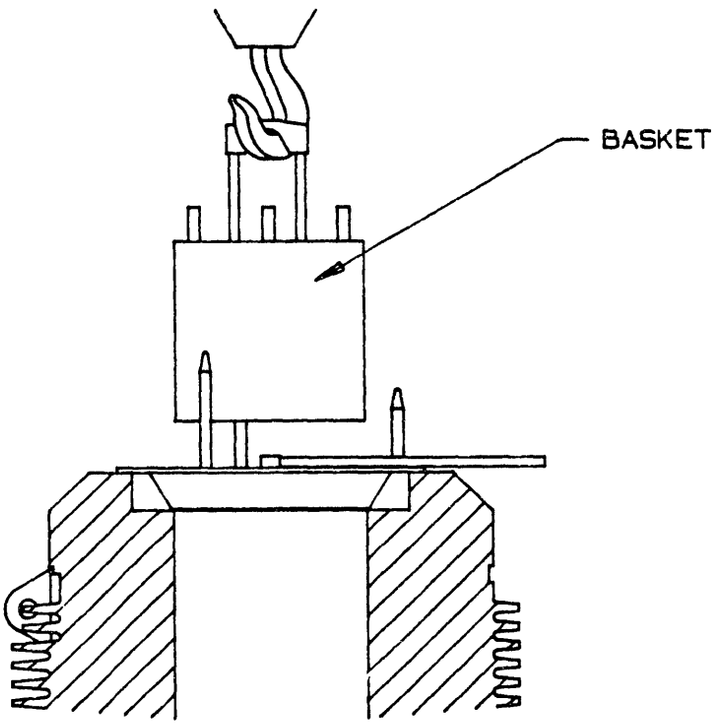


Figure 5.8
Basket Removal

5.5.5 Disengage the hook from the basket and proceed to unload the capsules following the standard operating procedure for the facility (Figure 5.9). Document this operation on the unloading checklist.

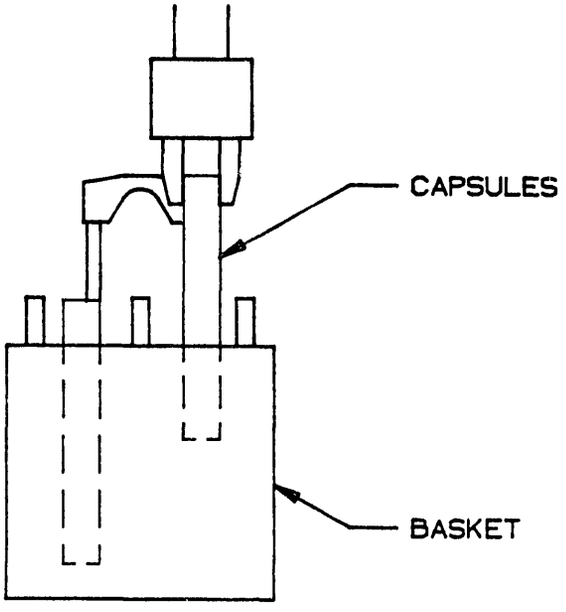


Figure 5.9
Capsule Unloading

5.5.6 Engage the empty basket with the crane hook and return it to the cask. Align the basket over the basket guide and slowly lower the basket into the cask cavity, avoiding excessive contact with the guide. Watch the hoist cables for slack as an indication that the basket is seated.

WARNING
RADIATION HAZARD
The cask will be removed from the pool or hot cell without its lid; it is imperative that all capsules are removed. Double check the basket to confirm that it is empty.

5.5.7.1 For wet unloading, engage the handle of the basket guide and lift from the cask. Remove the guide from the pool.

5.5.8.1 Engage the vertical lifting fixture, lower it into the pool, and engage the cask by the trunnions. Put a slight strain on the crane and check for proper matching of the lifting fixture and trunnions.

5.5.7.2 For dry unloading, **IF IT IS SAFE TO DO SO**, personnel may enter the cell to remove the basket guide from the cask. Remove the cask from hot cell to a work area, using the same method that was used for movement into the cell (i.e., crane or cart). Also remove the lid from the cell.

5.5.9.1 For wet unloading, slowly raise the cask from the pool and monitor for radiation at the cavity opening. Lift the cask until the cask bottom is over the pool surface and allow to hang over the pool until the water in the cask cavity has completely drained from the lower port. Move the cask to its work location. Remove the lifting fixture. Document this operation on the unloading checklist.

5.5.10.1 Remove the mating quick-connect fitting fron the lower port.

5.5.11.1 Allow the cask cavity and exterior to dry. As an alternate, drying may be expedited using an air supply or disposable wipes following standard operating procedure for the facility.

5.5.12 Perform radiation surveys/smear tests of the interior and exterior of both the cask body and lid. If surface contamination is found, decontaminate per standard operating procedure for the facility for stainless steel materials. Document this survey on the unloading checklist and attach data.

5.6 Lid Installation

5.6.1 Clean and inspect the lid seal surface of the cask body. Clean with lint-free cloths dampened with solvent.

NOTE

The used seal assembly will be retained for shipping or storage of the empty cask. Protect the seal assembly from damage to avoid having to replace with a new seal.

5.6.2 Completely extend the three lid jack-screws by turning them clockwise with a 3/4" socket wrench such that the brass tips extend through the seal spacer. Do not confuse the brass tip with the spring-loaded indicator pin (Figure 5.10). Document this operation on the unloading checklist.

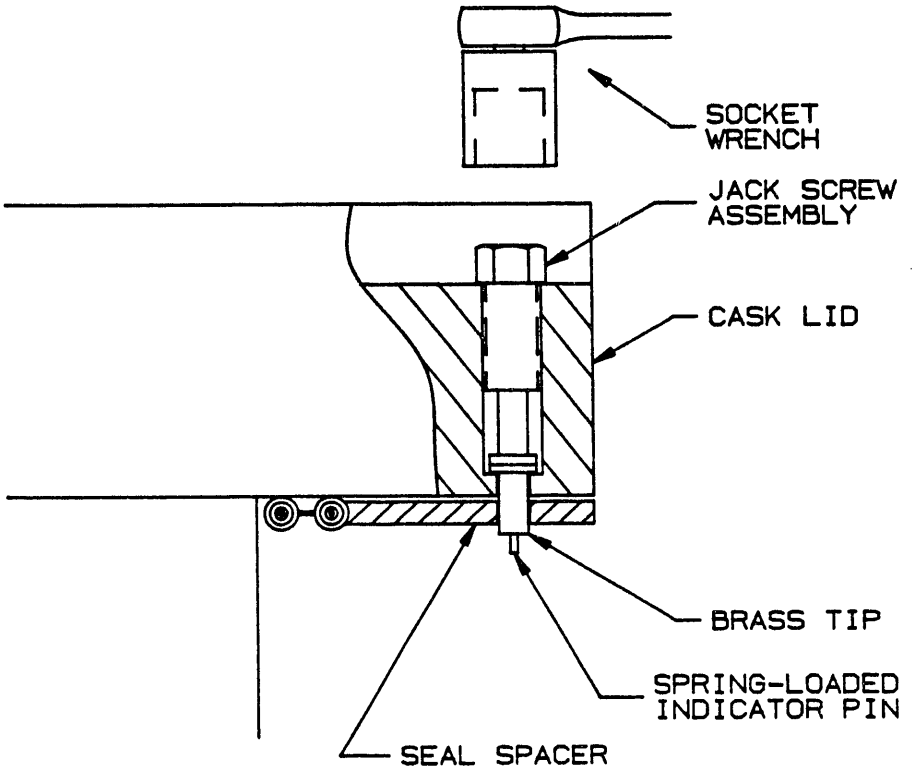


Figure 5.10
Lid Jack-Screw Extension

5.6.3 Engage the lid-lifting fixture with the crane hook and move the lid to the cask. Identify the three guide pin alignment holes in the lid. The alignment holes are not recessed in the lid like the 12 attachment bolt holes. The alignment stripe on the lid and cask body will aid in this alignment (Figure 5.11).

CAUTION

Be certain that a guide pin hole and not a attachment bolt hole has been identified for alignment and engagement with the guide pin. Lowering an improperly aligned lid could result in damage to the seal and/or the cask seal surface, or the lid guide pins.

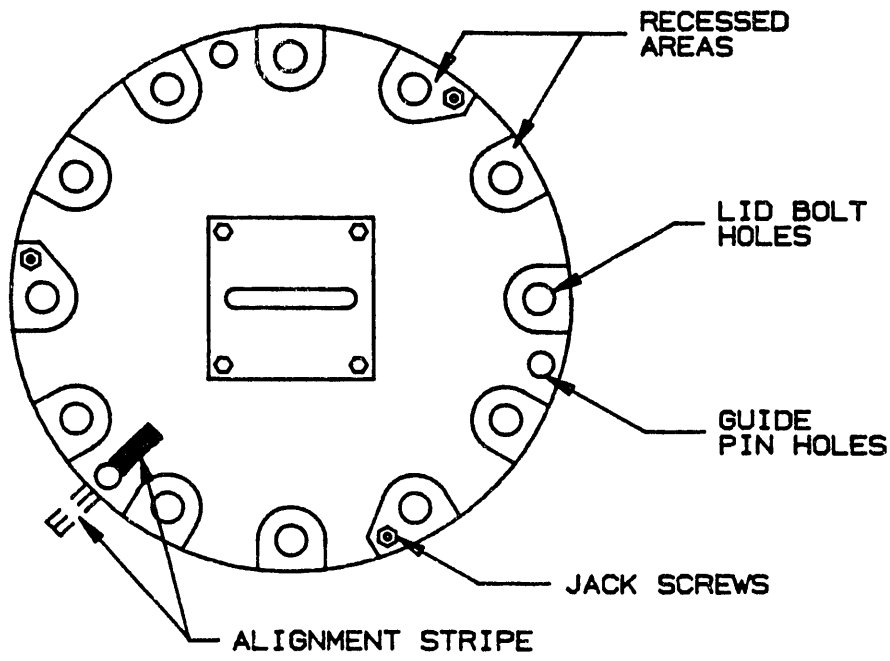


Figure 5.11
Lid Guide Pin Hole Identification

5.6.4 Align the appropriate guide pin hole in the lid over the long guide pin by aligning the alignment stripes. Lower the lid to engage on this pin. Align the remaining two guide pin holes over the short guide pins and lower the lid to engage them. The long guide pin may be used as a pivot point to aid in alignment. Slowly lower the lid until it contacts the cask body. Remove the crane hook from the lid-lifting bail.

NOTE
The extended jack-screws prevent the compression of the seal, thus the lid will not sit perfectly flush with the top of the cask body.

5.6.5 Lower the lid into place by sequentially turning each jacking screw one-quarter turn counterclockwise. Continue around the pattern until the indicator pins are flush with the jacking screw top (Figure 5.12). This signifies that the lid is supported only by the seal and is ready for bolt tightening. Remove the three lid guide pins using a suitable wrench and the flats. Remove the lid-lifting fixture by loosening and removing the four attachment bolts. Document this operation on the unloading checklist.

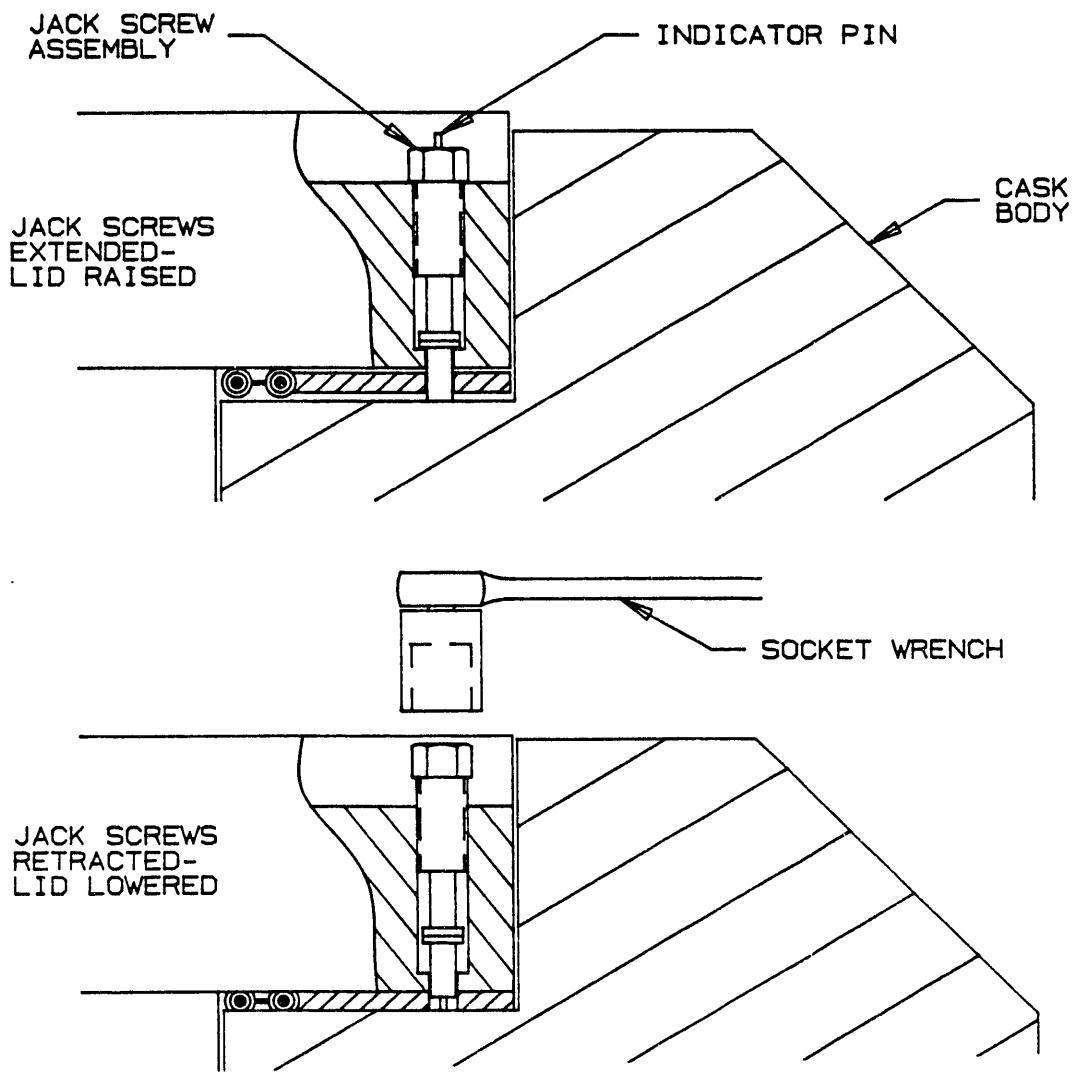


Figure 5.12
Lid Jack-Screw Retraction

5.6.6 Lubricate the twelve lid bolts with Neolube #1 lubricant or equivalent, applying with a small brush. Brush a thin layer of lubricant on the threads and on the bearing area under the head of the bolts.

5.6.7 Install the lid bolts and hand tighten. Using an appropriate torque wrench, tighten the bolts to 50 ft-lb in the following sequence:

1, 7, 4, 10, 2, 8, 5, 11, 3, 9, 6, 12

NOTE
The bolt numbers are marked on the lid surface next to the bolt holes.

Document this operation on the unloading checklist.

5.7 Port Cover Installation

5.7.1 Clean the port seal surfaces of the cask body using lint-free cloths dampened with solvent.

NOTE
The used port cover seal assemblies will be retained for shipping or storage of the empty cask. Protect the seal assembly from damage to avoid having to replace with a new seal.

5.7.2 Install the upper and lower port covers by holding in place against the cask body and installing the attachment bolts and washers. Using an appropriate torque wrench and a 3/4" socket, tighten the bolts in a crossing pattern to 20 ft-lb. Document this operation on the unloading checklist.

5.7.3 Install the two thermal shields on the cask body. Note that the two covers differ slightly from each other in regard to location of the groove. Check for proper alignment of this groove with the groove in the cask body. Attach the covers by holding in place against the cask body and operating the twist-lock fasteners. Document this operation on the unloading checklist.

NOTE
Proper selection and orientation of the thermal covers is imperative, otherwise installation of the tape joint cannot be accomplished.

5.7.4 Survey the cask exterior for non-fixed radioactive contamination. Following the procedure in 49 CFR 173.443 for taking the smears: Each smear should cover a 300 square centimeter area and sufficient smears should be taken to yield a representative assessment of the surface contamination levels. Concentrate on areas near the lid and ports. Measure radioactivity on each swipe and average it on a unit basis over the 300 square centimeter smeared area. The permissible shipping limits will be 10 percent of the maximum permissible limits in the regulations. The shipping limits are 2.2 dpm/cm^2 for beta-gamma radioactivity and 0.22 dpm/cm^2 for alpha radioactivity. If repeated decontamination cannot reduce the values to the shipping limits but the values remain less than the maximum permissible limits (173.443, Table 10), contact the cask owner or caretaker for instructions. The operation should be contamination-free. Attach the survey results to the checklist.

6.0 ASSEMBLY OPERATIONS: LOADING AND UNLOADING FACILITIES

6.1 Introduction

6.1.1 This section contains general instructions for final assembly of the BUSS cask at "wet" loading and unloading facilities and "dry" loading and unloading facilities (i.e., hot cells). These instructions cover impact limiter installation and attachment, attachment to the shipping skid and trailer, and final preparation of the cask for shipment. Critical operations are to be documented on the applicable (i.e. loading or unloading) checklist as the operation is performed. Sample checklists are supplied in Appendix 8.1.

6.1.2 The operating instructions for assembling the cask are identical for wet and dry facilities. Some instructional differences exist between loading and unloading facilities. Special notes are made where notable differences exist.

6.2 Limiter Installation

6.2.1 Engage the vertical lifting fixture with the crane hook. Engage the cask trunnions with the vertical lifting fixture. Put a slight strain on the crane and check for proper alignment.

6.2.2 Align the cask over the handling frame, orienting the lift lugs on the side of the cask with the cutout in the impact limiter (Figure 6.1).

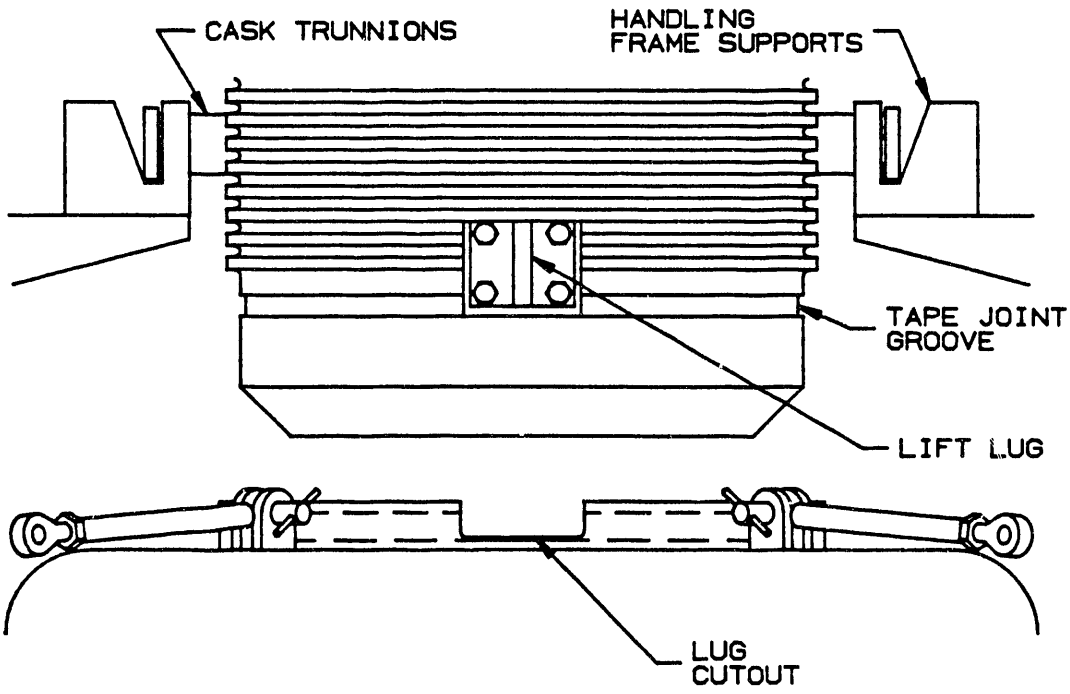


Figure 6.1
Lower Limiter Alignment

6.2.3 Lower the cask into the handling frame, engaging the trunnions in the frame supports. Use the slowest crane speed available. When the cask is seated in the frame, remove the vertical lifting fixture.

6.2.4 Operate the screw-actuated platform to raise the lower limiter near the bottom of the cask body. Verify alignment of the limiter with the cask by observing the location of the key on the cask body and aligning with the keyway in the limiter (Figure 6.2. The limiter rests on a 'floating' base that can be maneuvered to achieve precise alignment.

CAUTION

Proper alignment of the limiter with the cask body is critical. Damage to the limiter and/or the cask body will result from attempting to assemble when improperly aligned.

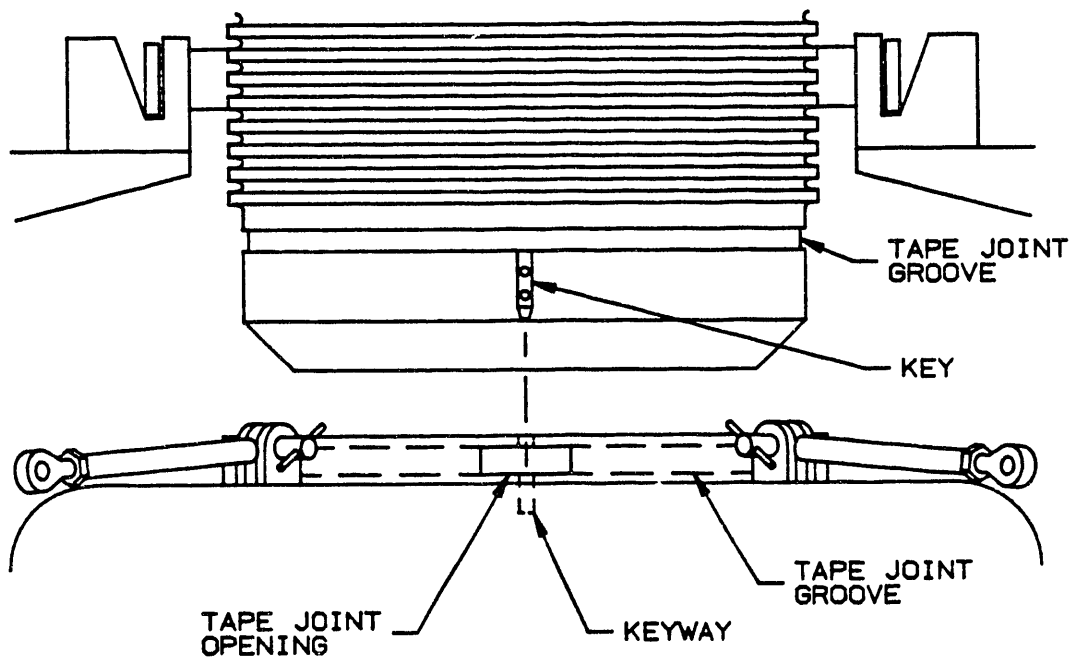


Figure 6.2
Lower Limiter Key Alignment

Raise the platform to install the lower limiter on the cask body. Watch for signs of binding while raising the limiter. Re-check key alignment and adjust the limiter as necessary.

6.2.5 Lubricate two tapes with a thin coating of Neolube lubricant or approved equivalent, being careful not to bend them excessively. Use the jack to achieve proper alignment of the cask and limiter grooves. The grooves may be observed though the tape opening in the limiter. Install each tape by inserting into tape opening, with the tapered end first and the slots in the tape facing the surface of the cask (Figure 6.3). Document this operation on the applicable checklist.

NOTE
If the impact limiter is not properly aligned with the cask, the tape joint grooves will not match and tape insertion cannot be made.

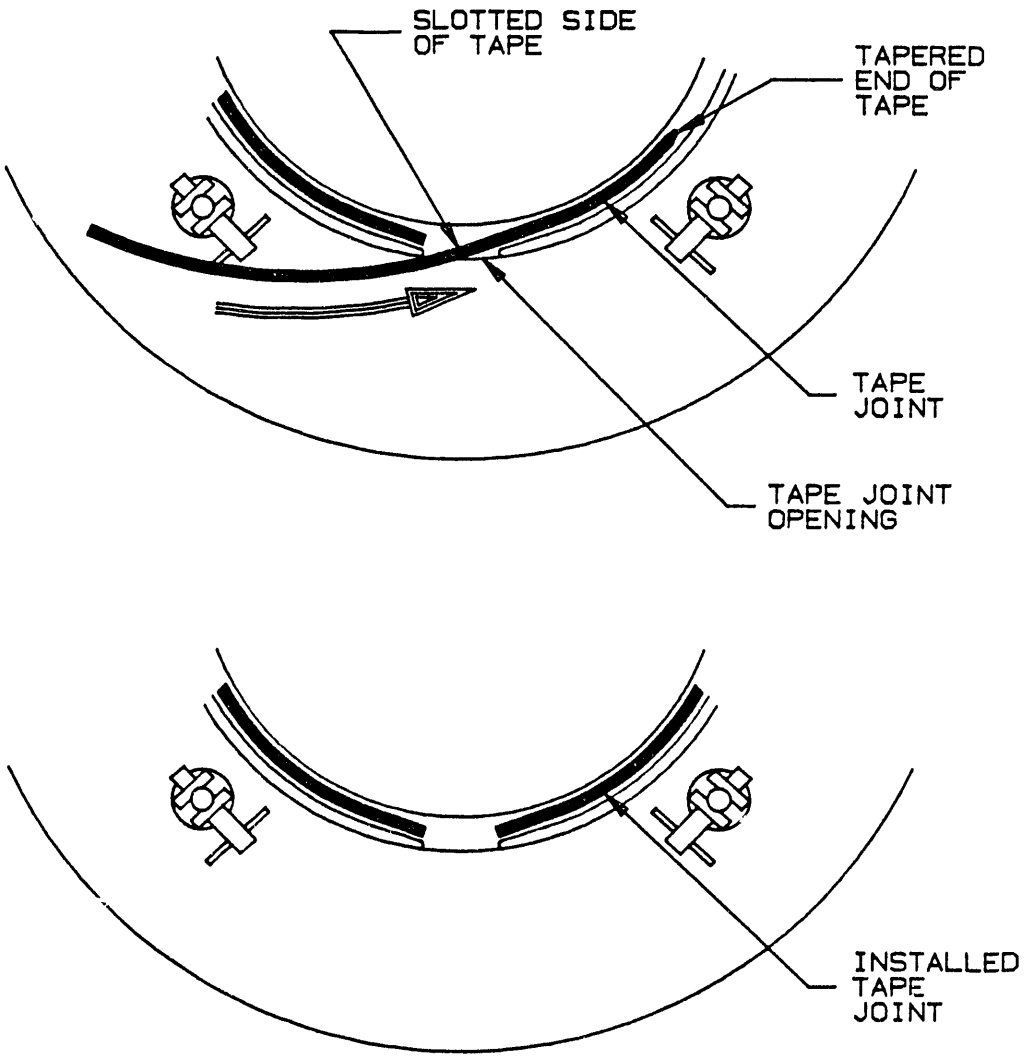


Figure 6.3
Tape Installation

CAUTION
Each tape must be installed with the slots facing the surface of the cask; inverting the tape could break it.

6.2.6 Engage the horizontal lifting fixture with the crane. Remove the two quick-release pins. Lift the fixture into position so that one leg aligns with the upper lifting lug on the cask. Install the upper quick-release pin (Figure 6.4).

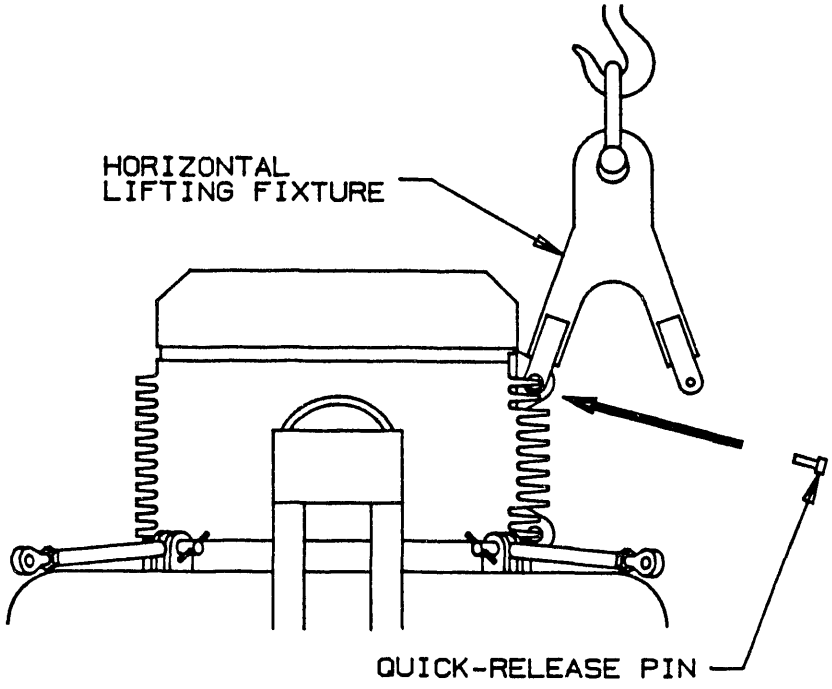


Figure 6.4
Horizontal Lifting Fixture Alignment

6.2.7 Slowly lower and traverse the crane to rotate the fixture until the unpinned leg aligns with the lower lifting lug. Install the lower quick-release pin. Detach the crane hook from the fixture (Figure 6.5). Document this operation on the applicable checklist.

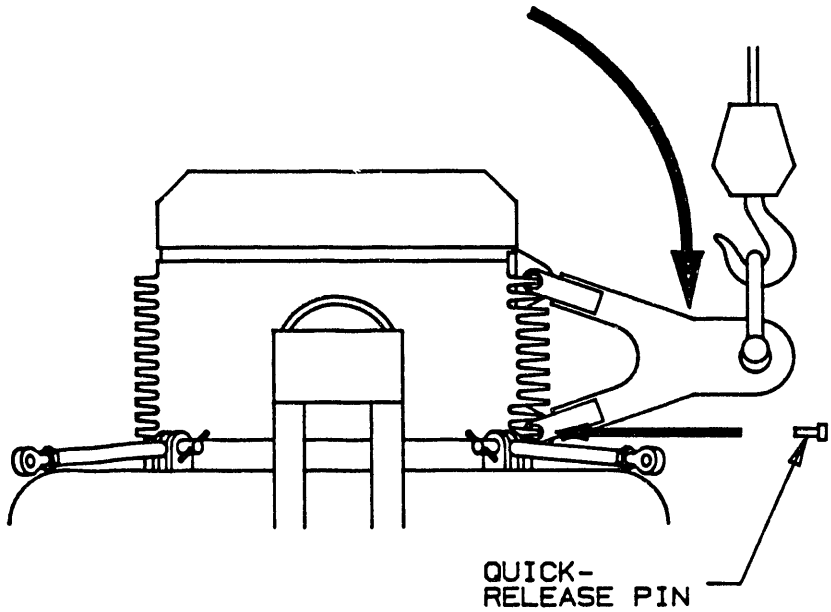


Figure 6.5
Horizontal Lifting Fixture Attachment

6.2.8 Lift the upper impact limiter by the lifting sling and align it over the cask. Rotate the limiter to align the cask-lifting lug and the cutout in the limiter (Figure 6.6). Lower the limiter until contact is made.

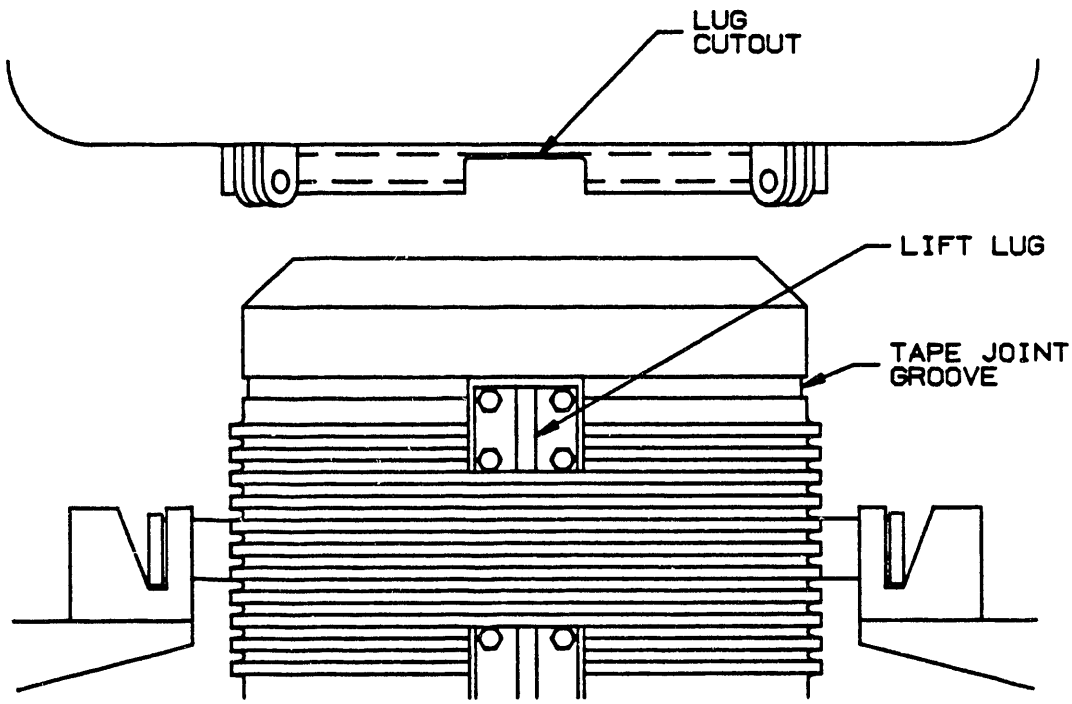


Figure 6.6
Upper Limiter Alignment

6.2.9 Verify proper alignment of the limiter with the cask by observing the location of the key on the cask body and aligning with the keyway in the limiter (Figure 6.7). Slowly lower the limiter to install on the cask body. Watch for signs of binding while lowering the limiter. Re-check key alignment and adjust the limiter as necessary. Lower until the tape grooves in the cask body and limiter are aligned. The grooves may be observed though the tape opening in the limiter.

NOTE
If the impact limiter is not properly aligned with the cask, the tape joint grooves will not match and tape insertion cannot be made.

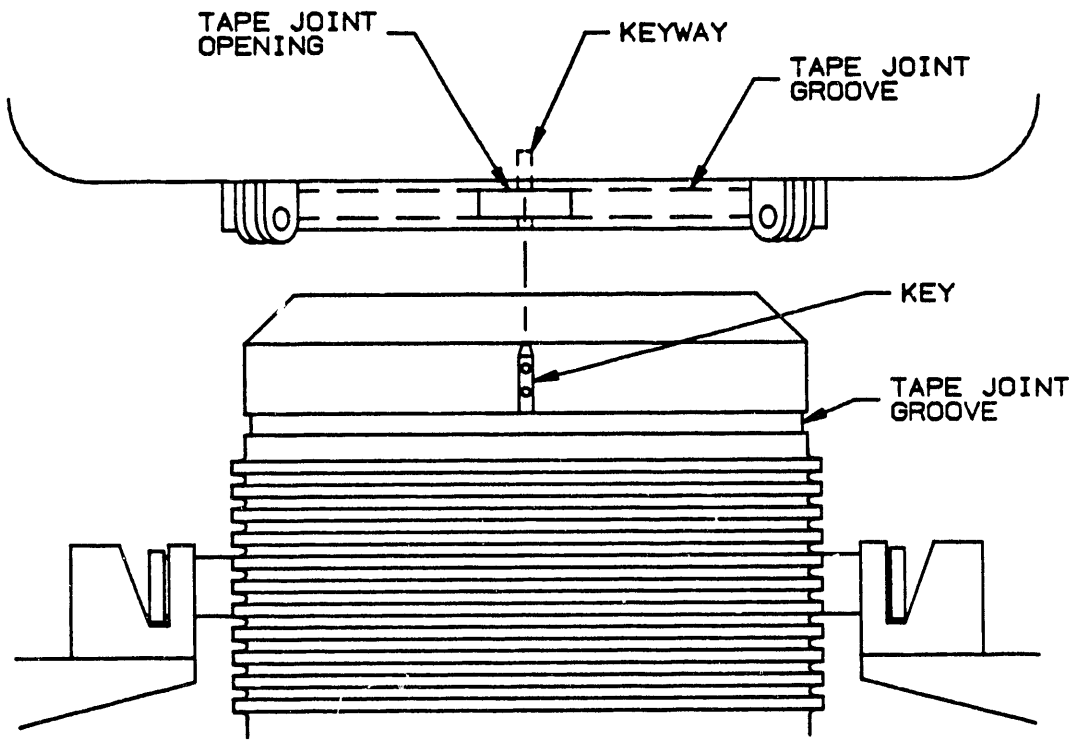


Figure 6.7
Upper Limiter Key Alignment

6.2.10 With the sling still attached, install the upper tapes. Lubricate the remaining two tapes with a thin coating of Neolube lubricant or approved equivalent, being careful not to bend them excessively. Install each tape by inserting into tape opening, with the tapered end first and the slots in the tape facing the surface of the cask. Document this operation on the applicable checklist.

CAUTION
Each tape must be installed with the slots facing the surface of the cask; inverting the tape could break it.

6.2.11 Install the free end of the each of the four turnbuckles to the upper limiter by swinging upward towards its respective attachment point. Attach each turnbuckle end using the quick-release pin. Depress the release button and slide through the limiter attachment point and the turnbuckle end (Figure 6.8).

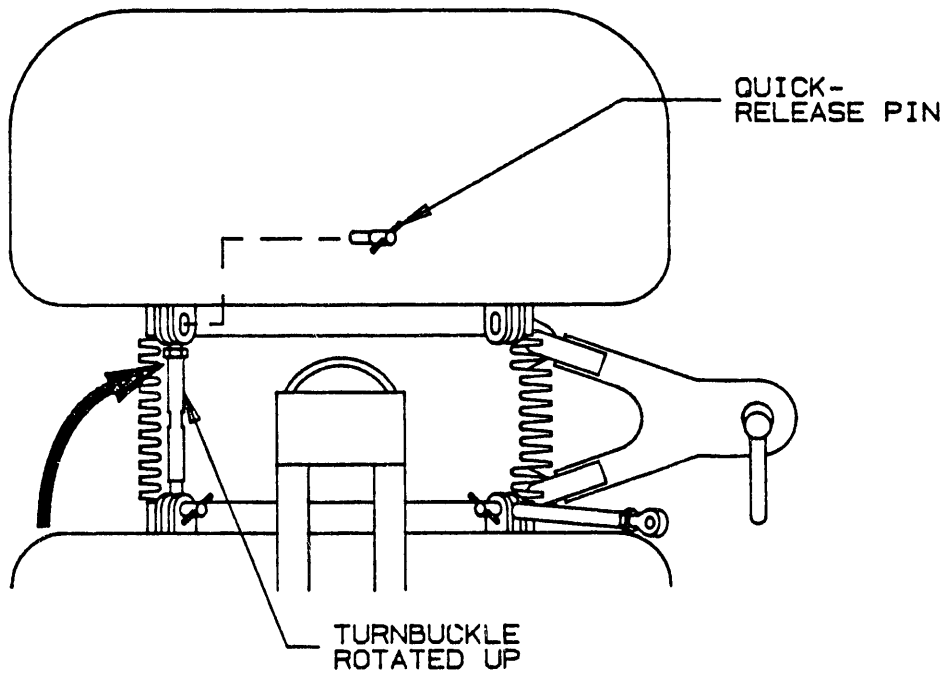


Figure 6.8
Limiter Turnbuckle Installation

6.2.12 Depress the button on the quick-release pin and install the lanyard attached retainer washer over the end of the quick-release pin such that lanyard attachment screw faces away from the limiter attachment (Figure 6.9).

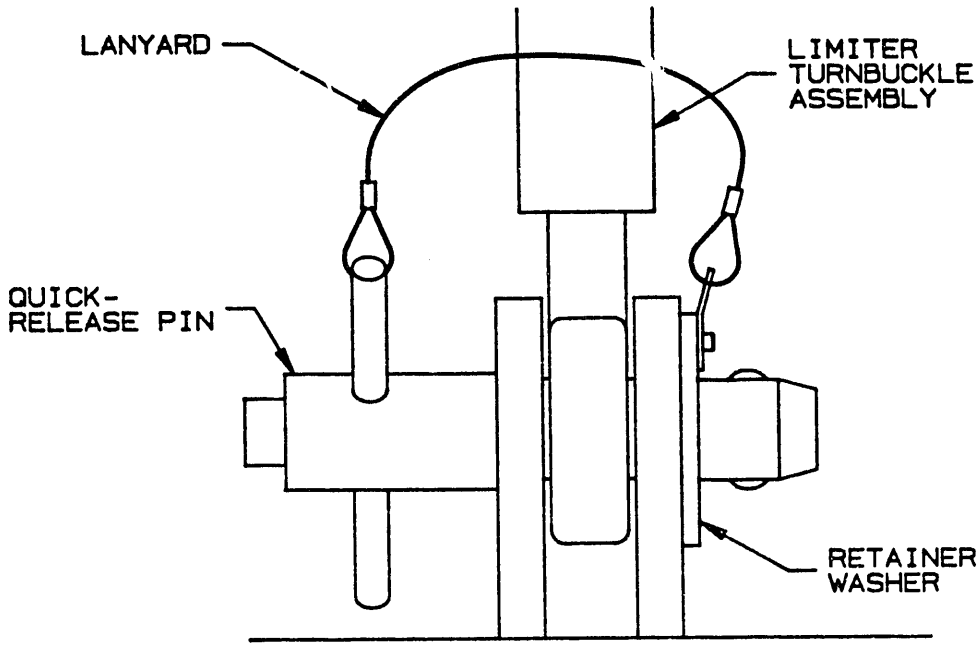


Figure 6.9
Quick-Release Pin Installation.

6.2.13 Progressively hand tighten the four turnbuckles until snug. Using a 1-1/2" wrench on the turnbuckle body flats, tighten each an additional one-quarter turn. Secure the turnbuckles by tightening the locking nuts. Document this operation on the applicable checklist.

6.2.14 Remove the upper limiter slings and the three limiter lifting eyebolts. Install a tape-locking plug into the tape opening in each limiter. Snug the attachment eyebolt with a wrench. Install a tamper seal on each tape locking plug by inserting the wire through the eyebolts (Figure 6.10). Document this operation on the applicable checklist.

NOTE
Tamper seals are not required for an empty cask assembly.

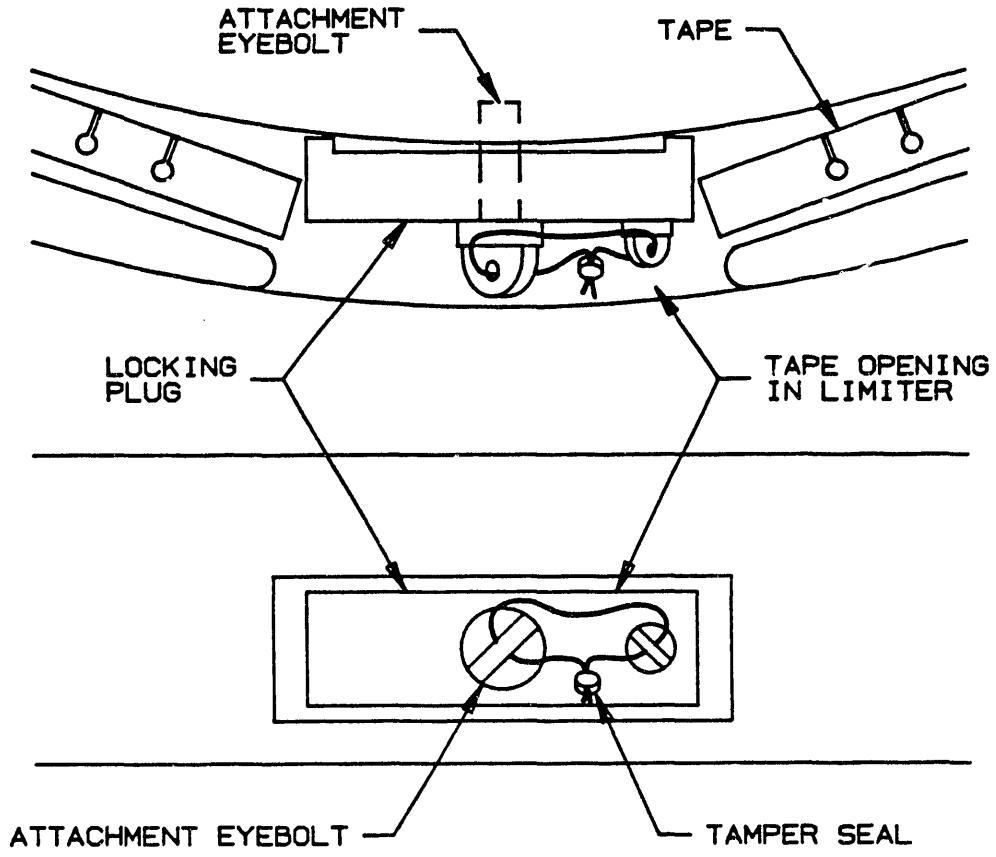


Figure 6.10
Tape-Locking Plug and Tamper Seal

6.2.15 Engage the horizontal lifting fixture with the crane hook. Operate the crane to lift the fixture slightly without applying load to the cask.

CAUTION

Exercise caution to lift the horizontal lifting fixture only; do not transfer load to the cask as this will rotate the cask and damage the lower limiter.

6.2.16 Lower the limiter platform to its lowest position (Figure 6.11A). Document this operation on the applicable checklist.

6.2.17 Keeping the cables near-plumb, rotate the cask to the horizontal position (Figure 6.11B). When the cask is horizontal (Figure 6.11C) continue the vertical lift and remove the cask from the handling frame (Figure 6.11D).

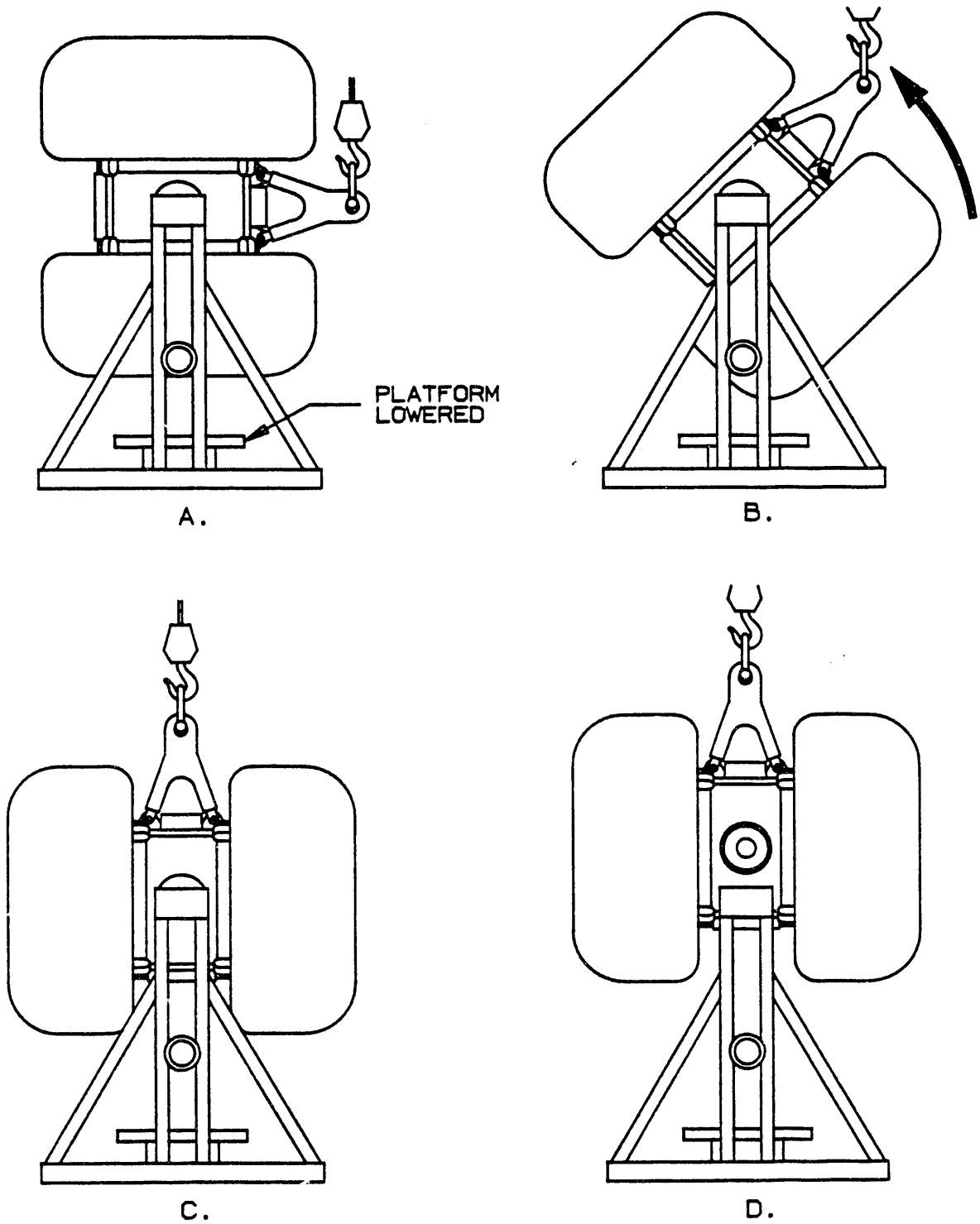


Figure 6.11
Cask Rotation and Removal From Handling Frame

6.3 Package Replacement on Trailer

The cask was removed from the transportation vehicle in one of two methods. Method "A" retained the skid on the trailer and only removed the cask. Method "B" removed the cask and skid from the trailer as a unit. Replace the cask per the same method as was used for removal.

6.3.1 Package Replacement - Method A

6.3.1.1 Using the overhead crane, move the cask to the trailer and skid and place it in position on the hexagonal base structure as shown in Figure 6.12. Be certain that the cask is symmetrically placed on the structure and that the two alignment keys on the hexagonal base are straddled by the appropriate cask fins (Figure 6.13). The fins of the cask also key in between the two brass wear strips on the base. The cask should be oriented as it was when received (i.e., the lid end of the cask facing the rear of the trailer). Document this operation on the applicable checklist.

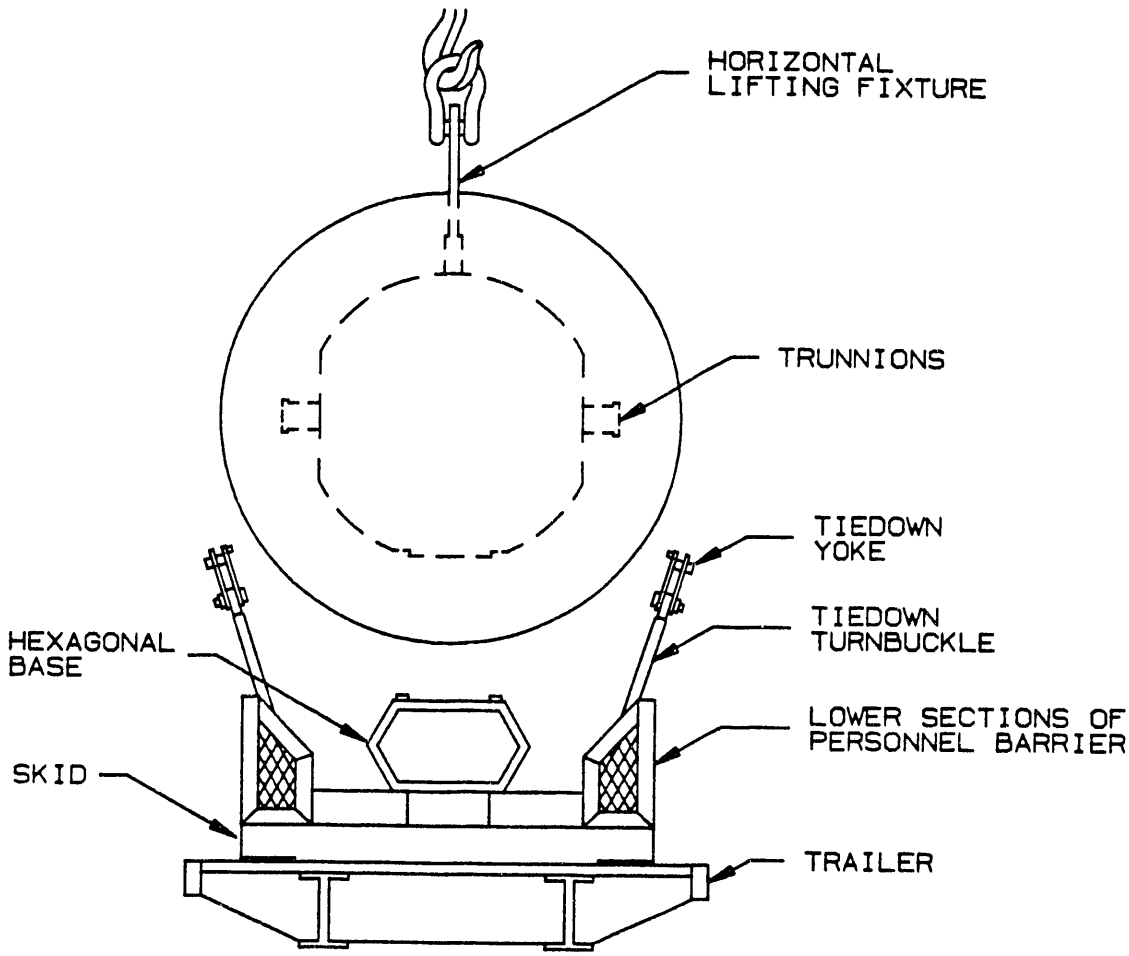


Figure 6.12
Cask Replacement on Skid - Method A

CAUTION

Do not set the cask fins on top of the alignment keys on the hexagonal support structure. This could result in a hazardous condition when the cable tension is released.

NOTE

The lid end may be identified by the 'LID' marking visible though the hole in the end of the limiter.

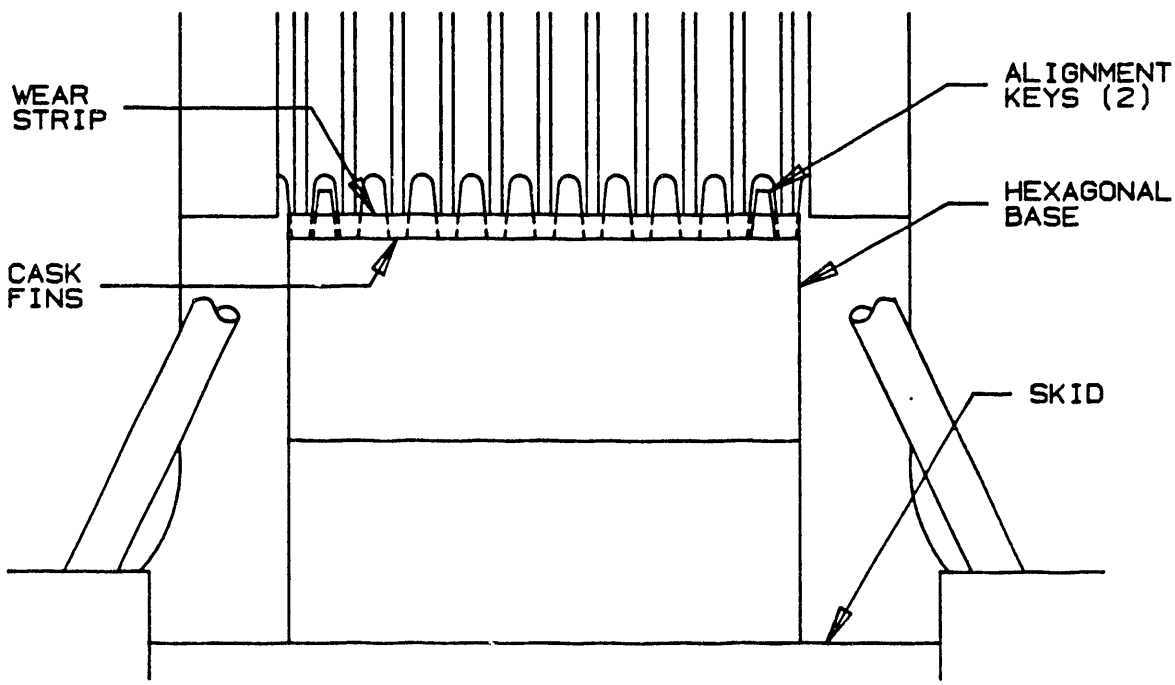


Figure 6.13
Cask Alignment on Hexagonal Base

6.3.1.2 With the crane tension slackened, install the two tiedown assemblies by swinging each inward toward the cask and over the trunnions (Figure 6.14). Uniformly hand tighten the turnbuckles making sure that the "keyhole" fully engages the trunnion. Using a 1-1/2" wrench on the turnbuckle body flats, tighten turnbuckle an additional one-quarter turn. Tighten the jam nuts. Document this operation on the applicable checklist.

6.3.1.3 Safety wire each pair of turnbuckle jam nuts as shown in Figure 6.15. The jam nuts are drilled to accept wire.

6.3.1.4 Remove the horizontal lifting fixture from the cask by removing the two quick-release pins.

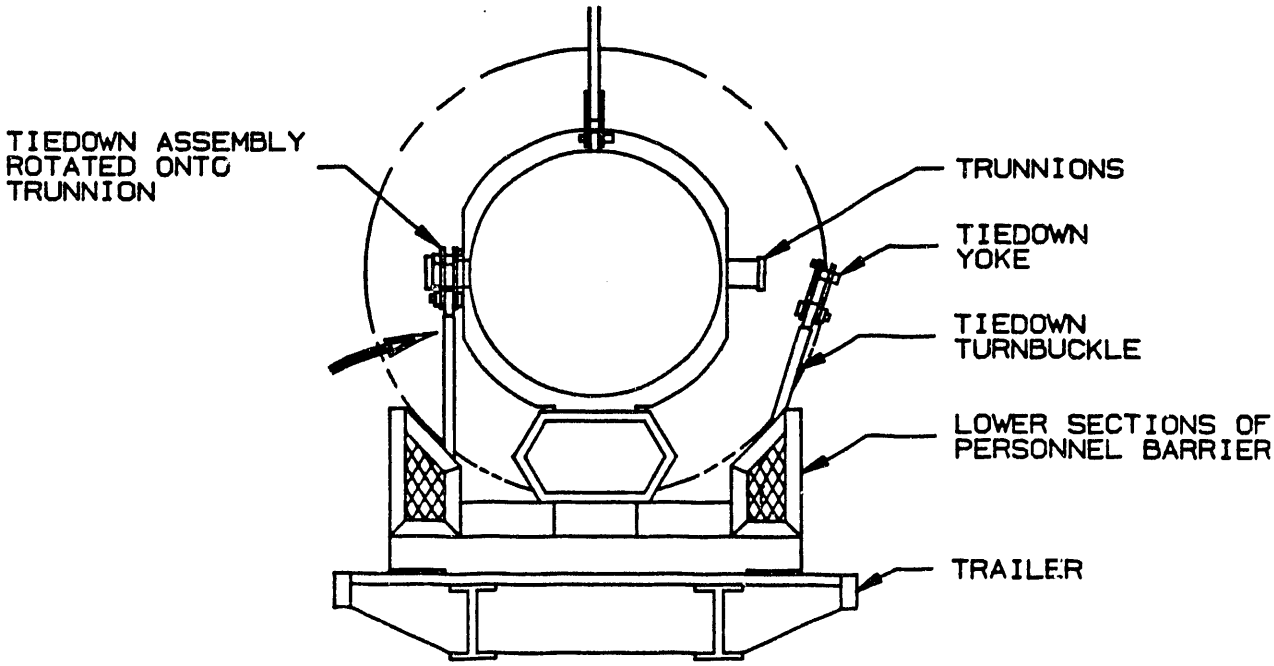


Figure 6.14
Tiedown System Attachment

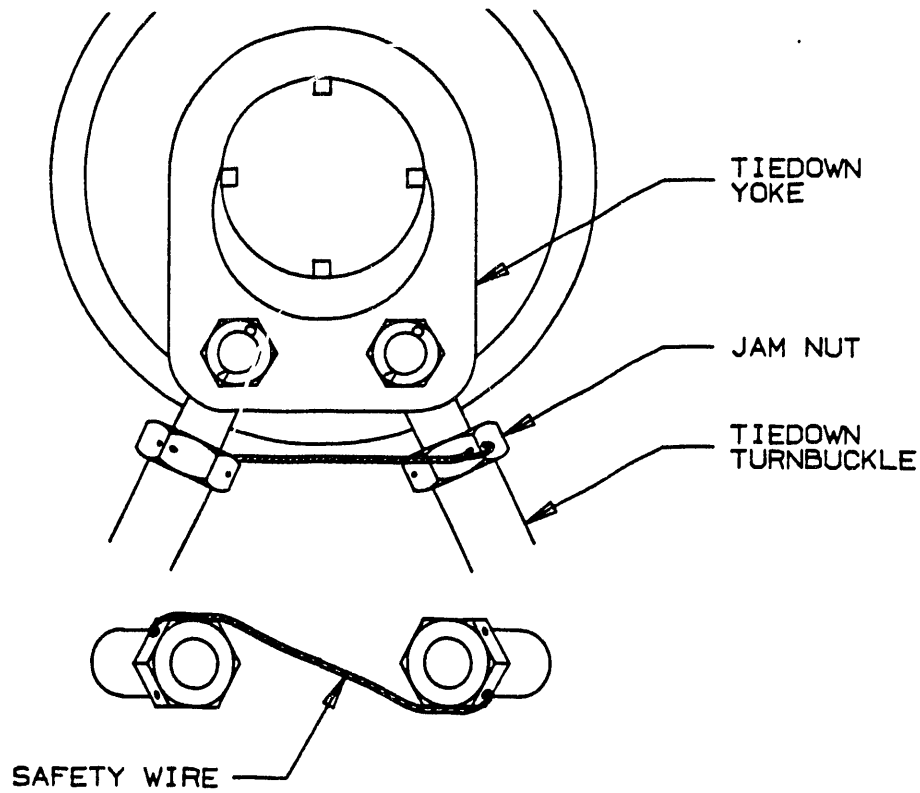


Figure 6.15
Jam Nut Safety Wire

6.3.2 Package Replacement - Method B

6.3.2.1 Move the cask to the skid and place it in position on the hexagonal base structure as shown in Figure 6.16. Be certain that the cask is symmetrically placed on the structure and that the two alignment keys on the hexagonal base are straddled by the appropriate cask fins (Figure 6.17). The fins of the cask also key in between the two brass wear strips on the base. Document this operation on the applicable checklist.

CAUTION
Do not set the cask fins on top of the alignment keys on the hexagonal support structure. This could result in a hazardous condition when the cable tension is released.

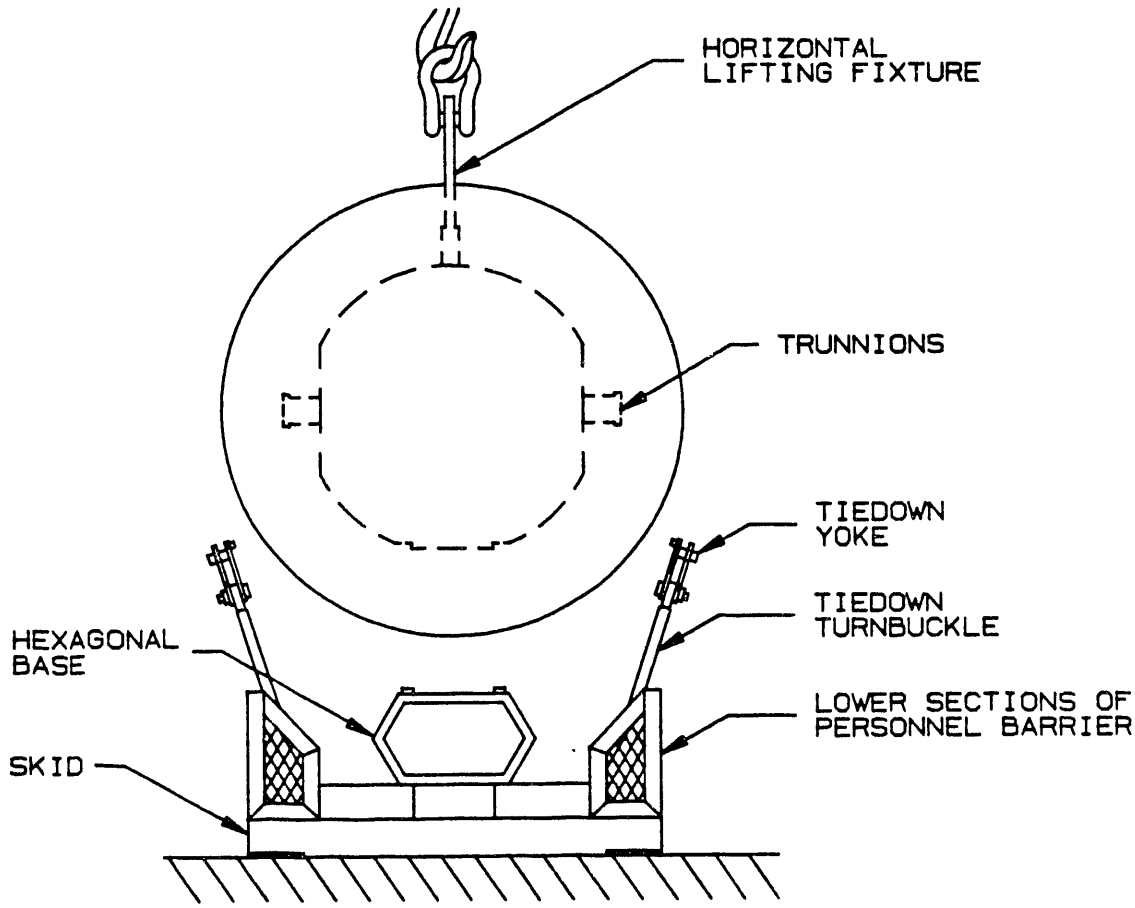


Figure 6.16
Cask Replacement on Skid - Method B

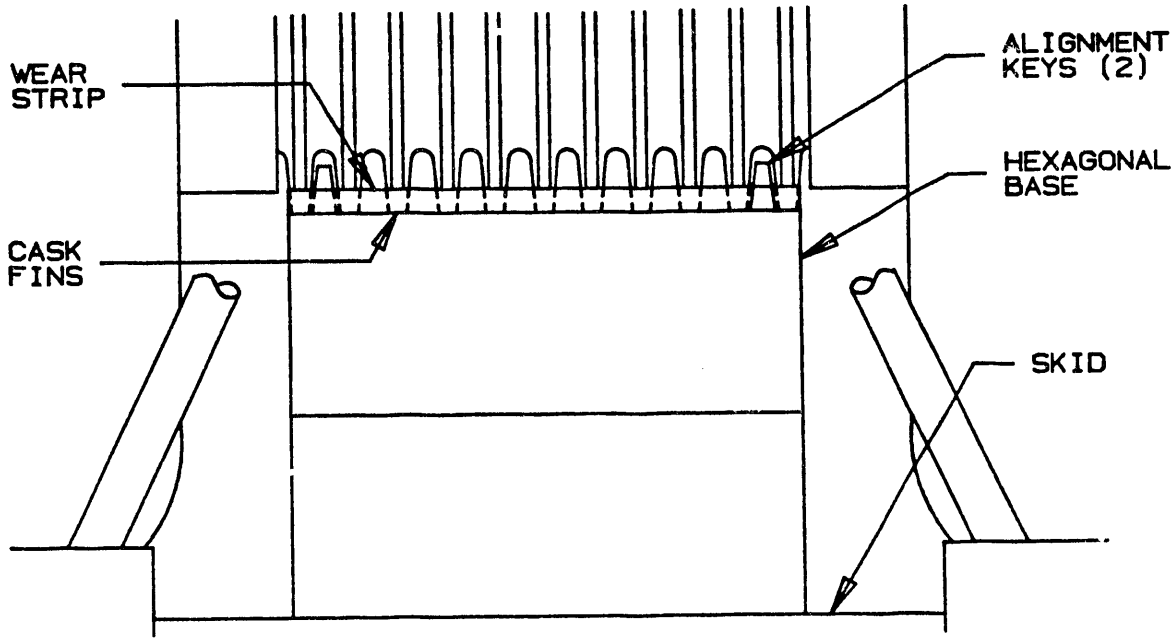


Figure 6.17
Cask Alignment on Hexagonal Base

6.3.2.2 With the crane tension slightly slackened, install the two tiedown assemblies by swinging each inward toward the cask and over the trunnions (Figure 6.18). Uniformly hand tighten the turnbuckles making sure that the "keyhole" fully engages the trunnion. Using a 1-1/2" wrench on the turnbuckle body flats, tighten each turnbuckle an additional one-quarter turn. Tighten the locking nuts. Document this operation on the applicable checklist.

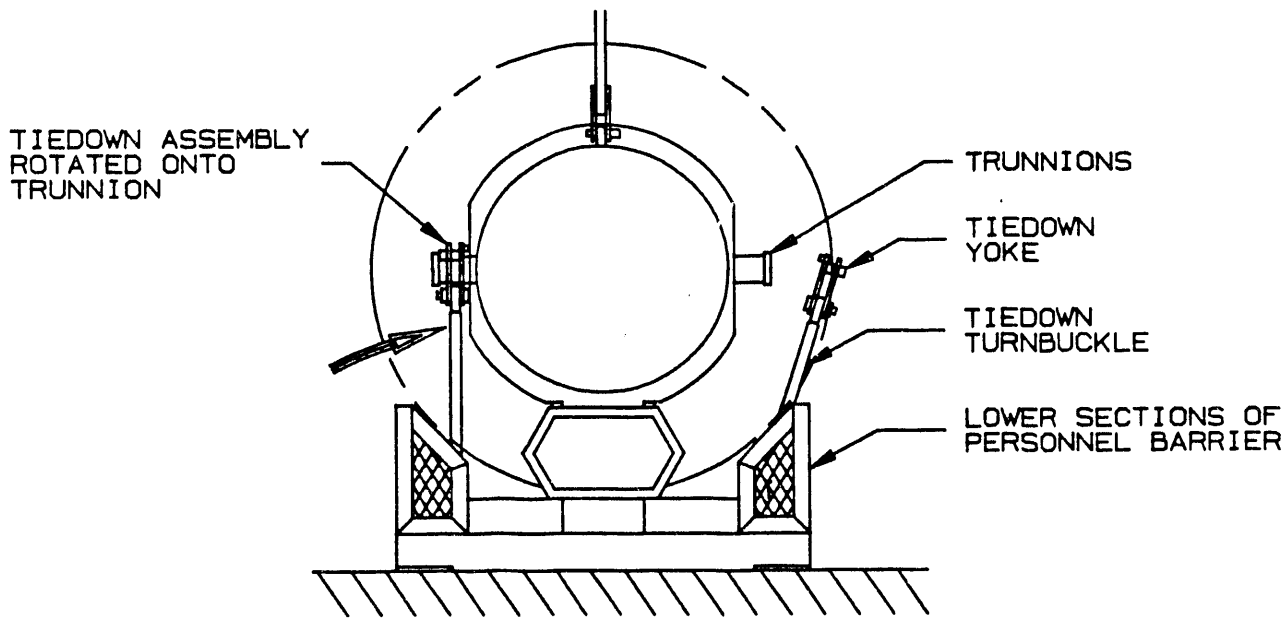


Figure 6.18
Tiedown System Attachment

6.3.2.3 Safety wire each pair of turnbuckle jam nuts as shown in Figure 6.19. The jam nuts are drilled to accept wire.

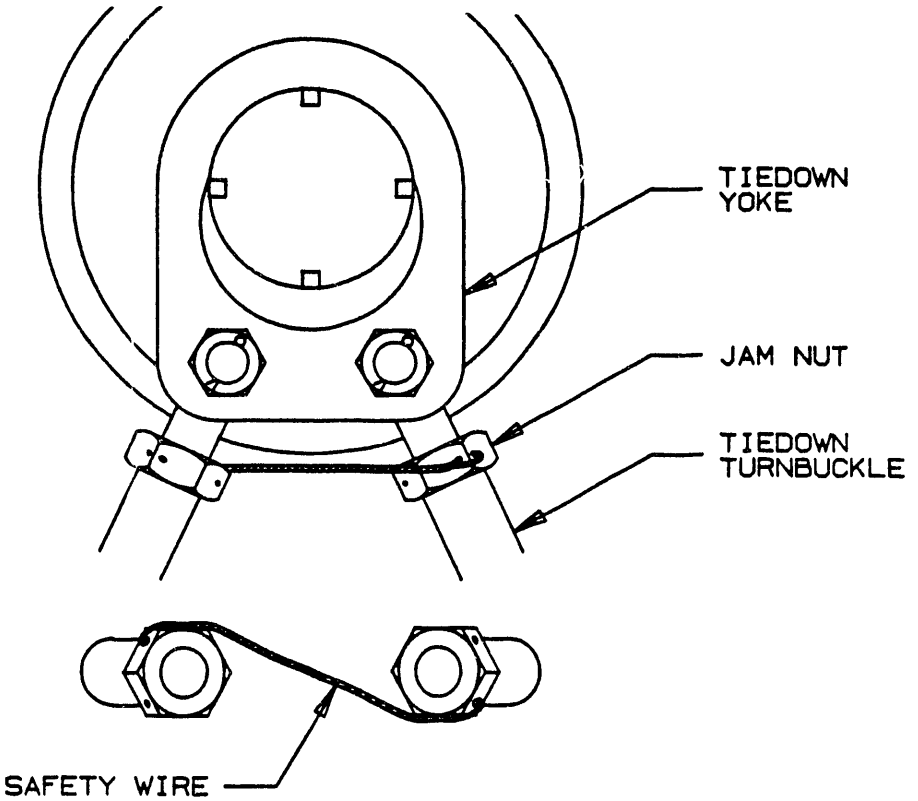


Figure 6.19
Jam Nut Safety Wire

6.3.2.4 Move the cask with attached skid to the transporter using either a fork lift or an overhead crane. Be certain that the fork lift engages the skid in the lifting pockets provided on the sides of the skid. Using an overhead crane, lift the package by the horizontal lifting fixture and place it on the trailer in the same orientation as when received (i.e. with the lid facing the rear of the trailer). Align the skid on the trailer such that the hold-down bolt holes are aligned. Document this operation on the applicable checklist.

NOTE
The lid end may be identified by the 'LID' marking visible though the hole in the end of the limiter.

6.3.2.4 Install the eight skid attachment bolts (1-8UNC x 2.0 inch long) and lock washers. Tighten the bolts to 125 ft-lb using an appropriate torque wrench and a 1-1/2" socket. Document this operation on the applicable checklist.

6.3.2.5 Detach the horizontal lifting fixture from the cask by removing the two quick-release pins. Remove and store the fixture.

6.4 Personnel Barrier Attachment

6.4.1 Perform a final radiation survey and record the results on the shipping papers; dose rate limits are 200 mr/hr at the package surface, 10 mr/hr at 2 meters from the sides of the transporter, and 2 mr/hr in the occupied sections of the tractor.

6.4.2 Label the cask in accordance with DOT regulations 49 CFR 172.400 to .450. Labels may placed on either side of the cask near the trunnions.

6.4.3 Remove the eight socket-head cap-screws from the upper section of the personnel barrier.

6.4.4 Install the upper section of the personnel barrier to the skid assembly. Rig the upper barrier section to a crane using appropriately sized slings and shackles. The barrier weighs approximately 100 pounds. Align the upper section over the two lower sections of barrier (Figure 6.20). The upper section of barrier slides behind and between the uprights of the lower sections of barrier. Lower the upper section until it bottoms in the lower setions.

6.4.5 Secure the upper section of barrier to the lower sections using the eight 3/8-inch screws (Figure 6.20). Torque the screws to 15 ft-lb using an appropriate torque wrench and 5/16" Allen socket. Document this operation on the applicable checklist.

6.4.6 Remove the rigging that was used to handle the barrier.

6.4.7 Replace 3 hex head cap screws (3/4-10 x 1.0, CRES) into the outer end of each impact limiter (6 screws total). Tighten the screws to 20 ft-lb.

6.4.8 Clean all cask-handling equipment and tools, and return them to safe storage.

NOTE

Cask-handling fixtures may be transported on the trailer with the cask assembly at the discretion of the cask owner. Refer to Figure 1.10 for recommended placement of fixtures of significant weight. These fixtures must be properly secured and free of removable contamination.

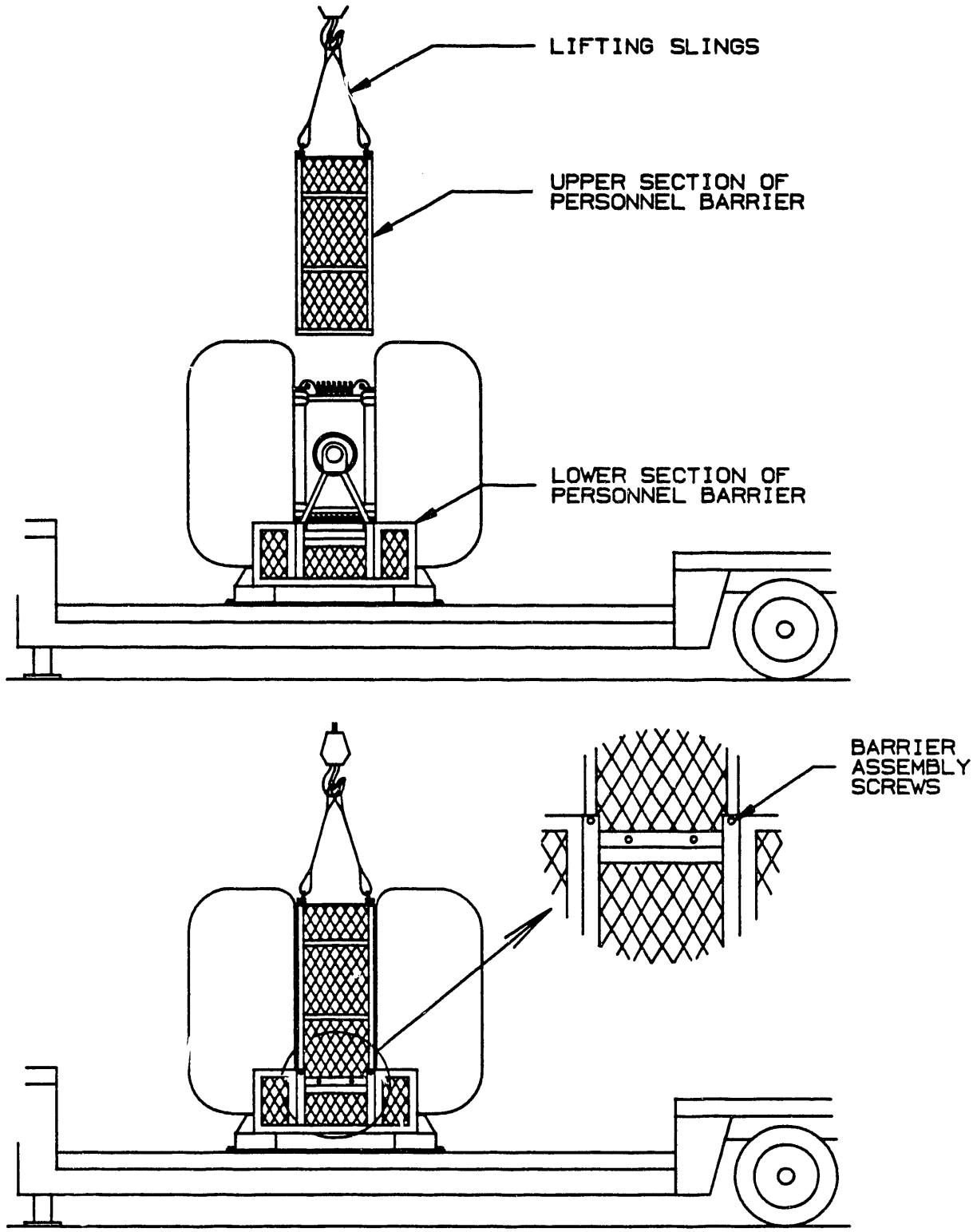


Figure 6.20
Personnel Barrier Assembly

6.5 Dispatching

6.5.1 Prepare the facility-required shipping papers (radiation shipping record, RAM shipping manifest, etc.) in accordance with DOT regulations 49 CFR 172.200 to .205. Record the results of the final radiation survey taken prior to installation of the personnel barrier (Section 6.4). Also record the smear test results and capsule information on the shipping papers.

> NOTE
> Be certain the shipping papers contain a Shippers Certification in compliance with DOT regulations of 49 CFR 172.204, and the certification is signed.

6.5.2 Be certain the vehicle is properly placarded in accordance with DOT regulations 49 CFR 172.500 to .558 and Appendices. Install placards in all four frames attached to the assembled trailer; one each at the front and rear of the trailer, and one on each side of the personnel barrier. If the quantity of material being shipped is classified as a Highway Route Controlled Quantity, the requirements of DOT regulation 49 CFR 177.825 apply, as well as other applicable sections of Part 177.

6.5.3 Verify that both the tractor and trailer have a current Commercial Vehicle Safety Alliance (CVSA) inspection with evidence of such. The inspection must be performed by certified inspectors and meet the requirements of 49 CFR 396.

6.5.4 The following visual inspections of the tractor and trailer are recommended prior to dispatching:

- Inspect the tires for wear and condition (3/32" minimum tread depth).
- Check operation of all lights.
- Inspect for significant fuel and lubricant leaks.
- Check the running gear and brakes, including air lines and connectors, for proper function.
- Check the communications system for proper function.

6.5.5 The transporter may be dispatched upon satisfactory execution of the shipping papers. The receiving facility should be notified of the shipment time, the route of travel, and the expected arrival time.

7.0 IN-TRANSIT OPERATIONS

7.1 Introduction

The responsibility for in-transit operations lies with the carrier. The carrier should be selected on the basis of quality of equipment, qualifications of drivers and experience. The shipper should take the steps necessary to assure that the carrier complies with the DOT requirements for placarded and Highway Route Controlled Quantity shipments as described in 49 CFR 177.825.

7.2 Instructions to Drivers

7.2.1 The driver must have the documents in his possession as defined by 177.825. The shipper should verify this prior to dispatching the loaded cask.

7.2.2 The shipper should provide the driver with the following cask-specific instructions:

7.2.2.1 The driver shall inspect the skid-to-trailer attachment (eight 1-inch bolts) at each planned stop.

7.2.2.2 The driver shall verify that the safety wire on the tiedown turnbuckle jam nuts is intact.

7.2.2.3 The driver shall verify that the tamper seals of the impact limiter tape locking plugs are intact.

7.2.2.4 The driver shall notify the shipper, directly or via the carrier's network, of any abnormal conditions of the BUSS.

7.3 Emergency Response

7.3.1 DOT regulations prescribe that the driver carry emergency response telephone numbers. As part of the emergency response system, the shipper should consider setting up a communications center that is accessible on a 24-hour basis to receive emergency calls from the driver, the carrier, or a law-enforcement agency.

7.3.2 The shipper should consider designating an emergency response team to be sent to the scene of an accident to provide assistance as requested by the local authorities. This team should be knowledgeable on the BUSS and have system drawings and contents information.

8.0 APPENDICES

8.1 Example Operational Checklists

8.1.1 LOADING CHECKLIST (3 pages)
8.1.2 CLOSURE SEAL LEAK TEST DATA SHEET
8.1.3 PAYLOAD CAVITY TEST DATA SHEET
8.1.4 UNLOADING CHECKLIST (2 pages)

8.2 Leak Rate Calculations

8.3 Reference Drawings

8.3.1 Vacuum/Pressure Fitting Assemblies (R35032)
8.3.2 Handling Fixture (S48501)
8.3.3 Lug, Lifting, Lid (S48590)
8.3.4 Guide Pin #1 (S48955)
8.3.5 Guide Pin #2 (S48956)
8.3.6 Cask Assembly (S48981)
8.3.7 Lifting Fixture, BUSS Cask (S49069)
8.3.8 Lifter, Buss Cask (S49072)
8.3.9 Basket Guide Assembly (S49073)
8.3.10 Cradle, BUSS Cask (S50032)
8.3.11 Guide Pin Nose (S51100)
8.3.12 Lid Lifting Assembly (S52562)
8.3.13 Mounting Block Assembly (S52607)
8.3.14 Cover, Drain Plug (S53743)
8.3.15 Drain Plug Assembly (S54757)
8.3.16 Lid Assembly, BUSS Cask (S54758)
8.3.17 Cask with Impact Limiters (S54773)
8.3.18 Cask in Cradle (S54774)
8.3.19 Port Valve Assembly (S55861)
8.3.20 Tool, BUSS Tape Joint Removal (S94963)
8.3.21 Seal, Helicoflex, Drain Plug (T99945)
8.3.22 Seal, Helicoflex, Cask Lid (T99946)

LOADING CHECKLIST

BUSS Serial No. _____ Facility _____

Loading Facility Type (i.e. pool or hot cell) _____

This checklist itemizes tasks that are critical to proper loading, assembly, and testing of the BUSS cask prior to shipment. Each item is to be initialed as the task is performed.

Task	Manual Section	Performed By	Date
Upper port seal replaced.	4.3	_____	_____
Lower port seal replaced.	4.3	_____	_____
Lid guide pins installed.	4.4.2	_____	_____
Lid seal replaced.	4.5	_____	_____
Drain valve fitting installed (pool loading only).	4.6.1.1	_____	_____
Upper port cover installed and torqued (hot cell loading only).	4.6.2	_____	_____
Lid jack-screws extended.	4.6.4	_____	_____
Basket guide installed.	4.6.10	_____	_____
Capsule Loading Information	4.7.2		
Basket Configuration (# holes): _____			
Capsule Type and Quantity: _____			
Estimated total heat load (4kw max): _____			
Verify basket configuration vs. capsule type and quantity.	Table 2.1	_____	_____
Loading documentation complete (as required by facility).		_____	_____
Jack-screws retracted; lid lowered. (wet) (dry)	4.7.13.1 4.7.11.2	_____	_____
Radiation surveys performed (attach results).	4.8.1-2	_____	_____

LOADING CHECKLIST (Continued)

Task	Manual Section	Performed By	Date
Loaded Cask Temperature Data	4.8.4		
Lid temperature: _____			
Body temperature: _____			
Lid and body within 40°F.		_____	_____
Lid bolts installed and torqued.	4.8.6	_____	_____
Upper port cover installed and torqued (pool loading only).	4.8.7.3	_____	_____
Payload cavity passed pressure test (attach data sheet).	4.9.6	_____	_____
Payload cavity filled with helium.	4.9.7	_____	_____
Lower port cover installed, torqued.	4.9.8	_____	_____
Thermal load test performed (attach data).	4.10.2	_____	_____
Closure Leak Test Information	4.10.3-23		
Cask lid seal leak rate: _____			
Upper port seal leak rate: _____			
Lower port seal leak rate: _____			
Total leak rate (sum 3): _____			
Total rate less than 1.0×10^{-4} (attach three data sheets).	4.10.24	_____	_____
Thermal shields replaced and alignment verified.	4.10.25	_____	_____
Lower impact limiter and two tapes installed.	6.2.4-5	_____	_____
Horizontal lift fixture installed.	6.2.6,7	_____	_____

LOADING CHECKLIST (Continued)

Task	Manual Section	Performed By	Date
Upper impact limiter and two tapes installed.	6.2.8-9		
Four limiter turnbuckles attached and snug; lock nuts tightened.	6.2.10-12		
Two tape-locking plugs installed; tamper seals installed.	6.2.13		
Handling platform in lowered position.	6.2.15		
Package replaced on transport skid; fin alignment on hex base verified.	(A) 6.3.1.1 (B) 6.3.2.1		
Two skid tiedowns installed; four turnbuckles and lock nuts tightened.	(A) 6.3.1.2 (B) 6.3.2.2		
Skid/cask placed in trailer with lid end facing rearward.	(A) 6.3.1.1 (B) 6.3.2.3		
Skid to trailer bolts torqued.	(A) 6.3.1.4 (B) 6.3.2.4		
Personnel barrier installed.	6.4		

Final sign-off: all operations listed above have been successfully completed.

By: _____ _____ _____
Name Title Date

CLOSURE SEAL LEAK TEST DATA SHEET

Seal location (lid, upper port, lower port) _____

Cask body temperature °C _____ + 273 = °K _____

Pressure at start of test _____ torr at _____ (time)

Pressure at end of test _____ torr at _____ (time)

Change in pressure _____ 5.0 minutes

Calculate the leak rate using the appropriate K value:

K = 0.0915 for lid seal measurements

K = 0.0510 for port seal measurements

K value used _____

$$L = K \times \frac{\text{Pressure change}}{\text{Temp °K}}$$

Calculated leak rate from above equation: _____ atm cc/sec

Maximum allowable leak rate = 1.0×10^{-4} cc/sec

Equipment information

Pressure Xducer MFG _____ Model No. _____

Serial No. _____ Cal expiration date _____

Thermocouple MFG _____ Model No. _____

Serial No. _____ Cal expiration date _____

TC Readout MFG _____ Model No. _____

Serial No. _____ Cal expiration date _____

Test result (pass/fail) _____

Action taken/comments _____

_____

Performed by: _____ (Name) _____ (Title) _____ (Date)

Witness by: _____ (Name) _____ (Title) _____ (Date)

PAYLOAD CAVITY TEST DATA SHEET

Pressure at start of test _____ torr at _____ (time)

Pressure at end of test _____ torr at _____ (time)

Change in pressure _____ 15.0 minutes

Maximum allowable pressure change = 2.0 torr

Equipment information

Pressure Xducer MFG _____ Model No. _____

Serial No. _____ Cal expiration date _____

Action taken/comments _____

_____

_____

Test result (pass/fail) _____

Performed by: _____ (Name) _____ (Title) _____ (Date)

Witness by: _____ (Name) _____ (Title) _____ (Date)

UNLOADING CHECKLIST

BUSS Serial No. _____ Facility _____

Loading Facility Type (i.e. pool or hot cell) _____

This checklist itemizes tasks that are critical to proper unloading, and reassembly of the BUSS cask for subsequent storage or return. Each item is to be initialed as the task is performed.

Task	Manual Section	Performed By	Date
Cask cooling performed (Optional)	5.2	_____	_____
Cask temperature: _____			
Cooling immersion time: _____			
Lower port cover removed; seal retained.	5.3.2	_____	_____
Payload cavity gas survey performed.	5.3.3	_____	_____
Port cover removed; seal retained.	5.3.5	_____	_____
Drain valve fitting installed (pool unloading only).	5.3.6.1	_____	_____
Lid guide pins installed.	5.4.2	_____	_____
Basket guide installed.	5.5.3	_____	_____
All capsules unloaded.	5.5.5	_____	_____
Survey performed of cask and lid interior and exterior (attach data).	5.5.12	_____	_____
Lid jack-screws extended.	5.6.2	_____	_____
Lid replaced: jack-screws retracted.	5.6.5	_____	_____
Lid bolts installed and torqued.	5.6.7	_____	_____
Two port covers installed and torqued.	5.7.2	_____	_____

UNLOADING CHECKLIST (Continued)

Two thermal covers installed and alignment verified.	5.7.3	_____	_____
Lower impact limiter and two tapes installed.	6.2.4-5	_____	_____
Horizontal lift fixture installed.	6.2.6-7	_____	_____
Upper impact limiter and two tapes installed.	6.2.8-9	_____	_____
Four limiter turnbuckles attached and snug; lock nuts tightened.	6.2.10-12	_____	_____
Two tape locking plugs installed.	6.2.13	_____	_____
Handling platform in lowered position.	6.2.15	_____	_____
Package replaced on transport skid; fin alignment on hex base verified.	(A) 6.3.1.1 (B) 6.3.2.1	_____	_____
Two skid tiedowns installed; four turnbuckles and lock nuts tightened.	(A) 6.3.1.2 (B) 6.3.2.2	_____	_____
Skid/cask placed in trailer with lid end facing rearward.	(A) 6.3.1.1 (B) 6.3.2.3	_____	_____
Skid to trailer bolts torqued.	(A) 6.3.1.4 (B) 6.3.2.4	_____	_____
Personnel barrier installed.	6.4	_____	_____

Final sign-off: all operations listed above have been successfully completed.

By: _____ _____ _____
Name Title Date

LEAK RATE CALCULATIONS

The equations for calculating the leakage rates of the lid seal (section 4.10.9) and the port seals (section 4.10.19) follow the pressure change method of leak testing described in ANSI N14.5. The equations in this manual are derived by simplifying the ANSI equation by inserting certain known values.

Pressure rise leakage rate formula per ANSI N14.5 (equation B19)

$$L_R = \frac{V\ T_S}{3600\ H\ P_S}\left[\frac{P_2}{T_2} - \frac{P_1}{T_1}\right] \text{ std } cm^3/s$$

where:
- L_R = volumetric leakage rate at standard conditions of 25°C and 1 atm abs.
- V = gas volume in test system (cm^3)
- T_S = standard temperature (298 K)
- H = test duration, hours
- P_S = standard pressure, 1 atm abs
- P_1 = pressure at start of test
- P_2 = pressure at end of test
- T_1 = gas temperature in test item at start of test, °K
- T_2 = gas temperature in test item at end of test, °K

The following variables in the equation have been determined either by procedural controls or by calculation or measurement of the operational BUSS hardware.

- V = 70 cm^3 for the lid seal (see next pages)
  39 cm^3 for the port seals (see next pages)
- P_S = 760 (measurements in torr/procedural control)
- H = 0.0833 (5 minutes/procedural control)
- T_1 = T_2, °K (temperature change over 5 minute test is negligible: assumed to be zero)

Insert the known values:

$$L_R = \frac{70(\text{lid})}{39(\text{port})} \times \frac{298}{3600(.0833)(760)}\left[\frac{P_2 - P_1}{T_1}\right] \text{ std } cm^3/s$$

The equations then simplify to the equations in section 4.10 of this manual.

LEAK RATE CALCULATIONS (continued)

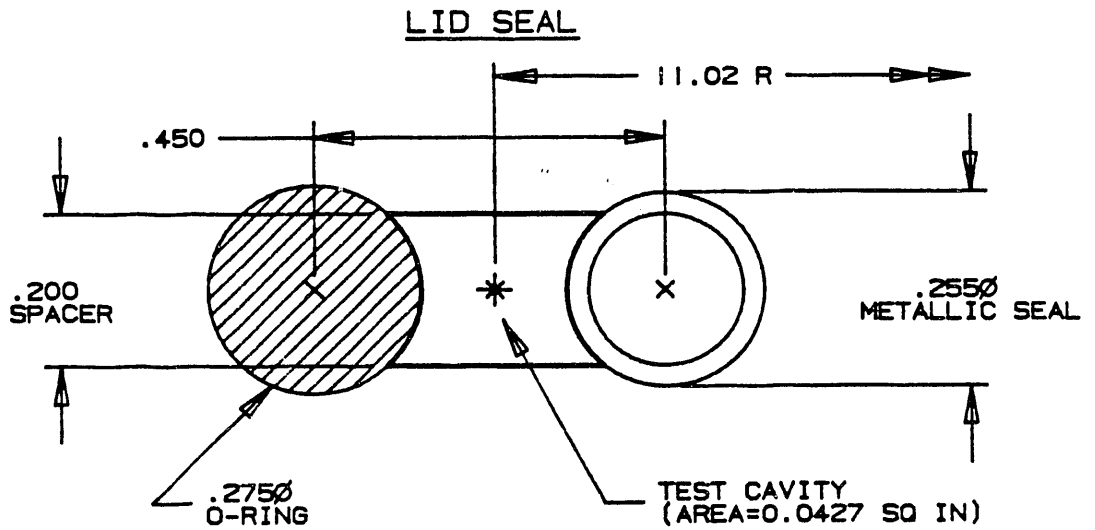
The system volumes given above are the <u>total</u> contained gas volumes in each of the test systems. Each test system is comprised of (1) the test cavity between the metallic and elastomeric seals, (2) the test port, and (3) the test plumbing assembly. These three items are defined below for both the lid and port cover test systems.

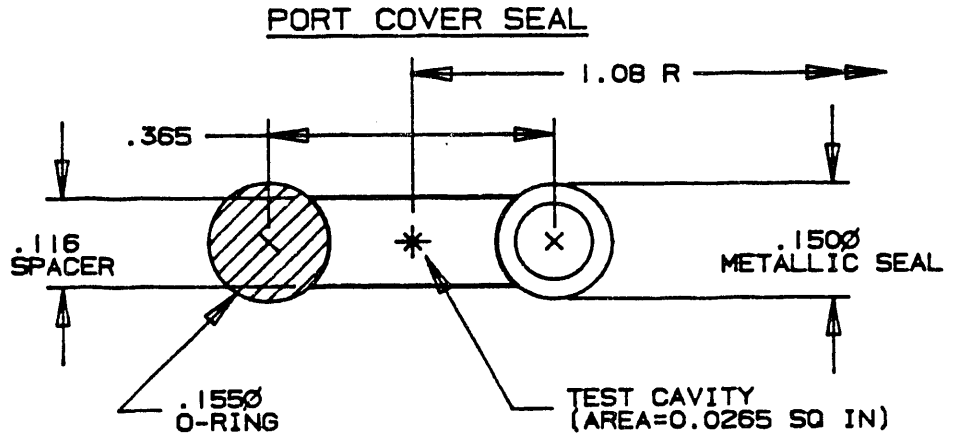
<u>Annular test cavity volumes:</u>

Lid seal test cavity = 48.5 cm^3 (2.95 in^3)

Port cover seal test cavity = 3.0 cm^3 (0.180 in^3)

The volumes of each of the seal test cavities were calculated by multiplying the cross sectional area of the cavity by the length of the path of its centroid of area ($V = A\ 2\pi$ x radius of rotation). Cross sectional areas and radii of rotation are illustrated below.





LEAK RATE CALCULATIONS (continued)

Test port volumes:

Lid test port cavity = 2.1 cm^3 (0.128 in^3)

Port cover test port cavity = 1.7 cm^3 (0.104 in^3)

This is the volume of the 1/8-inch-diameter port through the lid or port cover and the void volumes above and below the installed fittings. The above volumes are calculated using the fabrication drawings of the lid and port covers and measured fitting dimensions. Minimum material condition tolerances were used for all dimensions to create the largest possible volume, and therefore a conservative value for the leak-rate equation.

Test plumbing assembly volumes:

Lid test port cavity = 19 cm^3 (12cm^3 plumbing + 7cm^3 transducer)

Port cover test port cavity = 34 cm^3 (27cm^3 plumbing + 7cm^3 transducer

These volumes were determined by measurement of the operational hardware. Each plumbing assembly was filled with water using a graduated syringe, using care to preclude unfilled volumes (trapped air). These measurements were rounded up to the next full cm^3.

NOTE

The leak rate equations in Section 4.10 are valid only when the supplied plumbing assemblies, part nos. R35032-200 and R35032-300, are used. Use of any other plumbing assemblies will require calculations or measurements to determine system volumes.

Total system volumes: (rounded to next highest cm^3)

Lid test system: 48.5 + 2.1 + 19 = 70 cm^3

Port cover test system: 3.0 + 1.7 + 34 = 39 cm^3

DESIGN AGENCY PART NUMBER	PART CLASSIFICATION
R350J2-000	UNCLASSIFIED
R350J2-100	UNCLASSIFIED
R350J2-200	UNCLASSIFIED
R350J2-300	UNCLASSIFIED

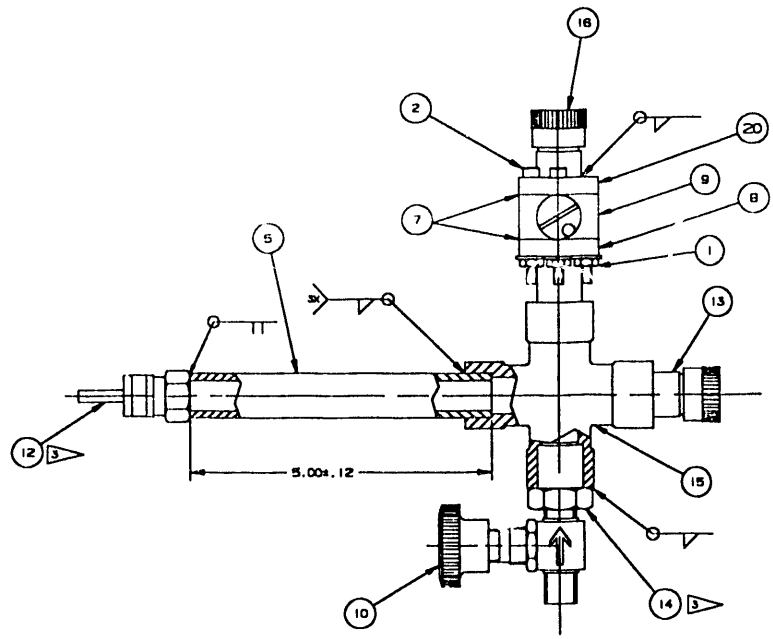
8. MAY OBTAIN FROM:

9. MAY OBTAIN FROM:

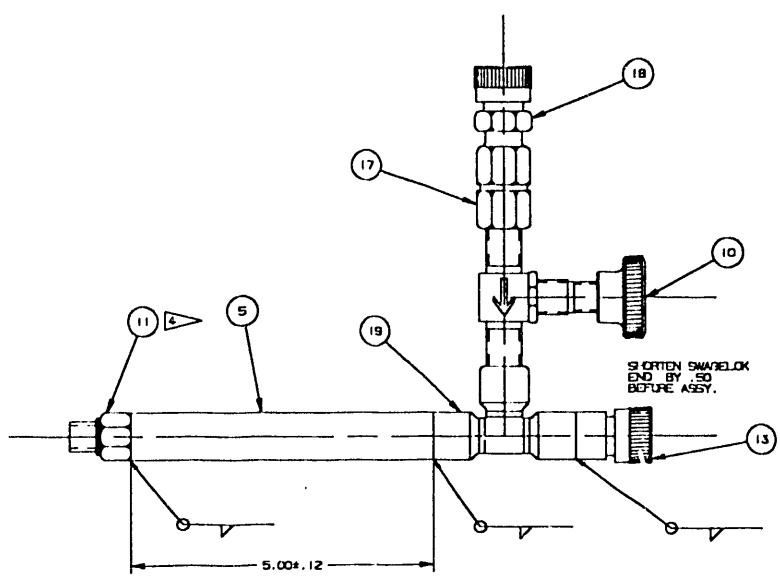
10. MAY OBTAIN FROM:

11. MAY OBTAIN FROM:

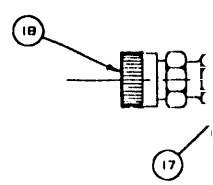
12. REMOVE O-RINGS PRI
11, 13, & 16.



-000



-200



-000, -200, -300
OPERATING PRESSURE

MAXIMUM ALLOWABLE WORKING PRESSURE (MAWP)

SAFE OPERATING PROCEDURE (SOP) PREPARED

OPERATING TEMPERATURE

SPECIFIC GAS OR LIQUID USED

RELIEF DEVICES

PRESSURE SAFETY ANALYSIS REPORT (PSAR) PREPARED

PRESSURE ADVISOR

GEOMETRIC PRECISION = XX.XXX XX

IC COMPANY
6842 CABOT BOULEVARD
AYWARD, CA 94545-1651

NUPRO COMPANY
4800 E. 345TH STREET
WILLOUGHBY, OHIO

AMETEK
U.S. GAUGE DIVISION
SELLERSVILLE, PA, 18960
CALIBRATE BEFORE USE.

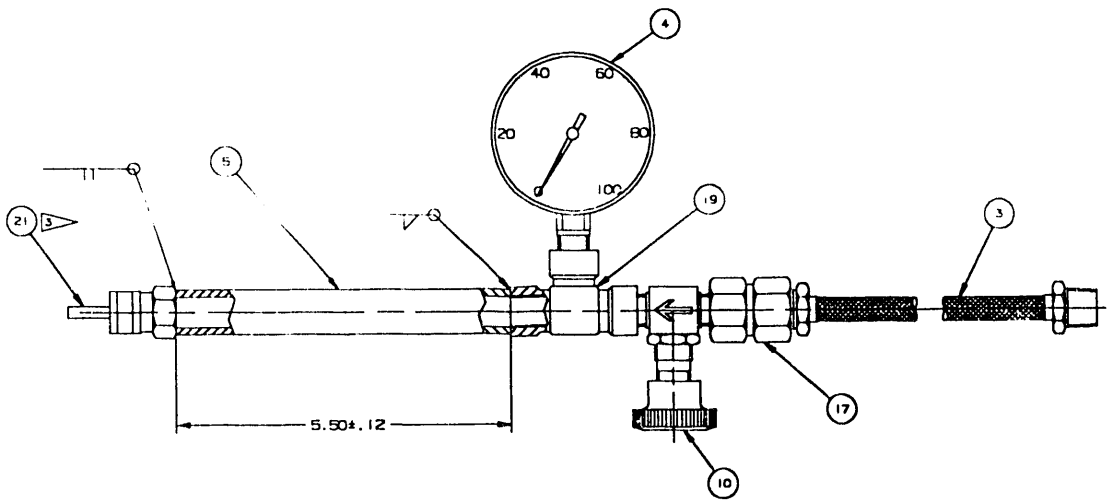
SWAGELOK COMPANY
SOLON, OHIO 44139

OR TO WELDING ON ITEMS

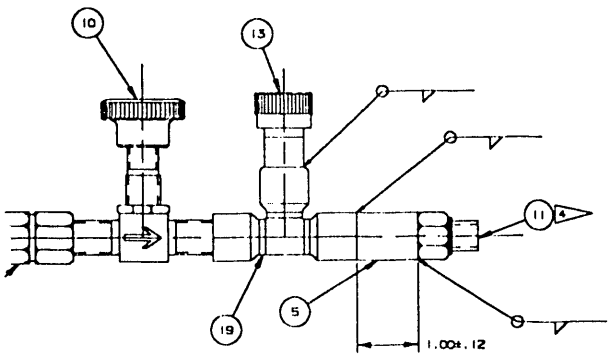
NOTES:

1. ASSEMBLE ALL PIPE THREADS WITH (ITEM 6) VAC GOOP THREAD SEALANT/LUBRICANT; AVAILABLE FROM: CRAWFORD FITTING CO. 29500 SOLON RD. SOLON, OHIO 44139
2. WELD & INSPECT PER 9912119, CLASS II, USING E308 ELECTRODES PER AWS A5.4-81 OR ER308 ELECTRODES OR RODS PER AWS A5.9-81, HELIUM LEAK TEST BEFORE USE.
3. CUT THE MALE NPT END OFF OF THE FITTING PRIOR TO ASSEMBLY.
4. CUT THE SWAGELOK END OFF OF THE FITTING PRIOR TO ASSEMBLY.
5. MARK DESIGN AGENCY NUMBERS PER 9919100, CLASS H-1-B.
6. ALL FILLET & BUTT WELDS ARE 1/8 UNLESS NOTED OTHERWISE.
7. MAY OBTAIN FROM: CAJON COMPANY 9760 SHEPARD RD. MACEDONIA, OH 44056

DESIGN AGENCY PART NUMBER	REVISIONS					
	ISS	SHEET ZONE	PREPARED BY DESCRIPTION	DATE	CHKR	APVD
SEE TABULATION	A		R.R.ROYBAL, 2858 D. BRONOWSKI, 6643	8-14-92		C.B.



-100



-300

			1		SS-QC8-D-8PM	QUICK CONNECT STEM, MODIFIED	11	21
			1		MDC 110003	DEL SEAL FLANGE	8	20
1	1	1			CAJON SS-4-T	TEE, NPT	7	19
1	1				CAJON SS-8-UT-1-6	MALE CONNECTOR, ULTRATORR	7	18
1	1	1			CAJON SS-6-HRCS-4	HEX REDUCING COUPLING	7	17
				1	CAJON SS-8-UT-A-10	ADAPTER, ULTRATORR	7	16
				1	CAJON SS-12-TSW-4	CROSS, WELD	7	15
				1	CAJON SS-8-RB-4	REDUCING BUSHING , MODIFIED	7	14
1	1			1	CAJON SS-8-UT-A-12	ADAPTER, ULTRATORR	7	13
				1	SS-QC8-S-8PM	QUICK CONNECT STEM, MODIFIED	11	12
1	1				SS-500-1-SST	SAE/MS MALE CONNECTOR	11	11
1	1	1	1	1	NUPRO SS-4H2	BELLOW SEALED VALVE	9	10
				1	MDC 360000	BUTTERFLY VALVE	8	9
				1	MDC 401000	DEL SEAL FLANGE	8	8
				2	MDC GK-075	GASKET	8	7
EM	EM	EM	EM	EM	MS-TL-VGT	VAC GOOP	1	6
1	1	1	1			SS TUBE .75Ø X .12 WALL		5
		1				PRESSURE GAGE 0-100 PSIG 1/4" NPT	10	4
		1				FLEX HOSE 3/8" NPT ENDS X 36"	11	3
				6		#8-32 X 1-1/2 SOC HD CAP SCREW		2
				6		#8-32 NUT AND FLAT WASHER		1
NA	NA	NA	NA	NA	9912119	WELDING, CARBON, LOW ALLOY OR CRES		A
NA	NA	NA	NA	NA	9919100	MARKING, GENERAL METHODS		
NA	NA	NA	NA	NA	9900000	GENERAL REQUIREMENTS		
NO. REQD	NO. REQD	NO. REQD	NO. REQD		PART/CONTROL NO.	DESCRIPTION/MATERIAL	NOTE	SHEET ZONE ITEM

ALT-ALTERNATE AR-AS REQ'D ANS-AS REQ'D PER ASSY EM-EXPENDABLE MATERIAL NA-DOCUMENT PM-PROJECTS MATERIAL

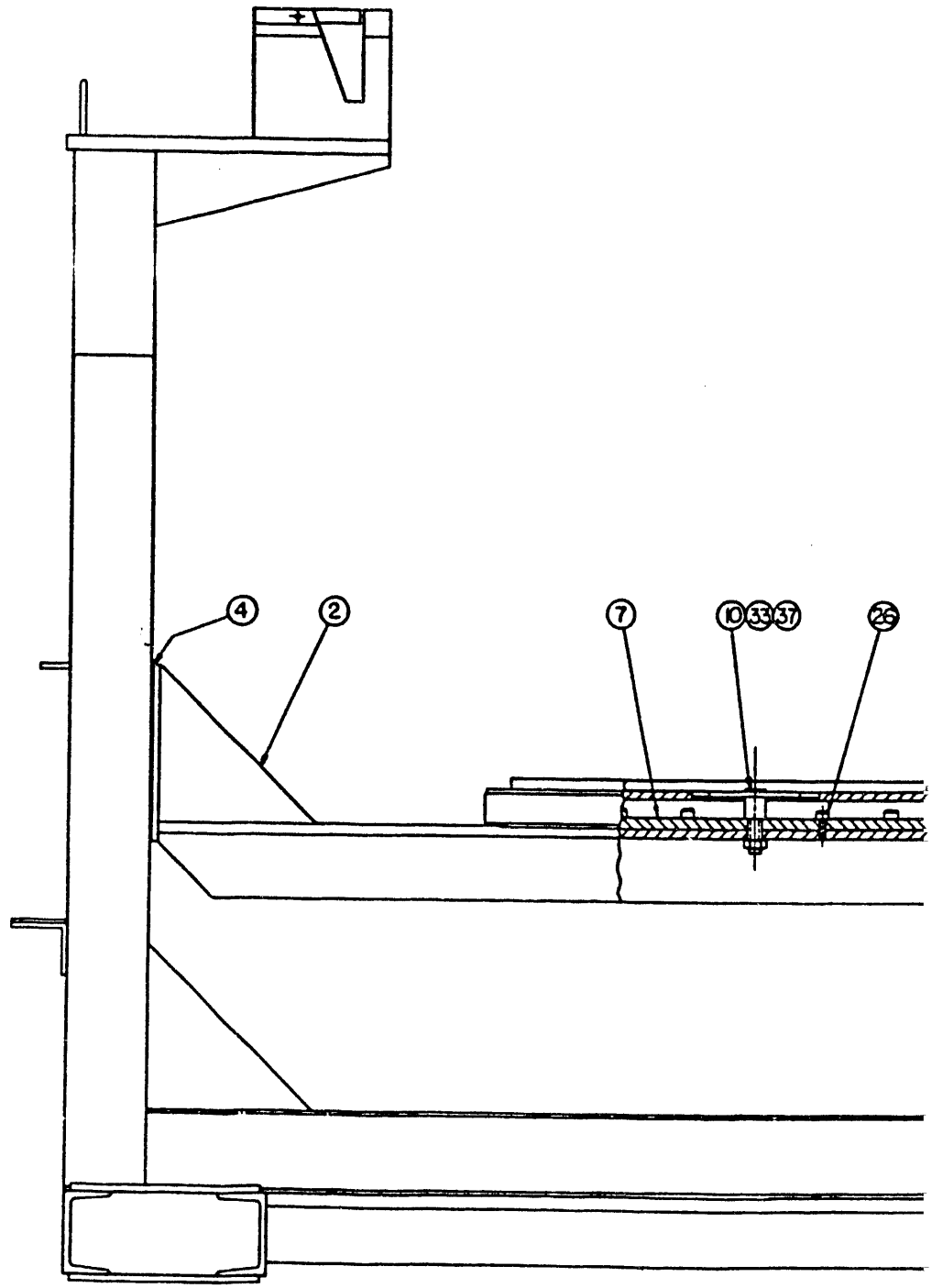
VACUUM; 0 PSIA	-100 OPERATING PRESSURE	75 PSIG	
1 PSIA, + 2 PSIG	MAXIMUM ALLOWABLE WORKING PRESSURE (MAWP)	100 PSIG	
X YES ____ NO	SAFE OPERATING PROCEDURE (SOP) PREPARED	X YES ____ NO	
100°F MAX 50°F MIN	OPERATING TEMPERATURE	100°F MAX 50°F MIN	
AIR, HELIUM	SPECIFIC GAS OR LIQUID USED	WATER	
NONE	RELIEF DEVICES	100 PSIG RELIEF VALVE	
____ YES X NO	PRESSURE SAFETY ANALYSIS REPORT (PSAR) PREPARED	____ YES X NO	
ORG. DATE	PRESSURE ADVISOR	ORG. DATE	

R35032-300	R35032-200	R35032-100	R35032-000	

SHEET 1 2 3 4 5 6
ISSUE A
PART CLASSIFICATION SEE TABULATION
DRAWING CLASSIFICATION UNCLASSIFIED
TITLE VACUUM /PRESSURE FITTING ASSEMBLIES (U)
SIZE E DRAWING NUMBER R35032
CAGEC 14213 SCALE 1/1 SHEET 1 OF 1
STATUS SA-REL-9-4-92 ORIGIN SA-ANS-V2.1

7. THIS PART MAY BE PURCHASED FROM G
BEARING COMPANY, WEST NYACK, NY 1
(TELEPHONE 914-EL8-6000).

8. AFTER ASSEMBLY AND ADJUSTMENT, AP
TWO COATS OF PRIMER FOLLOWED BY TW
COATS OF EPOXY-BASE PAINT, COLOR W
MASK ACTUATOR SCREW, ITEM 15 AND
OTHER STAINLESS STEEL PARTS.



NERAL
994.

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5. PRIOR TO FIRST USE, PERFORM A 46,000 POUND (150%) LOAD TEST PER ANSI N14.6, FOLLOWED BY AN NDE TEST OF THE WELDS OF THE UP-RIGHTS AND GUSSETS OF THE MAINFRAME, ITEM NO 1. APPLY THE TEST LOAD DOWNWARD AT THE PILLOW BLOCKS, ITEM NO. 6. TEST FIXTURE, PART NO R35208-000 MAY BE USED IN TESTING

6. THIS PART MAY BE PURCHASED FROM BOSTON GEAR DIVISION, NORTH AMERICAN ROCKWELL, 7111 JOHN W. CARPENTER FREEWAY, DALLAS, TEXAS 75247 (TELEPHONE 214-631-6620).

NOTES:

1. MARK DESIGN AGENCY PART NUMBER PER 9919100, CLASS B-2, METHOD OPTIONAL. LOCATE ON INDICATED SURFACE
2. LUBRICATE CHAIN WITH A GEL-TYPE GREASE.
3. USE ITEM 4 TO ADJUST ASSEMBLY TO RUN TRUE AND BIND-FREE.
4. MATCH-DRILL ITEM 17 AND ITEM 3 WITH TRAVELING NUTS OF ITEM 16 AFTER ADJUSTING ASSEMBLY TO RUN TRUE AND BIND-FREE.

DESIGN AGENCY PART IDENTIFICATION NO.	REVISIONS				
	ZONE	LTR	DESCRIPTION	DATE	APPD
S48501-000		A	ELEY 2855 / EAKES 6322	[illegible]	KE KE
		B	ADD STEPS & HANDLES TO ITEM 1 R. BAILEY 2831/D. BRONOWSKI 6643	6-2-93	CPB
		C	ADD ITEM 21, NOTE 8. WAS 5., ADD NEW NOTE 5., ITEM 22 WAS 18 REQD R. BAILEY 2881/D. BRONOWSKI 6643	7/28/93	CPB
		D	ITEM 48 WAS 4258-13 R. BAILEY 2881 / D. BRONOWSKI 6643	8/6/93	

MATCH DRILL .437-20UNF-2B THRU ITEM 8
4 HOLES 4X

					51
					50
60	4080-03	BALL TRANSFER	8		49
					48
1		MASTER LINK, #35 ROLLER CHAIN	7		47
ARS	# 35	CHAIN, ROLLER, ½ P	7		46
1	MK3A25-1	SPROCKET, 25T ½ P, Ø.625 BORE	7		45
1	MK3A16-1	SPROCKET, 16T, ½ P, Ø.625 BORE	7		44
2	C6948-5F	BEARING, FLANGED, Ø.500 BORE	7		43
2	C6940-3F	BEARING, FLANGED, Ø.625 BORE	7		42
2	UJNS-10-10	UNIVERSAL JOINT, Ø.625 BORE	7		41
24		WASHER, NOL SPRING, Ø.44			40
37		WASHER, LOCK, SPRING, Ø.50			39
2		PIN, SPRING, Ø.375 x 2.00 LG.			38
1		WASHER, FLAT, Ø.500			37
41		WASHER, FLAT, Ø.50			36
16		WASHER, FLAT, Ø.438			35
16		WASHER, FLAT, Ø.375			34
1		NUT, HEX, SELF-LOCK, .500-12 UNF-2B			33
32		NUT, HEX, .50-13 UNC-2B			32
16		WASHER, LOCK, SPRING, Ø.375			31
					30
					29
8		SCR, HEX HD, SELF-LOCK, 1/2-12UNF-2B x 2.00 LG			28
32		SCR, SOCK HD, .50-13 UNC-3A x 2.00 LG			27
19		SCR, SOCK HD, SELF-LOCK, .50-13UNC-3A x 1.50 LG			26
4		SCR, SOCK HD, .50-13 UNC-3A x 1.50 LG			25
					24
24		SCR, SOCK HD, .438-20UNF-3A x 1.00 LG			23
8		SCR, SOCK HD, .375-16UNC-3A x 1.00 LG			22
8		SCREW, HEX HD, .375-16UNC-3A x 1.00 LG			21
6		KEY, .188 x .188 x .75 LG.			20
1		KEY, .125 x .187 x 1.75 LG.			19
					18
2	S52720-000	PLATE, BEARING			17
2	S52719-000	ACTUATOR			16
1	S52718-000	HANDWHEEL			15
					14
1	S52716-000	SHAFT			13
1	S52715-000	SHAFT, HANDWHEEL			12
1	S52714-000	HOUSING, BEARING			11
1	S52713-000	PIN, PIVOT			10
1	S52712-000	RACE, UPPER			9
4	S52711-000	PLATE, NUT			8
1	S52710-000	RACE, LOWER			7
2	S52709-000	PAWL			6
2	S52708-000	BLOCK, PILLOW			5
ARS	S52707-000	SHIMPACK, CROSS FRAME			4
2	S52706-000	END, CROSS FRAME			3
1	S52705-000	CROSS FRAME			2
1	S52704-000	MAINFRAME			1
NS	9900000	GENERAL REQUIREMENTS			

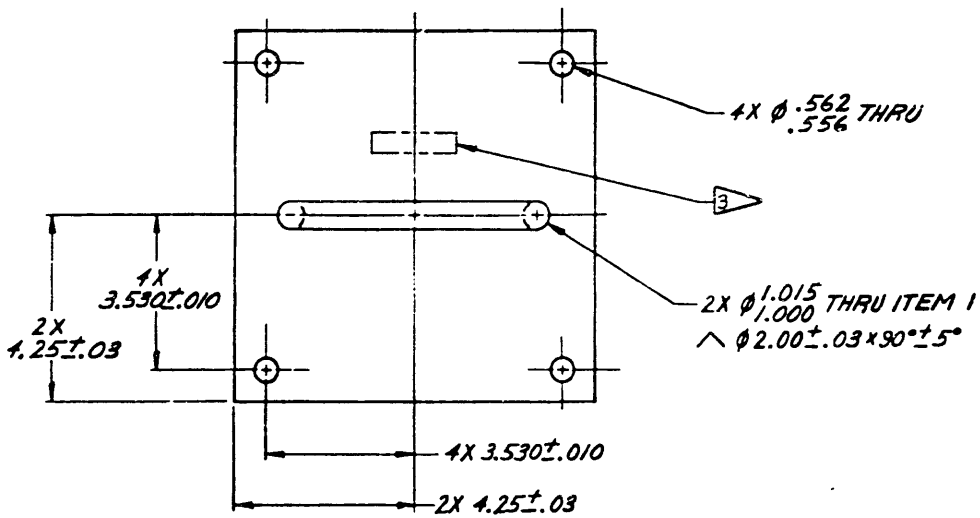
		HANDLING FIXTURE, BUSS CASK (U)	
		UNCLASSIFIED	
	UNCLASSIFIED	E 14213	S48501

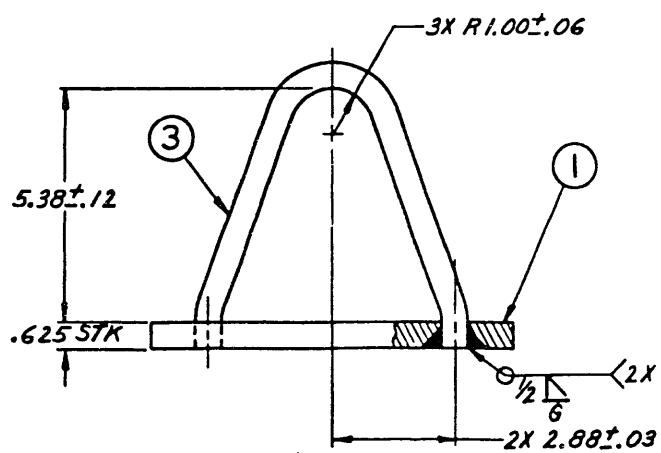
S48501-000 B

NOTES:

1. WELD AND INSPECT PER 9912119, CLASS II, USING E308 ELECTRODES PER AWS A5.4-69 OR ER308 ELECTRODES OR RODS PER AWS A5.9-69.
2. PASSIVATE PER 9904301.
3. MARK DESIGN AGENCY PART NUMBER PER 9919100, CLASS C1 OR C-2, METHOD A.
4. PRIOR TO FIRST USE, PERFORM A 2,300 POUND (150%) LOAD TEST PER ANSI N14.6, FOLLOWED BY AN NDE OF THE WELDS.

DESIGN AGENCY PART IDENTIFYING NO.	REVISIONS					
	LTR	DESCRIPTION	PREPARED BY	DATE	CHK	APP
S46590-000	A	R COOKE CD 7651/EAKES 6323		10/27/83	RE	HRY
	B	ADDED NOTE 3, SPEC TO L/M & FLAGNOTE 3 TO PIC Ø1.015/1.000 WAS .635/.625 CSK WAS Ø1.63, L/M ITEM 3 WAS .625 Ø STOCK R COOKE CD 7655/EAKES 6323		11/15/84	RE	200
	C	ADDED NOTE 4.	R. BAILEY 2581 / D. BRONOWSKI 8643			DRB 4/6/13





1	QQ-S-763	STEEL, ROD, CRES, TYPE 304, Ø1.00 STK			3
					2
1	QQ-S-766	STEEL, PLATE, CRES, TYPE 304			1
NA	9919100	MARKING, GENERAL METHODS			
NA	9912119	WELDING			
NA	9904301	PASSIVATION			
NA	9900000	GENERAL REQUIREMENTS			
NO PER DWG	DESIGN AGENCY NUMBER	DESCRIPTION	NOTE	SHEET ZONE	ITEM

LIST OF MATERIAL

AGENCY APPROVALS			SHEET	1
ORG	DATE	APPROVALS	ISSUE	C
6329	7/2/84		SHEET INDEX	
			PART CLASSIFICATION	UNCLASSIFIED
			DWG CLASSIFICATION LEVEL	UNCLASSIFIED
7651			SIZE	C

TITLE: LUG, LIFTING, LID (BUSS) (U)

FSCM NO. 14213 | DWG NUMBER S46590 | SCALE 1/2 | SHEET 1 OF 1

SF5300C(10-81)

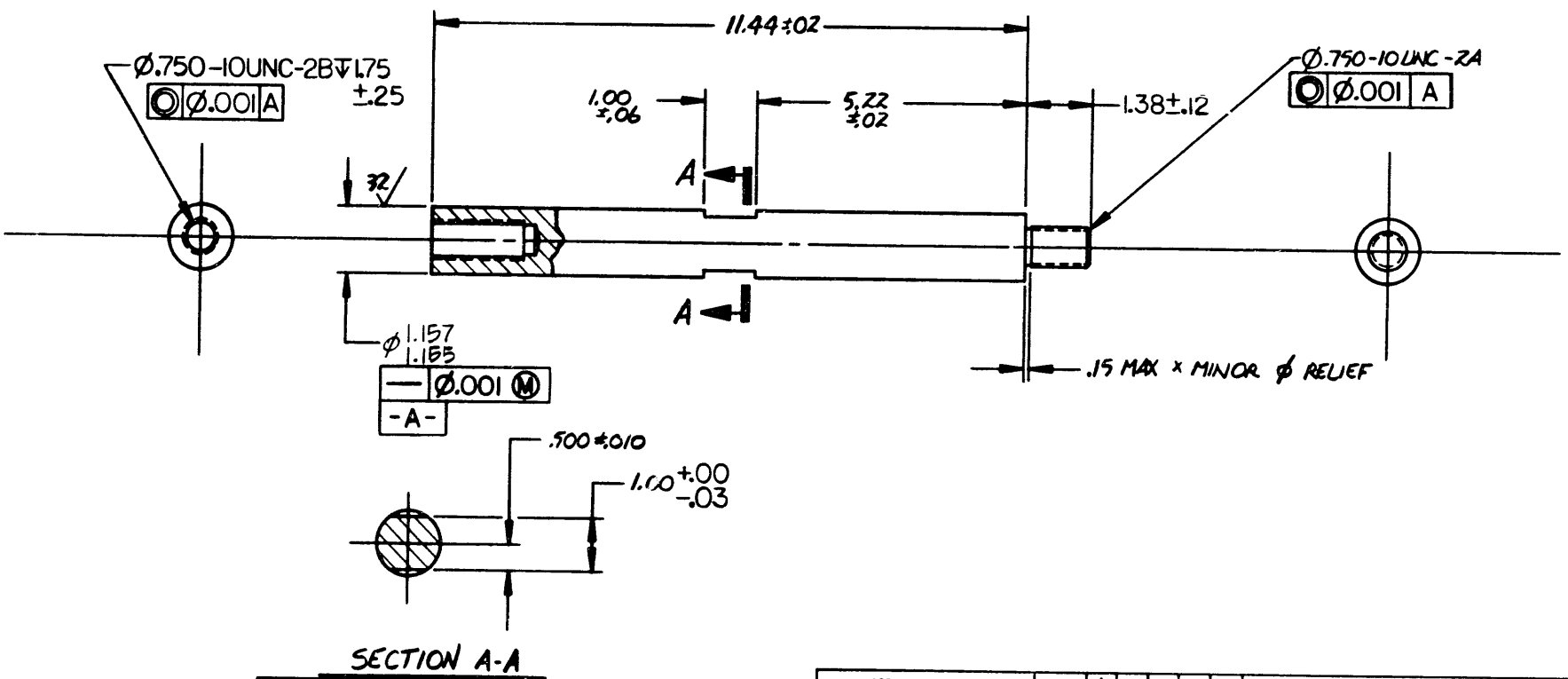
AF 17121

NOTES:

1. GENERAL REQUIREMENTS ARE DEFINED IN 9900000.
2. MARK DESIGN AGENCY PART NO. PER 9919100, CLASS H-1, METHODS A OR B.
3. MATERIAL: STEEL, STAINLESS, TYPE 17-4 PH (H900) PER ASTM-A-564, ROCKWELL "C" 40-47
4. PASSIVATE PER 9904301.

DESIGN AGENCY PART [redacted] NO.
548955-000

REVISIONS					
ISSUE	DESCRIPTION	PREPARED BY	DATE	CHKR	ENGR.
A	PLATZBECKER, 7355/EAKES, 6322		5/31/84	R.E	HRY
B	ADDED NOTE 4, 1.38±.12 WAS 1.25 C.JOJOLA(C&D)7651/EAKES 6323		9/4/84	RE	HRY
C	⌀ 1.157 / 1.155 WAS ⌀ 1.2513 / 1.2509 HOLLING 2853 / EAKES 6322		2/19/85	RE	RE



SECTION A-A

AGENCY APPROVALS		
ORG	DATE	INITIALS
6320	5 v 84	CM - QA

SHEET 1
ISSUE C
SHEET INDEX
PART CLASSIFICATION: UNCLASSIFIED
DWG CLASSIFICATION LEVEL: UNCLASSIFIED

TITLE: GUIDE PIN #1, CASK BODY, (BUSS)

SIZE	CODE IDENT NO.	DWG NUMBER
B	14213	548955

SCALE 1/2 SHEET 1 OF 1

PRINTED IN USA

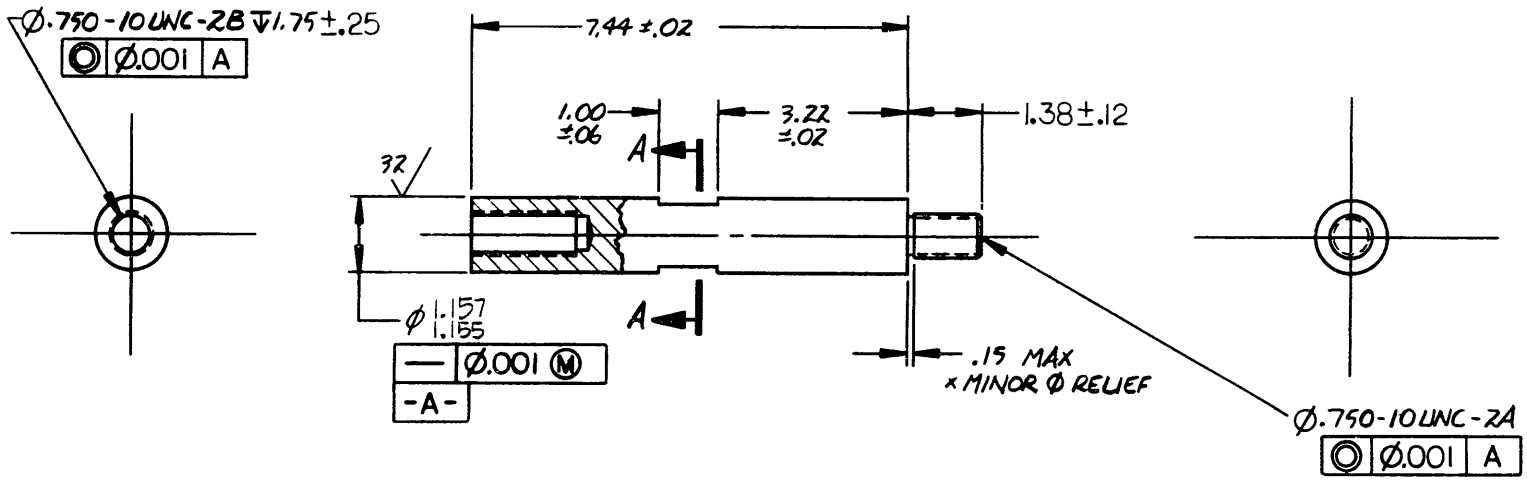
SF 5300-B 11-80

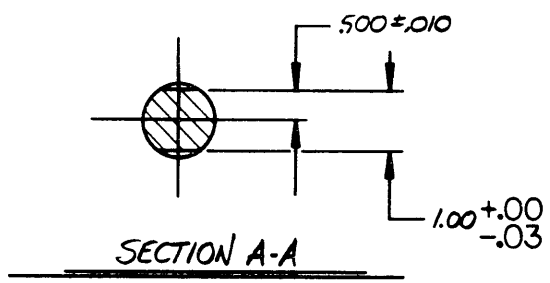
NOTES:

1. GENERAL REQUIREMENTS ARE DEFINED IN 9900000.
2. MARK DESIGN AGENCY PART NO. PER 9919100, CLASS 4-1, METHODS A OR B.
3. MATERIAL: STEEL, STAINLESS, TYPE 17-4 PH (H900) PER ASTM-A-564 ROCKWELL "C" 40 - 43.
4. PASSIVATE PER 9904301

DESIGN AGENCY PART [redacted] NO.
548956-000

REVISIONS					
ISSUE	DESCRIPTION	PREPARED BY	DATE	CHKR	ENGR.
A	PLATZBECKER, 7655 / EAKES, 6322		5/3/84	RE	HRY F
B	ADDED NOTE 4, 1.38±.12 WAS 1.25	C. JOJOLA (C&D) 7651 / EAKES 6323	9/4/84	RE	HRY F
C	Ø 1.157 / 1.155 WAS Ø 1.2513 / 1.2509	HOLLING 2853 / EAKES 6322	2/19/85	RE	RE F





SECTION A-A

AGENCY APPROVALS		
ORG	DATE	INITIALS
[illegible]	[illegible]	[illegible]

SHEET 1
ISSUE C
SHEET INDEX
PART CLASSIFICATION: UNCLASSIFIED
DWG CLASSIFICATION LEVEL: UNCLASSIFIED

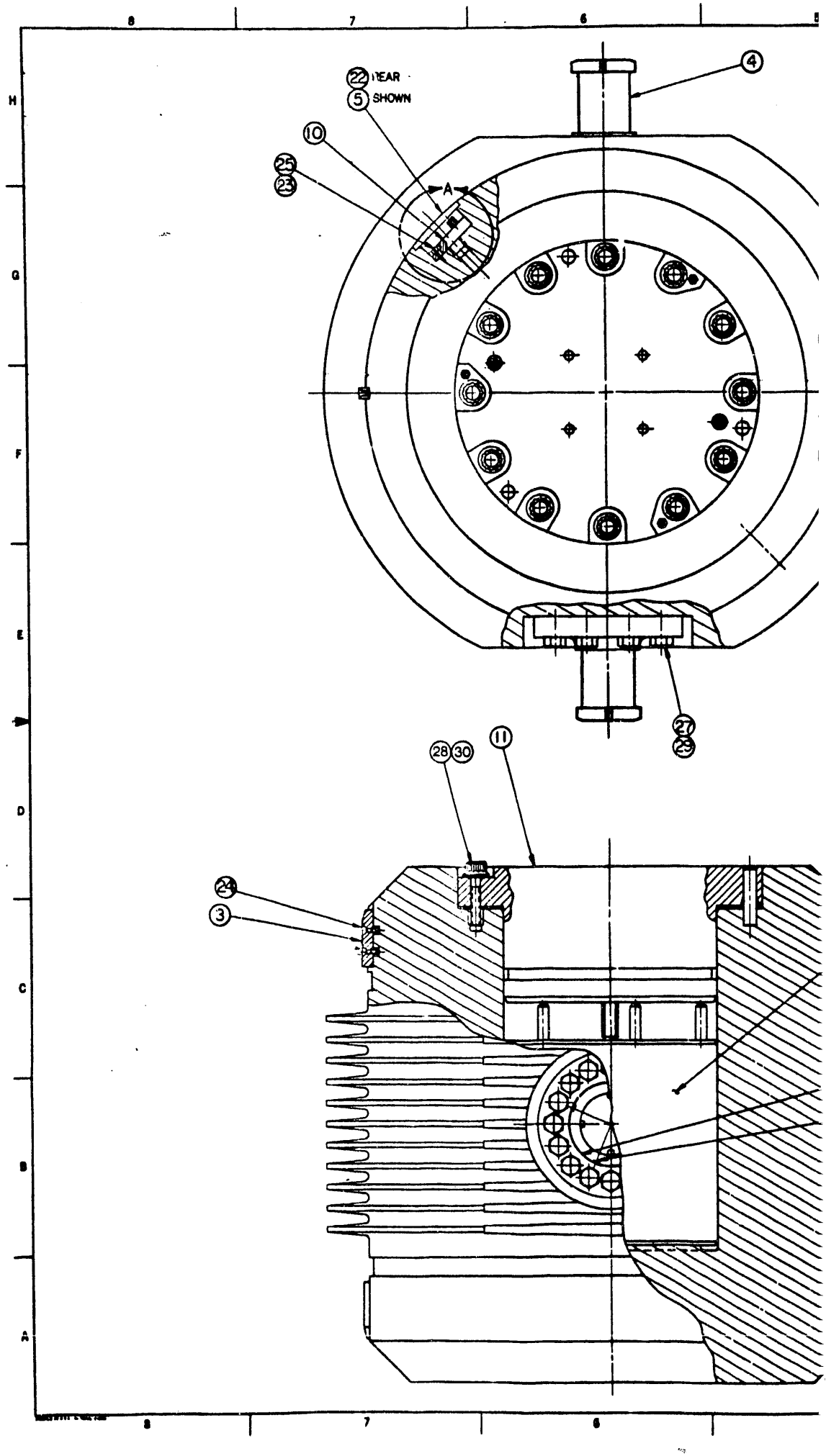
TITLE: GUIDE PIN #2, CASK BODY, (BUSS)

SIZE	CODE IDENT NO.	DWG NUMBER
B	14213	548956

SCALE 1/2 SHEET 1 OF 1

PRINTED IN USA

SF 5300-B 11-80

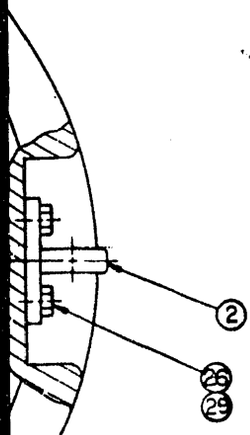

8
7
6
H
G
F
E
D
C
B
A
22 YEAR
5 SHOWN
4
10
25
23
A
27
29
28 30
11
24
3

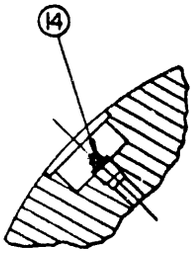
NOTES:

1. MARK DESIGN AGENCY PART NUMBER PER 9919100, CLASS H-1, METHOD B.
2. BOLT MATERIAL PER ASME SB 637 GRADE 718 CAD. PLATE PER QQ-P-416 TYPE II CLASS 3

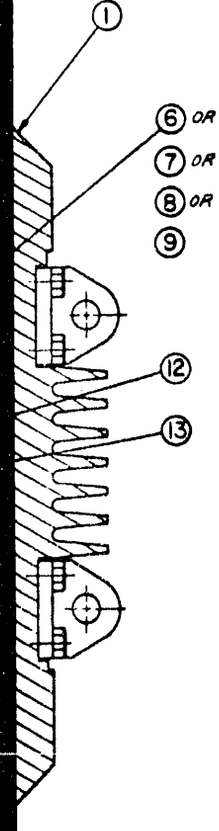
DESIGN AGENCY CONTROL NO. S48981-000

ITEM	ZONE	REVISIONS DESCRIPTION	PREPARED BY	DATE	CHK	APP
A		ELEV 2855 /EAKES 6322		9-21-11	RB	DF
B		R. BROWN 2855/EAKES 6322 ADDED ITEMS 12, 13 AND 22. CHANGED 553743-000 TO -010.		9/6/12	RB	RB
C		REVISED L/M, ITEMS 27/29	JARCHULETA(CHQ)2855/BRONOWSKI, 6323	6-19-13	DB	JWM
D		ITEMS 5 & 22 WERE 2 REQD., ADD ITEM 30 R. BAILEY 2831/D. BRONOWSKI 6643		9/6/13		DB
E		ITEM 22 L/M WAS REAR, ITEM 14 NO. REQD. WAS 2. R. BAILEY 2881 / R. EAKES 2851			RB	RB
F		ITEM 26 WAS 2.25LG, 28 WAS .500LG R. BAILEY 2881 / R. EAKES 2851				DB





DETAIL A
(ALTERNATE ASSY)



S48981-160	S48981-120	S48981-060	S48981-040						
12	12	12	12	MS20002C24	WASHER, FLAT, 1.5" Ø				30
40	40	40	40	MS15795-826	WASHER, FLAT 1" Ø CRES.				29
12	12	12	12	S66574-000	BOLT, EXT. WRENCH, 1.500-12UNF-2A x 5.00LG				28
32	32	32	32		BOLT, HEX HD, 1.000-12UNF-2A x 3.25LG	2			27
8	8	8	8		BOLT, HEX HD, 1.000-12UNF-2A x 2.375LG	2			26
12	12	12	12		BOLT, HEX HD, .500-20UNF-2A x 1.12 LG	2			25
4	4	4	4	MS24671-54	SCREW, FLT HD, 82°, .375-16UNC-2A x 1.50 LG				24
12	12	12	12	MS15795-818	WASHER, FLAT 1/2" NOM. Ø				23
1	1	1	1	553743-010	COVER, DRAIN PLUG, FRONT				22
AR	AR	AR	AR	S31100-006	GUIDE PIN NOSE				21
AR	AR	AR	AR	S49073-000	BASKET GUIDE ASSY				20
AR	AR	AR	AR	S49072-006	LIFTER, BUSS CASK				19
AR	AR	AR	AR	S49069-008	LIFTING FIXTURE, BUSS CASK				18
AR	AR	AR	AR	S48956-000	GUIDE PIN #2				17
AR	AR	AR	AR	S48955-000	GUIDE PIN #1				16
AR	AR	AR	AR	S48598-000	LUG, LIFTING, LID				15
1	1	1	1	S55861-000	PORT VALVE ASSY				14
8	8	8	8	MS51959-115	SCREW, FLAT HD, 82° 3/8"-16 x 2.00" LG.				13
2	2	2	2	S68157-000	WASHER, TRUNNION, CASK BODY				12
1	1	1	1	S54758-000	LID ASSEMBLY				11
2	2	2	2	S54757-000	DRAIN PLUG ASSY				10
1				S50060-000	BASKET ASSEMBLY, 16 HOLE				9
	1			S50059-000	BASKET ASSEMBLY, 12 HOLE				8
		1		S50058-000	BASKET, ASSEMBLY, 6 HOLE				7
			1	S50057-000	BASKET, ASSEMBLY, 4 HOLE				6
1	1	1	1	S53743-010	COVER, DRAIN PLUG				5
2	2	2	2	S51171-000	TRUNNION				4
2	2	2	2	S48958-000	KEY, CASK BODY				3
2	2	2	2	T83109-006	LUG, LIFTING				2
1	1	1	1	T73684-000	BODY, CASK				1
NA	NA	NA	NA	9919100	MARKING, GENERAL METHODS				
NA	NA	NA	NA	9900088	GENERAL REQUIREMENTS				
[illegible]					DESCRIPTION				

LIST OF MATERIAL

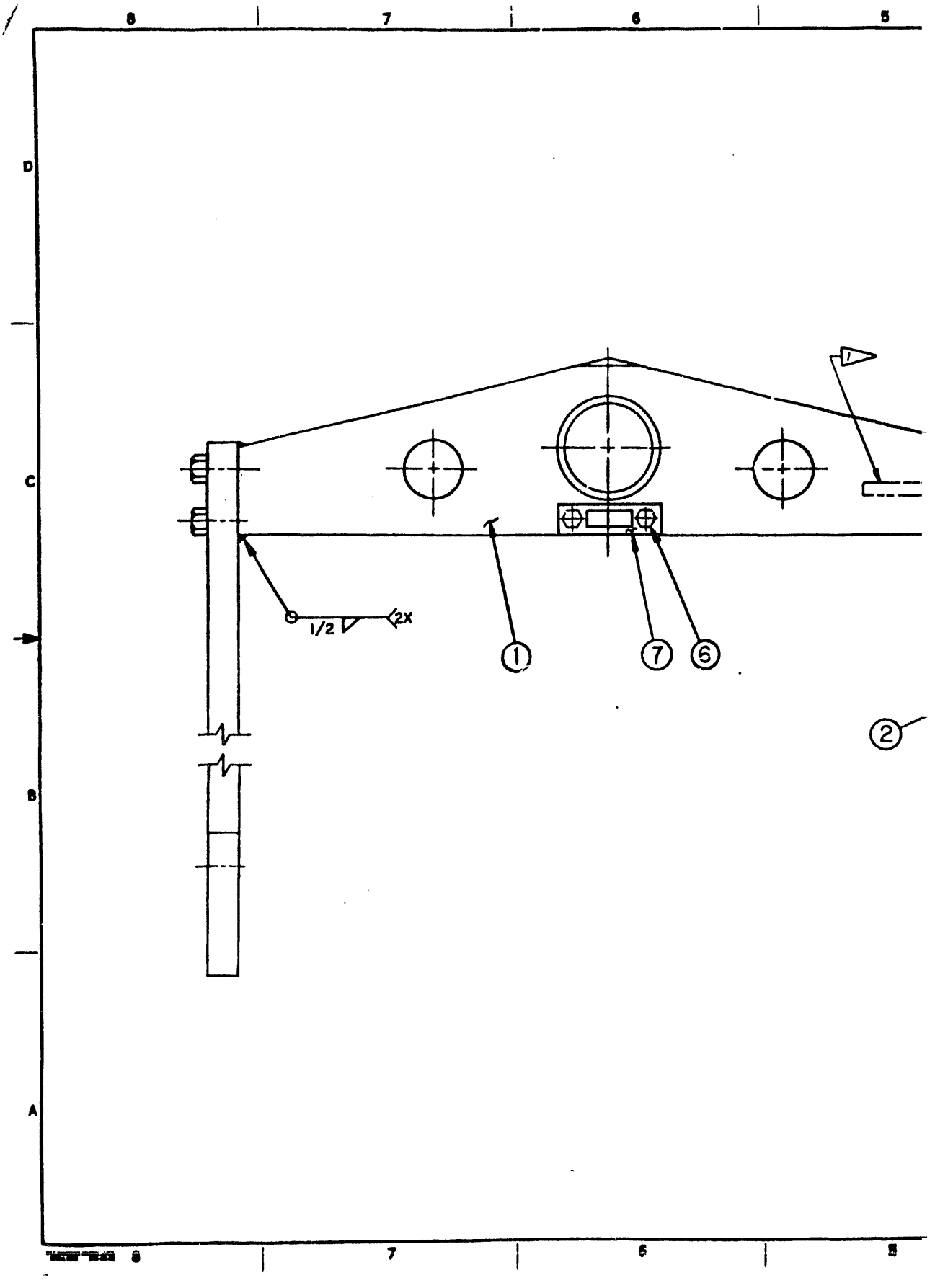
AGENCY APPROVALS			SHEET	/
O-G	DATE	APPROVAL	ISSUE	F
4322	2/4/13	[illegible]	SHEET INDEX	
			PART CLASSIFICATION: UNCLASSIFIED	
2855			DWG CLASSIFICATION LEVEL: UNCLASSIFIED	

TITLE: CASK ASSEMBLY (U)

DWG/ITEM NO.: E 14213 | DWG NUMBER: S48981 | SCALE 1/4 | SHEET 1 OF 1

S48981 REV B

A

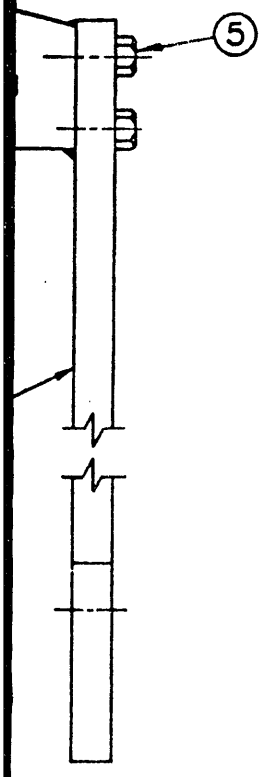

8
7
6
5
D
C
B
A
1/2
2X
1
7
6
2

NOTES

1. MARK DESIGN AGENCY PART NUMBER PER 99I3I00, CLASS C-I, METHOD A. LOCATE APPROX AS SHOWN.
2. WELD AND INSPECT PER 9912119, CLASS II. USE 70XX ELECTRODES.
3. PRIOR TO PAINTING AND FIRST USE, PERFORM A 36,000 POUND (150%) LOAD TEST PER ANSI N14.6, FOLLOWED BY AN NDE OF THE STRUCTURAL WELDS. TEST FIXTURE PART NO. R35028-000 MAY BE USED FOR TESTING.
4. AFTER LOAD TEST AND WELD NDE, APPLY ONE COAT OF ZINC CHROMATE PRIMER FOLLOWED BY TWO COATS OF EPOXY BASED ENAMEL, COLOR: FLAT WHITE.

DESIGN AGENCY PART [redacted] NO.: S49069-000

REVISIONS					
ISSUE	ECN/CRN	DESCRIPTION / PREPARED BY	DATE	CHK'D	APPR'D
A		ROOKE CD 7651 / EAKES 6822	5-23-95	RE	RE
B		ADDED WELDING SYMBOL J.ARCHULETA, (CID) 2895 / BRONOWSKI, 6323	11-1-99	DRB	JLM
C		ADD PART NO. FOR ITEM 7. R. BAILEY 2831 / D. BRONOWSKI 6643	9-2-32		DRB
D		ADDED NOTES 2, 3, & 4, REVISED WELD SYMBOL R. BAILEY 2881 / D. BRONOWSKI 6643			DRB



ITEM	NO OR DWG	DESIGN AGENCY NUMBER	DESCRIPTION	NOTE	SHEET ZONE	QTY
1		S68999-000	LEG, STANDOFF			7
2		MS90728-230	SCR, HEX HD, GRADE 8, Ø 1.00-8UNC-2A X 2.000 LG			6
4		MS90727-276	SCR, HEX HD, GRADE 8, Ø 1.250-12UNF-2A X 3.750 LG			5
						4
						3
2		S49071-000	HOOK			2
1		S49070-000	STRONGBACK			1
NA		99I3I00	MARKING, GENERAL METHODS			
NA		9900000	GENERAL REQUIREMENTS			

LIST OF MATERIAL

AGENCY APPROVALS		
ORG	DATE	APPROVAL

SHEET 1 | ISSUE D

SHEET INDEX

PART CLASSIFICATION: UNCLASSIFIED

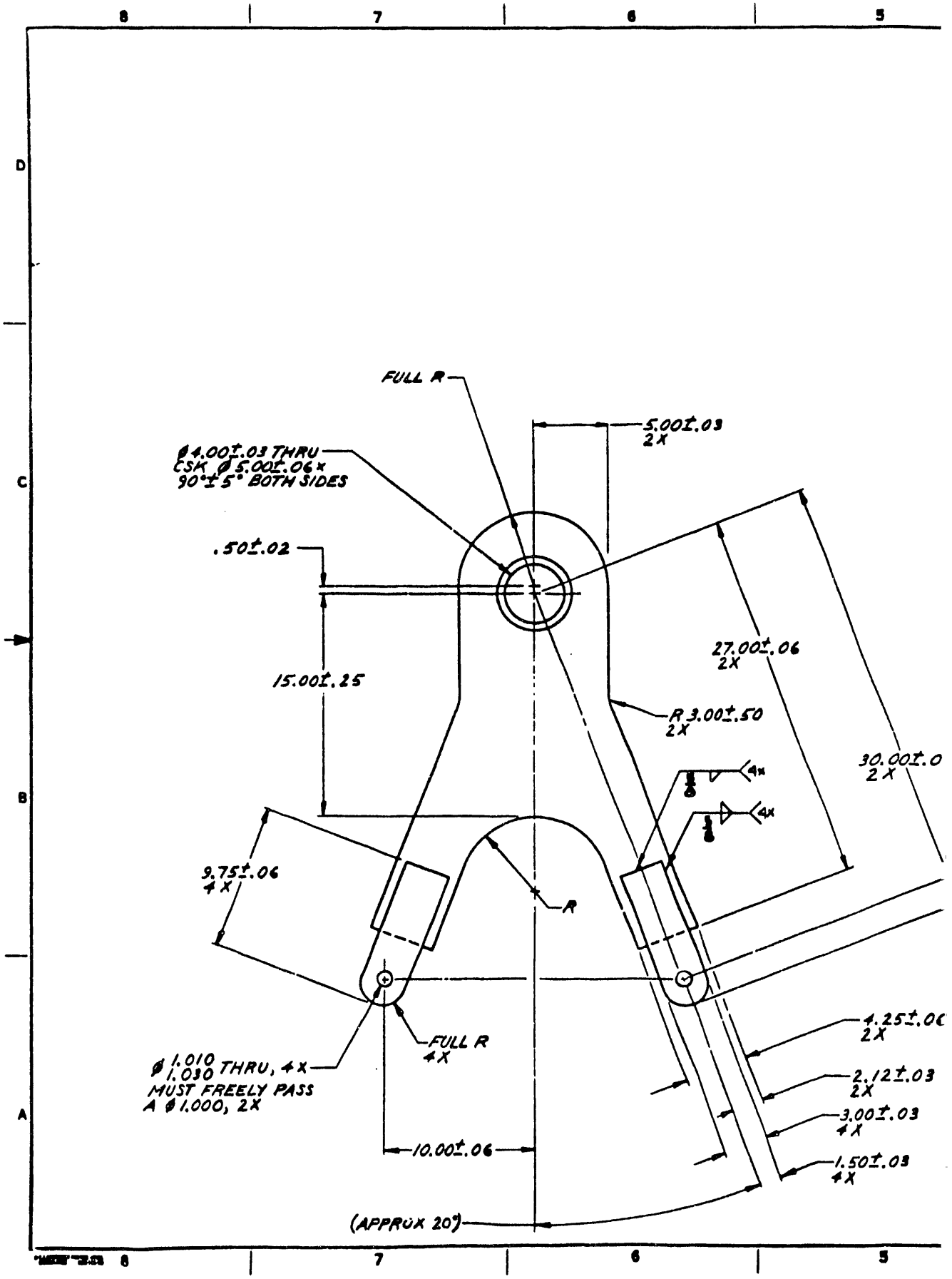
DWG CLASSIFICATION LEVEL: UNCLASSIFIED

TITLE: LIFTING FIXTURE, BUSS CASK (U)

SIZE	FSCM NO.	DWG NUMBER
D	14213	S49069

SCALE 1/4 | SHEET 1 OF 1

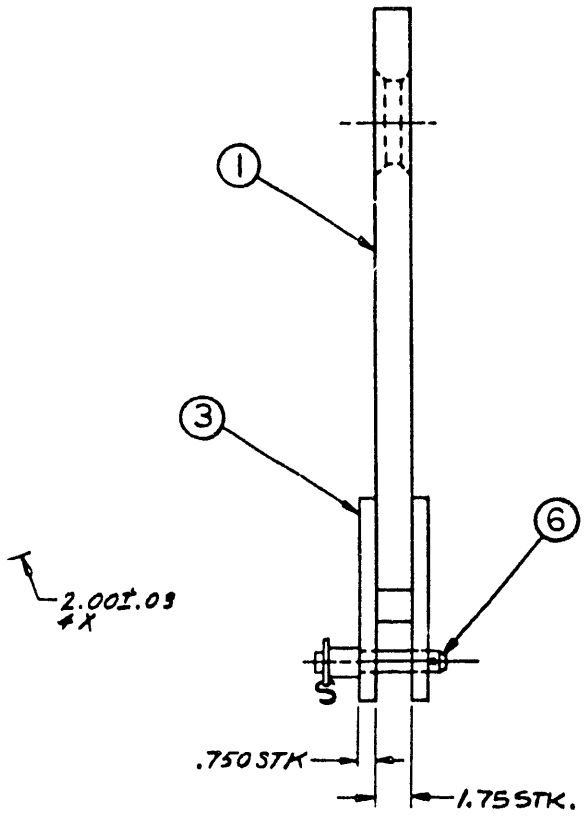
S49069 D


8
7
6
5
D
C
B
A
FULL R
Ø4.00±.03 THRU
CSK Ø5.00±.06 x
90°±5° BOTH SIDES
5.00±.03
2X
.50±.02
15.00±.25
27.00±.06
2X
R 3.00±.50
2X
30.00±.0
2X
4X
4X
9.75±.06
4X
R
FULL R
4X
Ø1.010
1.030 THRU, 4X
MUST FREELY PASS
A Ø1.000, 2X
10.00±.06
4.25±.0
2X
2.12±.03
2X
3.00±.03
4X
1.50±.03
4X
(APPROX 20°)

NOTES

1. WELD AND INSPECT PER 9912119, CLASS I, USING E308 ELECTRODES PER AWS A5.4-69 OR ER308 ELECTRODES PER AWS A5.9-69.
2. MARK DESIGN AGENCY PART NUMBER PER 9919100, CLASS C-1, METHOD A.
3. PRIOR TO FIRST USE, PERFORM A 49,000 POUND (150 %) LOAD TEST PER ANSI N14.6, FOLLOWED BY AN NDE OF THE WELDS. INCLUDE PINS, ITEM 6 IN THE LOAD TEST. TEST FIXTURE, PART NO. R36028-100 MAY BE USED FOR TESTING.

DESIGN AGENCY PART [redacted] NO.	REVISIONS					
	SHT	ZONE	DESCRIPTION / PREPARED BY	DATE	CHK	
S49072-000	A		R COOKE CD7651 / EAKES 6322	5-28	RJB	HRY
	B		ADDED NOTE 3. R. BAILEY 2881 / D. BRONOWSKI 6643			DCB



NO. PIECES	DESIGN AGENCY NUMBER	DESCRIPTION	NOTE	SHEET ZONE	ITEM
2	MS17985-C1635	PIN, QUICK RELEASE Ø1.00 x 3.50 GRIP, CRES			6
					5
					4
4	QQ-S-766	STEEL PLATE, CRES, TYPE 304			3
					2
1	QQ-S-766	STEEL PLATE, CRES, TYPE 304			1
NA	9919100	MARKING, GENERAL METHODS			
NA	9912119	WELDS, CRES			
NA	9900000	GENERAL REQUIREMENTS			

LIST OF MATERIAL

AGENCY APPROVALS		
ORG	DATE	APPROVALS
6322	4/7/93	[redacted]

SHEET 1
ISSUE B
SHEET INDEX
PART CLASSIFICATION: UNCLASSIFIED
DWG CLASSIFICATION LEVEL: UNCLASSIFIED

TITLE: LIFTER, BUSS CASK (U)

SIZE D | PECM NO. 14213 | DWG NUMBER S49072
SCALE 1/4 | SHEET 1 OF 1

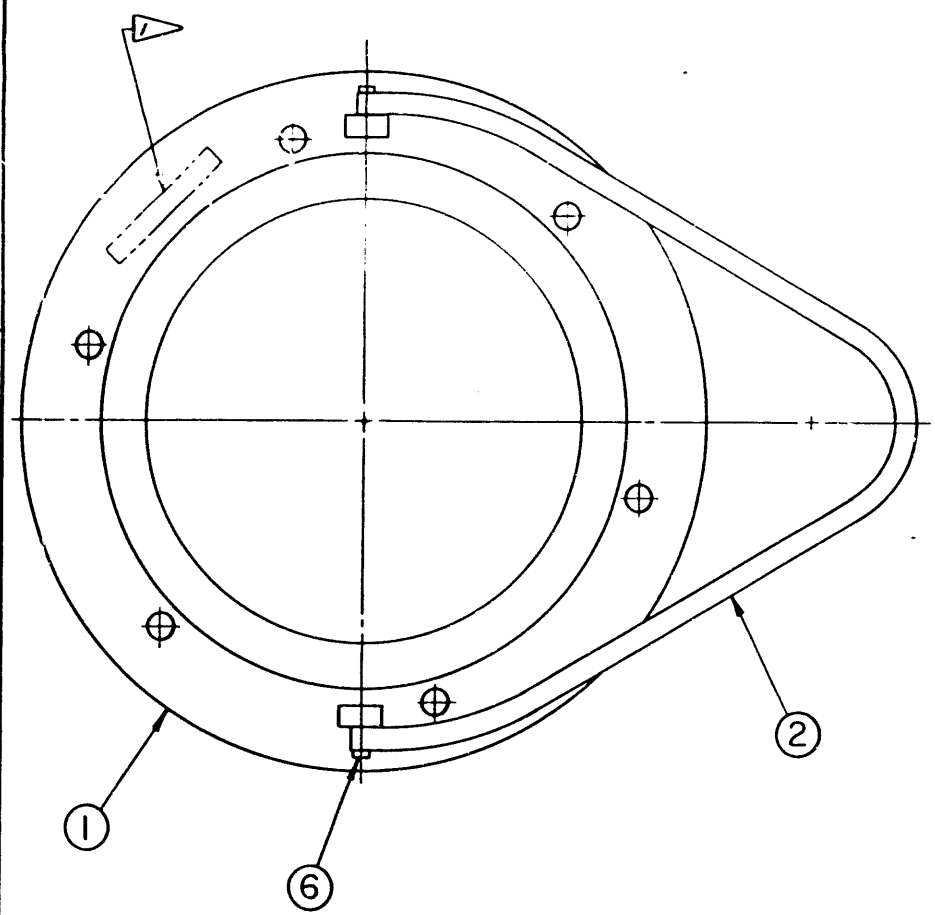
S49072 B

F D C B A

NOTES

1. MARK DESIGN AGENCY PART NO. PER 99/9100, CLASS C-1, METHOD A, LOCATE APPROX. AS SHOWN.

DESIGN AGENCY PART IDENTIFYING NO.	REVISIONS				
	SYM	DESCRIPTION	PREPARED BY	DATE	
S49073-000	A	R COOKE ⓓ7651/EAKES 6322			



ITEM	SHEET ZONE	NOTE	DESCRIPTION	DESIGN AGENCY NUMBER	NO REQD
6			BOLT, SHOULDER, SELF-LOCKING, CRES Ø 5/8 x 1.000 LG		2
4					
3					
2			HANDLE, BASKET GUIDE	S49075-000	1
1			GUIDE, BASKET	S49074-000	1
			MARKING, GENERAL METHODS	99/9100	NA
			GENERAL REQUIREMENTS	9900000	NA

LIST OF MATERIAL

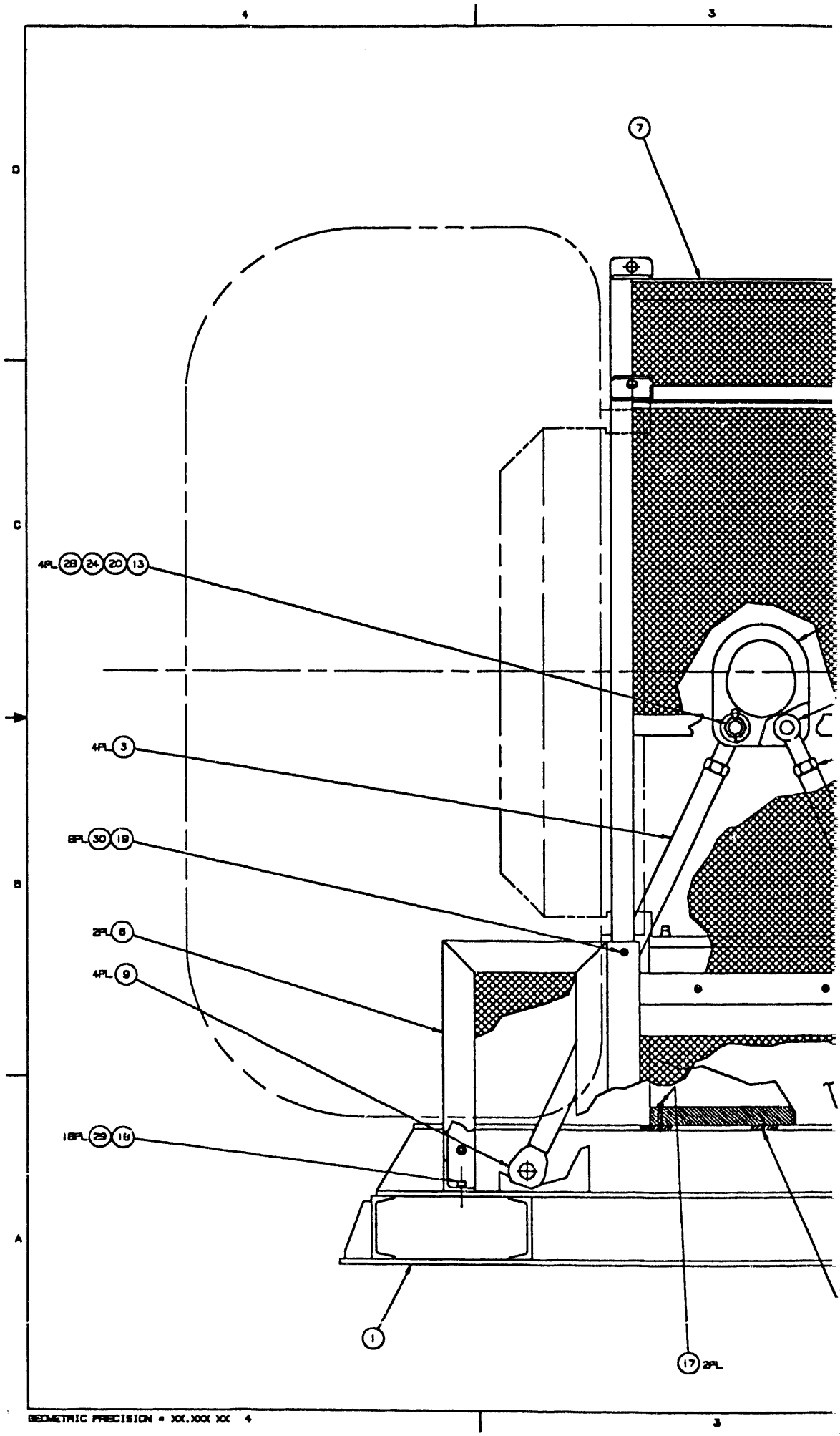
AGENCY APPROVALS			SHEET	1					
ORG	DATE	APPROVALS	ISSUE	A					
6333	7/2/84	[illegible]	SHEET INDEX						
			PART CLASSIFICATION: UNCLASSIFIED						
			DWG CLASSIFICATION LEVEL: UNCLASSIFIED						

TITLE: BASKET GUIDE ASSEMBLY, BUSS

SIZE C | FSCM NO. 14213 | DWG NUMBER S49073

SCALE 1/4 | SHEET 1 OF 1

SPE3000C(9-81)

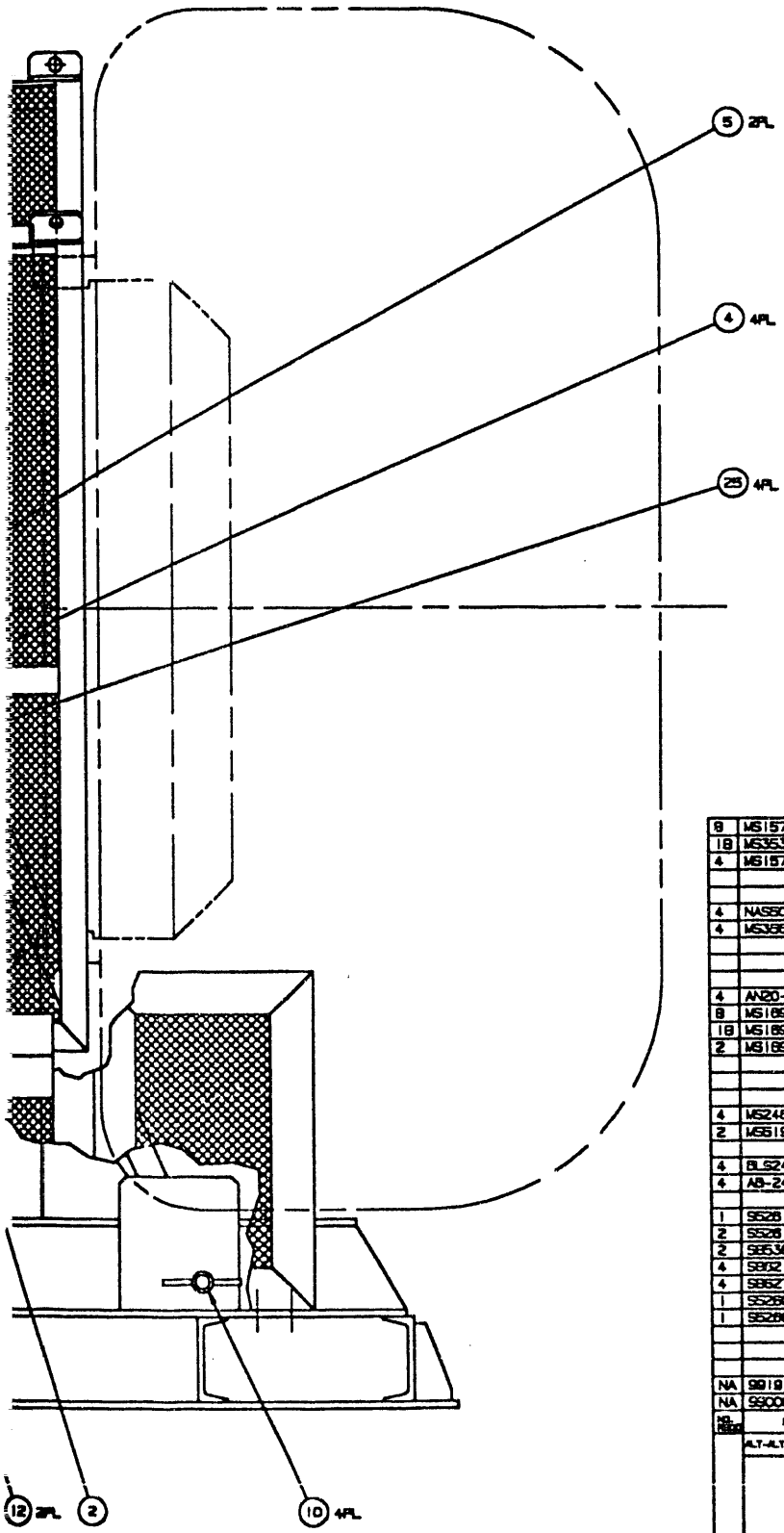

4
3
D
C
B
A
7
4PL 28 24 20 13
4PL 3
6PL 30 19
2PL 6
4PL 9
18PL 29 16
1
17 2PL
GEOMETRIC PRECISION = XX.XXX XX 4
3

NOTES:

1. MAY BE OBTAINED FROM:
   AURORA BEARING CO.
   740 PRAIRIE ST
   AURORA, IL 60506.

2. MAY BE OBTAINED FROM:
   AVIBANK MFG, INC
   210 SOUTH VICTORY BLVD
   BURBANK, CA 91503.

DESIGN AGENCY PART NUMBER	REVISIONS					
	SER	SHEET ZONE	PREPARED BY / DESCRIPTION	DATE	CHK	APVD
550032-000	D		REVISED AND REDRAWN TO CAD; ADDED BARRIER R.RICHARDSON, 2883/ D.BRONOWSKI, 8843			DB



8	MS15795-814	WASHER,FLAT,3/8 DIA				30
18	MS35338-86	WASHER,LOCKING,1/2 DIA				29
4	MS15795-828	WASHER,FLAT,1-1/4 DIA				28
						27
						26
4	NAS509-24	NUT,JAM,HEX,DRILLED 1-1/2-12UNF				25
4	MS35691-86	NUT,JAM,HEX,1-1/4-12UNF,CRES				24
						23
						22
						21
4	AN20-42	MACHINE HD,1-1/4-12UNF-3A X4.437LG				20
8	MS16995-82	#,CAP,SOC-HD,3/8-24UNF-3A X1.25LG				19
18	MS16995-86	#,CAP,SOC-HD,1/2-13UNC-3A X1.25LG				18
2	MS16995-71	#,CAP,SOC-HD,5/16-18UNC-3A X2.25LG				17
						16
						15
						14
4	MS24665-377	PIN,COTTER,.125 Ø X 2.00 LG				13
2	MS51923-305	PIN,SPRING,.250 Ø X 1.00 LG				12
						11
4	BLS240T69	PIN,QUICK RELEASE	2			10
4	AB-242-1	ROD END,BEARING	1			9
						8
1	S52815	PERSONNEL BARRIER - UPPER				7
2	S52814	PERSONNEL BARRIER - LOWER				6
2	S65368	YOKE,TIEDOWN				5
4	S89213	ROD EYE,TIEDOWN				4
4	S86271	TURNBUCKLE,TIEDOWN				3
1	S52807	MOUNTING BLOCK ASSEMBLY				2
1	S52808	PALLET				1
NA	9919100	MARKING, GENERAL METHODS				
NA	9900000	GENERAL REQUIREMENTS				
NO. REQD	PART/CONTROL NO.	DESCRIPTION/MATERIAL	NOTE	SHEET ZONE		ITEM

ALT-ALTERNATE AR-AS REQ'D APS-AS REQ'D PER ASSY EQ-EQUIVALENT MATERIAL NA-GOVERNMENT PA-PROCESS MATERIAL

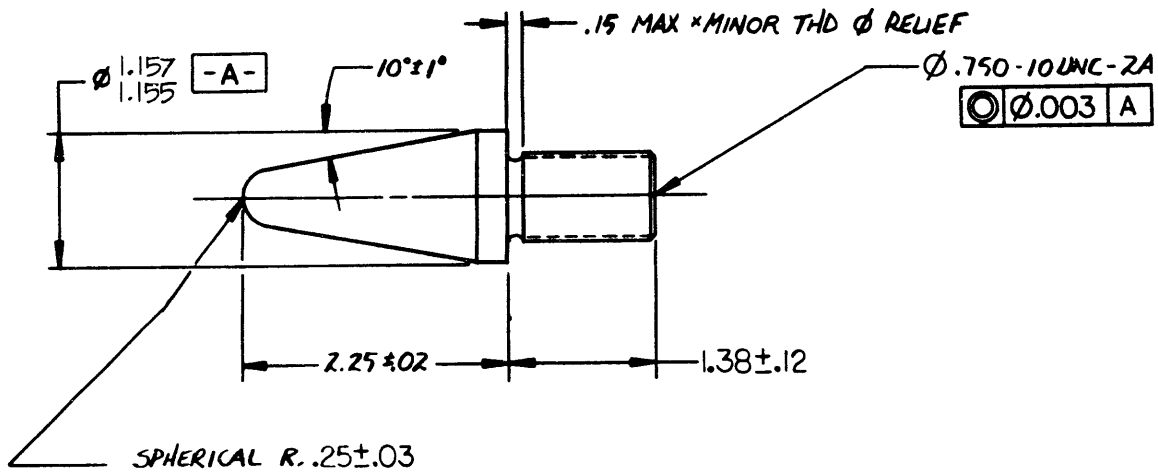
SHEET	1 2 3 4 5 6
ISSUE	D
PART CLASSIFICATION	UNCLASSIFIED
DRAWING CLASSIFICATION	UNCLASSIFIED
TITLE	CRADLE, BUSS CASK (U)
SIZE	E
DRAWING NUMBER	550032
	DASC 14213 SCALE 1/4 SHEET 1 OF 1
STATUS	SA-REL-5-14-93
DRAWN	SA-ANS-V2.1

NOTES:

1. GENERAL REQUIREMENTS ARE DEFINED IN 9900000.
2. MARK DESIGN AGENCY PART NO. PER 9919100, CLASS H-1, METHOD A OR B
3. MATERIAL: ROUND, FREE CUTTING BRASS PER ASTM-B-16, HALF HARD.

DESIGN AGENCY PART [redacted] NO.
551100-000

REVISIONS					
ISSUE	DESCRIPTION	PREPARED BY	DATE	CHKR	ENGR.
A	PLATZBECKER, 7655/EAKES, 6322		5/31/84	RE	HRY
B	1.38±.12 WAS 1.25, REDIMENSIONED SPH. R C. JOJOLA (C&D) 7651/EAKES 6323		9/4/84	RE	HRY
C	NOTE 3 WAS TEFLON® PER MIL-P-19468 R COOKE CO 7655/EAKES 6322		11/27/84	RE	HRY
D	Ø 1.157 1.155 WAS Ø 1.252 1.250 HOLLING 2853 / EAKES 6322		2/19/85	RE	RE



AGENCY APPROVALS		
ORG	DATE	INITIALS
1330	[illegible]	[illegible]

SHEET 1
ISSUE D
SHEET INDEX
PART CLASSIFICATION: UNCLASSIFIED
DWG CLASSIFICATION LEVEL: UNCLASSIFIED

TITLE: GUIDE PIN NOSE, CASK BODY, (BUSS)

SIZE	CODE IDENT NO.	DWG NUMBER
B	14213	551100

SCALE 1/1 SHEET 1 OF 1

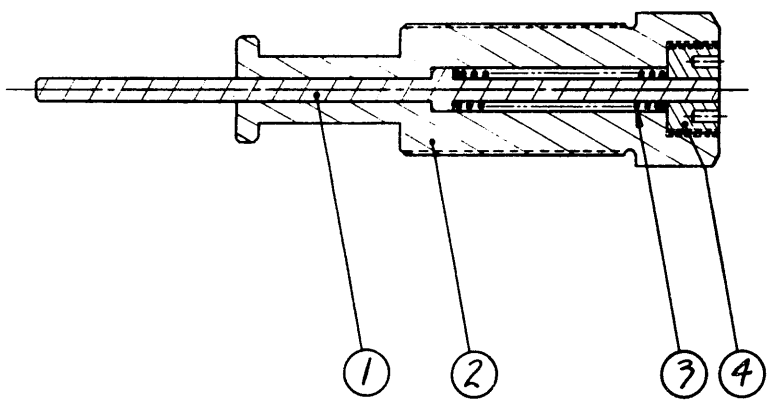
PRINTED IN USA

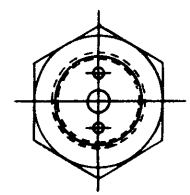
SF 5300-B 11-80

NOTES:

1. GENERAL REQUIREMENTS ARE DEFINED IN 9900000.
2. ITEM 3 MAY BE PURCHASED FROM:
   ASSOCIATED SPRING
   P.O. BOX 231
   GARDENA, CAL 90248
3. MARK DESIGN AGENCY PART NUMBER PER 9919100, CLASS H-1, METHOD OPTIONAL.

DESIGN AGENCY PART [redacted] NO.	ISSUE	REVISIONS DESCRIPTION / PREPARED BY	DATE	CHKR	ENGR
552562-000	A	PLATZBECKER, 7655/ EAKES, 6322	10/14/64	RE	HRY
	B	ADDED NOTE 3 R COOKE CD7655/EAKES 6322	11/13/64	RE	HRY
	C	REVISED HEX HEAD J. ARCHULETA, (C&D) 2855/BRONOWSKI, 6323	5/24/67	DRB	JLM





1	552566-000	SPRING RETAINER, CASK LID (BUSS)			4
1	CD180-014-150Q5	SPRING, COMPRESSION .180 O.D. (S.S) .75 #/IN	2		3
1	552563-000	LIFTING SCREW, CASK LID (BUSS)			2
1	552565-000	INDICATOR PIN, CASK LID (BUSS)			1
NA	9919100	MARKING, GENERAL METHODS			
NA	9900000	GENERAL REQUIREMENTS			
NO REQD	DESIGN AGENCY NUMBER	DESCRIPTION	NOTE	SHEET ZONE	ITEM

LIST OF MATERIAL

AGENCY APPROVALS			SHEET	1
ORG	DATE	APPROVALS	ISSUE	C
6322	7-8		SHEET INDEX	

PART CLASSIFICATION: **UNCLASSIFIED**

DWG CLASSIFICATION LEVEL: **UNCLASSIFIED**

TITLE: LID LIFTING ASSEMBLY, CASK LID (BUSS)

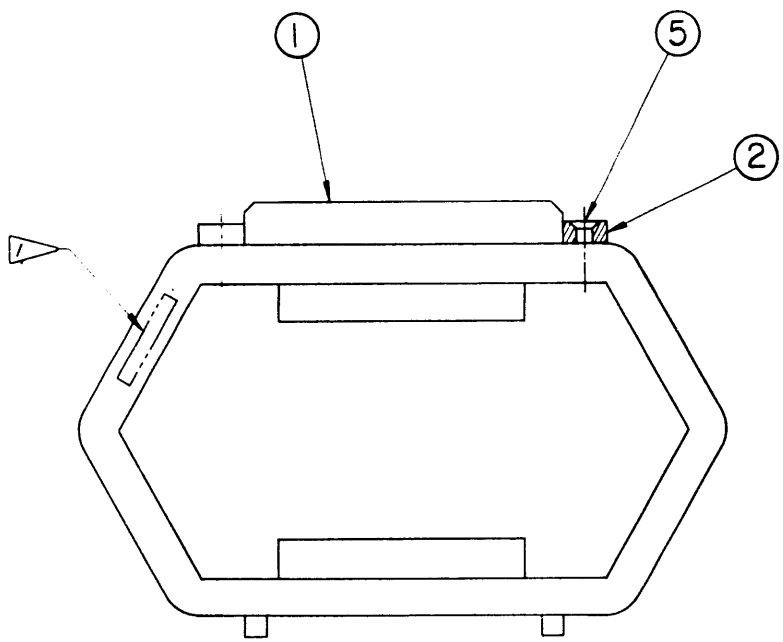
SIZE	FSCM NO	DWG NUMBER
C	14213	552562
SCALE 2/1		SHEET 1 OF 1

SF5300C(9-81)

NOTES

1. MARK DESIGN AGENCY PART NUMBER PER 9919100, CLASS C-1A OR C-2A.

DESIGN AGENCY PART [redacted] NO.	REVISIONS ISSUE	DESCRIPTION PREPARED BY	DATE	CHKR	ENGR
S52607-000	A	R COOKE CD 7651/EAKES 6322	2-26-85	RE	JLM
	B	R. BROWN 2855/BRONOWSKI 6322 CHANGED ITEM 5 TO Ø.750-10UNC	1-9-88	DRB	JLM



NO REQD	DESIGN AGENCY NUMBER	DESCRIPTION	NOTE	SHEET ZONE	ITEM
10		SCREW, MACHINE, 82°FL HD. SELF LOCK, Ø.750-10UNC× 2.00LG			5
					3
2	S52609-000	WARE STRIP			2
1	S52608-000	BLOCK, MOUNTING			1
NA	9919100	MARKING, GENERAL METHODS			
NA	9900000	GENERAL REQUIREMENTS			

LIST OF MATERIAL

AGENCY APPROVALS			SHEET 1
ORG	DATE	APPROVALS	ISSUE B
6323	2/15/85	[signature]	SHEET INDEX
			PART CLASSIFICATION: UNCLASSIFIED
			DWG CLASSIFICATION LEVEL: UNCLASSIFIED

TITLE: MOUNTING BLOCK ASSEMBLY

SIZE C | FSCM NO. 14213 | DWG NUMBER S52607 | SCALE 1/4 | SHEET 1 OF 1

SF5300C(9 81)

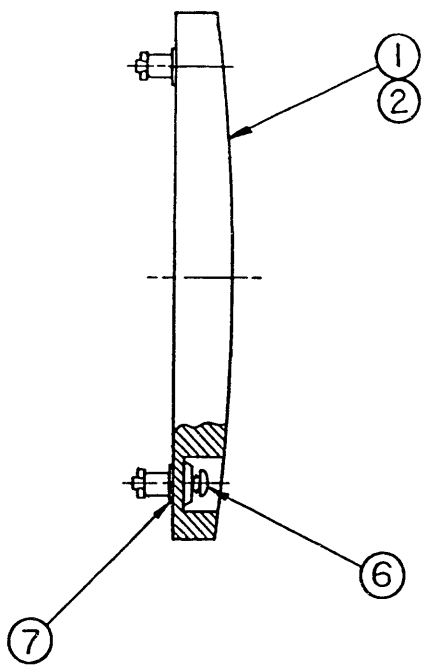
NOTES

1. MARK DESIGN AGENCY PART NUMBER PER 9919100. CLASS H-1. METHOD OPTIONAL.

2. ITEMS 6 & 7 MAY BE OBTAINED FROM CAMLOC DIV., REXNORD SPECIALTY FASTENERS GROUP, 601 ROUTE 46 WEST, HASBROUCK HEIGHTS, NEW JERSEY 07604.

DESIGN AGENCY PART IDENTIFYING NO.	REVISIONS				
	STATUS	DESCRIPTION	PREPARED BY	DATE	CHKD
SEE TABULATION	A	R COOKE CO 7651 / EAKES 6322		31-85	RE HRY
	B	ITEM 2 L/M FRONT WAS REAR			RE KE
		R. BAILEY 2881 / R. EAKES 2851			

F 11 6/13



S53743-020	S53743-010					
4	4	2600-SW	RETAINING RING, CRES			7
4	4	26551-5	STUD ASSY, CRES			6
						4
1		S58998-000	PLATE, COVER (FRONT)			2
	1	S53741-000	PLATE, COVER			1
NA	NA	9919100	MARKING, GENERAL METHODS			
NA	NA	9900000	GENERAL REQUIREMENTS			
	NO REQD	DESIGN AGENCY NUMBER	DESCRIPTION	NOTE	SHEET ZONE	ITEM

LIST OF MATERIAL

ASSEMBLY APPROVALS			SHEET 1
ORG	DATE	INITIALS	ISSUE B
6313	4/8/85	[illegible]	SHEET INDEX

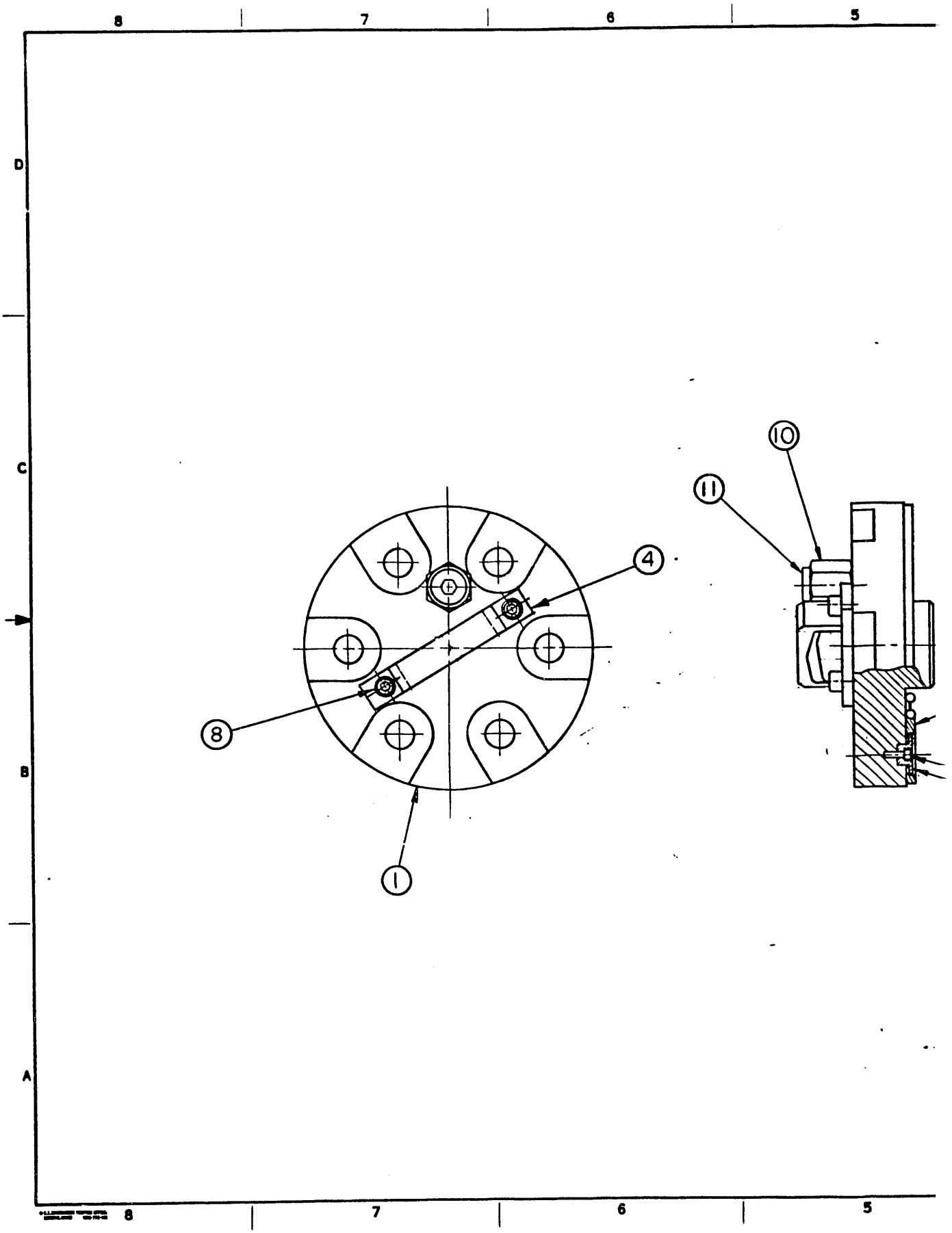
PART CLASSIFICATION: UNCLASSIFIED

SYMB. CLASSIFICATION LEVEL: UNCLASSIFIED

TITLE: COVER, DRAIN PLUG (U)

SIZE	CODE IDENT. NO.	DWG. NUMBER
C	14213	S53743

SCALE | SHEET 1 OF 1


8
7
6
5
D
C
B
A
10
11
4
8
1

NOTES

1. MARK DESIGN AGENCY PART NUMBER PER 9919100, CLASS H-1, METHOD A.
2. ITEMS 10 & 11 MAY BE OBTAINED FROM PARKER HANNIFIN CORP., TUBE FITTINGS DIV., 17325 EUCLID AVE., CLEVELAND, OHIO 44112.

DESIGN AGENCY PART [redacted] NO.	REVISIONS					
	ZONE	LTR	DESCRIPTION	PREPARED BY	DATE	CHK	APP
S54757-000		A	RCOOKE CD7651/EAKES 6322		10-X-95	RE	PE
		B	REVISED L/M, ITEM 8, .500 WAS .625 & MS16995-48 WAS -49 J.ARCHULETA, (C/D) 2855/BRONOWSKI, 6323		6-A-97	DRB	JLM

						12
3	5-HP5ON-SS	PLUG, HEX, STRAIGHT THD				11
3	4-5-F5065-SS	REDUCER-EXPANDER, STR THD				10
						9
2	MS16998-48	SCREW, CAP, SOC HD, 1/4-20 UNC x .500 LG				8
3	MS16995-9	SCREW, CAP, SOC HD, 0.112-40UNC x .250 LG				7
						6
						5
1	S58940	HANDLE, DRAIN PLUG				4
3	T99945-000	SEAL, DRAIN PLUG				3
3	T99943-000	RETAINER, SEAL, DRAIN PLUG				2
1	T73685-000	PLUG, DRAIN				1
NA	9919100	MARKING, GENERAL METHODS				
NA	9900000	GENERAL REQUIREMENTS				
NO PREFIX	DESIGN AGENCY NUMBER	DESCRIPTION	NOTE	SHEET ZONE	ITEM	

LIST OF MATERIAL

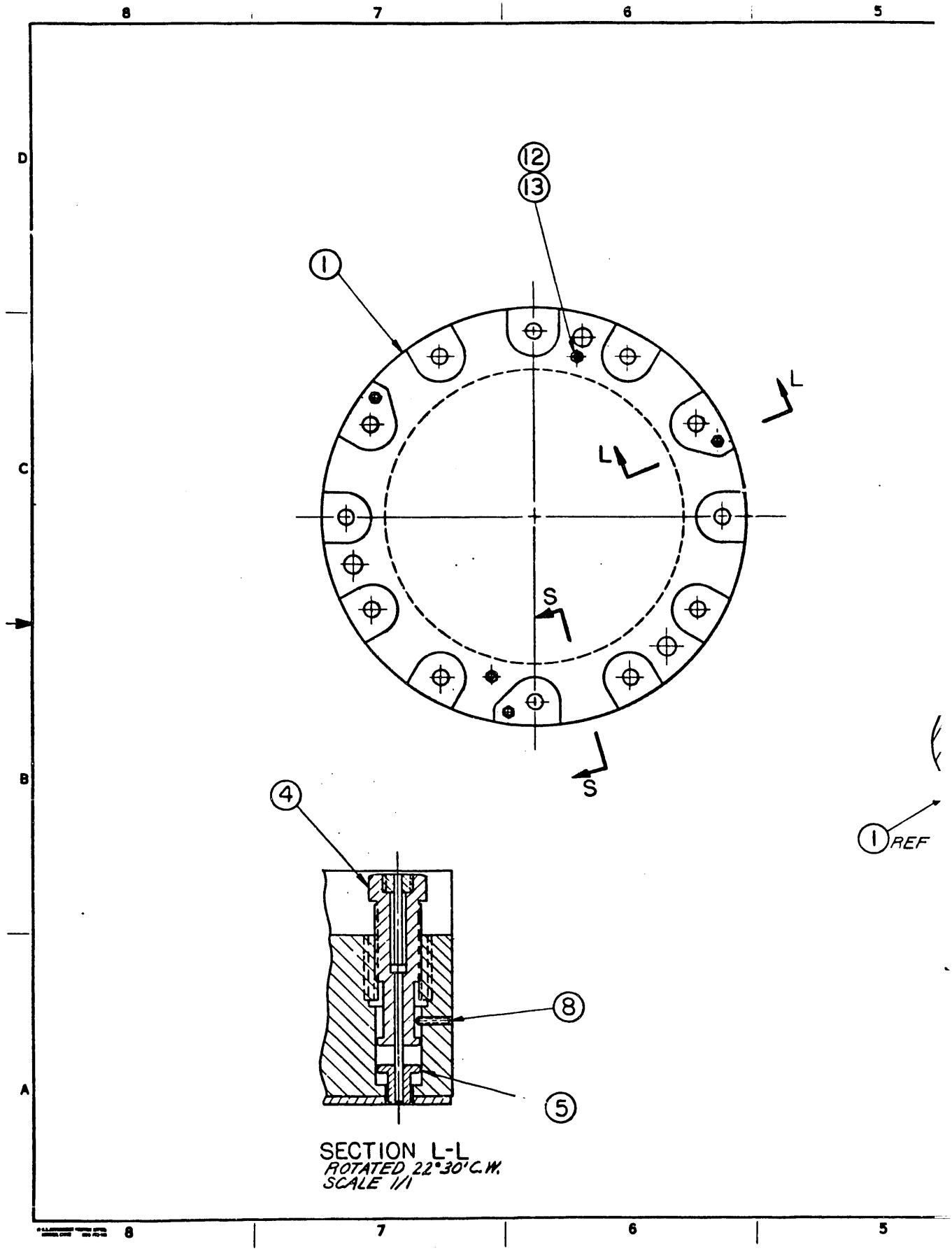
DWG NO S54757

AGENCY APPROVALS			SHEET 1	
ORG	DATE	APPROVAL	ISSUE B	
			SHEET INDEX	
			PART CLASSIFICATION: UNCLASSIFIED	
			DWG CLASSIFICATION LEVEL: UNCLASSIFIED	

TITLE: DRAIN PLUG ASSEMBLY, BUSS

SIZE	FSCM NO	DWG NUMBER
D	14213	S54757
SCALE 1/1		SHEET 1 OF 1

SFE3000(9-81)

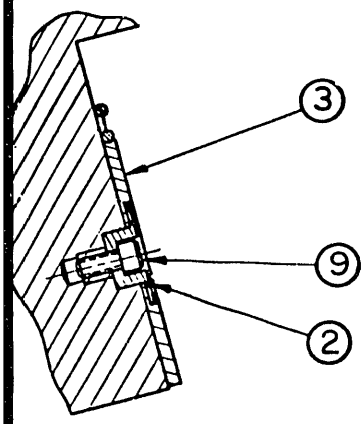


SECTION L-L
ROTATED 22°30' C.W.
SCALE 1/1

NOTES

1. MARK DESIGN AGENCY PART NUMBER PER 9919100, CLASS H-1, METHOD A.
2. ITEMS 12 & 13 MAY BF OBTAINED FROM PARKER HANNIFIN CORP., TUBE FITTINGS DIV., 17325 EUCLID AVE., CLEVELAND, OHIO 44112.

DESIGN AGENCY PART [redacted] NO.	REVISIONS					
	ISSUE	SHEET ZONE	DESCRIPTION PREPARED BY	DATE	ORIG	ISSUE
S54758-000	A		R COOKE CD7657/EAKES 6322	10-31-89	RE	RE



SECTION S-S
SCALE 1/1

NO REQD	DESIGN AGENCY NUMBER	DESCRIPTION	NOTE	SHEET ZONE	ITEM
2	S-HPSON-SS	PLUG, HEX, STRAIGHT THD			13
2	4-S-F506[illegible]-SS	REDUCER-EXPANDER, STR THD			12
					11
					10
6	MS16995-47	SCREW, CAP, SOC HD, Ø.250-20UNC x .375 LG			9
3	MS51021-25	SETSCREW, SOC HD, Ø #6-32UNC x .375LG			8
					7
					6
3	S52564-000	LIFTING SCREW TIP			5
3	S52562-000	LID LIFTING ASSY			4
1	T99946-000	SEAL, CASK LID			3
6	T99944-000	RETAINER, SEAL, CASK LID			2
1	T73693-000	CASK LID			1
NA	9919100	MARKING, GENERAL METHODS			
NA	9900000	GENERAL REQUIREMENTS			

LIST OF MATERIAL

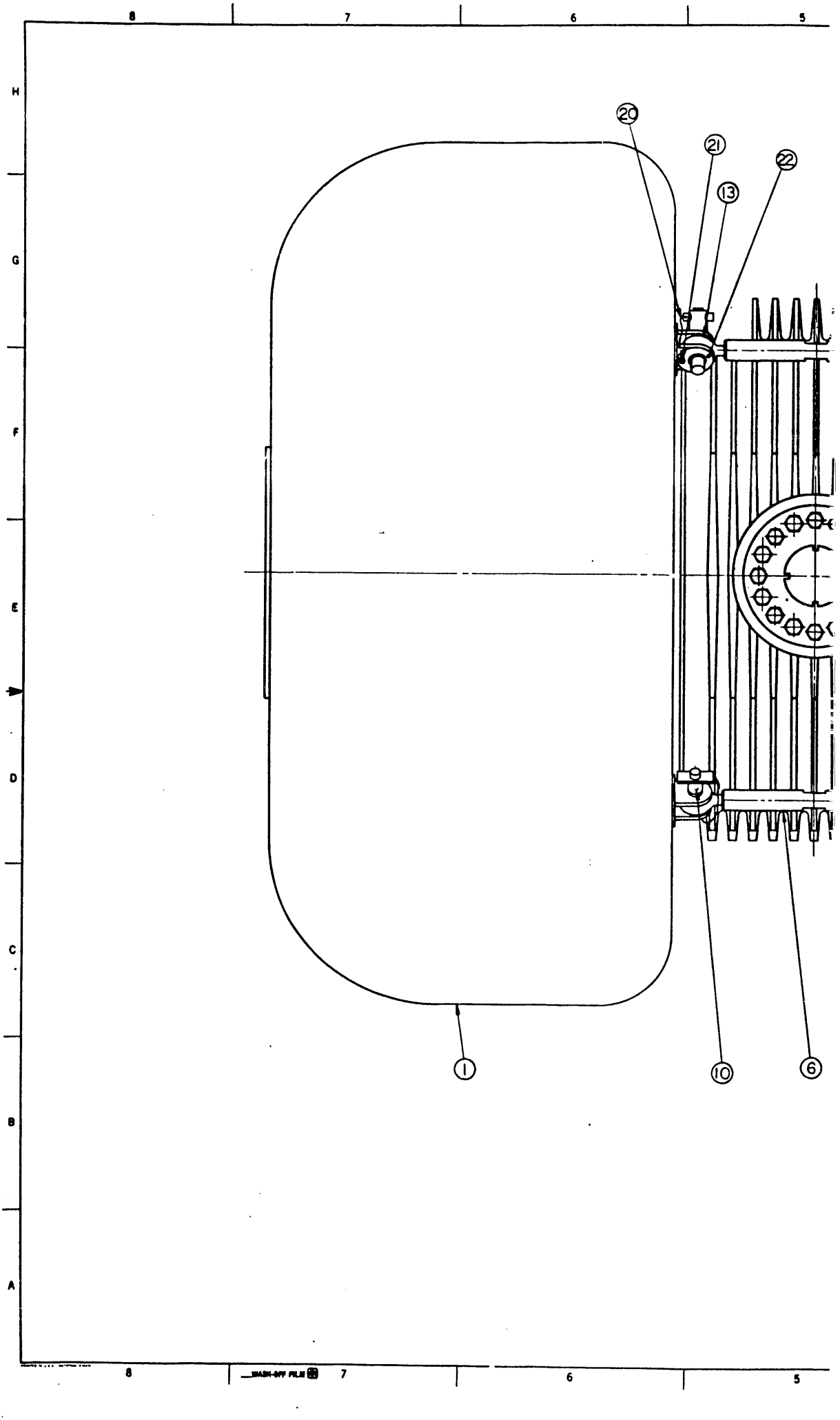
AGENCY APPROVALS		
ORG	DATE	APPROVALS

SHEET 1
ISSUE A
SHEET INDEX
PART CLASSIFICATION: UNCLASSIFIED
DWG CLASSIFICATION LEVEL: UNCLASSIFIED

TITLE: LID ASSEMBLY, BUSS CASK

SIZE D | FSCM NO 14213 | DWG NUMBER S54758
SCALE 1/1 UNLESS NOTED | SHEET 1 OF 1

DWG. NO S54758


8
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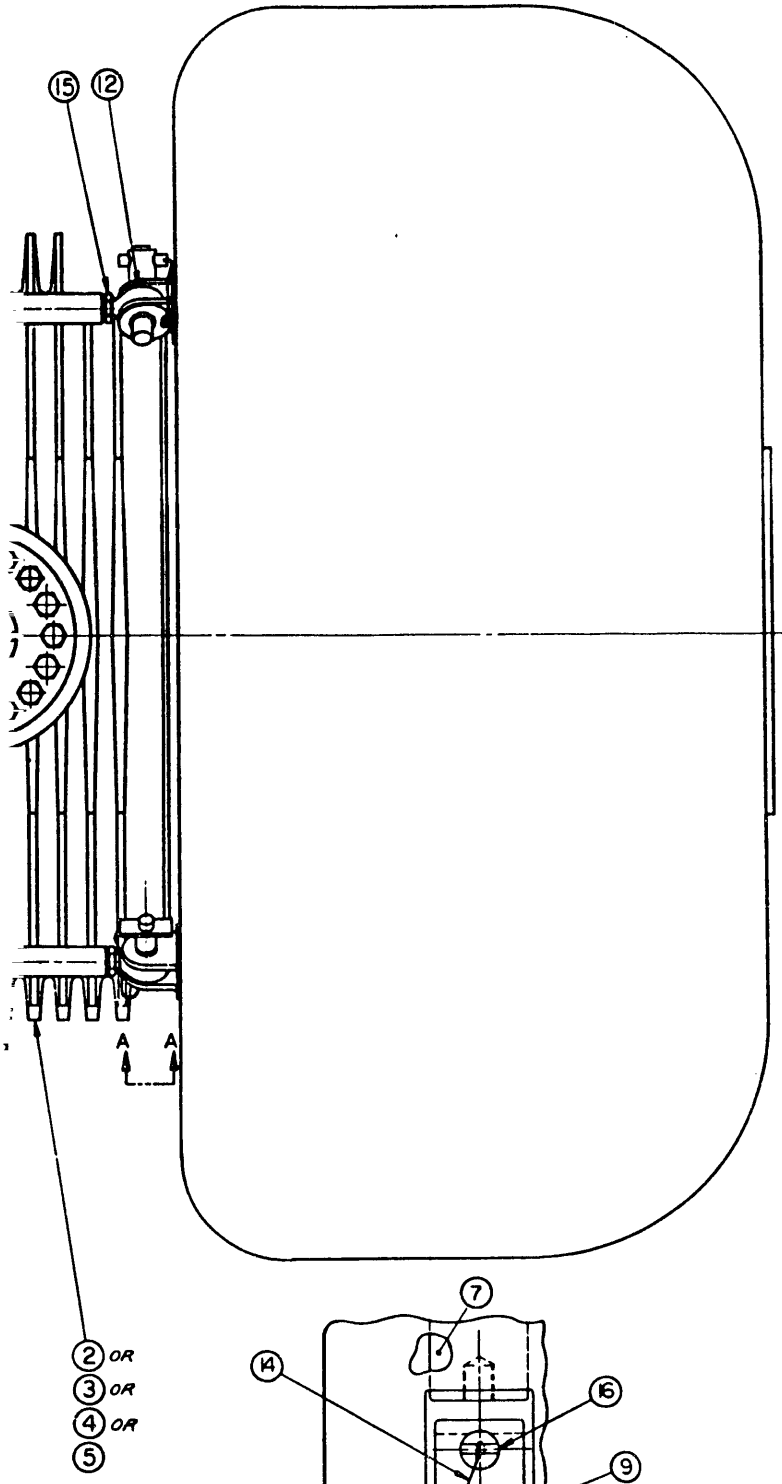
6
WASH-OFF FILM

NOTES

1. MARK DESIGN AGENCY PART NUMBER PER 9919100, CLASS H-1, METHOD 8.
2. MAY BE OBTAINED FROM:
   AVIBANK MFG. INC.,
   210 S. VICTORY BLVD.
   BURBANK, CA 91501

DESIGN AGENCY DRAWING CONTROL NO.
S54773-000

REVISIONS					
REV	ECN	DESCRIPTION	PREPARED BY	DATE	DES	MFG
A		ROOKE ID 7655/EAKES 6322		4-3-95	RW	RW
B		ADDED VIEW A-A, ITEMS 7,9,11,14,16,17 20,21/22. DELETED ITEM 8. J. ARCHULETA (C 40) 2855/BRONOWSKI, 6323		6-14-95	JMA	JMA



VIEW A-A
SCALE : 1/1

S54773-160	S54773-120	S54773-060	S54773-040				
							24
							23
8	8	8	8	S84795-000	WASHER, RETAINER		22
8	8	8	8	MS16997-30	SCREW, SKT. HD. (*8), 164-32UNC x .250		21
8	8	8	8	LT1504-08-12	LANYARD ASSEMBLY	2	20
							19
							18
2	2	2	2	S81387-000	EYE BOLT (1/2)		17
2	2	2	2	S81386-000	EYE BOLT (1/4)		16
4	4	4	4	MS35691-11	NUT, HEX JAM, 10-12UNF, CRES		15
AR	AR	AR	AR		SEAL WIRE		14
4	4	4	4	S86214-200	ROD END, BEARING, TURNBUCKLE		13
4	4	4	4	S86214-100	ROD END, BEARING, TURNBUCKLE		12
AR	AR	AR	AR		CRIMP SEAL		11
8	8	8	8	BLC24GT95	PIN, QUICK RELEASE, T HANDLE, 1.90 DIA	2	10
2	2	2	2	S81352-000	SECURITY BLOCK		9
							8
4	4	4	4	S58938-000	TAPE IMPACT LIMITER		7
4	4	4	4	S48984-000	TURNBUCKLE, IMPACT LIMITER		6
1				S48981-160	CASK ASSEMBLY		5
	1			S48981-120	CASK ASSEMBLY		4
		1		S48981-060	CASK ASSEMBLY		3
			1	S48981-040	CASK ASSEMBLY		2
2	2	2	2	S48929-000	IMPACT LIMITER		1
NA	NA	NA	NA	9919100	MARKING, GENERAL METHODS		
NA	NA	NA	NA	9900000	GENERAL REQUIREMENTS		

LIST OF MATERIAL

AGENCY APPROVALS		
ORG	DATE	APPROVAL
CVS	4/17/95	RW

SHEET 1 / 1
ISSUE B
SHEET INDEX
PART CLASSIFICATION: UNCLASSIFIED
DWG CLASSIFICATION LEVEL: UNCLASSIFIED

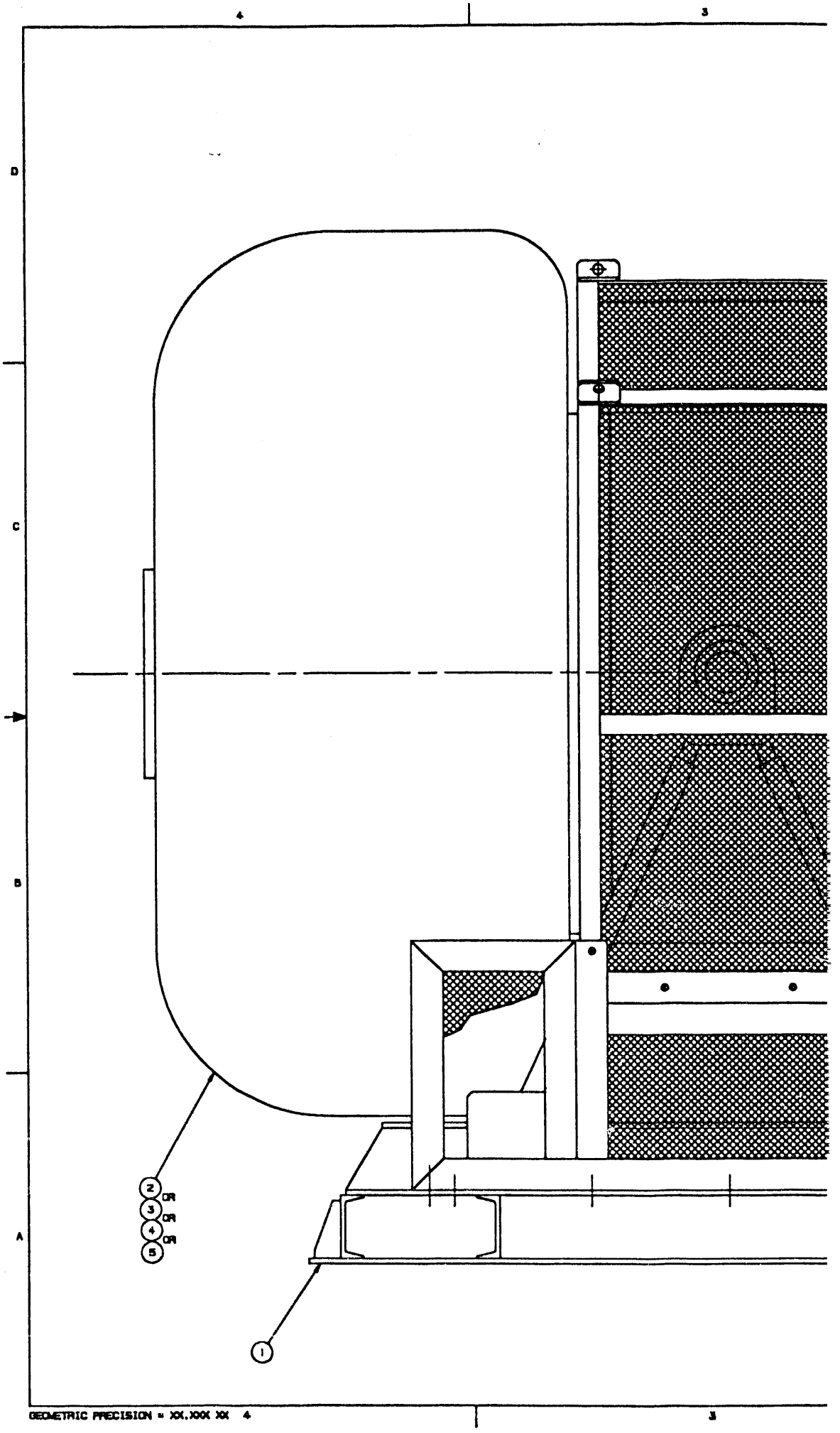
TITLE: CASK WITH IMPACT LIMITERS

SIZE	FSCM NO.	DWG NUMBER
E	14213	S54773

SCALE 1/4 NOTED | SHEET / OF /

DWG NO S54773 REV B

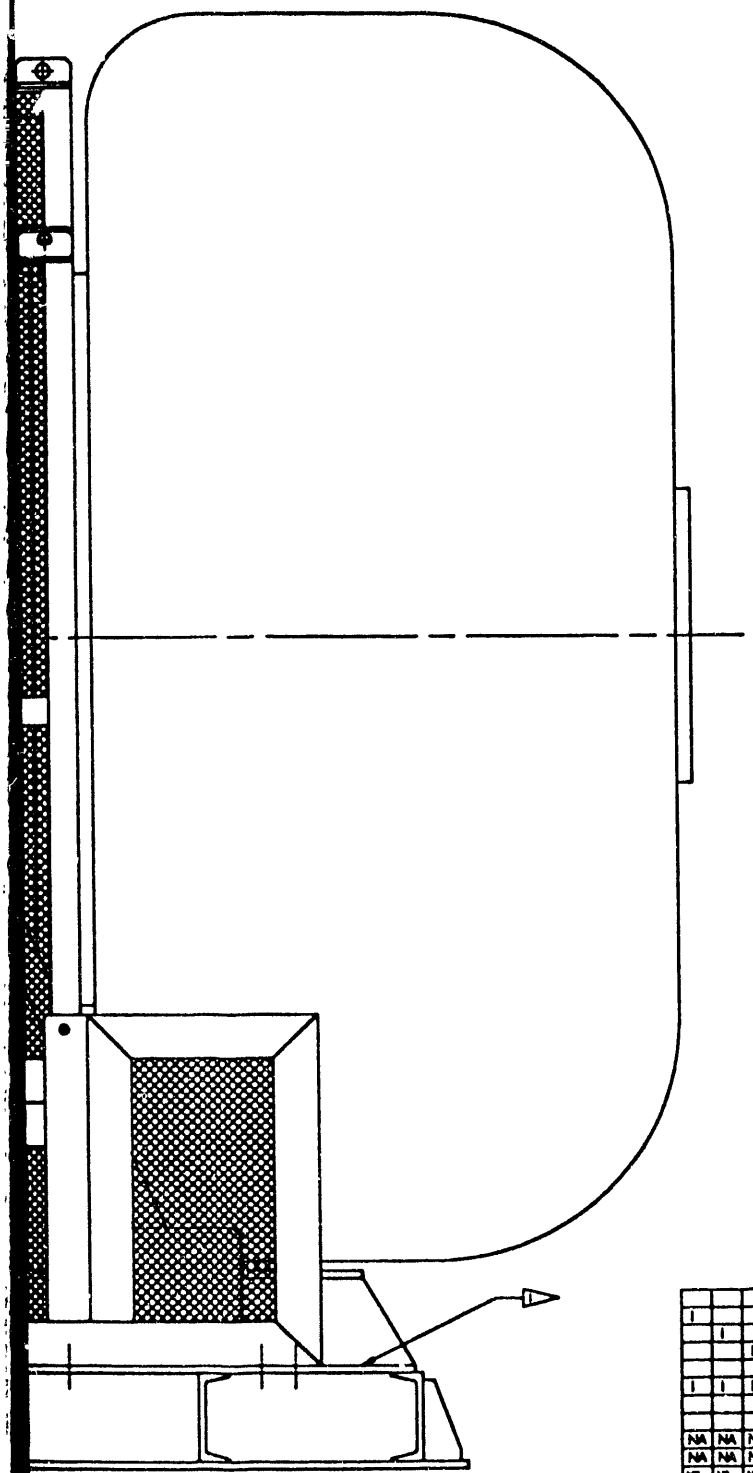
A


4
3
D
C
B
A
2 OR
3 OR
4 OR
5
1
GEOMETRIC PRECISION = XX.XXX XX 4
3

NOTES:

1. MARK DESIGN AGENCY PART NUMBER PER 9919100, CLASS H-1, METHOD B.

DESIGN AGENCY PART NUMBER	REVISIONS						
	ITEM	SHEET AFFECTED	PREPARED BY / DESCRIPTION	DATE	CHKR	APVD
554774-000	C		REVISED AND REDRAWN TO CAD R.RICHARDSON, 2883/ D.BRONOWSKI, 8843			DB



			554773-180	CASK WITH IMPACT LIMITERS			6
1			554773-120	CASK WITH IMPACT LIMITERS			5
	1		554773-060	CASK WITH IMPACT LIMITERS			4
		1	554773-040	CASK WITH IMPACT LIMITERS			3
			554774-000	CRADLE, BUSS CASK			2
1	1	1	9800332-000				1
NA	NA	NA	9919100	MARKING, GENERAL METHODS			
NA	NA	NA	9800000	GENERAL REQUIREMENTS			
NO. REQD	NO. REQD	NO. REQD	PART/CONTROL NO.	DESCRIPTION/MATERIAL	NOTE	SHEET AFFECTED	ITEM

ALT-ALTERNATE AR-AS REQ'D APS-AS REQ'D PER ASSY EN-ENGINEERING MATERIAL NA-DOCUMENT PA-PROCESS MATERIAL

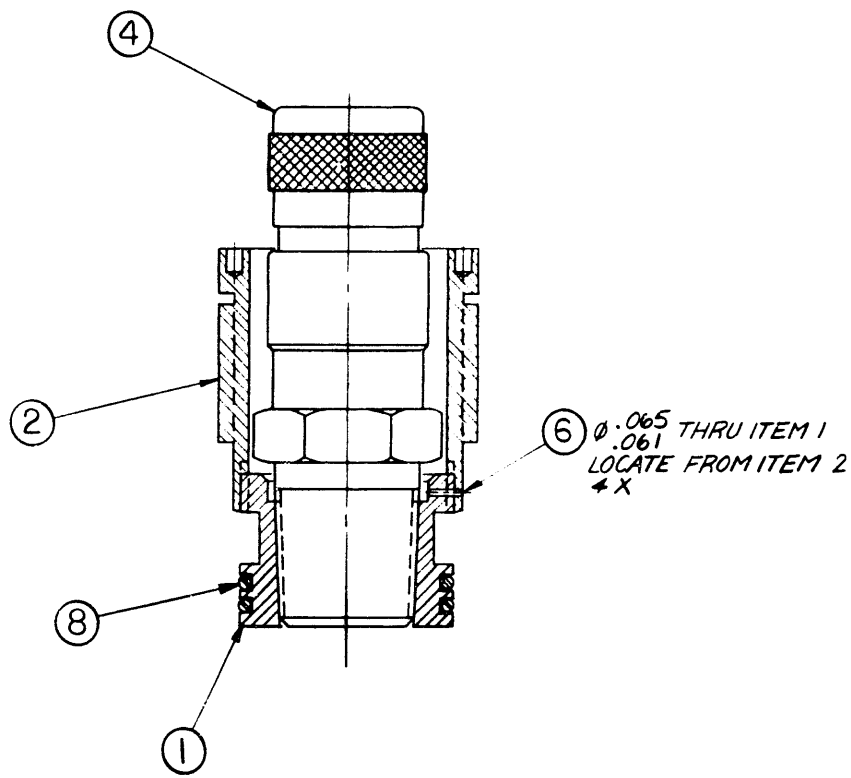
554774-110	554774-100	554774-010	554774-040		

SHEET	1 2 3 4 5 6	TITLE	CASK IN CRADLE (U)
SERIES	C		
PART CLASSIFICATION	UNCLASSIFIED		
DRAWING CLASSIFICATION	UNCLASSIFIED	SERIES E	DRAWING NUMBER 554774
		CHANGE 4213	SCALE 1/4 SHEET 1 OF 1
STATUS SA-RELEASED 5-14-03		DRAWN SA-ANS-V2.1	

NOTES

1. MARK DESIGN AGENCY PART NUMBER PER 9919100, CLASS H-1, METHOD OPTIONAL.

DESIGN AGENCY PART [redacted] NO.	REVISIONS				
	LTR	DESCRIPTION PREPARED BY	DATE	CHKD	APPD
S55861-000	A	ROCKE CO 7655/ALLEN 6322	3-6-86	RE	HKY
	B	REVISED L/M, ITEM 6 J. ARCHULETA, (C/D) 2855/ BRONOWSKI, 6323	6-17	DRB	JLM



NO REQD	DESIGN AGENCY NUMBER	DESCRIPTION	NOTE	SHEET ZONE	ITEM
2	2-024-V747-75	PACKING, PREFORMED, VITON (PARKER)			8
					7
4	MS51923-147	PIN, SPRING Ø 1/16 x 3/16 LG CRES			6
					5
1	SS-QC8-B-8PM	FITTING, QUICK-CONNECT 1/2" SIZE (SWAGELOK)			4
					3
1	S55863-000	SLEEVE			2
1	S55862-000	ADAPTER			1
NA	9919100	MARKING, GENERAL METHODS			
NA	9900000	GENERAL REQUIREMENTS			

LIST OF MATERIAL

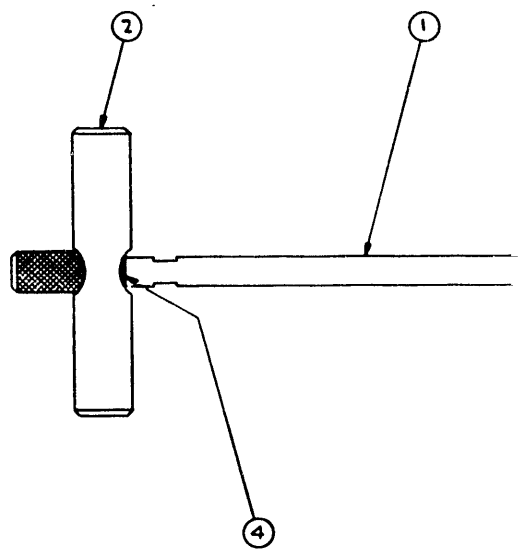
AGENCY APPROVALS		
ORG	DATE	APPROVALS
6323	2/5/86	[signature]

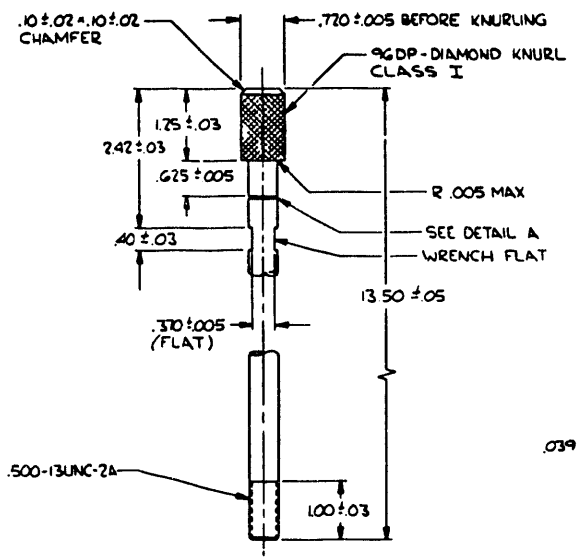
SHEET 1
ISSUE B
SHEET INDEX
PART CLASSIFICATION: UNCLASSIFIED
DWG CLASSIFICATION LEVEL: UNCLASSIFIED

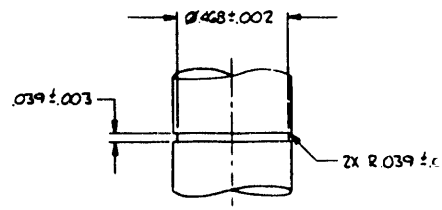
TITLE: PORT VALVE ASSEMBLY

SIZE C | FSCM NO. 14213 | DWG NUMBER S55861
SCALE 2/1 | SHEET 1 OF 1

SF5300C(9-81)







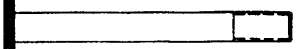
DETAIL A
SCALE 4/1

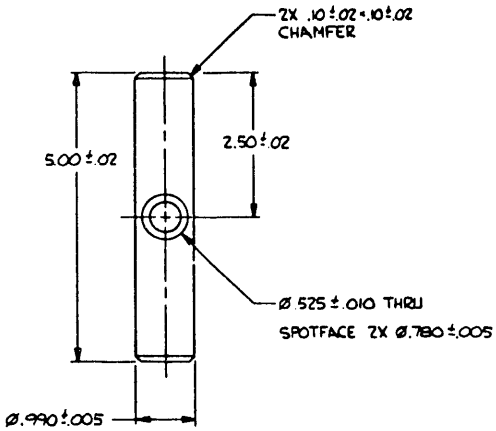
ITEM 1

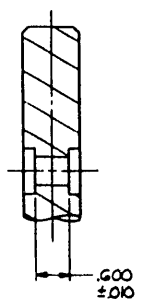
NOTES

1. GENERAL REQUIREMENTS PER 9900000.
2. PASSIVATE PER 9904301.

DESIGN AGENCY PART OR IDENTIFYING NO.	REVISIONS					
	ZONE	LTR	DESCRIPTION	PREPARED BY	DATE	APPD
S949G3-000		A	L. GUILLEN 7855/D BRONOWSKI 935	1-15-88	[illegible]	MY







ITEM 2

ITEM	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION			QTY
1	MS16624-1050	RING, RETAINING			4
					3
1		STEEL, STAINLESS, TYPE 304			2
1		STEEL, STAINLESS, TYPE 304			1
NA	9904301	PASSIVATION, CRES			
NA	9900000	GENERAL REQUIREMENTS			

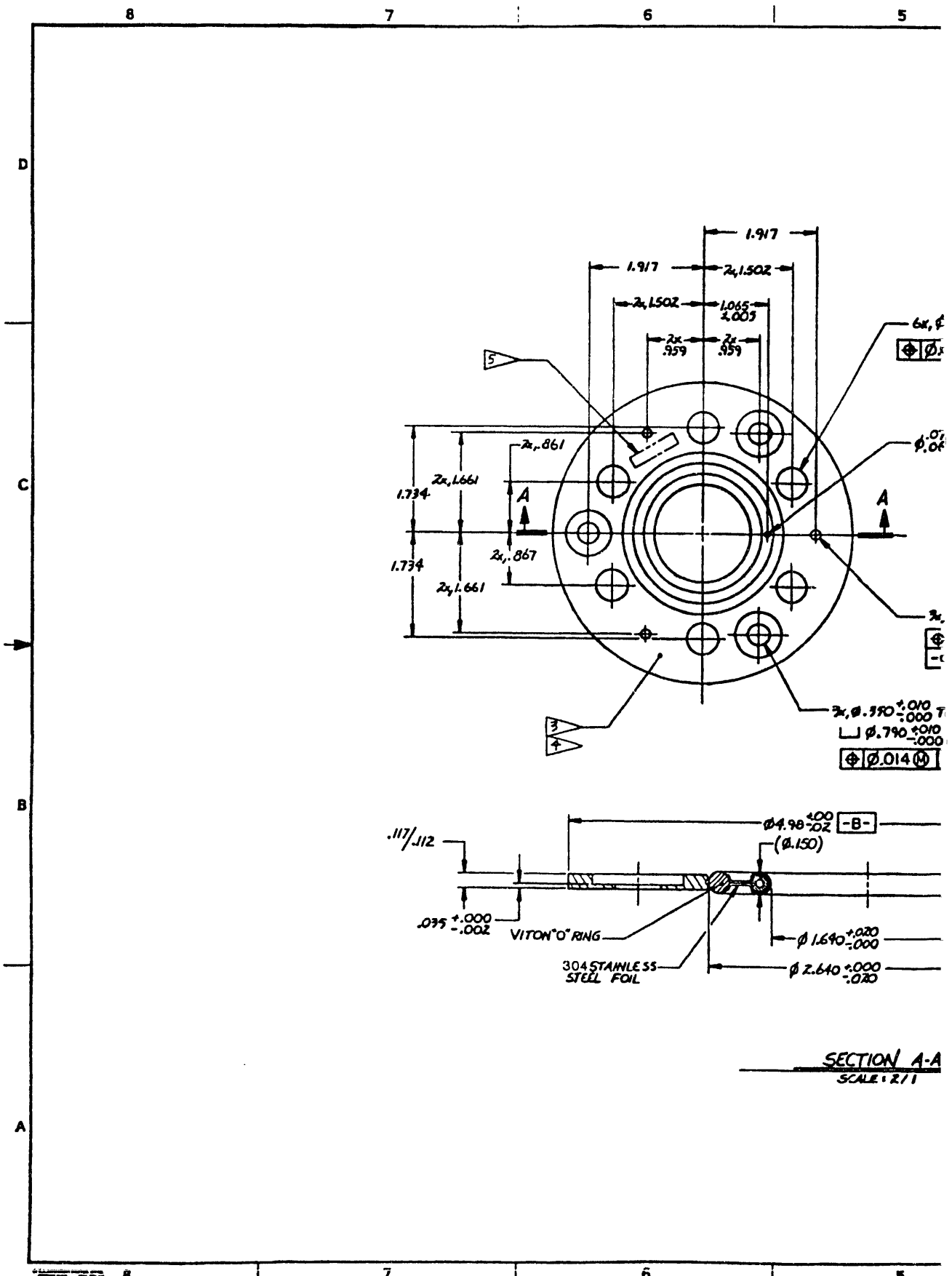
LIST OF MATERIAL

AGENCY APPROVALS			SHEET 1
ORG	DATE	SIGNATURE	ISSUE A
4323	1-15-88	[signature]	SHEET INDEX
4343	1-15-88	[signature]	PART CLASSIFICATION: UNCLASSIFIED
			DWG CLASSIFICATION LEVEL: UNCLASSIFIED

TITLE: TOOL, BUSS TAPE JOINT REMOVAL

SIZE E | PROD NO 14213 | DWG NUMBER S949G3 | SCALE 1/1 & NOTED | SHEET 1 OF 1

S949G3 REV A



SECTION A-A
SCALE: 2/1

NOTES:

1. GENERAL REQUIREMENTS ARE DEFINED IN 9900000.
2. SEAL (TYPE HNDE 290 C WITH LIMITER) MAY BE PURCHASED FROM:
   HELICOFLEX
   400 MYRTLE AVE.
   BOONTOWN, N.J. 07005
3. MATERIAL: STEEL, STAINLESS, TYPE 304 PER QQ-S-763. CONDITION A.
4. PASSIVATE PER 9904301.
5. MARK DESIGN AGENCY PART NO. PER 9919100, CLASS A-1, METHOD A, LOCATE APPROX. AS SHOWN

DESIGN AGENCY PART [redacted] NO.: T99945-000

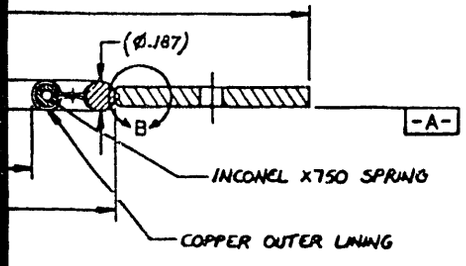
REVISIONS					
ISSUE	SHEET ZONE	DESCRIPTION PREPARED BY	DATE	DSGN	CHKD
A		PLATZBECKER, 7655 / EAKES, 6322	10/18/84	RE	HRY
B		R. BROWN 2855/BRONOWSKI 6323 CHANGED: .118 TO (.112), Ø.165 TO (Ø.150), Ø.185 TO (Ø.187)	12/4/87	DEB	JLM
C		ADDED TO NOTE 2, CONDITION A R. BAILEY 2881 / R. EAKES 2851		RE	RE
D		DIM .117 WAS .112, 2.640 WAS 2.670 ADDED DETAIL B. R. BAILEY 2881 / R. EAKES 2851	2/11/93	RE	RE

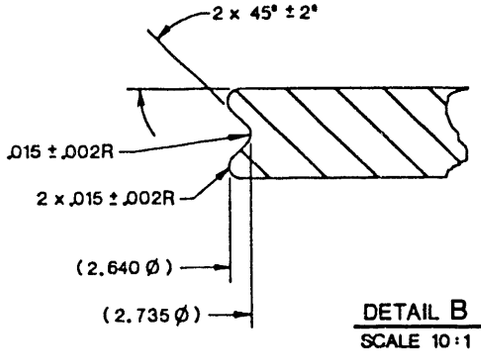
.531 +.006 -.009 THRU
014 Ⓜ A B Ⓢ C Ⓢ

THRU

Ø .149 .137 THRU
Ø.006 Ⓜ A B Ⓢ

THRU
DEPTH SHOWN
A B Ⓢ C Ⓢ



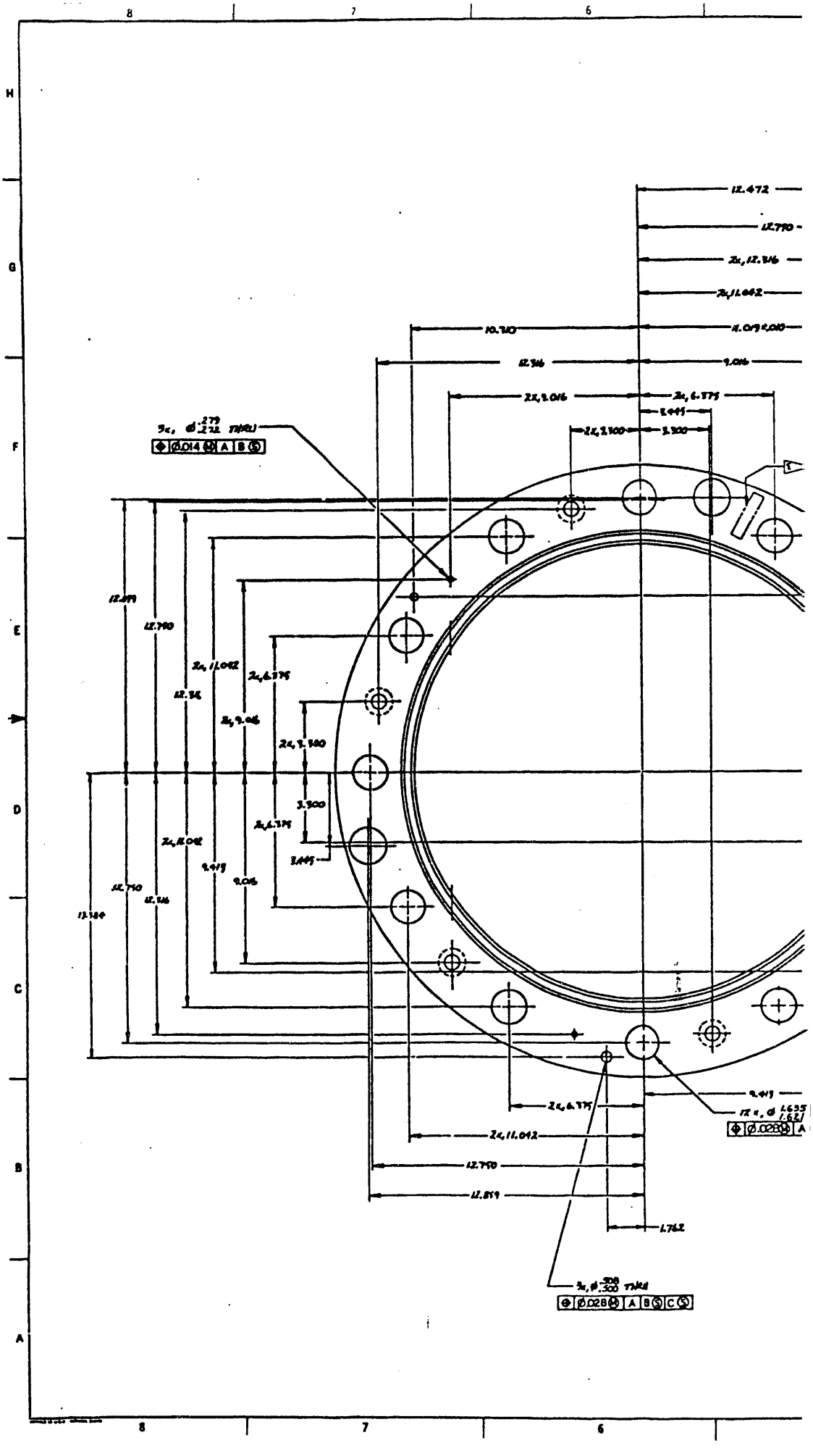


DETAIL B
SCALE 10:1

DWG NO T99945

AGENCY APPROVALS			SHEET 1	TITLE
ORG	DATE	APPROVALS	ISSUE D	SEAL, HELICOFLEX, DRAIN PLUG, (BUSS) (U)
6323	7/24/84	[redacted]	SHEET INDEX	
			PART CLASSIFICATION: UNCLASSIFIED	
			DWG CLASSIFICATION LEVEL: UNCLASSIFIED	SIZE D; FSCM NO. 14213; DWG NUMBER T99945; SCALE 1/1; SHEET 1 OF 1

SPEC00009-611

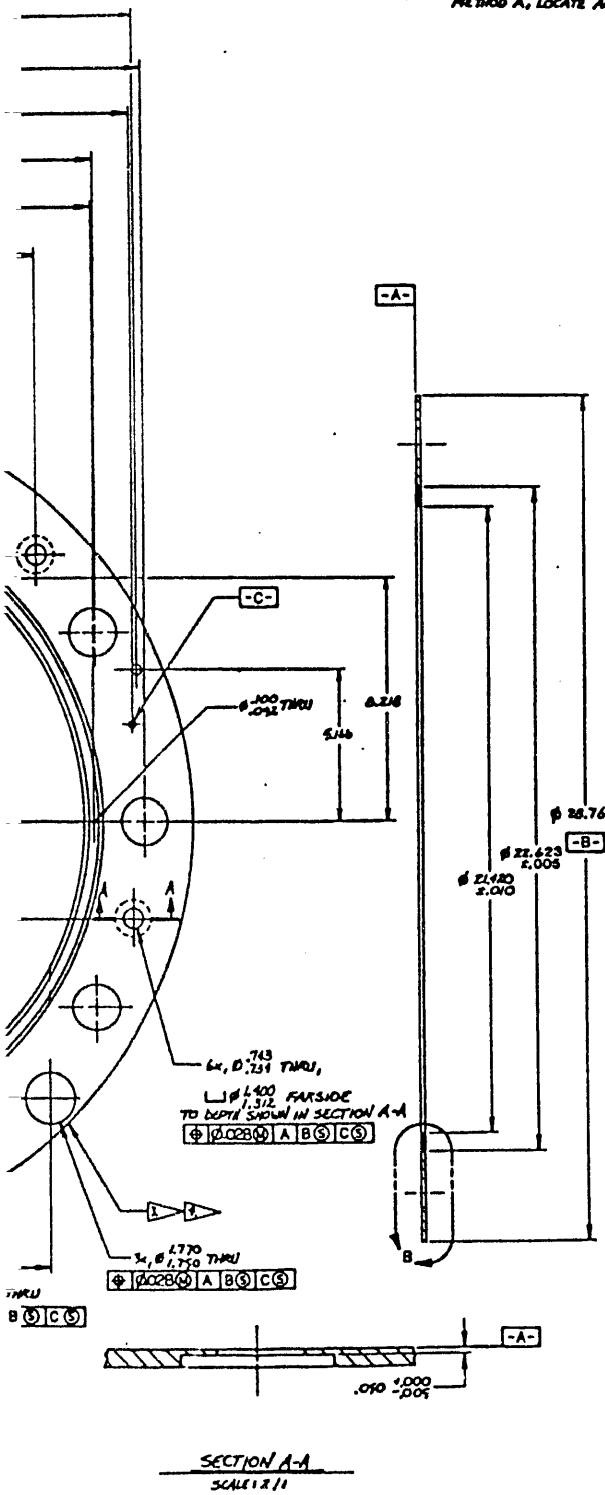

12.472
12.795
2x, 12.346
2x, 11.062
10.740
4.079 4.010
12.346
9.016
2x, 9.016
2x, 6.375
8.445
2x, 8.100
3.300
12.899
12.795
2x, 11.062
2x, 6.375
12.346
2x, 9.016
2x, 8.100
3.300
2x, 6.375
2x, 11.062
9.413
12.795
12.346
13.384
9.413
2x, 6.375
2x, 11.062
12.795
12.819
1.762

DESIGN AGENCY PART IDENTIFICATION NO.
799916-000

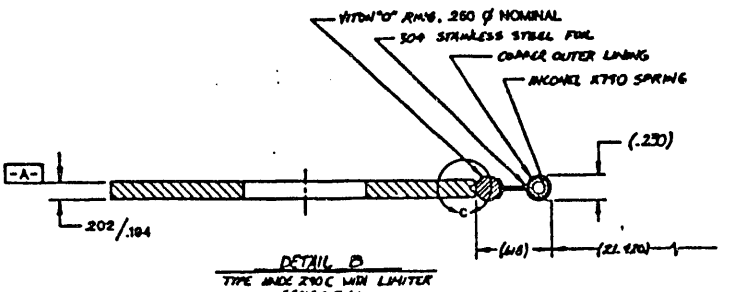
REVISIONS						
ZONE	LTR	DESCRIPTION	PREPARED BY	DATE	APVD	DWN
	A	FLATZBECKER, 7451 / EAKES, 6322				
	B	85 L.574/L.557 DIM. WAS L.042/1.025. ELEY 2855 / EAKES 6322				
	C	R. BROWN 2855/EAKES 6322 CHANGED DIM. 1.514/1.557 TO 1.635/1.621, .220/.210 TO .744/.754, 1.280/1.270 TO 1.400/1.512, .428/.418 TO .508/.500, .275/.262 TO .274/.272 AND POSITIONAL TOL. TO .014. ALL OTHER POSITIONAL TOL. ARE .028.				
	D	R. BROWN 2855/ BRONOWSKI 6525 CHANGED: (.157) TO (.187), (.220) TO (.250), (.205) TO (.250).				
	E	ADDED TO NOTE 3, CONDITION A. ⌀22.823 WAS ⌀22.856, .202 WAS .187 THK, ADDED DETAIL C AND "O" RING ⌀.250 NOMINAL. R. BAILEY 2851 / R. EAKES 2851				

NOTES:

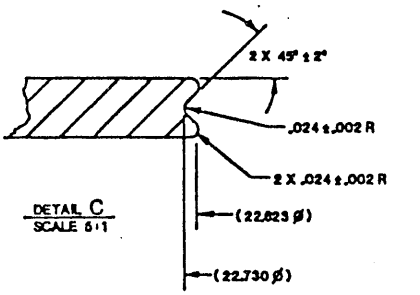
1. GENERAL REQUIREMENTS ARE DEFINED IN 9900000.
2. SEAL MAY BE PURCHASED FROM:
   HELICOFLEX
   400 MARKLE AVE.
   DOWNTOWN, N.J. 07005
1. MATERIAL: STAINLESS STEEL, TYPE 304 PER QQ-S-763, CONDITION A.
2. PASSIVATE PER 9909301.
3. MARK DESIGN AGENCY PART NO. PER 9919100, CLASS A-1, METHOD A, LOCATE APPROX. AS SHOWN.



SECTION A-A
SCALE 1 2/1



DETAIL B
TYPE MDE 290 C WITH LIMITER
SCALE 1 2/1



DETAIL C
SCALE 6 1

AGENCY APPROVALS		
ZONE	DATE	APPROVAL

SHEET	1
ISSUE	E
SHEET INDEX	
PART CLASSIFICATION	UNCLASSIFIED
ZONE CLASSIFICATION LEVEL	UNCLASSIFIED

TITLE: SEAL, HELICOFLEX, CASK LID (BUSS) (U)

SIZE	FSCM NO.	DWG NO.
E	14213	799916
SCALE 1/2		SHEET 1 OF 1

DWG NO 799916 B

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