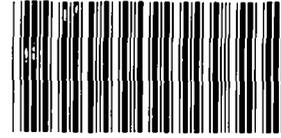


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BENEFICIAL USES SHIPPING SYSTEM CASK

BUSS

MAINTENANCE MANUAL

Prepared by
Sandia National Laboratories, Albuquerque, NM 87185
for the Department of Energy
under Contract DE-AC04-76P00789



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**MAINTENANCE MANUAL
FOR THE
BENEFICIAL USES
SHIPPING SYSTEM CASK**

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Revision 1
May 1993

Abstract

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

* A United States Department of Energy Facility

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Section 1

1.0 GENERAL INFORMATION AND INSTRUCTIONS

1.1 Introduction

This Maintenance Manual contains instructions for maintenance, inspection, testing, and repair of the Beneficial Uses Shipping System (BUSS) cask. This manual details tasks that are outlined in the BUSS Safety Analysis Report for Packaging (SARP). This system consists of: the cask assembly, transportation skid, and ancillary equipment. Refer to Section 1.4 of the BUSS Cask Operations Manual for a complete system description. The trailer is dedicated to the BUSS and maintenance is the responsibility of the owner or caretaker.

1.2 Scope and Purpose

This manual is divided into 10 sections. Section 1 contains general information and instructions. Inspection criteria for the cask assembly, transportation skid assembly, ancillary equipment, and the transport trailer are contained in Sections 2, 3, 4, and 5, respectively. Section 6 describes routine maintenance tasks of cleaning/decontamination and elastomeric O-ring and gasket replacement. Section 7 consists of acceptance test procedures for the cask assembly. Load-testing procedures for cask-handling equipment are contained in Section 8. Section 9 addresses repair of various components. Section 10 is an appendix containing inspection and acceptance test data sheets and fabrication drawings of ancillary equipment.

1.3 Safety Precautions

All personnel using this manual should be thoroughly familiar with all 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 and cask-turning operations should be performed by personnel who have been specifically trained in BUSS handling.

- All hoisting equipment should be inspected and tested in accordance with applicable specifications, e.g., American Society of Mechanical Engineers (ASME) or 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 components and handling equipment have the potential of radioactive contamination. A radiological survey should be performed prior to inspections to determine hazard potential. All handling of items that present a hazard should be performed wearing appropriate protective apparel.

In addition to the general precautions described above and safety precautions established at the loading or unloading facility, specific warnings, and cautions are provided in these instructions, where appropriate, in the text 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 Maintenance, Inspection, and Test Requirements

1.4.1 Table 1.1 lists cask components and ancillary equipment that are subject to periodic maintenance, inspection, and testing. All cask-related activities are required on an annual basis (interval not to exceed 12 months) as mandated in the SARP and regulated by the Certificate of Compliance and applicable federal regulations. Lifting-fixture activities are recommended at an interval of 12 months (per ANSI N14.6). This table does not cover prior-to-shipment activities; these are contained in the specific procedures of the Operations Manual.

Table 1.1
Annual Maintenance, Inspection and Test Requirements

Item	Task	Manual Section
Cask Assembly	Hydrostatic test	7.1
	Boundary leak test	7.2
	Lid seal leak test	7.3
	Upper port seal leak test	7.4
	Lower port seal leak test	7.5
Cask Body	Visual inspection	2.2
Lid and Hardware	Visual inspection	2.4
Port Covers/Hardware	Visual inspection	2.5
Trunnions/Lift Lugs	Visual inspection	2.3
	Dye penetrant inspection	2.3
	Bolt torque verification	2.3
Quick-Connect Valve	O-ring replacement	6.2
Test Port Fittings	O-ring replacement	6.3
Baskets	Visual inspection	2.6
Impact Limiters	Visual inspection	2.7
	Weight measurement	2.7
	Gasket replacement	6.4
Limiter Hardware	Visual inspection	2.9
	Operation check and lube	2.9
Transportation Skid Skid/Barrier	Visual inspection	3.2
Tiedowns	Visual inspection	3.3
	Operation check and lube	3.3

Table 1.1 (continued)
Annual Maintenance, Inspection and Test Requirements

<u>Item</u>	<u>Task</u>	<u>Manual Section</u>
Ancillary Equipment		
Horizontal Lift Fixture	Visual inspection	4.2
	Load test	8.5
	Dye penetrant inspection	8.5
Vertical Lift Fixture	Visual inspection	4.3
	Load test	8.6
	Dye penetrant inspection	8.6
Cask Handling Frame	Visual inspection	4.4
	Load test	8.7
	Dye penetrant inspection	8.7
	Operation check and lube	4.4
Lid Lifting Bail	Visual inspection	4.5
	Load test	8.8
	Dye penetrant inspection	8.8
Basket Guide	Visual inspection	4.6
Guide Pins	Visual inspection	4.7
Transport Trailer	Visual inspection	5.2
	Safety inspection	5.2

Note: Load and NDE tests of lift fixtures are recommended annually; actual requirements are to be determined by the using facilities.

Operations needed to perform the required activities consist of disassemblies, cleanings, inspections, reassemblies, and several types of nondestructive evaluations. While not mandatory, it is highly recommended that all required activities on cask components be performed during the same period of inactivity. By performing the activities during the same period and in sequence, cask downtime and labor can be minimized. The recommended task sequence for the cask is to first perform inspection operations per Section 2.0, and then perform the hydrostatic and leak tests per Sections 7.1 through 7.6. Other required maintenance tasks (O-ring replacement, cleaning, etc.) are referenced in these two sections at locations that allow convenient performance of the task.

Required annual inspections and maintenance on the transport skid, ancillary equipment, and designated trailer may be performed at intervals independent of cask maintenance.

1.4.2 The BUSS owner or caretaker is responsible for implementing maintenance, inspection, and test activities. Adequate records must be kept to assure that required activities are conducted in a timely fashion and that appropriate quality levels are applied to the activities.

1.4.3 During periods of inactivity, periodic maintenance, inspection, and tests do not have to be performed. However, the BUSS owner or caretaker will ensure that all periodic activities are completed prior to returning the BUSS to service.

1.5 Repairs and Modifications

1.5.1 Repairs and modifications to the BUSS must be authorized by the BUSS owner or caretaker. All work must be performed to the same standards as that of the original effort.

1.5.2 Repairs or modifications are to be performed by qualified personnel following approved procedures. Repairs or modifications are governed by the same criteria as the original work. Repair or modification work shall be controlled by a Quality Assurance Plan that is commensurate with the activity being conducted. Refer to Tables 1.2 and 1.3 for the applicable quality level for individual cask and ancillary equipment components.

1.5.3 The BUSS owner or caretaker will document all repair or modification work, and will retain the documentation in a manner similar to that of the original BUSS fabrication records.

1.5.4 Repairs and modifications will be consistent with the Certificate of Compliance, SARP, and all applicable Federal regulations.

1.6 Recordkeeping and Reporting

1.6.1 The master copy of all inspection, test, and maintenance records is to be maintained by the cask owner.

1.6.2 Document all inspection, test, and maintenance operations on data sheets (examples in Section 10.1).

1.6.3 All anomalies or out-of-specification conditions discovered during inspection or testing activities are to be recorded and reported to the appropriate supervisor for possible remedial action.

1.6.4 File all records by part or serial number. Included are the cask, ancillary equipment, and trailer. All records pertaining to the cask assembly (assembled cask with impact limiters) shall be retained for the operational life of the cask plus five (5) years. Records pertaining to the trailer and ancillary equipment shall be retained for the life of the equipment.

1.6.5 Tractor recordkeeping is the responsibility of the carrier. The shipper will secure the right to inspect the records of the transporter from the carrier.

1.7 Quality Assurance

1.7.1 The Quality Assurance plan under which the BUSS cask was designed and fabricated is described in Chapter 9 of the SARP.

1.7.2 All testing, modifications, and fabrication or procurement of replacement parts must be performed in accordance with the requirements set forth in the SARP and the cask owner's Quality Assurance Plan.

1.7.3 The component list in Table 1.2 defines the quality level of all fabricated and commercially procured cask components. Refer to Section 1.9.1 for additional information.

1.7.4 The component list in Table 1.3 defines the quality level of ancillary equipment and tools. This is a general list of significant components only. All remaining components, such as the numerous commercially procured items on the handling frame, have a quality level of III, minor.

1.7.5 Handling fixtures shall be load tested annually to verify integrity.

1.8 Fabrication Drawings

1.8.1 Refer to Table 1.2 for a drawing list of all cask components and their related quality assurance level. This is a staggered listing arranged by assembly to aid in locating components. Additional information on commercial items can be found in the fabrication drawing on which the item is used. All cask component fabrication drawings are contained in Volume II of the SARP. Additionally, each activity in this manual references specific drawings applicable to the specific task.

1.8.2 A drawing list and all fabrication drawings of ancillary equipment and tools are contained in Section 9.2 of this manual (these drawings are not contained in the SARP). Additionally, drawings are referenced in applicable inspection sections of this manual (Sections 3, 4, and 5).

Table 1.2
Quality Levels of BUSS Cask Components

Part No	1	2	3	4	5	6	Quality Level
S54774-000	Cask in Cradle						NA
S54773-000	Cask With Impact Limiters						NA
S48981-000	Cask Assembly						NA
T73684-000	Body, Cask, 304 (BUSS)						I
S50980-000	Specification, 304 Cask Components						NA
T73689-000	Casting/Forging, Cask Body						I
S66575-000	*	Insert, Buss Cask (Lid Bolt)					I
S48957-000	Guide Pin #3						III
TR24445	*	Insert, Trunnion, Tridair, SA320 mat'l					I
TR24445	*	Insert, Lift Lug, Tridair, SA320 mat'l					I
TR24446-820	*	Insert, Drain Plug, Tridair, SA320 mat'l					I
TR24446-616	*	Insert, Key, Tridair					III
KNQ-25	*	Insert, Drain Plug Cover					III
MS51923-303	Pin, Spring, Lid Bolt Insert						III
T83109-000	Lug, Lift						I
SB637 Mat'l	*	Bolt, Lift Lug, 1.00-12UNF-2Ax2.37					I
MS15795-826	*	Washer, Lift Lug Bolt					II
S51171-000	Trunnion, Cask Body						I
SB637 Mat'l	*	Bolt, Trunnion, 1.00-12UNF-2Ax3.25					I
MS15795-826	*	Washer, Trunnion Bolt					II
S68157-000	Washer, Trunnion, Cask Body						III
MS51959-115	*	Screw, Trunnion Washer					III
S48958-000	*	Key, Cask Body					III
MS24671-54	*	Screw, Key					III

I - Critical

II - Major

III - Minor

NA - Not Applicable (Quality levels apply to individual piece parts)

* - Spare parts (Available from cask owner)

Table 1.2 (continued)
Quality Levels of BUSS Cask Components

Part No	1	2	3	4	5	6	Quality Level
S48981-000						Cask Assembly (continued)	NA
S54758-000						Lid Assembly, BUSS Cask	NA
T73693-000						Cask Lid, 304	I
S50980-000						Specification, 304 Cask Components	NA
T83100-000						Cask Lid Forging	I
KNH820J-T						Insert, Lid Lift Lug, Tridair	II
KNH1210JMXSP *						Insert, Lid Lifting Assy, Tridair	III
KNH420J-T						Insert, Seal Retainer, Tridair	III
MS16555-646						Pin, Dowel	III
4-5-F50G5-SS *						Fitting, Reducer, Parker Hannifin	II
3-904 V0747 *						Packing, Preformed, Parker Seal	II
5-HP50N-SS *						Fitting, Plug, Parker Hannifin	III
3-905 V0474 *						Packing, Preformed, Parker Seal	III
T99946-000						Seal, Helicoflex, Cask Lid	NA
*						Seal, Metallic	I
*						Seal, Elastomeric	II
*						Spacer	II
T99944-000 *						Retainer, Seal, Cask Lid	III
MS16995-47 *						Screw, Retainer	III
S52562-000						Lid Lifting Assembly, Cask Lid	NA
S52563-000 *						Lifting Screw, Cask Lid	III
S52565-000 *						Indicator Pin, Cask Lid	III
S52566-000 *						Spring Retainer, Cask Lid	III
C0180-014-15005						Spring, Comp., Associated Spring Co.	III
S52564-000 *						Lifting Screw Tip, Cask Lid	III
MS51021-25						Setscrew, Lifting Screw Assy	III
S66574-000 *						Bolt, Lid	I
MS20002-C24 *						Washer, Lid Bolt	II

Table 1.2 (continued)
Quality Levels of BUSS Cask Components

<u>Part No</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>Quality Level</u>
S48981-000						Cask Assembly (continued)	NA
S54757-000						Drain Plug Assembly	NA
T73685-000						Plug, Drain	I
KNCA0440J-T						Insert, Retainer, Keensert	III
MS16555-627						Pin, Dowel	III
T99945-000						Seal, Helicoflex, Drain Plug	NA
	*					Seal, Metallic	I
	*					Seal, Elastomeric	II
	*					Spacer	II
4-5-F50G5-SS	*					Fitting, Reducer, Parker Hannifin	II
3-904 V0747	*					Packing, Preformed, Parker Seal	II
5-HP50N-SS	*					Fitting, Plug, Parker Hannifin	III
3-905 V0474	*					Packing, Preformed, Parker Seal	III
T99943-000	*					Retainer, Seal, Drain Plug	III
MS16995-9	*					Screw, Retainer	III
S58940-000						Handle, Drain Plug	III
MS16995-48						Screw, Handle	III
SB637 Mat'1	*					Bolt, Port Cover, .50-20UNFx1.12	I
MS15795-818	*					Washer, Port Cover Bolt	II
S53743-010						Cover, Drain Plug	NA
S53741-000						Plate, Cover, Drain Plug	II
26S51-5	*					Stud Assembly, Rexnord Specialty	III
2600-SW						Retaining Ring, Rexnord Specialty	III
S53743-020						Cover, Drain Plug	NA
S58998-000						Plate, Cover, Drain Plug (Front)	II
26S51-5	*					Stud Assembly, Rexnord Specialty	III
2600-SW						Retaining Ring, Rexnord Specialty	III

Table 1.2 (continued)
Quality Levels of BUSS Cask Components

Part No	1	2	3	4	5	6	Quality Level
S48981-000						Cask Assembly (continued)	NA
S55861-000	*					Port Valve Assembly	NA
S55862-000						Adapter	II
S55863-000						Sleeve	II
2-024-V0747	*					Packing, Preformed, Parker Seal	II
MS51923-147						Pin, Spring	II
SS-QC8-B-8PM						Fitting, Quick-Connect, Swagelok Co.	II
2-012-V0747	*					Packing, Preformed, Parker Seal	II
2-014-V0747	*					Packing, Preformed, Parker Seal	II
2-114-V0747	*					Packing, Preformed, Parker Seal	II
S50057-000						Basket Assembly, 4 Hole	NA
S50052-000						Basket, 4 Hole	II
S50063-000						Pin, Basket	II
S52829-000						Capsule Support, 4 & 6 Hole	II
MS51831CA103	*					Insert, Handle Screw	II
S50056-000						Basket Handle Assembly	NA
S50061-000						Handle Guide Housing, Basket	II
S50062-000						Handle Guide, Basket	II
S50065-000						Handle, Basket	II
S50066-000						Handle Bracket, Basket	II
D13-1500						Pin, Dowel, PIC Co.	II
D13-1250						Pin, Dowel, PIC Co.	II
S50064-000						Compression Spring, Basket	III
NAS1352N5-16	*					Screw, Handle	II

Table 1.2 (continued)
Quality Levels of BUSS Cask Components

<u>Part No</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>Quality Level</u>
S48981-000						Cask Assembly (continued)	NA
S50058-000						Basket Assembly, 6 Hole	NA
S50053-000						Basket, 6 Hole	II
S50063-000						Pin, Basket	II
S52829-000						Capsule Support, 4 & 6 Hole	II
MS51831CA103 *						Insert, Handle Screw	II
S50056-000						Basket Handle Assembly (See listing under 4 hole basket assembly (S50057-000))	NA
S50064-000						Compression Spring, Basket	III
NAS1352N5-16 *						Screw, Handle	II
S50059-000						Basket Assembly, 12 Hole	NA
S50054-000						Basket, 12 Hole	II
S50063-000						Pin, Basket	II
S52830-000						Capsule Support, 12 & 16 Hole	II
MS51831CA103 *						Insert, Handle Screw	II
S50056-000						Basket Handle Assembly (See listing under 4 hole basket assembly (S50057-000))	NA
S50064-000						Compression Spring, Basket	III
NAS1352N5-16 *						Screw, Handle	II

Table 1.2 (continued)
Quality Levels of BUSS Cask Components

<u>Part No</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>Quality Level</u>
S48981-000						Cask Assembly (continued)	NA
S50060-000						Basket Assembly, 16 Hole	NA
S50055-000						Basket, 16 Hole	II
S50063-000						Pin, Basket	II
S52830-000						Capsule Support, 12 & 16 Hole	II
MS51831CA103 *						Insert, Handle Screw	II
S50056-000						Basket Handle Assembly (See listing under 4 hole basket assembly (S50057-000))	NA
S50064-000						Compression Spring, Basket	III
NAS1352N5-16 *						Screw, Handle	II
S54773-000						Cask With Impact Limiters (continued)	NA
S58938-000 *						Tape, Impact Limiter	I
S48984-000						Turnbuckle, Impact Limiter	II
S86214-100						Rod End, Bearing, Turnbuckle	II
S86214-200						Rod End, Bearing, Turnbuckle	II
MS35691-111						Nut, Jam, Turnbuckle	III
BLC24GT35						Pin, Quick-Release, Avibank Mfg.	II
S84795-000 *						Retainer Washer	II
LT1504-C6-12 *						Lanyard Assembly, Avibank Mfg.	III
MS16997-30						Screw, Lanyard	II
S81352-000						Security Block	III
S81386-000						Eyebolt, 1/4	III
S81387-000						Eyebolt, 1/2	III

Table 1.2 (continued)
Quality Levels of BUSS Cask Components

Part No	1	2	3	4	5	6	Quality Level
S54774-000	Cask in Cradle (continued)						NA
S54773-000	Cask With Impact Limiters (continued)						NA
S48929-000	Impact Limiter, BUSS						I
FR3710.75	Foam, Polyurethane, General Plastics						I
S48921-000	Cover, Inner Cylinder						III
S48923-000	Lifting Support #2						II
S48924-000	Lifting Support #1						II
S.S. Mat'l	*	Bolt, Lift Support Plug, .75-10UNFx1.0					III
S48926-000	Housing, Rod End						II
S48927-000	Fill Cover, Impact Limiter						III
S48928-000	*	Fill Gasket, Impact Limiter					III
MS51861-650	Screw, Fill Cover						III
S53296-000	Cable Assembly						NA
RR-W-410D	Wire Rope, 5/8", 6x9, SST						II
MS20667-20	Terminal, Wire Rope						II
S58901-000	Pin, Cable						II
1/8" x 2.00	Pin, Cotter, CRES						III
S53297-000	Housing, Cable End						II
S69358-000	Impact Ring						III
MS51959-85	Screw, Impact Ring						III

Table 1.2 (continued)
Quality Levels of BUSS Cask Components

Part No	1	2	3	4	5	6	Quality Level
S54774-000	Cask in Cradle (continued)						NA
S50032-000	Cradle, BUSS Cask						NA
S52606-000	Pallet						II
S52607-000	Mounting Block Assembly						NA
S52608-000	Block, Mounting						II
S52609-000	Ware Strip						III
3/4-10 x 2.0	Screw, Ware Strip, 82° Flat Head						III
MS16995-71	*	Screw, Mounting Block					III
MS51923-305	Pin, Spring, Mounting Block						III
S85366-000	Yoke, Tiedown						II
AN20-42	Bolt, Yoke, Drilled						II
MS35691-95	*	Nut, Jam, Yoke					III
MS15795-828	Washer, Yoke						III
MS24665-377	Pin, Cotter, Yoke						III
S86213-000	*	Rod Eye, Tiedown					II
AB-24Z-1	*	Rod End, Bearing					II
BLS24GT68	Pin, Quick-Release, BLS24GT68						II
S68271-000	Turnbuckle, Tiedown						II
NAS509-24	*	Nut, Jam, Tiedown Turnbuckle, Drilled					III
S52615-000	Personnel Barrier, Upper						III
MS21077-6	Nut, Floating						III
MS16995-10	Screw, Floating Nut Attachment						III
MS35338-135	Washer, Lock, Nut Attachment Screw						III
S52614-000	Personnel Barrier, Lower						III
MS16995-95	Screw, Barrier Attachment						III
MS35338-86	Washer, Lock, Attachment Screw						III
MS16995-82	*	Screw, Barrier Assembly					III
MS15795-814	*	Washer, Flat, Assembly Screw					III

Table 1.3
Quality Levels of BUSS Ancillary Equipment

<u>Part No</u>	<u>1 2 3 4 5 6</u>	<u>Quality Level</u>
S49069-000	Vertical Lifting Fixture	NA
S49070-000	Strongback	II
S49071-000	Hook	II
S58999-000	Leg, standoff	III
MS90727-276	Hook attachment bolts	II
MS90728-230	Leg attachment bolts	III
S48590-000	Lid Lifting Fixture	II
S49072-000	Lifter (horizontal)	II
MS17985-C1635	Quick-release pins	II
S49073-000	Basket Guide	III
S48501	Handling Fixture	NA
S52704	Mainframe	II
	All other handling frame components (listed in Section 4.4)	III
	All handling frame assembly hardware (listed on S48501, assembly drawing)	III
	All specialty tools	III

II - Major

III - Minor

NA - Not Applicable (Quality levels apply to individual piece parts)

1.9 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 that is 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.

1.9.1 Facility-Supplied Tools and Equipment

Overhead crane, 40,000 pound minimum capacity

Beta-gamma radiation survey meter

Helium leak detector, 1E-6 cc/s minimum sensitivity.

Standard leak, helium, 5.0E-6 cc/s max leak rate

Helium supply w/regulator

Flow meter, 100 to 150 liter/min range

Hydraulic pump, hand or power operated

Vacuum pump

Miscellaneous vacuum hoses and fittings

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 crescent wrench)

Small adjustable wrench

1.9.2 Cask-Owner-Supplied Tools and Equipment

Port test cover, Part No. S94924

Port valve assembly tool, Part No. S94921

Lid bolt insert assembly tool, Part No. S94922

Helium backfill plumbing assembly, Part No. R35032-000

Hydrostatic test plumbing assembly, Part No. R35032-100

Lid leak test plumbing assembly, Part No. R35032-200

Port cover leak test plumbing assembly, Part No. R35032-300

Pullpac hydraulic cylinder w/hose and pump

Load test fixtures, Part Nos. R35028-000 and -100

Surface refinishing tools, Part Nos. R35029-000, -100, and -200

Surface temperature measurement apparatus

Pressure transducer and readout, 0 to 1000 torr range

Cask marking silk screen set

1.9.3 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
Paint, epoxy, impact limiter
Epoxy screening ink

1.10 Spare Parts

Spare parts consist of routine maintenance replacement parts, i.e. elastomeric O-rings and gaskets, and non-routine replacement parts, i.e., parts to be used if an operational part becomes damaged or worn. Items that are readily available from the cask owner are identified by an asterisk (*) in Table 1.2.

1.11 Reference Documents

1.11.1 Operations Manual for the Beneficial Uses Shipping System Cask, SAND 92-0966 (TTC-1209)

1.11.2 Beneficial Uses Shipping System - Safety Analysis Report for Packaging, SAND 83-0698(TTC-0430), Volumes I and II, latest revision

1.11.3 Quality Assurance Program Plan, Organization 6000 Energy Programs Vice Presidency, Sandia National Laboratories, Albuquerque, NM, 87185, November, 1986

1.11.4 American National Standard for Radioactive Materials, Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds or More, ANSI N14.6, July 1987

2.0 CASK ASSEMBLY

2.1 Introduction

The cask assembly consists of the following components: body, lid and related hardware, port covers and related hardware, trunnions, lifting lugs and related hardware, baskets, and impact limiters and hardware. The following defines the cleaning, inspection, maintenance, and test requirements for the cask assembly. General guidelines on cleaning and routine maintenance procedures are contained in Section 6.1 of this manual.

Tests to be performed on the cask assembly consist of a hydrostatic pressure test, a containment boundary leak test, and leak tests of each of the three closure seals. These tests are to be performed before first use of the cask as a fabrication verification and annually to verify continuing compliance. It is recommended that the cleaning and inspections detailed in this section be performed first, followed by the required tests. Instructions to configure and perform the required tests are contained in Section 7.0 of this manual.

Many of the components inspected contain threaded inserts. If thread damage or insert looseness is observed, the insert is to be replaced. Section 9.3 of this manual details insert replacement.

When inspecting threads of bolts or inserts, a damaged component is identified by galling of the threads. All threaded components should operate smoothly by hand. If tools are required to operate, the threaded component(s) should be replaced.

Document all inspections on the Inspection Data Sheets and maintain as part of the permanent cask file. Example sheets for the various cask components are contained in the Section 10.1 of this manual.

2.2 Cask Body

2.2.1 Inspect the cask body annually. See Figure 2.1 for inspection points.

2.2.2 Refer to the following drawings in Volume II of the SARP for as-fabricated information.

- S48981 Cask Assembly
- T73684 Body, Cask, BUSS, 304
- S66574 Bolt, Tension, 12 Point, Flanged
- S48957 Guide Pin #3, Cask Body
- S48958 Key, Cask Body
- S66575 Insert, BUSS Cask

2.2.3 Conduct inspection with the lid, basket, port covers, and impact limiters removed. See the Operations Manual for the procedures for lid, basket, port cover, and impact limiter removal.

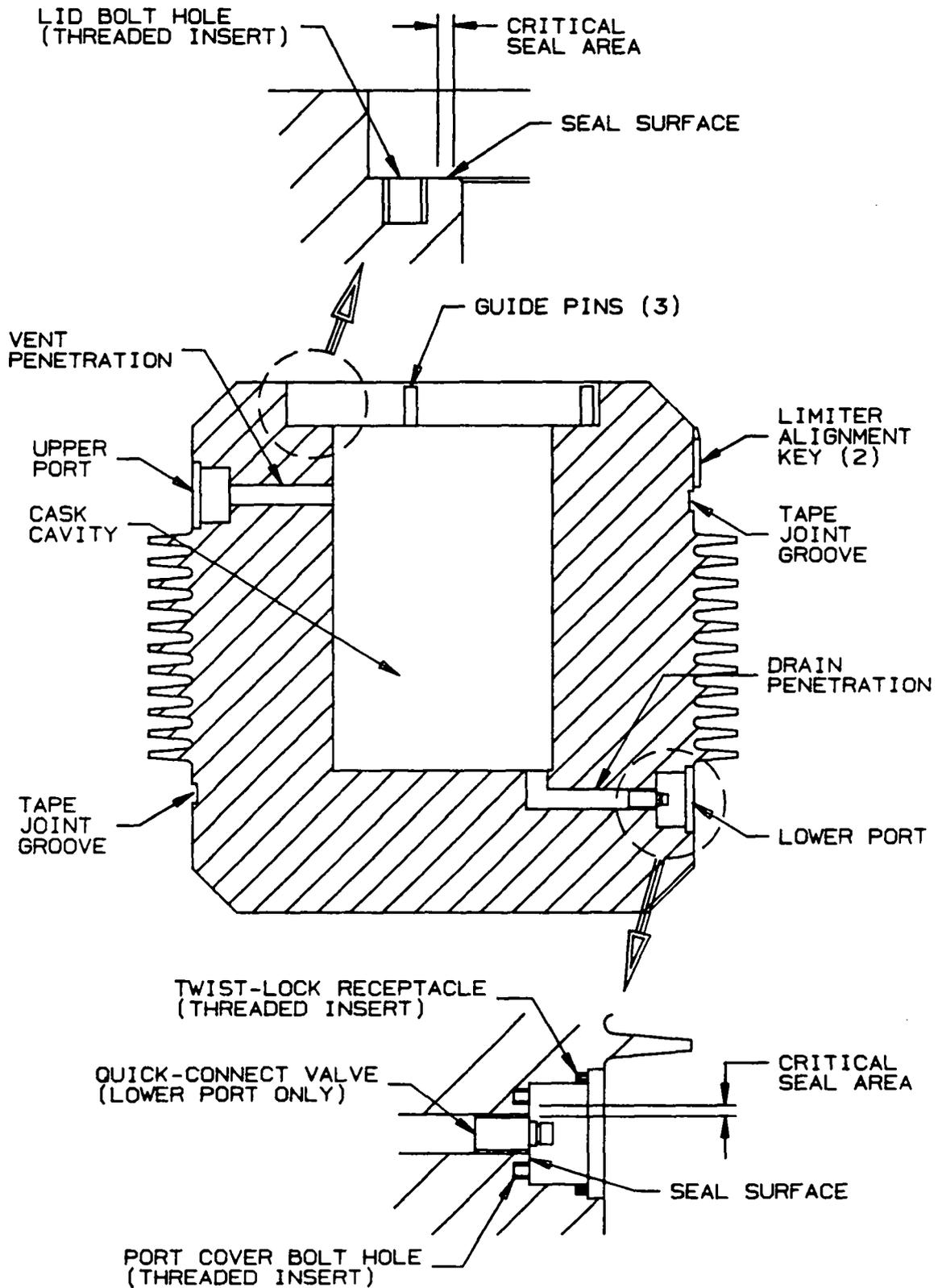


Figure 2.1
Cask Body

WARNING
RADIATION HAZARD

The possibility exists that the cask cavity contains radioactive material or contamination. Perform a radiation survey of the cask exterior before removing the lid and smear-survey the interior prior to inspection.

2.2.4 Remove 2 lifting lugs, 2 trunnions, and 2 limiter alignment keys from the cask body.

2.2.5 Thoroughly clean cask body interior and exterior. Also clean removed components. Guidelines on cask-washing methods and approved cleaners are contained in Section 6.1. Survey all cleaning materials for contamination.

2.2.6 Install a mating fitting in the quick-connect valve to open. Do not remove valve assembly from cask at this time. Flow demineralized/deionized water through the two ports from the cask exterior. Clean the penetrations of any accumulated debris. Check debris for contamination.

2.2.7 Inspect cask interior and exterior for signs of mechanical damage such as gouges, dents, and distortions. Pay particular attention to tape joint grooves.

2.2.8 Inspect lid and port cover sealing surfaces for scratches or other damage that might affect containment. The seals are extremely critical to scratches across the circular lay of the seal surface. Section 9.1.2 contains instructions for lid seal surface repairs. Section 9.1.3 contains instructions for port seal surface repairs.

2.2.9 Inspect lid bolts and threaded holes for thread wear or damage. Check thread operation by threading each of the twelve bolts into a different hole; they should operate smoothly by hand. The holes are threaded inserts; examine them for signs of looseness. Remove bolts and clean any debris from bottoms of the bolt holes. Survey debris for contamination.

2.2.10 Inspect 12 lid bolts for signs of galling under the head. The bolts are turned using a 12-point drive socket, inspect the drive teeth for wear or damage.

NOTE

The lid bolts are of a high-strength material and replacement units must come from controlled stock.

2.2.11 Inspect 12 lid bolt washers for damage. These washers are susceptible to galling. Replace with new washers (available from the cask caretaker).

2.2.12 Inspect port cover bolts and threaded holes for thread wear or damage. Check thread operation by threading each of the twelve bolts into a different hole; they should operate smoothly by hand. The holes are threaded inserts; examine them for signs of looseness. Remove bolts and clean any debris from the bottoms of the bolt holes. Survey debris for contamination.

2.2.13 Inspect 12 port cover bolts for signs of galling under the head. Inspect 12 port cover bolt washers for damage.

NOTE

The port cover bolts are of a high-strength material and replacement units must come from controlled stock.

2.2.14 Inspect 8 lift lug and 32 trunnion bolts and threaded holes for thread wear or damage. Check thread operation by threading each bolt into a different hole; they should operate smoothly by hand. The holes are threaded inserts; examine them for signs of looseness. Remove the bolts.

2.2.15 Inspect lift lug and trunnion bolts for signs of galling under the head. Inspect the 40 related washers for damage.

NOTE

The lift lug and trunnion bolts are of a high-strength material and replacement units must come from controlled stock.

2.2.16 Install and remove thermal shields to check operation of the twist-lock receptacles. These are threaded inserts; examine them for signs of looseness.

2.2.17 Check the three short guide pins for straightness and tightness; they are pressed in place. Inspect threaded holes in the pins for signs of damage or wear by installing three mating pins (see Section 4.7). Remove mating pins and clean any debris accumulation from the threaded holes.

2.2.18 Inspect alignment key screws and threaded holes for thread wear or damage. Check thread operation by threading each of the four screws into a different hole; they should operate smoothly by hand. The holes are threaded inserts; examine them for signs of looseness. Remove the screws.

2.2.19 Inspect 2 limiter alignment keys for damage or gouges. Replace keys on the cask body. Torque the mounting screws to 30 ft-lb.

2.3 Trunnions and Lifting Lugs

2.3.1 Inspect cask trunnions and lifting lugs annually for soundness. See Figure 2.2 for inspection points.

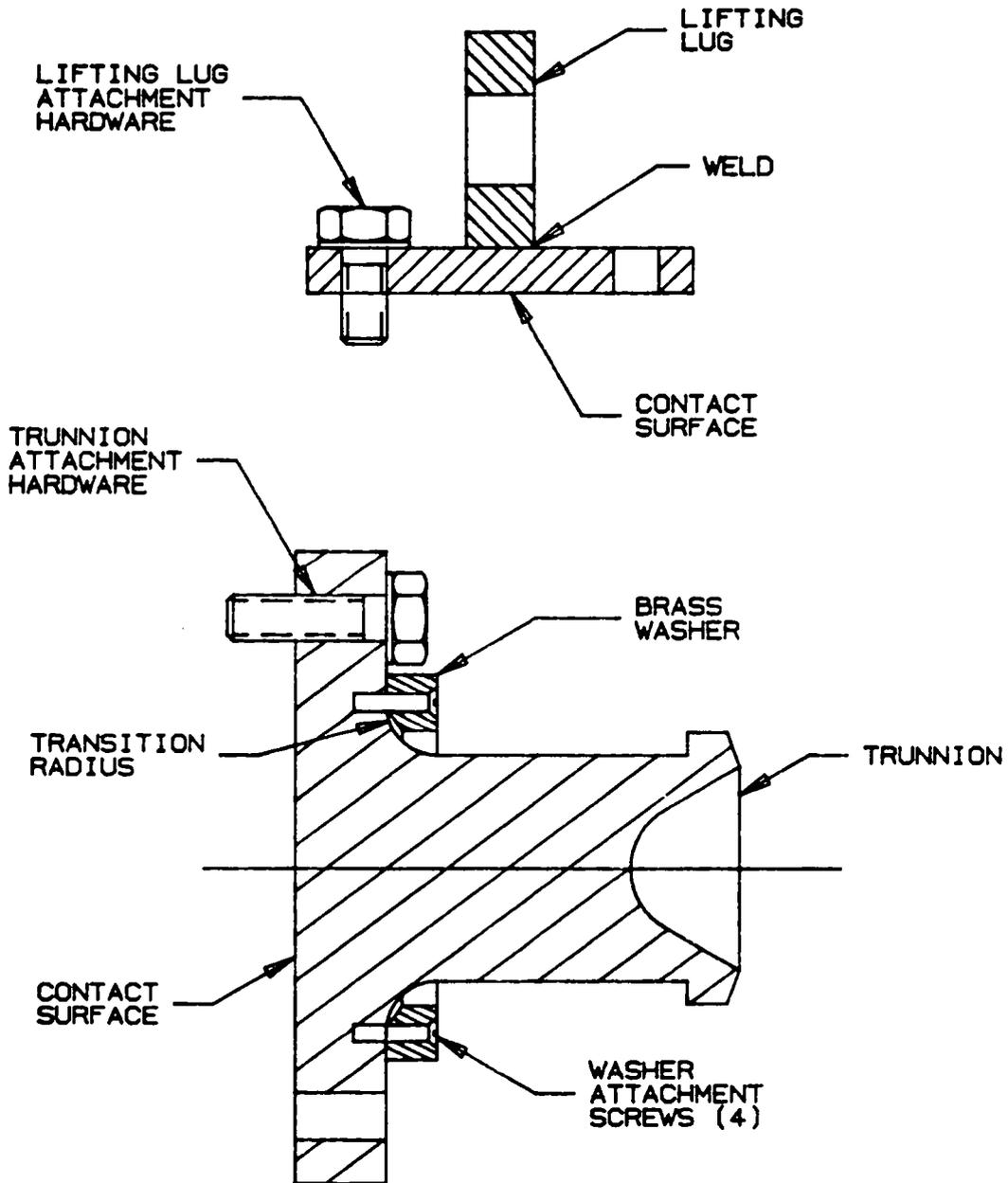


Figure 2.2
Cask Trunnions and Lifting Lugs

2.3.2 Refer to the following drawings in Volume II of the SARP for as-fabricated information.

- T83109 Lug, Lift, BUSS
- S51171 Trunnion, Cask Body
- S68157 Washer, Trunnion, Cask Body
- S48981 Cask Assembly

2.3.3 Dye-penetrant check lug welds for indications of cracking. Reinstall lugs to cask body using eight 2.37-in long bolts. Torque bolts to 250 ft-lb.

2.3.4 Remove 2 large brass washers from the trunnions (four screws per washer, one washer per trunnion). Dye-penetrant check each trunnion for cracks in the radius transition where the cylindrical lifting element joins the mounting flange. Reinstall washers to trunnions and torque screws to 20 ft-lb. Remount trunnions to cask body, tightening bolts in a crossing pattern. Trunnion bolt torque is 250 ft-lb.

2.4 Cask Lid

2.4.1 Inspect the cask lid annually. See Figure 2.3 for inspection points.

2.4.2 Refer to the following drawings in Volume II of the SARP for as-fabricated information.

- S54758 Lid Assembly, BUSS Cask
- T73693 Cask Lid, BUSS, 304
- T99946 Seal, Helicoflex, Cask Lid
- T99944 Retainer, Seal, Cask Lid
- S52562 Lid Lifting Assembly, Cask Lid
- S52563 Lifting Screw, Cask Lid
- S52564 Lifting Screw Tip, Cask Lid
- S52565 Indicator Pin, Cask Lid
- S52566 Spring Retainer, Cask Lid

2.4.3 Remove seal assembly from lid prior to inspection.

2.4.4 Thoroughly clean all surfaces of lid. Guidelines on cask washing methods and approved cleaners are contained in Section 6.1. Survey all cleaning materials for contamination.

2.4.5 Inspect lid surfaces for signs of mechanical damage such as gouges, dents, and distortions.

2.4.6 Inspect lid sealing surface for scratches or damage that might affect containment. The seals are extremely critical to scratches across the circular lay of the seal surface. Section 9.1.4 contains instructions for lid seal surface repairs.

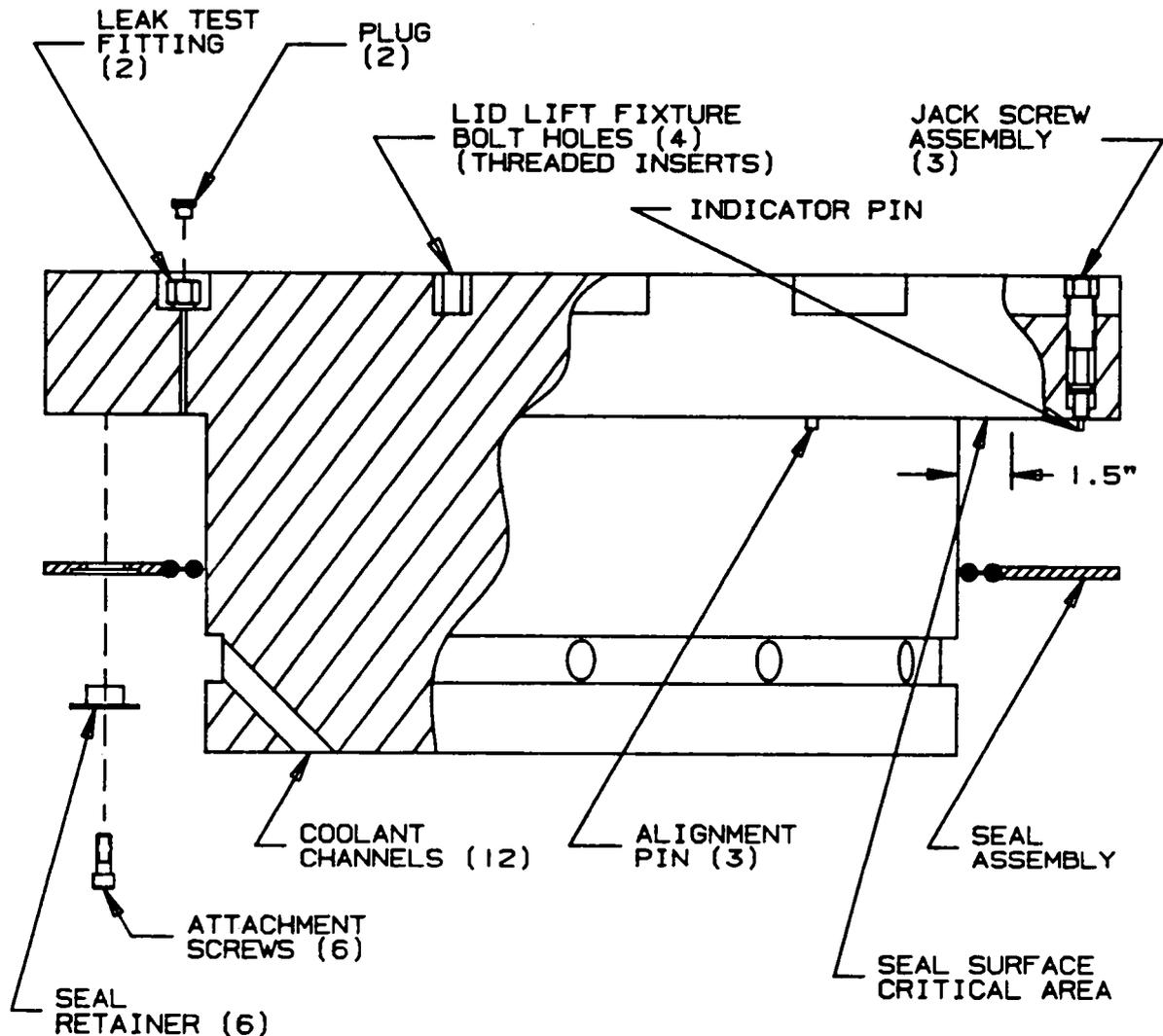


Figure 2.3
Cask Lid

2.4.7 Inspect 6 seal-mounting screws and threaded holes for thread wear or damage. Check thread operation by threading each of the screws into a different hole; they should operate smoothly by hand. The holes are threaded inserts; examine them for signs of looseness. Remove the screws.

2.4.8 Inspect 6 seal retainers for damage.

2.4.9 Inspect 4 lid-lifting bail bolts and threaded holes for thread wear or damage. Check thread operation by threading each of the four screws into a different hole; they should operate smoothly by hand. The holes are threaded inserts; examine them for signs of looseness. Remove the bolts. Clean out any debris that may have accumulated in the bottom of the bolt holes. Check debris for contamination.

2.4.10 Operate the 3 lid jack screws. Check for smooth operation and be certain that they fully extend and retract. Depress spring-loaded indicator to check function. Do not remove jacking screw assemblies unless abnormal operation is observed. If jack screw removal and replacement are necessary, refer to Section 9.4. If a loose or damaged jack screw insert is noted, remove jack screw and replace insert per Section 9.3. Fully retract (counter-clockwise) each jack screw and lubricate the exposed screw threads with Neolube.

NOTE

If an indicator pin is not operating smoothly, the problem may be a slight deformity of the exposed end of the lift screw tip, the result of the cask lid being lowered too quickly. This can be repaired without removal of the jack screw from the lid. Ream the hole in the end of the jack screw tip using a #29 twist drill. Alternately, a burr can be removed from the edge of the hole using a small 90° countersink bit. If the end of the brass tip is badly deformed, i.e., bent or mushroomed, replace the component.

2.4.11 Remove 2 leak-test fitting plugs from leak-test fittings using a 3/16-in Allen wrench. Remove 2 leak-test fittings from cask lid using a 3/4-in socket and wrench. Replace O-rings on each fitting component following instructions in Section 6.3 of this procedure. Document O-ring replacement. Examine penetrations through lid to be certain that they are not obstructed. Clean threaded and seal areas of the fittings. Replace leak-test fittings, tightening to 10 ft-lb. Replace plugs into fittings, tightening until snug.

2.4.12 Inspect coolant flow channels on underside of lid for obstructions. Clean as required.

2.4.13 Examine 3 seal alignment dowels for signs of loosening; they are pressed into place.

2.4.14 Inspect 12 bolt clearance holes for indications of damage. Inspect surfaces of lid around bolt holes for signs of galling due to bolt head action. Minor galling in this area is to be expected.

2.5 Port Covers and Hardware

2.5.1 Inspect port hardware annually. Port hardware consists of the port cover and associated attachment bolts and thermal shields. See Figure 2.4 for inspection points.

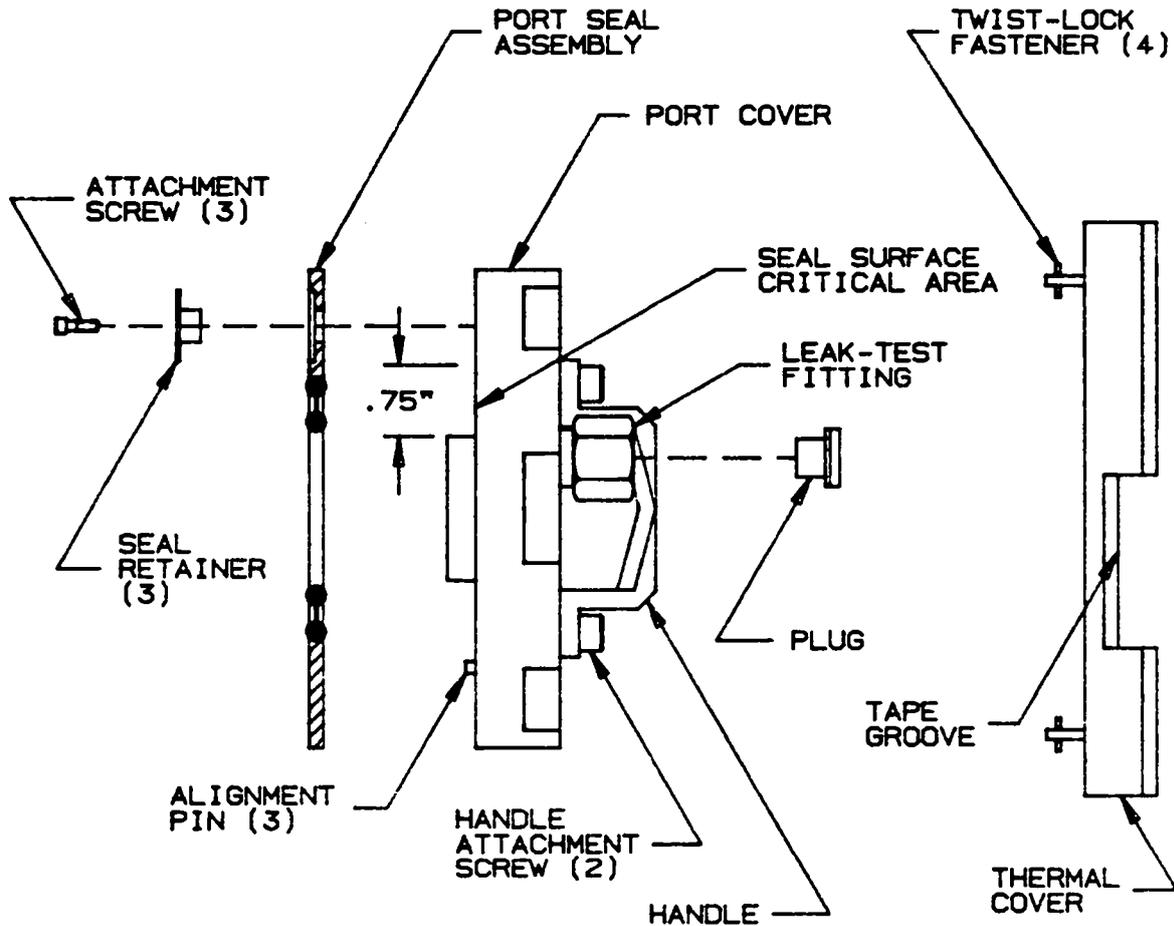


Figure 2.4
Port Components

2.5.2 Refer to the following drawings in Volume II of the SARP for as-fabricated information.

- S54757 Drain Plug Assembly, BUSS
- T73685 Plug, Drain, BUSS
- S58940 Handle, Drain Plug
- T99945 Seal, Helicoflex, Drain Plug
- T99943 Retainer, Seal, Drain Plug
- S53743 Cover, Drain Plug (assembly)
- S58998 Plate, Cover, Drain Plug (upper)
- S53741 Plate, Cover, Drain Plug (lower)

2.5.3 Remove seal assemblies from port covers prior to inspection.

2.5.4 Thoroughly clean all surfaces of port covers and thermal shields. Guidelines on cask-washing methods and approved cleaners are contained in Section 6.1. Survey all cleaning materials for contamination.

2.5.5 Inspect cover sealing surfaces for scratches or other damage that could affect containment. The seals are extremely critical to scratches across the circular lay of the seal surface. Section 9.1.5 contains instructions for port cover seal surface repairs.

2.5.6 Inspect 3 seal mounting screws and threaded holes of each port cover for thread wear or damage. Check thread operation by threading each of the screws into a different hole; they should operate smoothly by hand. The holes are threaded inserts; examine them for signs of looseness. Remove the screws.

2.5.7 Inspect 6 seal retainers for damage.

2.5.8 Remove leak-test fitting plug from leak-test fitting using a 3/16-in Allen wrench. Remove leak-test fitting from the port cover using a 3/4-in socket and wrench. Replace O-rings on each fitting component following instructions in Section 6.3 of this procedure. Document O-ring replacement. Examine penetration through the port cover to be certain that it is not obstructed. Clean the threaded and seal areas for the fitting. Replace leak-test fitting, tightening to 10 ft-lb. Replace plug into fitting, tightening until snug.

2.5.9 Check 2 handle bolts for tightness.

2.5.10 Check 3 seal alignment pins for tightness; these are pressed into place.

2.5.11 Upper and lower port covers are protected by thermal shields. Each shield is mounted by 4 twist-lock fasteners. Check shields and fasteners and cask body receptacles for the fasteners for operativeness, damage, or wear.

2.6 Baskets

2.6.1 Inspect each of the basket configurations annually. The BUSS cask has four types of baskets of similar construction. Conduct inspection with basket removed from cask. See Figure 2.5 for inspection points.

2.6.2 Refer to the following drawings in Volume II of the SARP for as-fabricated information.

- S50057 Basket Assembly, 4 Hole, BUSS
- S50058 Basket Assembly, 6 Hole, BUSS
- S50059 Basket Assembly, 12 Hole, BUSS
- S50060 Basket Assembly, 16 Hole, BUSS
- S50056 Basket Handle Assembly, BUSS
- S50052 Basket, Cask Body, 4 Hole
- S50053 Basket, Cask Body, 6 Hole
- S50054 Basket, Cask Body, 12 Hole
- S50055 Basket, Cask Body, 16 Hole

- S50061 Handle Guide Housing, Basket
- S50062 Handle Guide, Basket
- S50063 Pin, Basket
- S50064 Compression Spring, Basket
- S50065 Handle, Basket
- S50066 Handle Bracket, Basket
- S52829 Capsule Support, 4 & 6 Hole Basket
- S52830 Capsule Support, 12 & 16 Hole Basket

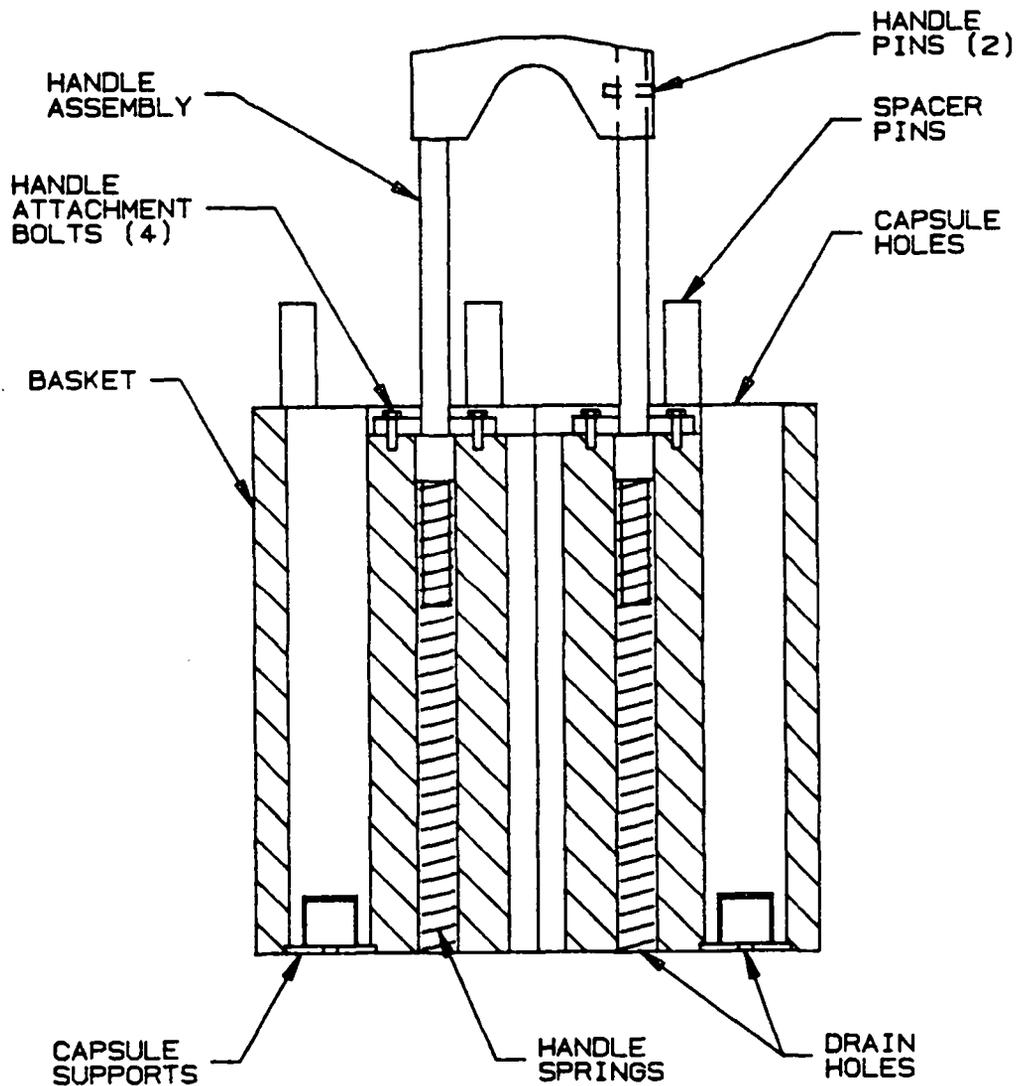


Figure 2.5
Capsule Basket (Typical)

2.6.3 Clean exposed surfaces of basket assemblies. Swab out the capsule holes. Guidelines on cask-washing methods and approved cleaners are contained in Section 6.1. Survey all cleaning materials for contamination.

2.6.4 Inspect exterior surfaces of basket assembly for signs of mechanical damage such as gouges, dents, and distortions.

2.6.5 Operate basket handle assembly. It should automatically extend by internal spring action and easily and smoothly retract into the cask with moderate hand force. Check assembly bolts and handle pins for tightness. Assembly bolt torque is 25 ft-lbs. Do not remove handle assembly unless abnormal functioning is observed.

2.6.6 Inspect capsule support welds on the basket bottom. Visually check for signs of cracking. Be certain that capsule support and handle assembly drainage holes are not obstructed.

2.6.7 Check the 6 or 8 basket spacer pins for looseness and damage. These are pressed into place on the basket top.

2.7 Impact Limiters

2.7.1 Inspect 2 impact limiters annually. See Figure 2.6 for inspection points.

2.7.2 Refer to the following drawings in Volume II of the SARP for as-fabricated information.

- S54773 Cask with Impact Limiters
- S48929 Impact Limiter, BUSS
- S48921 Cover, Inner Cylinder, Impact Limiter
- S69358 Impact Ring, BUSS Cask
- S48927 Fill Cover, Impact Limiter
- S48928 Fill Gasket, Impact Limiter
- S48923 Lifting Support #2, Impact Limiter
- S48924 Lifting Support #1, Impact Limiter
- S48926 Housing, Rod End, Impact Limiter
- S53296 Cable Assembly
- S53297 Housing, Cable End

2.7.3 Remove limiters following instructions in the Operations Manual.

2.7.4 Survey limiter for surface contamination. Clean limiter surfaces with biodegradable detergent and wipe dry.

2.7.5 Weigh each impact limiter. Use properly rated rigging equipment and a calibrated load cell for weighing. Compare measured weight to original weight (marked on the attached ID plates). Weight change, if any, should not deviate more than -1% or +3% from the original value. If an out-of-limit condition is noted, contact cask owner.

2.7.6 Inspect exterior surfaces of limiter skin for dents, gouges, or tears. Small dents are permissible. Repaint areas of missing paint due to dings or scrapes.

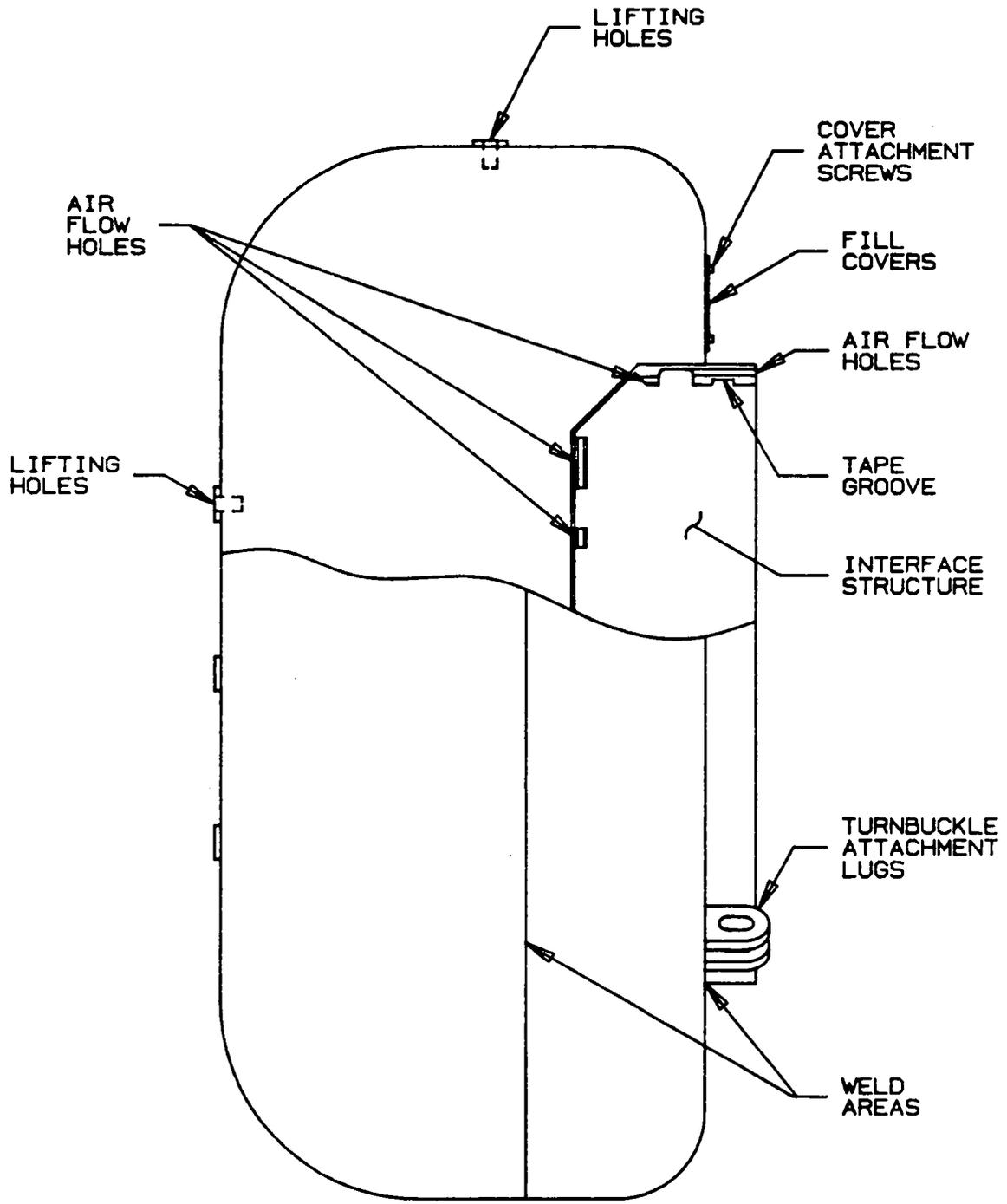


Figure 2.6
Impact Limiter

2.7.7 Inspect limiter-to-cask interface structure, especially tape joint groove. Look for signs of wear, galling, or damage. Visually inspect welds around the interface structure for cracks. Check that air flow holes are not obstructed.

2.7.8 Inspect 6 lifting holes (3 on outer end and 3 on circumference) of each limiter for signs of thread wear or damage. Examine areas immediately adjacent to holes for signs of distortion. These holes are threaded inserts; inspect them for looseness.

2.7.9 Replace 4 fill-cover gaskets of each limiter per Section 6.4 of this manual.

2.7.10 Examine 4 turnbuckle attachment lugs of each limiter. Look for signs of wear or damage. Also inspect area around each fitting for signs of distortion of the limiter skin or cracks in the welds. Remove paint for further inspection only if obvious cracks are observed through the paint.

2.7.11 Visually inspect weld around circumference of limiter for cracks. Remove paint for further inspection only if obvious cracks are observed through the paint.

2.8 Impact Limiter Attachment Hardware

2.8.1 Inspect impact limiter attachment hardware annually. Limiter attachment hardware consists of 4 flexible steel tapes, 4 turnbuckle assemblies, 8 quick-release pins and 2 tape locking plugs. See Figure 2.7 for inspection points.

2.8.2 Refer to the following drawings in Volume II of the SARP for as-fabricated information.

- S54773 Cask with Impact Limiters
- S48984 Turnbuckle, Impact Limiter
- S86214 Rod End Bearing, Turnbuckle
- S58938 Tape, Impact Limiter
- S81352 Security Block
- S81386 Eyebolt (1/4)
- S81387 Eyebolt (1/2)
- S84795 Retainer Washer

2.8.3 Clean tapes, using rags dampened with biodegradable detergent to remove dirt and accumulated lubricant. Use no solvents.

2.8.4 Visually inspect each of the four tapes. Look for indications of damage, galling or cracking, particularly at the thin section of each slot.

CAUTION

Bending a tape in the opposite direction from the mounting curvature could damage or destroy the tape.

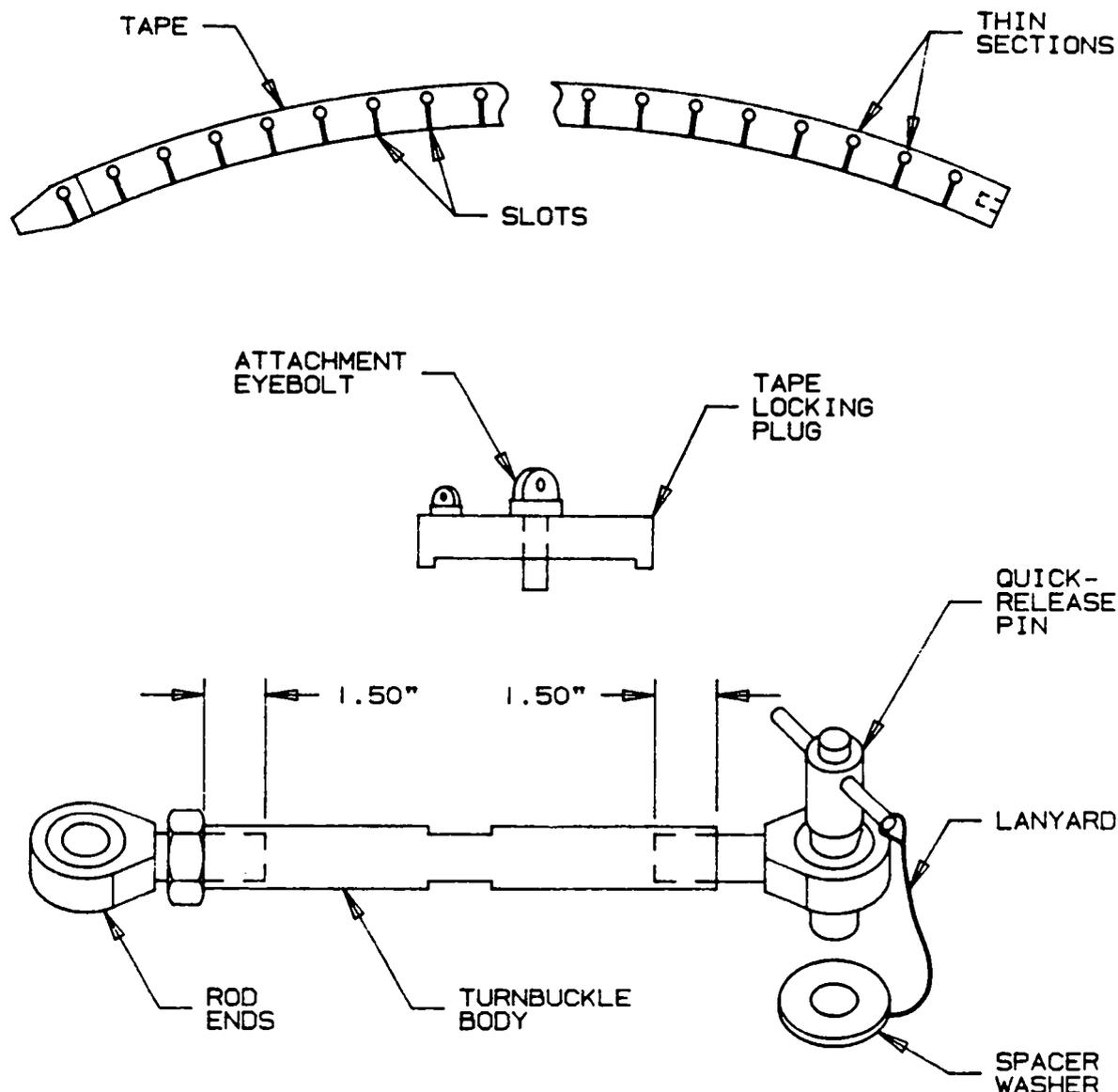


Figure 2.7
Limiter Attachment Hardware

2.8.5 Inspect bonded lubricant on the tapes. If lubricant is excessively worn, remove existing lubricant and recoat following tape fabrication drawing, S58938 and drawing referenced process specifications, 9903551 and 6530910-917. These specifications detail materials, suppliers, and application techniques.

NOTE

It is anticipated that the lubricant will last approximately 50 assemblies, and should not need recoating annually.

NOTE

As an alternate to recoating per the fabrication specifications, tapes may be recoated annually with a spray or brush on dry lubricant, such as graphite (Neolube), molybdenum disulfide, or silicone. Check with facility for pool and radwaste compatibility, as small amounts may adhere to cask with usage.

2.8.6 Inspect 4 limiter turnbuckles. Actuate each and check for smooth operation. If thread damage is noted, repair the component per Section 9.2 of this manual. Lubricate threads with Neverseez or equivalent before reinstallation. Lubricate rod ends with lithium grease in the grease fittings. Adjust rod ends of each assembly such that approximately 1.50 inches of shank is threaded into the turnbuckle body.

2.8.7 Inspect 8 quick-release pins for damage. Actuate each and check for smooth operation and positive locking upon release. Check spacer washer and lanyard for secure attachment to the pin.

2.8.8 Check tape-locking plug and attachment eyebolt for damage or gouges.

3.0 TRANSPORTATION SKID ASSEMBLY

3.1 Introduction

The transportation skid consists of the skid with hexagonal base, cask-to-skid tiedown assemblies, and personnel barrier. The following defines the maintenance, inspection, and testing requirements for the transportation skid.

3.2 Transportation Skid

3.2.1 Inspect skid and hexagonal base annually. See Figure 3.1 for inspection points.

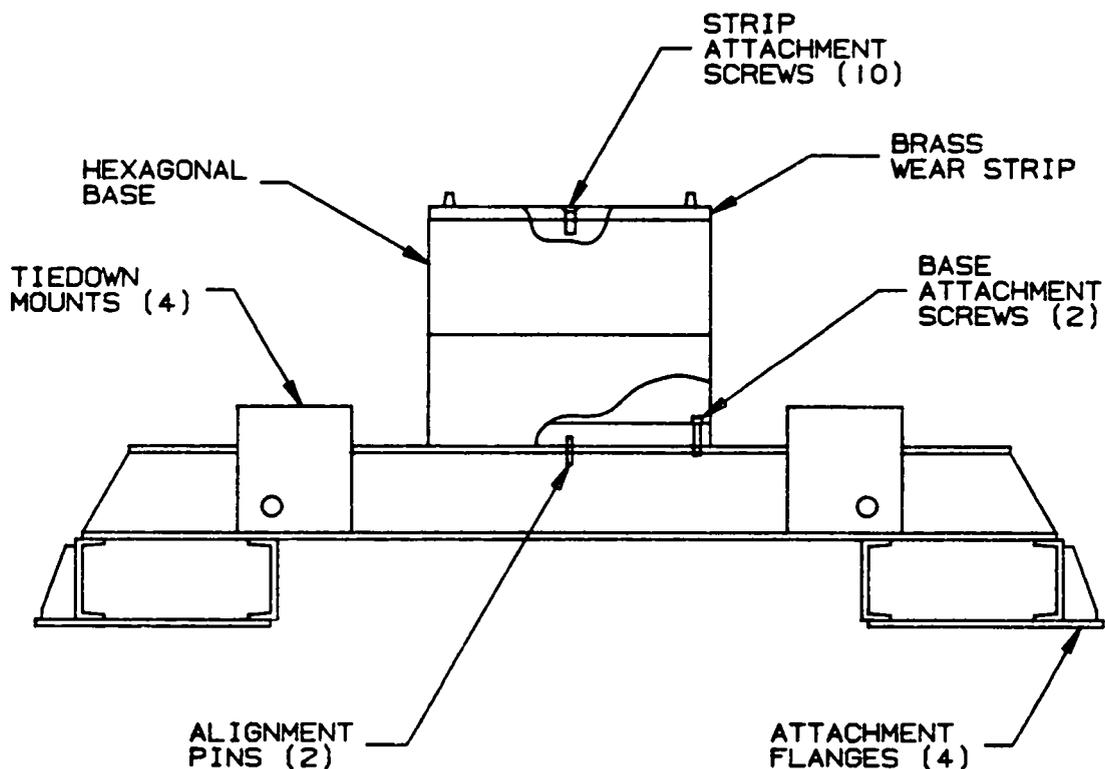


Figure 3.1
Transportation Skid

3.2.2 Refer to the following drawings in Volume II of the SARP for as-fabricated information.

- S50032 Cradle, BUSS Cask
- S52606 Pallet, BUSS Cask
- S52607 Mounting Block Assembly
- S52608 Block, Mounting
- S52609 Ware Strip

3.2.3 Remove cask from skid prior to inspection. Follow instructions in the Operations Manual for removal.

3.2.4 Remove hexagonal mounting block assembly from skid. Inspect 2 attachment screws, 2 alignment pins, and their holes. Remove 2 brass wear strips by removing the five Allen drive countersunk screws from each bar. Inspect the wear strips for signs of damage or wear. Minor dents or scrapes are permissible.

3.2.5 Perform a dye-penetrant inspection of all welds on the mounting block. See Figure 3.2 for weld locations.

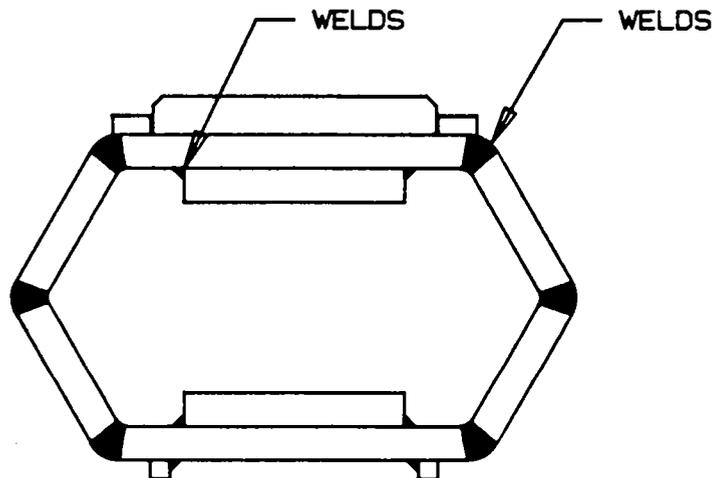


Figure 3.2
Mounting Block Welds

3.2.6 Reinstall wear strips to the mounting block. Tighten strip mounting screws to 50 ft-lb.

3.2.7 Visually inspect the skid welds for signs of cracking. Pay particular attention to tiedown mounts and skid-to-trailer attachment flanges. Do not remove paint unless weld cracks are suspected. Using dye-penetrant or magnetic particle methods, inspect any suspect welds after paint removal.

3.2.8 Repaint skid, as necessary, to repair scuffing and wear, or paint removed for inspection. Use zinc chromate primer and flat white epoxy base enamel. Follow the paint manufacturer's recommendations on application.

3.2.9 After inspecting skid and hexagonal base, reinstall base assembly, and tighten 2 retaining screws to 10 ft-lb.

3.3 Tiedown Assemblies

3.3.1 Inspect tiedown hardware annually. Each tiedown consists of a steel weldment yoke that fits over the cylindrical portion of the trunnion and is connected to the skid by two turnbuckles. The turnbuckles are in an inverted "V" configuration and are equipped with spherical rod ends. See Figure 3.3 for inspection points.

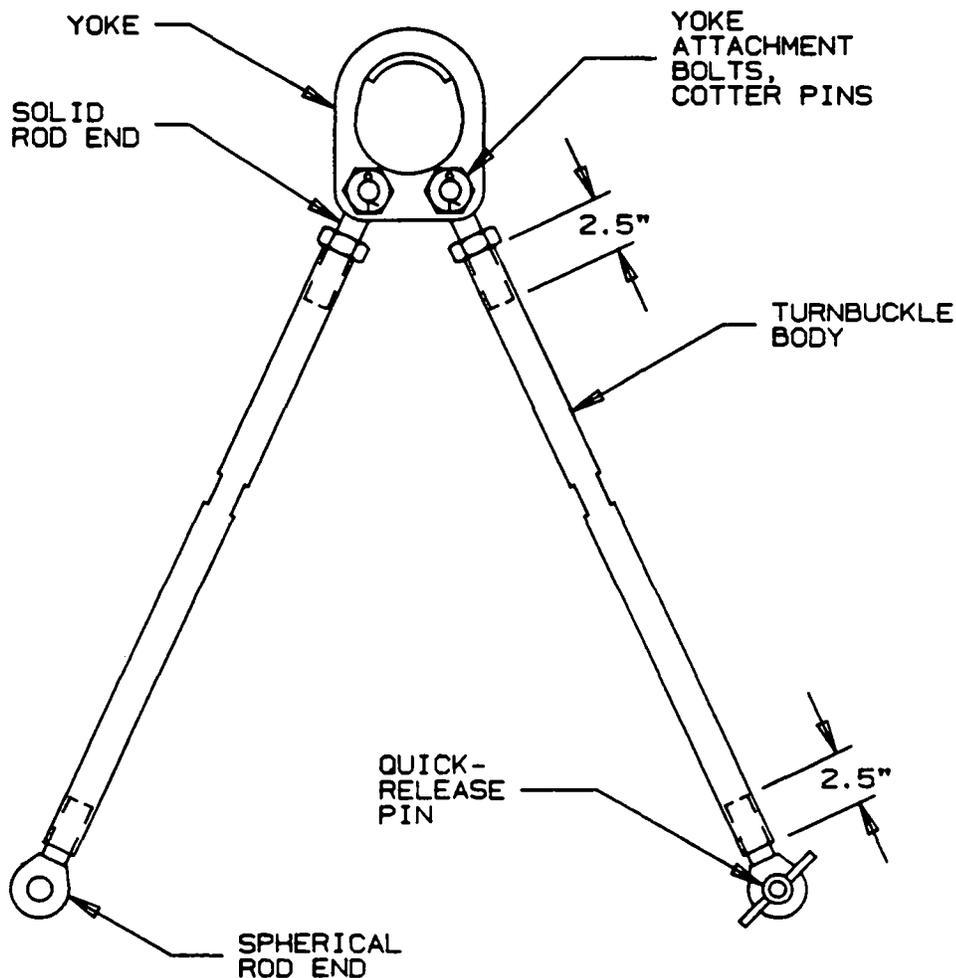


Figure 3.3
Cask to Skid Tiedowns

3.3.2 Refer to the following drawings in Volume II of the SARP for as-fabricated information.

- S50032 Cradle, BUSS Cask
- S85366 Yoke, Tiedown
- S86213 Rod Eye, Tiedown
- S86271 Turnbuckle, Tiedown

3.3.3 Inspect and operate each turnbuckle assembly. Do not disassemble unless there are obvious signs of damage or deterioration. Lubricate threads with Neverseez or equivalent lubricant. If, after lubrication, threaded portions do not operate smoothly (by hand) disassemble rod ends from the body and inspect for thread damage. Refer to Section 9.2 for thread repair.

3.3.4 Lubricate lower rod ends with lithium grease through the grease fittings. Readjust each assembly such that approximately the same amount of threaded rod end is inserted into the turnbuckle body (approximately 2.5 inches).

3.3.5 Examine yoke for indications of damage or cracks in welds. If weld cracks are suspected, remove paint and inspect using dye penetrant.

3.3.6 Repaint yoke, as necessary, to repair scuffing and wear, or paint removed for inspection. Use zinc chromate primer and flat white epoxy base enamel. Follow the paint manufacturer's recommendations on application.

3.3.7 Check turnbuckle-to-yoke attachment bolt cotter pins for integrity. Replace damaged cotter pins. Nuts on these bolts act as retainers only and are not tightened.

3.3.8 Inspect quick-release pins that mount turnbuckles assemblies to skid for signs of looseness, wear, or deterioration. Actuate each and check for smooth operation and positive locking upon release.

3.3.9 Reinstall tiedown assemblies to skid (if disassembled) by installing with the quick-release pins.

3.4 Personnel Barrier

3.4.1 Inspect personnel barrier annually. See Figure 3.4 for inspection points.

3.4.2 Refer to the following drawings in Volume II of the SARP for as-fabricated information.

- S52614 Personnel Barrier, Lower
- S52615 Personnel Barrier, Upper

3.4.3 The upper section of barrier will have been removed as part of cask removal. Remove lower sections of barrier from skid for inspection by removing 9 screws from each section.

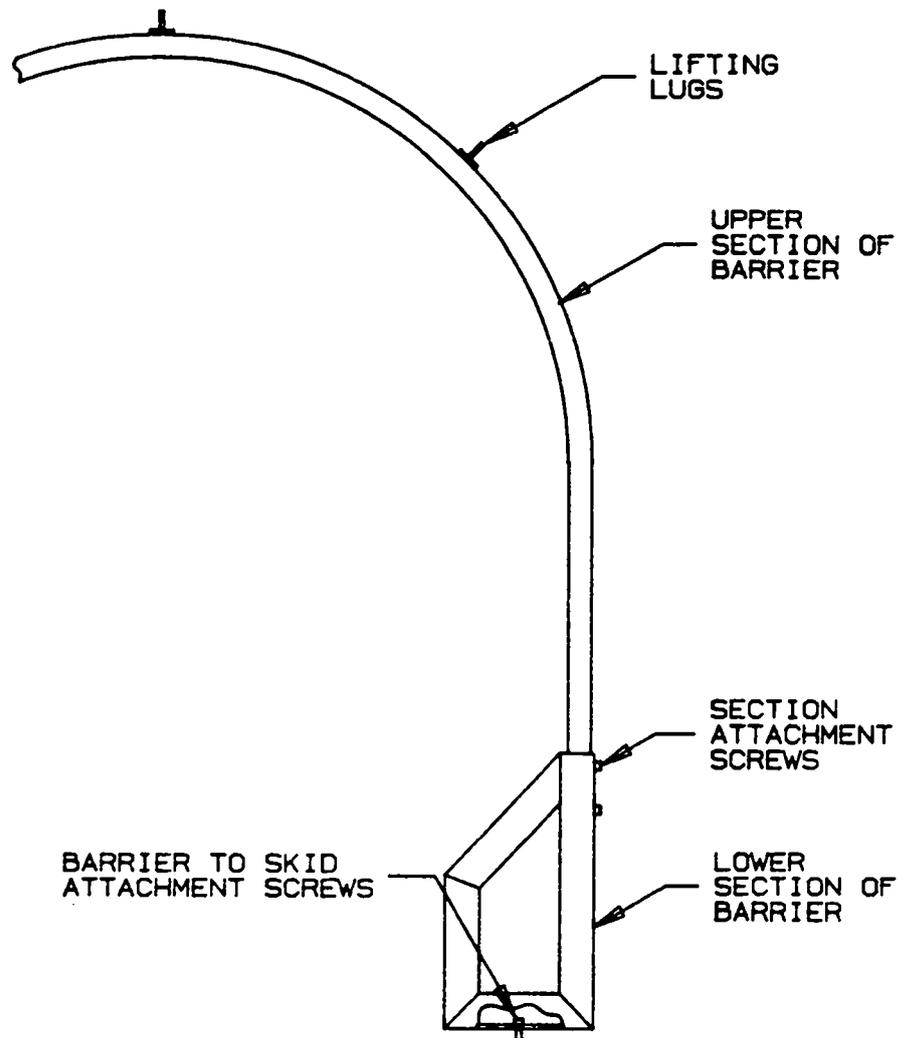


Figure 3.4
Personnel Barrier

3.4.5 Inspect frame, screen, and mounting bolts for signs of damage or cracking of welds. Pay particular attention to the mounting flanges of each lower section and its welds.

3.4.6 Inspect floating nut-plates on the upper section of barrier for corrosion, function, and thread condition. Lubricate threads with Neverseez.

3.4.7 Reattach lower sections to skid and torque the assembly screws to 20 ft-lb.

4.0 ANCILLARY EQUIPMENT

4.1 Introduction

Cask ancillary equipment consists of the following: cask horizontal lifting fixture, cask vertical lifting fixture, cask-handling frame, lid-lifting bail, basket guide, and lid guide pins.

It is recommended that load testing of lifting fixtures (i.e. horizontal and vertical cask lift fixtures, and lid-lifting bail) be performed annually and that load testing of the cask handling frame be performed at 3 year intervals. The cask owner/caretaker shall make final determination of load test (and posttest NDE) intervals.

4.2 Horizontal Lifting Fixture

4.2.1 Inspect horizontal lifting fixture(s) annually or as determined by cask owner/caretaker. See Figure 4.1 for inspection points.

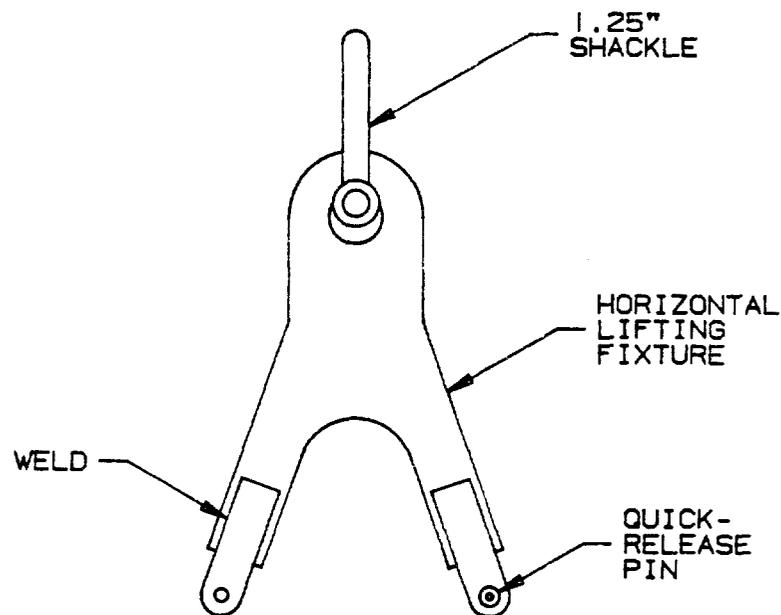


Figure 4.1
Horizontal Lifting Fixture

4.2.2 Refer to the following drawing in Section 10.2 for as-fabricated information.

- S49072 Lifter, BUSS Cask

4.2.3 Inspect attachment pins for indications of cracking, damage, or distortion. Actuate each and check for smooth operation and positive locking upon release. Pins should slide freely in the mounting holes.

4.2.4 Inspect crane hook attachment hole for signs of cracking, damage, or distortion.

4.2.5 Perform a 51,000-lb load test on the lifting device (if required). This is 150% of rated capacity. Use operational attachment pins for test. Procedure for testing is described in Section 8.5 of this manual.

4.2.6 Perform an NDE inspection of all lift fixture welds per Section 8.5 (if required).

4.2.7 Document all observations and results of the load test and weld inspections. File documentation in the cask file.

4.3 Vertical Lifting Fixture

4.3.1 Inspect vertical lifting fixture(s) annually or as determined by cask owner/caretaker. See Figure 4.2 for inspection points.

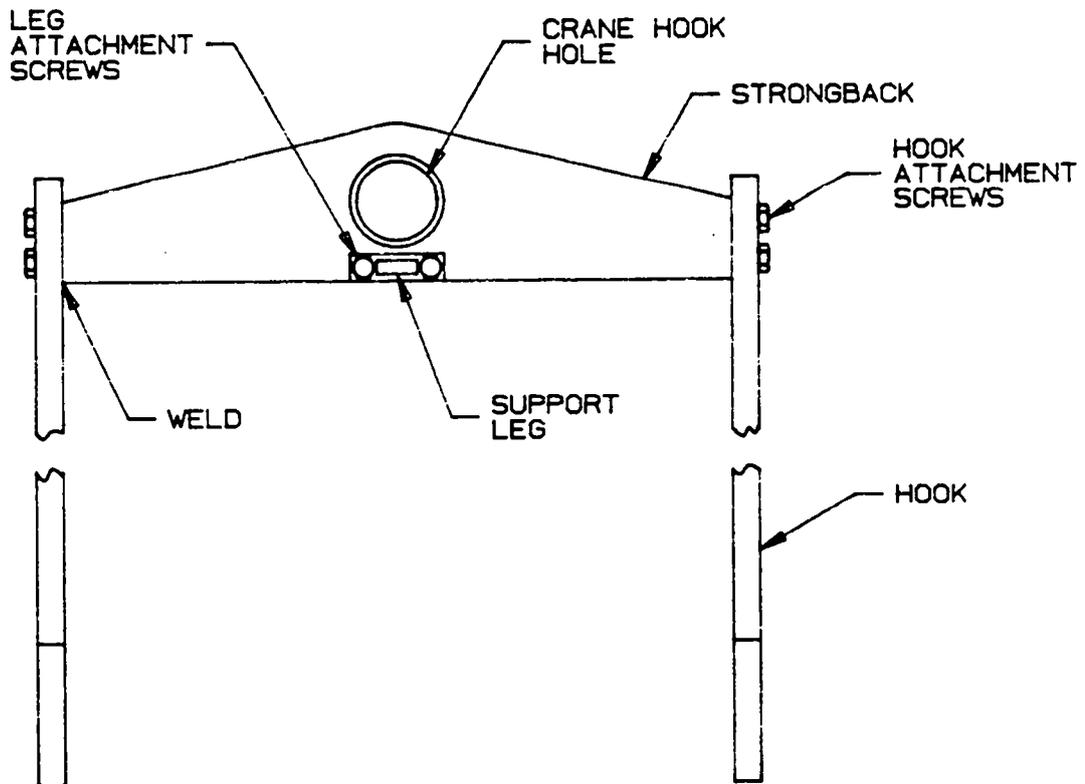


Figure 4.2
Vertical Lifting Fixture

4.3.2 Refer to the following drawings in Section 10.2 for as-fabricated information.

- S49069 Lifting Fixture, BUSS Cask
- S49070 Strongback
- S49071 Hook, BUSS
- S58999 Leg, Standoff

4.3.3 Remove paint from lift fixture welds by sandblasting or other facility approved technique. Visually inspect welds for cracks.

4.3.4 Yoke arms are secured by four 1.250-12 UNF cap-screws and welds. Remove screws and inspect for signs of distortion or corrosion. Lubricate threads with Neolube or equivalent. Reassemble and torque cap screws to 300 ft-lb.

4.3.5 Inspect crane attachment and trunnion engagement surfaces for signs of damage or distortion.

4.3.6 Check 2 support leg cap-screws for tightness and check welds for visual signs of cracking or distortion.

4.3.7 Perform a 36,000-lb load test on the vertical lifting fixture. This is 150% of rated capacity. Procedure for this test is contained in Section 8.6.

4.3.8 Perform an NDE inspection of lift-fixture welds per Section 8.6.

4.3.9 Repaint fixture with zinc chromate primer and flat white epoxy base enamel. Follow the paint manufacturer's recommendations on application.

4.3.10 Document all observations and results of the load test. File documentation in the cask file.

4.4 Handling Frame

4.4.1 Inspect cask-handling frame(s) annually or as determined by cask owner/caretaker. See Figure 4.3 for inspection points. It is recommended that, as a minimum, visual and operational inspections, general cleaning, and lubrication tasks be performed annually. Load tests and weld NDE are recommended at 3 to 5 year internals.

4.4.2 Refer to the following drawings in Section 10.2 for as-fabricated information.

- S48501 Handling Fixture, BUSS Cask
- S52704 Mainframe
- S52705 Crossframe
- S52706 End, Cross Frame
- S52707 Shimpack, Cross Frame
- S52708 Block, Pillow

- S52709 Pawl
- S52710 Race, Lower
- S52711 Plate, Nut
- S52712 Race, Upper
- S52713 Pin, Pivot
- S52714 Housing, Bearing
- S52715 Shaft, Handwheel
- S52716 Shaft
- S52718 Handwheel
- S52719 Actuator
- S52720 Plate, Bearing

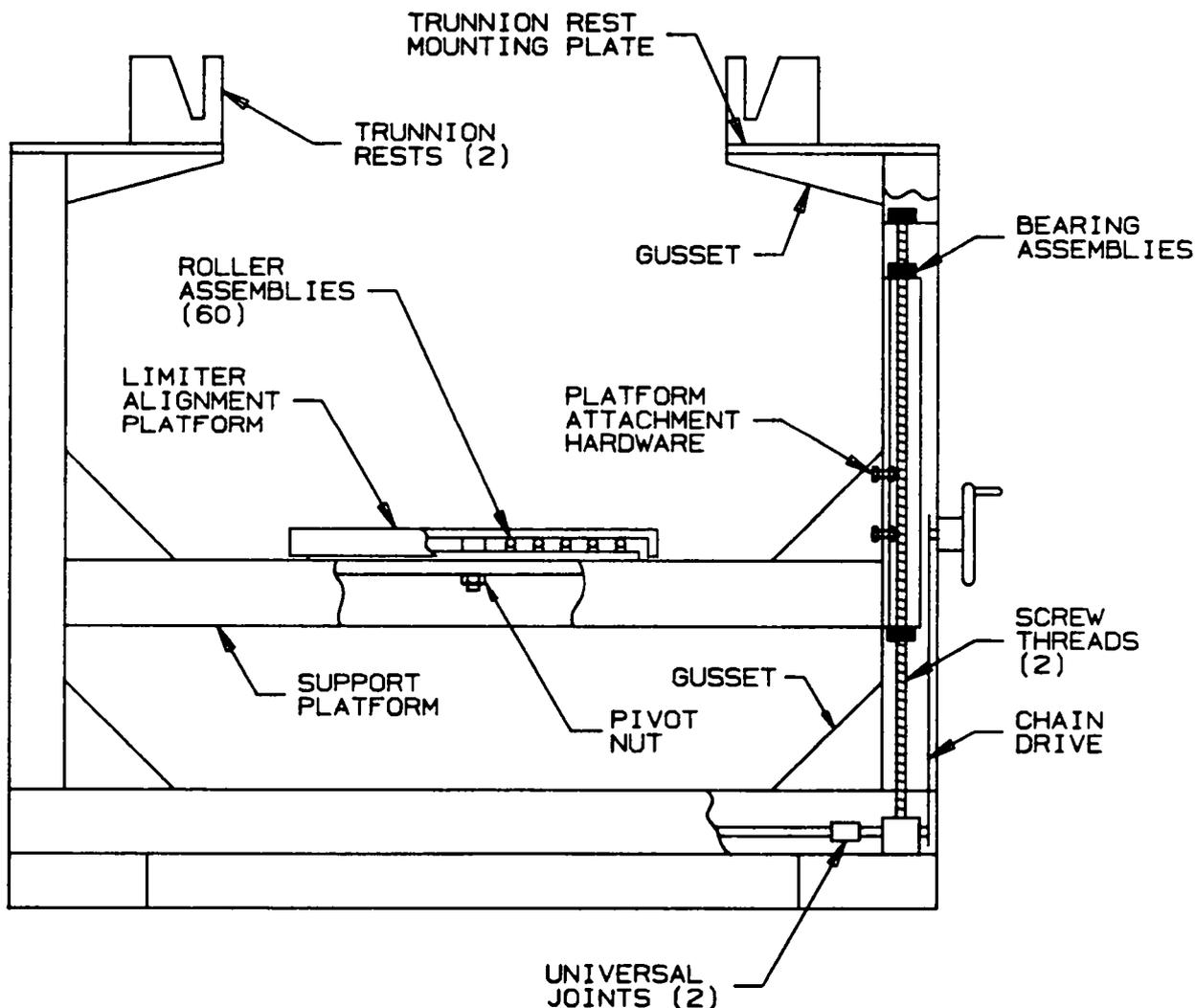


Figure 4.3
Handling Frame

4.4.3 Remove paint from the welds around triangular gussets at top and bottom of each frame upright (Figure 4.3). These welds are considered critical areas. Visually inspect welds for cracks.

- 4.4.4 Visually examine the vertical frame members for distortion.
- 4.4.5 Raise support platform approximately 2 feet from lowered position. Prepare to remove platform assembly from frame by supporting the platform on forklift tines or by rigging with slings to a forklift or overhead crane. Remove 4 bolts from each side of support platform. See Figure 4.3. Remove platform from frame.

NOTE

Hardware on bearings of the vertical drive screws may be loosened to obtain clearance for platform removal. A scribe mark around the bearing before loosening will aid in locating it at reassembly.

- 4.4.6 Perform 150% load test per Section 8.7 of this manual.
- 4.4.7 Perform an NDE inspection of critical weld areas per Section 8.7
- 4.4.8 Reassemble platform into handling frame. Install 8 attachment bolts and tighten to 50 ft-lb.
- 4.4.9 Check operativeness of the impact limiter jack. The support platform should raise and lower smoothly. Any binding can be corrected by adjusting the location of the bearing assemblies on screw threads. Lubricate screw threads and the drive chain and sprockets. A dry film lubricant such as spray silicone or graphite is recommended. Grease the universal joints of the jack shafts through the grease fittings.
- 4.4.10 Remove pivot nut on underside of support platform. Remove alignment turntable top and inspect roller assemblies. Clean out accumulated dirt and lubricate rollers with silicone or graphite. Reassemble turntable top and tighten pivot nut to 50 ft-lb.
- 4.4.11 Inspect trunnion contact surfaces for wear or damage.
- 4.4.12 Repaint frame welds with zinc chromate primer and flat white epoxy base enamel. Also repaint any scraped areas. Follow paint manufacturer's recommendations on application.

4.5 Lid-Lifting Fixture

- 4.5.1 Inspect lid-lifting fixture(s) annually or as determined by cask owner/caretaker. See Figure 4.4 for inspection points.
- 4.5.2 Refer to the following drawing in Section 10.2 for as-fabricated information.

• S48590 Lug, Lifting, Lid

4.5.3 Examine fixture and mounting bolts for indications of damage or distortion.

4.5.4 Perform a 2,400-lb load test on the lid-lifting fixture. This is 150% of the rated capacity. The procedure for this test is contained in Section 8.8.

4.5.5 Perform an NDE inspection of fixture welds per Section 8.8.

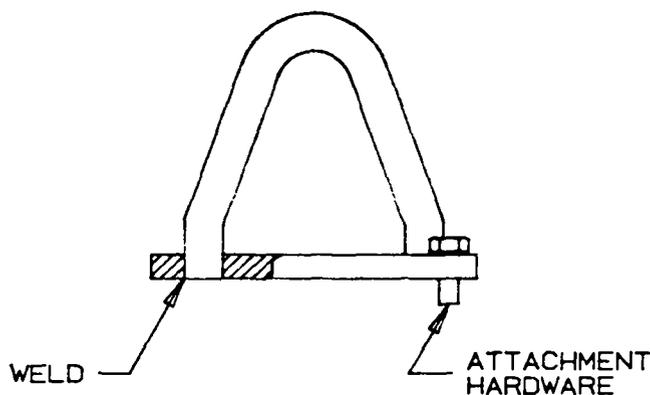


Figure 4.4
Lid Lifting Fixture

4.6 Basket Guide

4.6.1 Inspect basket guide(s) annually or as determined by cask owner/caretaker. See Figure 4.5 for inspection points.

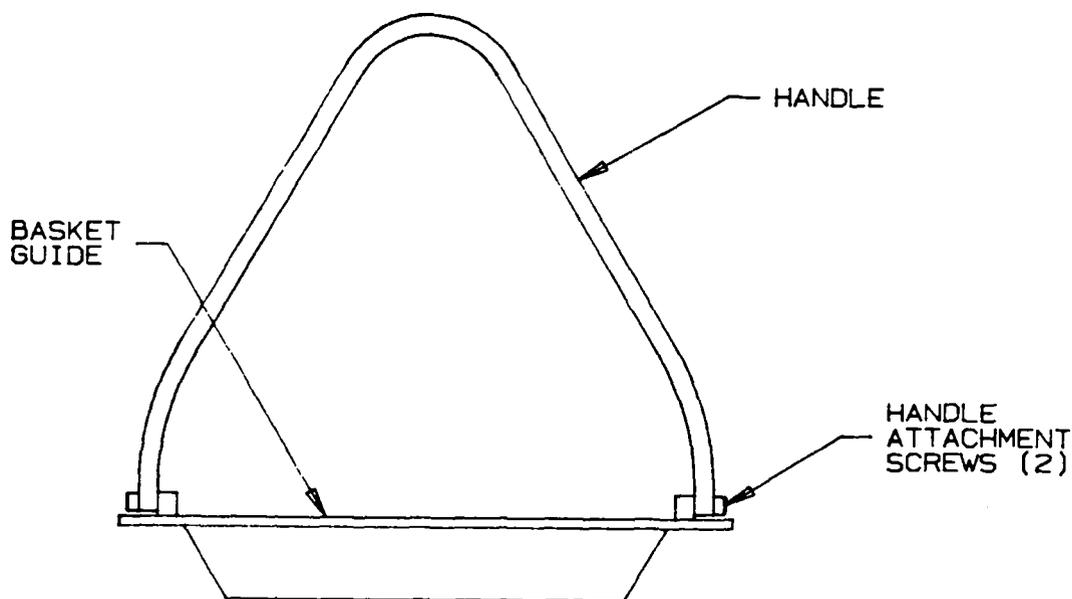


Figure 4.5
Basket Guide

4.6.2 Refer to the following drawings in Section 10.2 for as-fabricated information.

- S49073 Basket Guide Assembly, BUSS
- S49074 Guide, Basket, BUSS
- S49075 Handle, Basket Guide, BUSS

4.6.3 Visually inspect guide for signs of damage or distortion. Minor dents and gouges on guide inner surfaces are acceptable.

4.6.4 Visually examine all welds for signs of cracking.

4.6.5 Check handle attachment bolts for tightness (10 ft-lb).

4.7 Lid Guide Pins

4.7.1 Inspect lid guide pins annually or as determined by cask caretaker/owner. See Figure 4.6 for inspection points.

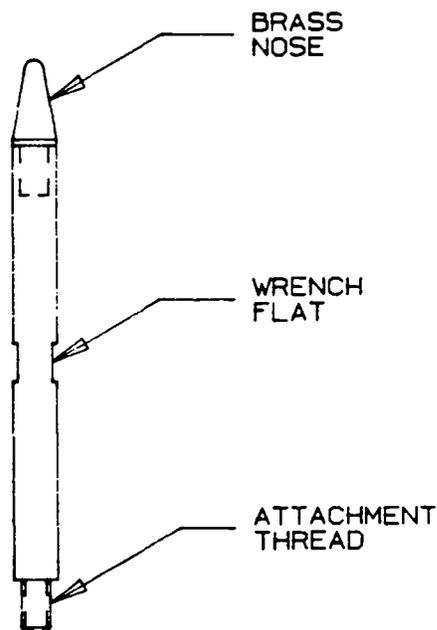


Figure 4.6
Lid Guide Pins

4.7.2 Refer to the following drawings in Section 10.2 for as-fabricated information.

- S48955 Guide Pin #1, Cask Body
- S48956 Guide Pin #2, Cask Body
- S51100 Guide Pin Nose

4.7.3 Remove brass pin nose by unscrewing from pin and examine it (including the threads) for signs of wear or distortion. Also examine pin's internal threads into which nose piece is mounted. Replace nose if excessive gouging is observed.

4.7.4 Check pin body for straightness. Examine external mounting threads for signs of wear or damage.

5.0 TRANSPORTER

5.1 Introduction

The transporter consists of the cask trailer and tractor. The trailer is a unit dedicated to the BUSS and is the responsibility of cask owner or caretaker. The carrier is responsible for the tractor; however the shipper should have evidence that DOT requirements are met. Following are requirements and guidelines for the shipper regarding tractor and/or trailer inspection.

NOTE

The shipper will not perform any maintenance or repair on the tractor unless directed to do so by the carrier. Any such work must be inspected and approved by the carrier.

Tractor inspection items of concern discovered by the shipper or cask owner/caretaker should be brought to the carrier's attention for resolution. Prior to shipping, the cask owner/caretaker must resolve items of concern.

5.2 Trailer

5.2.1 The trailer shall undergo a Commercial Vehicle Safety Alliance (CVSA) inspection annually. Inspection must be performed by certified inspectors and meet the requirements of 49 CFR 396.

5.2.2 Annually inspect transportation skid-to-trailer attachment points for signs of wear or cracks. The skid-to-trailer attachment system consists of 4 mounting areas that are integral to the trailer frame. These areas align with the four corners of the skid. Each area has 2 threaded holes to accept 1-in attachment bolts.

5.2.2.1 Remove the 8 attachment bolts and inspect for corrosion, thread damage, or distortion.

5.2.2.2 Remove skid from trailer and inspect the contact points for corrosion. Repaint as necessary using zinc chromate primer and flat white epoxy base enamel. Follow the paint manufacturer's recommendations on application.

5.2.2.3 Inspect mounting plate threaded holes for thread condition and corrosion. Repaint plate top surfaces as necessary using zinc chromate primer and epoxy base enamel of a matching color. Follow the paint manufacturer's recommendations on application.

5.3 Tractor

5.3.1 The tractor shall have a current Commercial Vehicle Safety Alliance (CVSA) inspection with evident of such. The inspection must be performed by certified inspectors and meet the requirements of 49 CFR 396.

6.0 MAINTENANCE PROCEDURES

6.1 Cask-Cleaning Guidelines

6.1.1 Introduction

These guidelines are to be followed when cleaning or decontaminating the cask assembly, either in the course of handling for shipment or during maintenance activities.

6.1.2 Description

All exposed surfaces of the BUSS Cask are austenitic stainless steel, with few exceptions. These exceptions are occasional items of 17-4 PH stainless steel, A286 steel, Nitronic 60 steel, 4140 steel, ASME SA637 steel, and brass.

NOTE

Cask ancillary equipment may be stainless steel or painted carbon steel. However, these items do not have the contamination potential of the cask and may be cleaned by conventional methods appropriate for the surface.

Because of the anticipated service of the BUSS Cask and the typical operations involved in loading and unloading, the possibility of contamination is relatively low. The hot-cell work is generally performed with the cask covered in some fashion to exclude airborne contamination. The pools into which the cask is placed for unloading or loading are generally contamination-free or have a very low level of contamination.

Performance of the metallic O-ring portion of the lid or port cover seals is quite sensitive to the presence of dirt, lint or other foreign matter on the seal or sealing surfaces. Seal surfaces must be thoroughly cleaned before assembly.

6.1.3 Cleaning - General

6.1.3.1 The stainless steel construction of the BUSS Cask is resistant to detrimental effects of most common solvents used for the removing of grease. Check with the manufacturer of the solvent prior to application.

6.1.3.2 Mechanical removal of contaminants or dirt, such as through the use of steel wool or grit blasting, is prohibited.

6.1.3.3 A biodegradable household detergent is the most successful for general decontamination or cleaning. Cleaners specifically for stainless steel (e.g., Turco Products) are also available.

CAUTION

All cleaning agents must be checked for compatibility with the facility radwaste treatment system.

6.1.3.4 Acids or other strong chemicals that might attack the surface are prohibited.

6.1.3.5 Chemicals with high chlorides are to be avoided.

6.1.3.6 Water for cleaning and rinsing should be demineralized and deionized.

6.1.3.7 Threaded holes should be thoroughly cleaned, and all traces of water or cleaning agents must be removed. A compressed air supply is recommended for drying threaded holes.

NOTE

The threaded inserts are plated alloy steel and are more susceptible to corrosion.

6.1.3.8 During periodic maintenance, the inaccessible areas behind the lifting lugs and trunnions must be inspected and cleaned. Instructions for removal and replacement of these items are contained in Section 2.3.

6.1.3.9 All cleaning-agent residue must be removed from cask surfaces prior to returning the cask to service.

6.1.3.10 Cleaning with abrasives such as Scotch Brite or steel wool is prohibited.

6.1.4 Cleaning - Seal Surfaces

6.1.4.1 Particular care must be taken in cleaning of sealing surfaces. Because the surface finish is critical for the operation of the metallic seal, it is prohibited to use activities or cleaning agents that might adversely affect the surface finish.

6.1.4.2 Clean metallic flange sealing surfaces on the lid and port covers using a small amount of denatured or ethyl alcohol on a clean, soft, lint-free cloth. Wipe in circular pattern, concentric with component diameter.

NOTE

The Helicoflex seal assemblies are cleaned prior to installation. Cleaning information is included with seal replacement instructions contained in the operations manual.

6.1.5 Operational Guidelines

6.1.5.1 When placing the BUSS Cask into a pool, wetting the surface with clean water prior to immersion will reduce contamination potential, assisting in decontamination processes.

6.1.5.2 When removing the cask from a pool, washing the surface with clean water as the cask emerges from the pool will reduce contamination potential, assisting in decontamination processes.

6.1.5.3 The cask bottom may be more difficult to decontaminate because it gets roughened from use which creates traps for contaminants. Placing the cask on a piece of plywood or other pliable material, even when immersing in a pool, will reduce the contamination potential.

6.1.5.4 When placing cask in a hot cell, exterior surfaces may be covered with plastic sheet if there is the possibility of airborne contamination in the cell.

6.2 Quick-Connect Valve Maintenance

6.2.1 Introduction

This procedure is to be used when the quick-connect valve requires removal, refurbishment, and subsequent replacement. The quick-connect valve is located in the lower port of the cask and is removed as an assembly. This valve assembly contains several elastomeric O-rings that require annual replacement. It is recommended that this maintenance be performed when the assembly is removed to perform an annual leak test on the lower port described in Section 7.3 of this manual.

The valve will also be removed and repaired in the event of valve malfunction (failure to close upon release) or leaking while under pressure (during hydrostatic testing, evacuating, or helium backfilling).

In the event that replacement of the O-rings does not return satisfactory performance, the valve itself will have to be replaced. A complete valve assembly (part no. S55861) may be obtained from the cask owner/caretaker. Since the O-rings in the valve assembly have a limited shelf life, a new valve assembly will require the replacement of all O-rings per this procedure prior to use.

6.2.2 References

Refer to the following drawings in Volume II of the SARP for as-fabricated information on the port valve assembly.

- S48981 Cask Assembly
- T73684 Body, Cask, BUSS
- S55861 Port Valve Assembly
- S55862 Adapter
- S55863 Sleeve

Refer to the following drawing in Section 10.2 for as-fabricated information on the port valve tool.

- S94921 Tool, BUSS Port Valve

6.2.3 Replacement Parts

The following spare parts will be required:

- O-ring, part no. 2-024 V0747-75, 2 each
- O-ring, part no. 2-012 V0747-75, 1 each
- O-ring, part no. 2-014 V0747-75, 1 each
- O-ring, part no. 2-114 V0747-75, 2 each

Compound V0884-75 is an acceptable alternate for V0747-75.

These O-rings may be obtained from the cask owner/caretaker or from Parker Seal Company (or a Parker Seal distributor).

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 the recommended maximum shelf life.

6.2.4 Valve Removal

6.2.4.1 Remove lower port thermal shield and cover (if required) following procedures in Section 4.2 of the Operation Manual.

6.2.4.2 Align 4 four pins of the port valve tool (part no. SS94921) with holes in the quick-connect valve assembly. Unscrew (counter-clockwise) and remove assembly using port valve tool and a 1/2-in drive ratchet and extension (Figure 6.1).

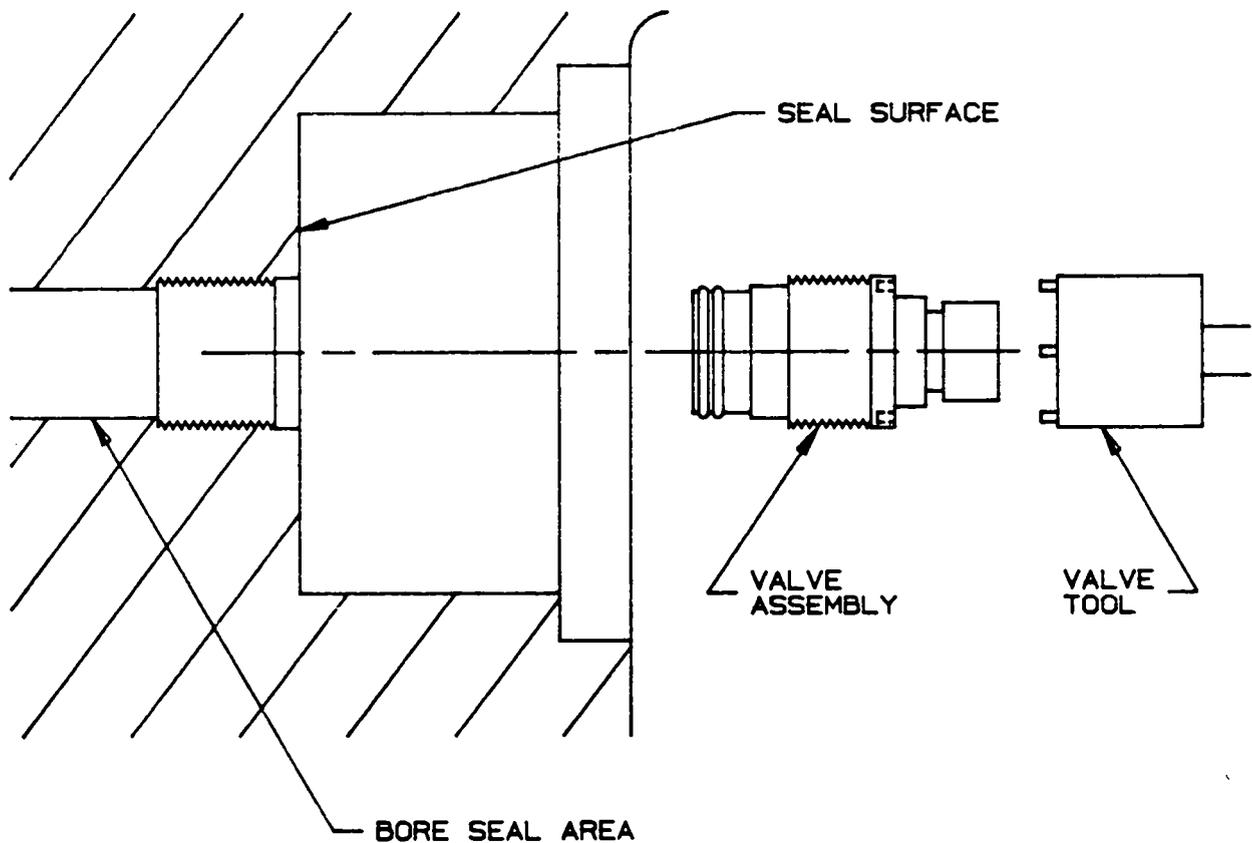


Figure 6.1
Port Valve Assembly Removal

Caution

Exercise extreme care during port valve removal and replacement operations to prevent damage to cask seal surface. It is recommended that the seal surface be protected with several layers of heavy tape (duct tape or equivalent) prior to valve removal.

6.2.5 Valve O-Ring Replacement

6.2.5.1 Figure 6.2 shows a cutaway of the valve assembly. This assembly consists of a valve body assembly installed in an adapter assembly. Note two sets of wrench flats, one on the top section of the valve body and the other on the adapter assembly. Using appropriately sized wrenches on these wrench flats, disassemble valve body assembly by unscrewing (counterclockwise). This will remove the top section of valve body assembly while leaving the bottom section in place in adapter assembly.

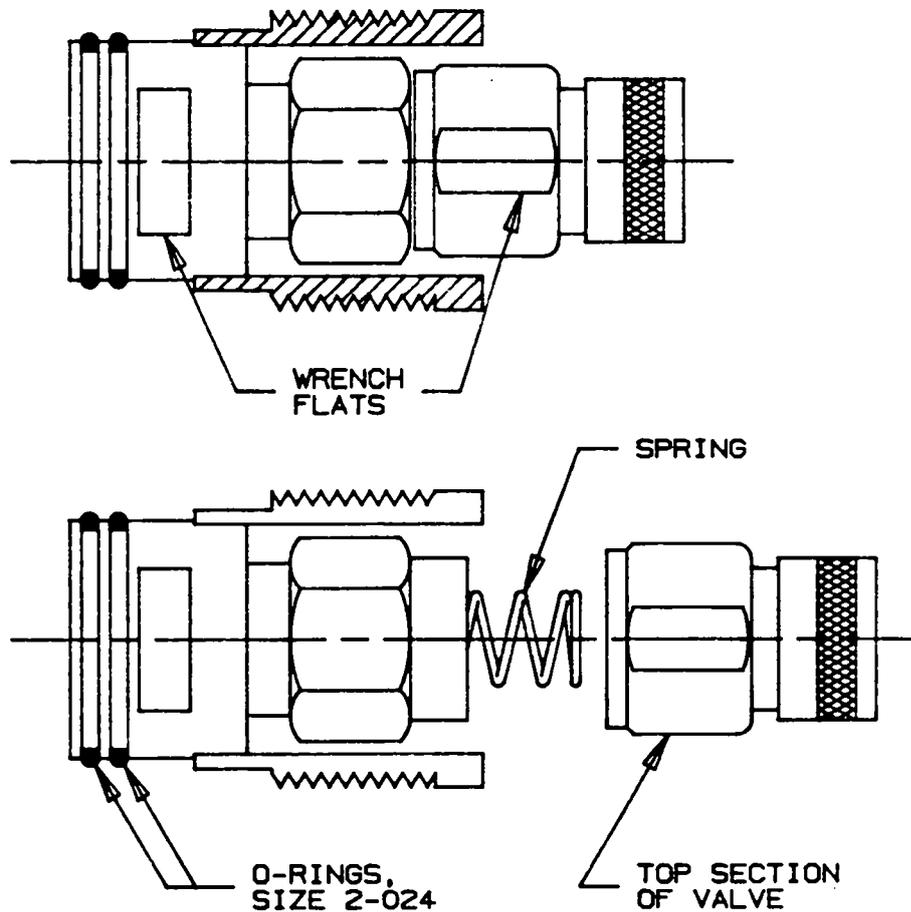


Figure 6.2
Cutaway of Port Valve Assembly

6.2.5.2 Remove poppet and seat from top section of valve. Remove by pushing out of top section using a non-marring pin (Figure 6.3).

Caution

Use soft, non-marring pins for all operations in or around valve seal or O-ring areas. Wood or plastic toothpicks or dowel stock are recommended. The use of a sharp, hard object to remove an O-ring may result in scratches, necessitating valve replacement.

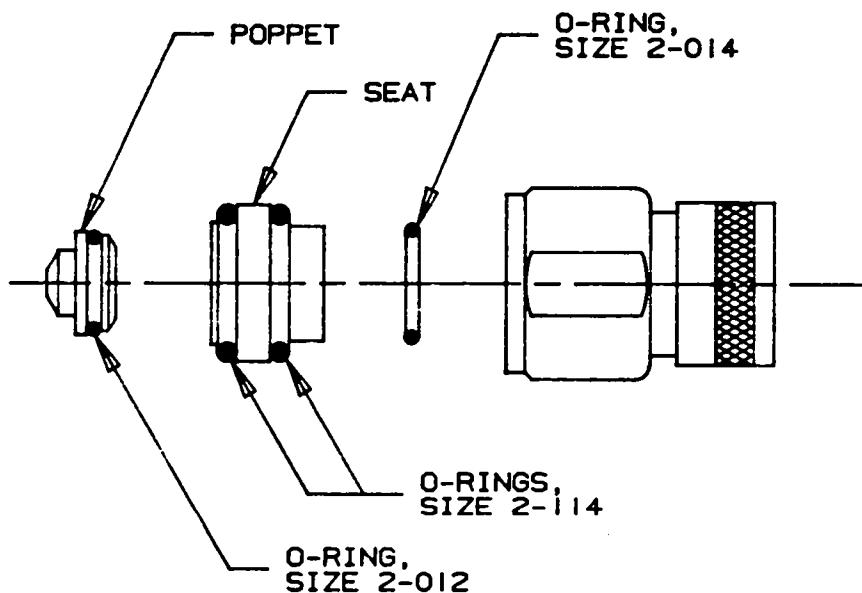


Figure 6.3
Valve Detail

6.2.5.3 Remove 4 O-rings from the valve components. Tag O-rings for disposal. Clean all O-ring grooves and seal surfaces using alcohol dampened, lint free wipers and cotton swabs.

6.2.5.4 Remove 2 O-rings from the adapter assembly.

6.2.5.5 Lubricate a set of new O-rings (listed in Section 6.2.3) using very small quantities of high-vacuum grease.

6.2.5.6 Reassemble 4 O-rings, poppet, and seat into the top section of valve. Refer to Figure 6.3 for component locations.

6.2.5.7 Reassemble top section to lower section by screwing together. Tighten to approximately 10 ft-lb.

6.2.5.8 Install 2 remaining O-rings on the adapter assembly (Figure 6.2).

6.2.6 Valve Installation

6.2.6.1 Use a clean, lint-free cloth dampened with alcohol to clean lower port of cask body, particularly the smooth bore located behind the threads. Check threads for debris.

6.2.6.2 Reinstall valve assembly in lower port using port valve tool. Exercise care to avoid touching seal surface with valve assembly or tool. Tighten to 15 ft-lb.

6.3 Leak Test Fitting Maintenance

6.3.1 Introduction

This procedure is to be used when leak-test fittings, located on lid and port covers, require removal, refurbishment, and subsequent replacement. These fittings contain elastomeric O-rings that require annual replacement. It is recommended that this maintenance be performed when the cask is disassembled and cleaned for annual inspections described in Section 2.0 of this manual. A leak test fitting is made up of an adapter and a plug each of which has an O-ring seal. There are 4 of these fittings on the BUSS cask; 2 on the lid and one on each port cover.

This procedure will also be used when unscheduled maintenance is required as a result of a leaking O-ring.

In the event that replacement of the O-rings does not return satisfactory performance, the fitting itself will have to be replaced. Replacement fittings may be obtained from the cask owner/caretaker. Since O-rings in these fittings have a limited shelf life, new fittings will require replacement of O-rings per this procedure prior to use.

6.3.2 References

Refer to the following drawings in Volume II of the SARP for as-fabricated information on the port valve assembly.

- S54758 Lid Assembly, BUSS Cask
- S54757 Drain Plug Assembly, BUSS

6.3.3 Replacement Parts

The following spare parts will be required:

- O-ring, part no. 3-904 V0747-75
- O-ring, part no. 3-905 V0747-75

Compound V0884-75 is an acceptable alternate for V0747-75.

These O-rings may be obtained from the cask owner/caretaker or from Parker Seal Company (or a Parker Seal distributor).

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 the recommended maximum shelf life.

6.3.4 Fitting O-Ring Replacement

6.3.4.1 Remove O-rings from both adapter fitting and fitting plug using a non-marring pin (Figure 6.4).

Caution

Use soft, non-marring pins for all operations in or around valve seal or O-ring areas. Wood or plastic toothpicks or thin dowel stock are recommended. The use of a sharp, hard object to remove an O-ring may result in scratches, necessitating fitting replacement.

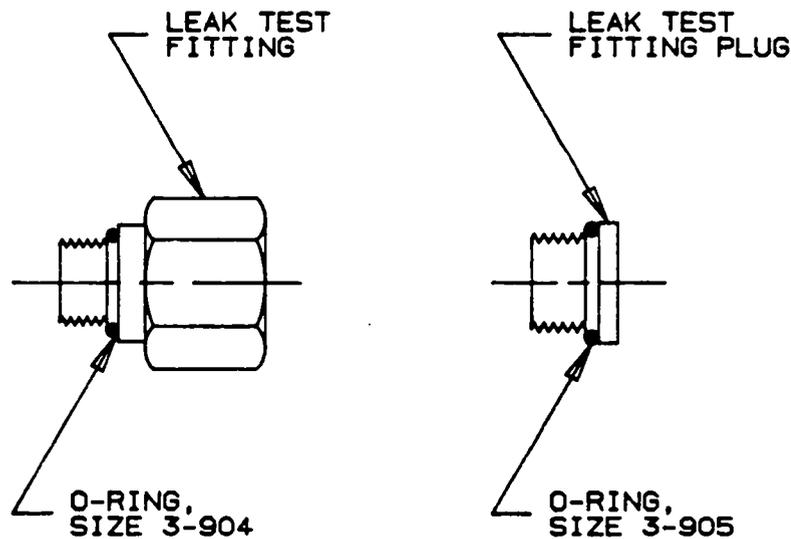


Figure 6.4
Leak Test Fitting and Plug

6.3.4.2 Clean O-ring seal surfaces using alcohol dampened, lint free wipers and cotton swabs.

6.3.4.3 Lubricate a pair of new O-rings (listed in Section 6.3.3) using very small quantities of high vacuum grease.

6.3.4.4 Install O-rings on fitting components. See Figure 6.3 for O-ring part number versus location.

6.4 Limiter Gasket Replacement

6.4.1 Introduction

This procedure is to be used for annual replacement of fill cover gaskets on cask impact limiters. These rubber gaskets can deteriorate over time and exposure to natural elements. Gaskets may be obtained from cask owner/caretaker.

6.4.2 References

Refer to the following drawings in Volume II of the SARP for as-fabricated information on limiters and fill covers.

- S48929 Impact Limiter, BUSS
- S48927 Fill Cover, Impact Limiter
- S48928 Fill Gasket, Impact Limiter

NOTE

The gaskets have a limited shelf life. Administrative controls must be in place to assure that out-of-date gaskets are not used. Three years from manufacture date of the sheet stock from which the gaskets are made is recommended as the maximum life.

6.4.3 Gasket Replacement

Remove the four fill covers of each limiter by removing 4 four screws securing each cover. Look for signs of gasket deterioration. Remove any loose material adhered to the cover or limiter using a putty knife. Wipe off debris or dirt with a dry rag. Place a new gasket over each fill hole, orienting over the screws holes. Reinstall covers and attach with the screws. Tighten screws to approximately 5 ft-lb.

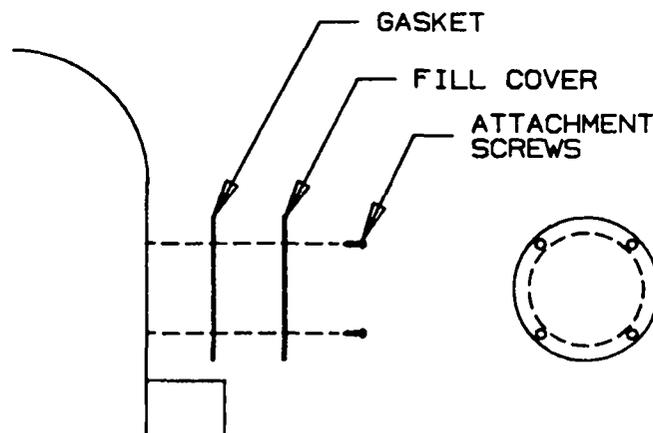


Figure 6.5
Impact Limiter Fill Cover Gasket

7.0 CASK TEST PROCEDURES

Instructions herein assume an empty, disassembled cask. It is recommended that these tests be performed after the annual inspections of the cask components performed in Section 2.0 of this procedure, since the cask will be disassembled and cleaned after these inspections. If the cask is not empty and disassembled, refer to the operations manual for procedures on disassembly.

It is further recommended that these tests be performed in the following sequence:

	<u>Section</u>
1. Hydrostatic test	7.1
2. Containment boundary leak test	7.2
3. Lid seal leak test	7.3
4. Upper port seal leak test	7.4
5. Lower port seal leak test	7.5

The procedures in this section are written to perform the required tests in this sequence, and will eliminate unnecessary disassembly, reassembly, and use of Helicoflex seals.

In certain instances, such as the rework of a seal surface, only one particular test may be required. In these instances, individuals performing the work should review this entire section to determine the cask configuration required for the particular test.

NOTE

In the event that only one particular test is required, a used seal may be installed on any closure. This used seal will form the tracer gas cavity and will not be tested.

7.1 Cask Hydrostatic Test

7.1.1 Introduction

This procedure is to be used when performing a hydrostatic test of the BUSS Cask containment boundary. This test imposes a mechanical load on the assembled cask containment boundary.

The cask containment boundary consists of the cask body with lid and upper port cover installed. New Helicoflex seals are mounted on the cask lid and port covers, and these closures are secured by bolts. The quick-connect valve assembly that is in place in the lower port is used for plumbing connections. The hydrostatic test will pressurize the entire containment boundary with the exception of the lower port cover, as this port is used for plumbing purposes. Figure 7.1 shows the hydrostatic test set-up.

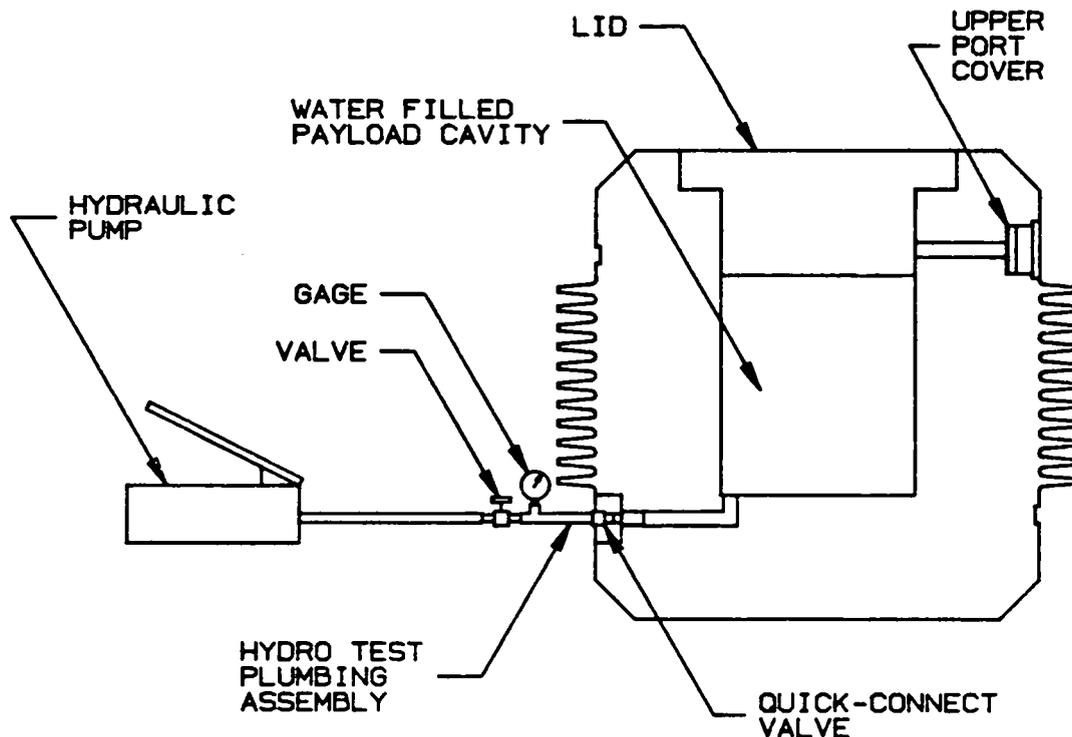


Figure 7.1
Hydrostatic Test Configuration

7.1.2 Acceptance Criterion

There shall be no detectable decrease in pressure during the 30-minute test within the sensitivity of the 0-100 psig pressure gage.

7.1.3 Documentation

Document all hydrostatic test data and results on a Structural Pressure Test Data Sheet (see example in the Section 10.1 of this manual) and maintain as part of permanent cask file.

7.1.4 Test Preparation

7.1.4.1 Install new Helicoflex seals on cask lid and one port cover, following procedures in Sections 4.3 and 4.5 of the cask operations manual. Install port cover by centering over upper port in cask body, aligning 6 mounting holes. Hold cover from moving while installing 6 mounting bolts and washers. Using an appropriate torque wrench and a 3/4-in socket, incrementally tighten bolts in a crossing pattern to 10, 30, and then 60 ft-lb. Torque pattern again at 60 ft-lb.

7.1.4.2 Fill cask payload cavity (no basket in place) with demineralized/deionized water to within approximately 6 inches of lid seal surface. Water level will be at the approximate centerline of upper port penetration into cask interior and will be approximately 35 gallons.

7.1.4.3 Install 3 lid guide pins. Completely extend 3 lid jack screws by turning clockwise with a 3/4-in socket wrench. Lubricate 12 lid bolts with Neolube #1 lubricant, applying with a small brush. Brush a thin coating of lubricant to the threads and bearing surface of bolt heads, and allow to dry.

7.1.4.4 Place lid on the cask, expelling excess water. Install lid bolts and tighten by hand. Remove 2 lid leak-check fitting plugs.

CAUTION

Use only hand operations to install lid bolts. Assisted tightening with jacking screws extended will damage cask body and lid.

7.1.4.5 Attach hydrostatic plumbing assembly (part no. R35032-100) as shown in Figure 7.1 by inserting into the quick-connect valve until a snap is felt. Attach flexible line to a water-filled hydraulic pump (manual or power-operated). Verify calibration of 0-100 psig pressure gage installed in plumbing assembly.

CAUTION

If a power-operated pump is used, a pressure relief valve must be installed to protect against inadvertent overpressure. Test pressure is 75 (-0, +5) psig.

7.1.4.6 Lower lid using the jack screws. Using a 3/4-in socket wrench, turn each jack screw one-quarter turn counter-clockwise. Continue around screw pattern until indicator pins are flush with top of jack screw.

7.1.4.7 Remove 3 lid guide pins and lid lifting fixture.

7.1.4.8 Using an appropriate-sized torque wrench and a 12 point, 1-5/8-in socket, torque 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 marked on lid surface adjacent to each bolt hole.

7.1.4.9 Increase lid bolt torque to 100 ft-lb, following sequence above. Increase to 200 ft-lb, 600 ft-lb, and then a final torque of 1,250 ft-lb, following sequence at each torque increment. Make two additional passes at 1,250 ft-lb value repeating above torquing pattern.

7.1.4.10 Using compressed air, blow water out of closure head/cask body groove and dry cask exterior. Also, apply air to one lid leak test fitting to force water out of leak test cavity.

7.1.5 Hydrostatic Test

7.1.5.1 Operate pump to slowly increase pressure to first 25, 50, and then 70 psig. Stop after each increment and observe cask, lid, upper port cover, and lower port quick-connect valve for signs of water leakage. If leakage is observed, depressurize cask, remove leaking component, and inspect seal and sealing surfaces for damage or foreign matter.

7.1.5.2 When test pressure of 70 psig is reached, valve off pump. Allow cask to set for a minimum period of 2 hours to allow water temperature to stabilize.

7.1.5.3 Open valve to the pump. Raise test pressure to 75 (-0, +5) psig and close valve. Observe pressure gauge for a period of 30 minutes. There should be no drop in pressure. A pressure drop indicates a leak.

7.1.5.4 Observe lid and ports for indications of leakage during 30-minute test period. If pressure decreases and no exterior leakage is observed there are several possible causes:

- Air is trapped in the system.
- The pump isolation valve is leaking.
- Leakage is occurring between the metallic and elastomeric sealing elements but has not filled the test cavity enough to vent through the leak-test fitting.
- Test water was warmer than the cask, and cooling reduced its volume.

7.1.5.5 In the event of a failed test (i.e., pressure decay) without any visible indications of water leakage, retest the cask. Prior to retesting:

- Check for test equipment line and/or valve leaks.
- Allow additional time for water temperature to come to equilibrium with that of the cask.

7.1.5.6 If a water leak at a flange is observed, remove component, inspect sealing surfaces, replace seal with new seal and re-test. A second failure, as indicated by leakage, is cause for remedial action on sealing components.

7.1.5.7 If a water leak at lower port quick-connect valve is observed, remove and replace valve per Section 8.1 of this manual.

7.1.5.8 Record test parameters on a test data sheet. Sign off sheet as required. An example data sheet is shown in Section 9.1 to this procedure.

7.1.5.9 Depressurize cask and remove plumbing assembly from lower port quick-connect valve.

7.1.5.10 Remove quick-connect fitting assembly from lower port following instructions in Section 6.2 of this manual. Removal of this valve will allow water to drain from cask cavity.

NOTE

The cask may be suspended over the facility pool or a large tray to catch the water (approximately 35 gallons) drained from cask cavity. Cask lifting must be made by use of a vertical lifting fixture.

7.1.5.11 Reinstall quick-connect fitting assembly in lower port following instructions in Section 6.2 of this manual.

7.2 Containment Boundary Leak Test

7.2.1 Introduction

This procedure shall be used when performing a periodic verification test of the cask containment boundary. This leakage test is performed on an annual basis or before returning the cask to service if it has not been used in more than one year.

This test shall also be performed before first use of the cask as a fabrication verification test. It is recommended that the test be performed in conjunction with the hydrostatic test on the assembled cask described in Section 7.1. Performing this test immediately after the hydrostatic test will eliminate need for additional new seal assemblies, as the cask will already be in the required configuration.

Additionally, this test must be performed after a major repair to cask body or lid. A major repair requires welding, drilling, or other major machine work. Resurfacing (sanding) of lid or port seal surfaces does not constitute a major repair.

This procedure tests the entire containment boundary of the assembled cask. The test consists of evacuating the payload cavity with a helium mass spectrometer leak detection system and exposing the exterior of the cask to a helium atmosphere. A helium atmosphere is created by a plastic bag purged with tracer gas. The presence of helium, as indicated by the mass spectrometer, signifies a leak across the containment boundary. The inability to evacuate the test cavity or to maintain a vacuum indicates a gross leak. Test configuration is shown in Figure 7.2.

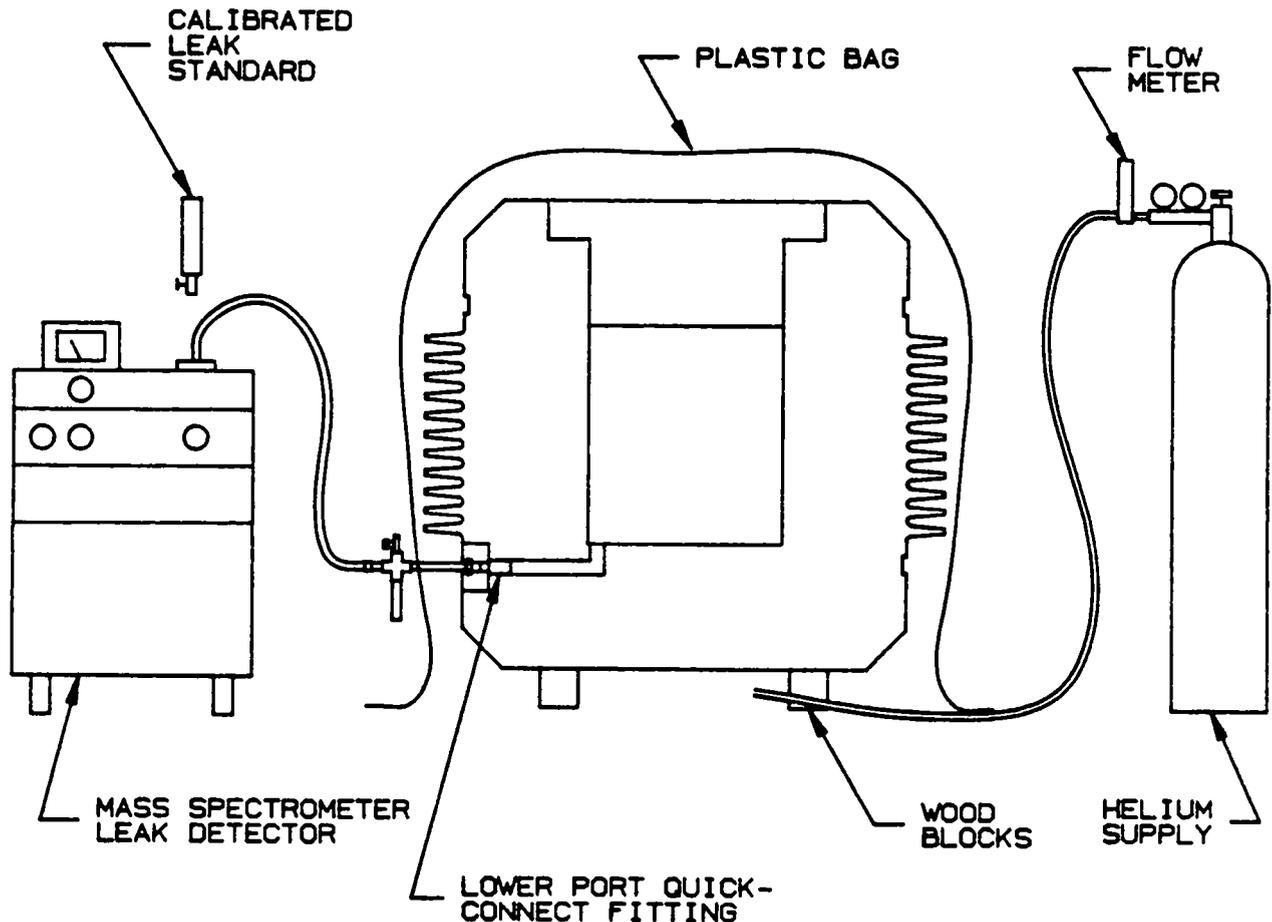


Figure 7.2
Assembled Containment Boundary Test Configuration

7.2.2 Acceptance Criterion

The leakage rate limit for the annual test is:

$$L = 1.0E-5 \text{ std cm}^3/\text{s (helium)}$$

Minimum test sensitivity shall be $L/2$ ($5.0E-6 \text{ std cm}^3/\text{s}$).

7.2.3 Documentation

Document all leak-test results on Leak Test Data Sheet (example in Section 10.1 of this manual) and maintain as part of permanent cask file.

7.2.4 References

American National Standard for Radioactive Material - Leakage Tests on Packages for Shipment, ANSI N14.5, 1987

NOTE

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

7.2.5 Test Preparation

7.2.5.1 Raise cask off floor by setting on blocks or timbers.

7.2.5.2 Place or wrap cask in plastic bag. Figure 7.2 shows a recommended way of ensuring a complete envelope: Place plastic bag over cask assembly. Place helium supply line and leak test line under bag, against floor. Tape lower edges (open end) of bag to floor.

NOTE

It is recommended that the envelope be only large enough to surround the cask assembly. This will minimize the amount of helium required to fill the envelope.

7.2.5.3 Install helium backfill plumbing assembly (part no. R35032-000) through a small hole in bag into lower port quick-connect fitting. Insert into valve until a snap is felt. See Figure 7.3.

7.2.5.4 Loosen ring on O-ring sealed fitting near butterfly valve of plumbing assembly (see Figure 7.3). Install flexible tubing to this fitting by slowly inserting into fitting and pushing past O-ring seal. Tighten ring finger tight. Attach other end of flexible tube to a vacuum pump.

NOTE

If the type of vacuum pump being used can be adversely affected by pumping water vapor, a trapping system should be installed in the line to the plumbing assembly. A liquid nitrogen cold trap is recommended. As much as 100 cm³ of water may be present in the cask cavity.

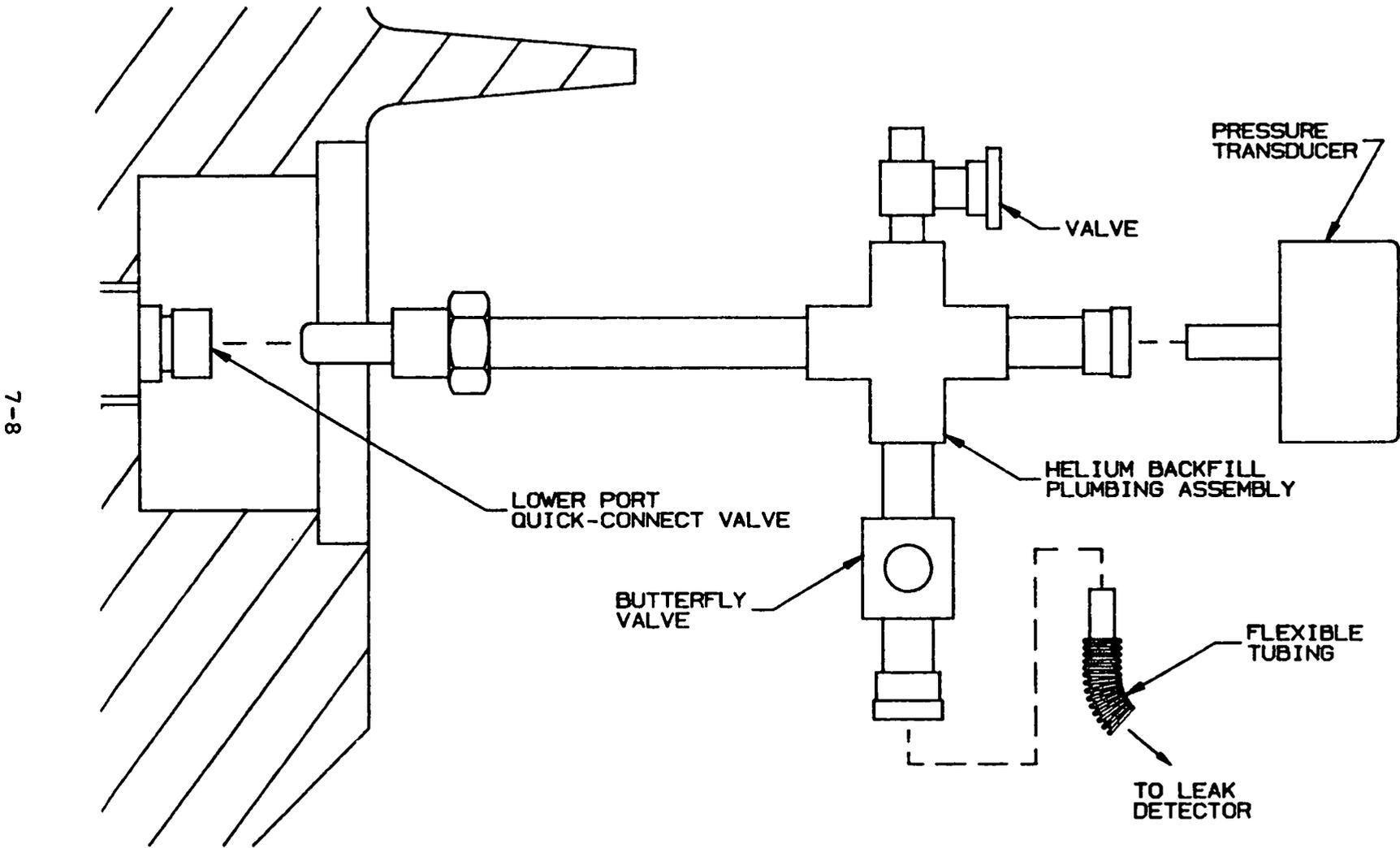


Figure 7.3
Containment Boundary Test Plumbing Detail

7.2.5.5 Loosen ring on other O-ring sealed fitting (adjacent to "cross" of plumbing assembly). Install the 0 to 1000 torr range pressure transducer to this fitting and tighten ring finger tight (Figure 7.3). Close high-vacuum valve of plumbing assembly; no connection will be made to this fitting.

7.2.5.6 Evacuate test cavity with vacuum pump to a pressure of 5.0 torr or less. After satisfactory evacuation, close butterfly valve of the plumbing assembly.

NOTE

Evacuation times may vary from 15 to 60 minutes, depending on pump size and amount of water trapped in cask payload cavity.

7.2.5.7 Prepare mass spectrometer leak detector for operation per manufacturer's instructions. Record standard leak calibration information on data sheet. Using formula supplied with calibration documentation, correct standard leak to standard temperature (0°C). Record corrected value on the data sheet.

7.2.5.8 Disconnect flexible line from vacuum pump and connect it to leak detector.

NOTE

An air flow should be established past or away from cask, and leak detector placed at an upwind location. This will reduce the possibility of the leak detector being affected by the excess helium that will escape from the envelope.

7.2.5.9 Calibrate leak detector using standard leak and its temperature corrected leak rate value. Record detector calibration reading on data sheet.

7.2.5.10 Open butterfly valve on plumbing assembly and evacuate cask payload cavity with leak detector. Record background reading.

7.2.5.11 Fill envelope with helium. A high concentration (95% minimum) must be assured. A recommended method of assuring a high concentration is to first remove excess air from envelope by collapsing the bag and then establish a helium flow of 25 ft³/minute or greater.

NOTE

Technical grade helium, (99.5% purity) is sufficient quality for the tracer gas.

7.2.5.12 Monitor leak detector for a minimum period of 10 minutes or until readings stabilize. Record final stabilized reading.

NOTE

In the event of a leak in excess of the requirement, the leak can be found by removing the envelope and spraying small amounts of helium around suspect areas while monitoring the detector.

NOTE

A small leakage rate ($<E-8$ cc/s) may be noted approximately 10 minutes into the test. This rise is the result of helium permeating the elastomeric O-rings in the lower port quick-connect valve assembly.

7.2.5.13 Vent payload cavity. Recheck calibration of detector using standard leak. Record results.

7.2.5.14 Disconnect detector from lower port and shut off leak detector per manufacturer's instructions. Store detector and leak test equipment. Remove plumbing assembly from lower port quick-connect valve. Remove plastic envelope.

7.3 Lid Seal Leak Test

7.3.1 Introduction

This procedure shall be used when performing a periodic verification test of the BUSS cask lid seal. This leakage test is performed on an annual basis or before returning the cask to service if it has not been used in more than one year.

This test shall also be performed before the first use of the cask as a fabrication verification test. It is recommended that the test be performed in conjunction with the containment boundary leak test on the assembled cask described in Section 7.2. Performing this test immediately after the boundary test will eliminate the need for additional new seal assemblies, as the cask will already be in the required configuration.

Additionally, this test shall be performed after a repair has been made to a closure area of the cask containment boundary, i.e., a seal surface repair.

The procedure consists of leak testing the Helicoflex seal component of the lid seal assembly. A helium mass spectrometer is connected to the test cavity via the leak-test port, and the seal-test cavity is evacuated. The cask cavity is evacuated and then backfilled with helium to one atmosphere pressure. The presence of helium, as indicated by the mass spectrometer, signifies a leak across the metallic O-ring. The inability to evacuate the test cavity or to maintain a vacuum indicates a gross leak across one or both seals of the assembly.

7.3.2 Acceptance Criterion

The leakage rate limit for the test is:

$$L = 1.0 \times 10^{-4} \text{ std-cm}^3/\text{s (helium)}$$

This leakage rate is the allowable maximum rate for 1) the lid seal and 2) the sum of the rates for the lid, upper port, and lower port seals. This means that while a 1.0×10^{-4} leak is acceptable for the lid seal, the subsequent tests of the two port seals would have to show zero leakage to meet the 1.0×10^{-4} for the sum of the three seal tests. It is therefore desirable to have individual leakage rates in the 10^{-5} range or less.

For each test, a minimum test sensitivity of 1.5×10^{-5} is required.

7.3.3 Documentation

Document all leak-test results on a Leak Test Data Sheet (example in Section 10.1) and maintain as part of permanent cask file.

7.3.4 References

American National Standard for Radioactive Material - Leakage Tests on Packages for Shipment, ANSI N14.5, 1987

NOTE

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

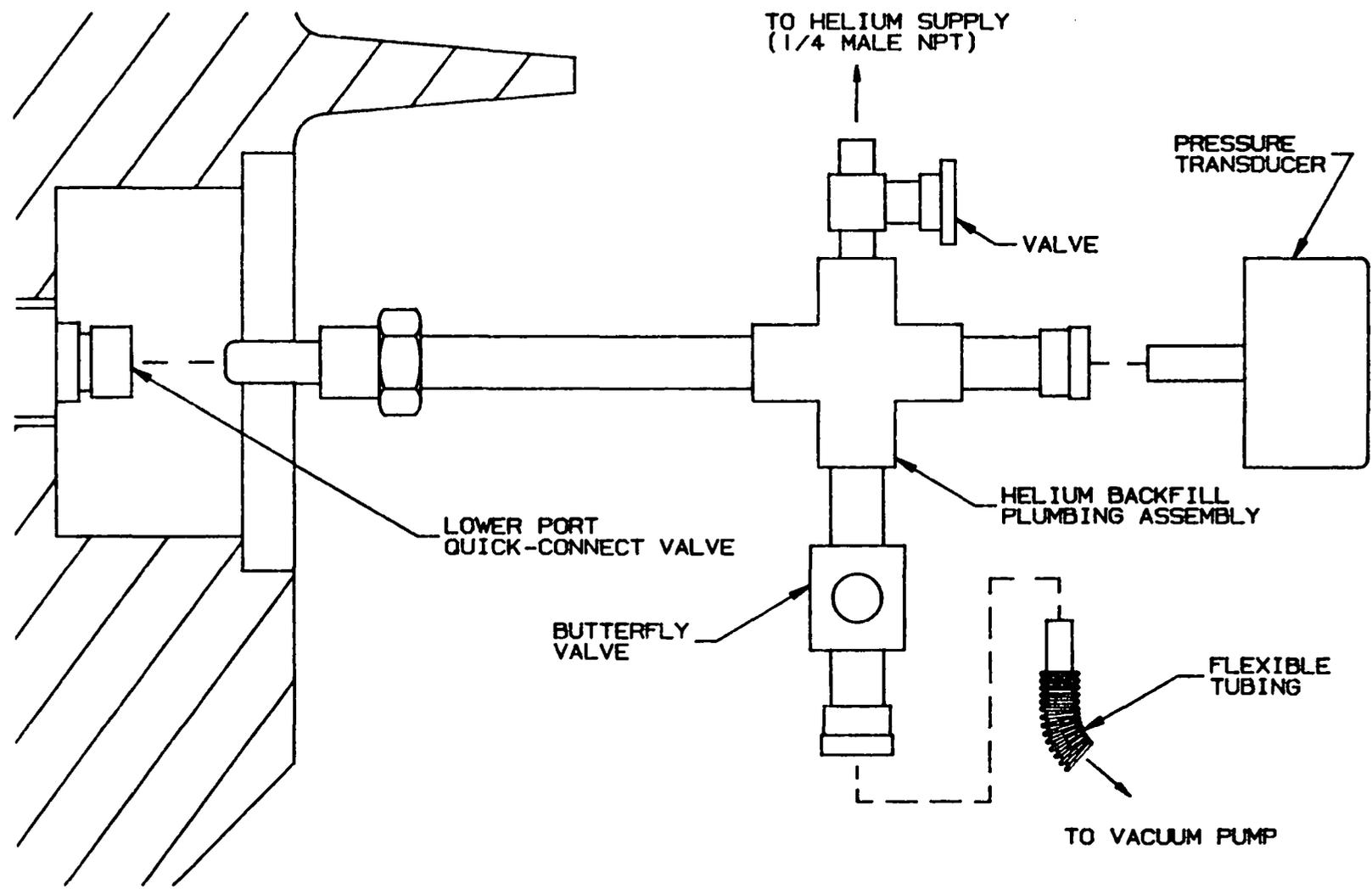
7.3.5 Test Preparation

7.3.5.1 Install helium backfill plumbing assembly (part no. R35032-000) into lower port quick-connect fitting. Insert into valve until a snap is felt (Figure 7.4).

7.3.5.2 Loosen ring on O-ring sealed fitting near butterfly valve of plumbing assembly (Figure 7.4). Install flexible tubing to this fitting by slowly inserting into fitting and pushing past O-ring seal. Tighten ring finger tight. Attach other end of flexible tube to a vacuum pump.

7.3.5.3 Loosen ring on other O-ring sealed fitting (adjacent to "cross" of plumbing assembly). Install 0 to 1000 torr range pressure transducer to this fitting and tighten ring finger tight (Figure 7.4).

7.3.5.4 Connect helium supply to high-vacuum valve side of the plumbing assembly (Figure 7.4).



7-12

Figure 7.4
Helium Backfill Plumbing Assembly

NOTE

Technical grade helium, (99.5% purity) is sufficient quality for the tracer gas.

7.3.5.5 Open butterfly valve to vacuum pump and evacuate cask cavity to a pressure of 5 torr or less.

7.3.5.6 Remove plug from one of the two test port fittings on lid, using a 3/16-in Allen wrench or hex driver (Figure 7.5). Check to see that the remaining plug is fully seated and tight. Install lid leak test plumbing assembly (part no. R32035-300) into leak test port by screwing in until fully seated.

7.3.5.7 Attach leak detector to plumbing assembly using a flexible line. Install line to O-ring sealed fitting nearest the lid (Figure 7.5). Close the valve of the plumbing assembly.

7.3.5.8 Prepare mass spectrometer leak detector for operation per manufacturer's instructions. Record standard leak calibration information on data sheet. Using formula supplied with calibration documentation, correct the standard leak to standard temperature (0°C). Record corrected value on data sheet.

NOTE

Personnel involved in leak testing the cask should be thoroughly familiar with operation of the mass spectrometer leak detector and with standards and practices defined in ANSI N14.5.

7.3.5.9 Calibrate leak detector using standard leak and its temperature corrected leak rate value. Record detector calibration reading on data sheet.

7.3.6 Lid Seal Test

7.3.6.1 Evacuate seal test cavity with the leak detector. Allow sufficient time for leak detector reading to stabilize. Record this test cavity background reading on worksheet.

NOTE

Excessive pumping time to obtain an acceptable operating pressure or background reading may indicate the presence of significant moisture in the test cavity or a leak in the seal. If the pressure and/or background reading gradually decreases, continue pumping, as this indicates the presence of moisture. If the readings are high and show no improvement over time, a significant leak in the seal assembly is indicated and the seal will have to be replaced.

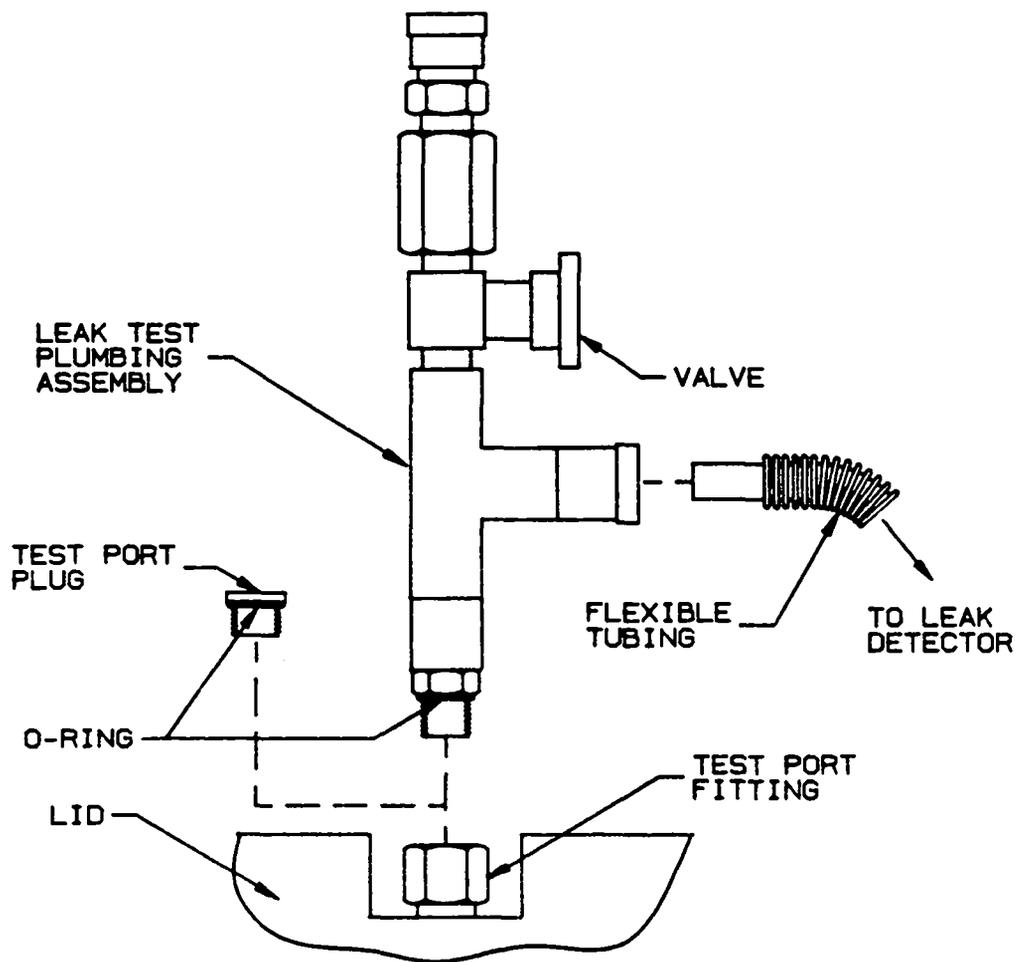


Figure 7.5
Lid Seal Leak Test Configuration

7.3.6.2 Valve in helium supply and backfill payload cavity to 1 atmosphere of pressure (760 torr). Document operation on worksheet.

7.3.6.3 Monitor leak detector. An acceptable measurement is one that is stable over a time period of two minutes. Record leak rate value on data sheet. This leak rate must be less than 1.0×10^{-4} std cc/s. If leak rate exceeds this value, lid must be removed and seal replaced. See Operations Manual, Section 4.0 for lid removal and seal replacement instructions.

NOTE

A calculation, which relates the measured leak reading to calibration reading, may be required, depending on make and model of leak detector.

7.3.6.4 Vent leak detector and remove flexible line from plumbing assembly. Remove plumbing assembly from lid test port. Reinstall plug in test port fitting until fully seated and tight.

7.3.6.5 Remove helium from payload cavity by evacuating with the vacuum pump. Leave helium backfill plumbing assembly and all connected equipment in place in lower port.

7.4 Upper Port Cover Seal Test

7.4.1 Introduction

This procedure shall be used when performing a periodic verification test of the BUSS cask upper port seal. This leakage test is performed on an annual basis or before returning the cask to service if it has not been used in more than one year.

This test shall also be performed before first use of the cask as a fabrication verification test. It is recommended that the test be performed in conjunction with the leak test on the cask lid seal described in Section 7.4. Performing this test immediately after the lid test will eliminate the need for additional seal assemblies, as the cask will already be in the required configuration.

Additionally, this test shall be performed after a repair has been made to a closure area of the cask containment boundary, i.e., a seal surface repair.

The procedure consists of leak testing the Helicoflex seal component of a port seal assembly. A helium mass spectrometer is connected to the test cavity via a leak-test port, and the seal test cavity is evacuated. The cask cavity is evacuated and then backfilled with helium to one atmosphere pressure. The presence of helium, as indicated by the mass spectrometer, signifies a leak across the metallic O-ring. The inability to evacuate the test cavity or to maintain a vacuum indicates a gross leak across one or both seals of the assembly.

7.4.2 Acceptance Criterion

The leakage rate limit for the test is:

$$L = 1.0 \times 10^{-4} \text{ std-cm}^3/\text{s (helium)}$$

This leakage rate is the allowable maximum rate for 1) the upper port seal and 2) the sum of the rates for the lid, upper port, and lower port seals. This means that while a 1.0×10^{-4} leak is acceptable for this seal, the tests of the lid and lower port seals would have to show zero leakage to meet the 1.0×10^{-4} for the sum of the three seal tests. It is therefore desirable to have individual leakage rates in the 10^{-5} range or less.

For each test, a minimum test sensitivity of 1.5×10^{-5} is required.

7.4.3 Documentation

Document all leak test results on a Leak Test Data Sheet (example in Section 9.1) and maintain as part of permanent cask file.

7.4.4 References

American National Standard for Radioactive Material - Leakage Tests on Packages for Shipment, ANSI N14.5, 1987

NOTE

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

7.4.5 Test Preparation

7.4.5.1 Remove plug from test port fitting of upper port, using a 3/16-in Allen wrench or hex driver (Figure 7.6). Install port leak test plumbing assembly (part no. R32035-200) into leak test port by screwing in until fully seated.

7.4.5.2 Attach leak detector to plumbing assembly using flexible line. Install line to O-ring sealed fitting nearest plumbing assembly "tee" (Figure 7.6). Close valve of plumbing assembly.

7.4.5.3 Open butterfly valve to vacuum pump and evacuate cask cavity to pressure of 5 torr or less.

7.4.5.4 Prepare mass spectrometer leak detector for operation per manufacturer's instructions. Record standard leak calibration information on data sheet. Using formula supplied with calibration documentation, correct the standard leak to standard temperature (0°C). Record corrected value on data sheet.

NOTE

Personnel involved in leak testing the cask should be thoroughly familiar with operation of the mass spectrometer leak detector and with standards and practices defined in ANSI N14.5.

7.4.5.5 Calibrate leak detector using standard leak and its temperature-corrected leak rate value. Record detector calibration reading on data sheet.

7.4.6 Upper Port Seal Test

7.4.6.1 Evacuate seal test cavity with leak detector. Allow sufficient time for leak detector reading to stabilize. Record this test cavity background reading on worksheet.

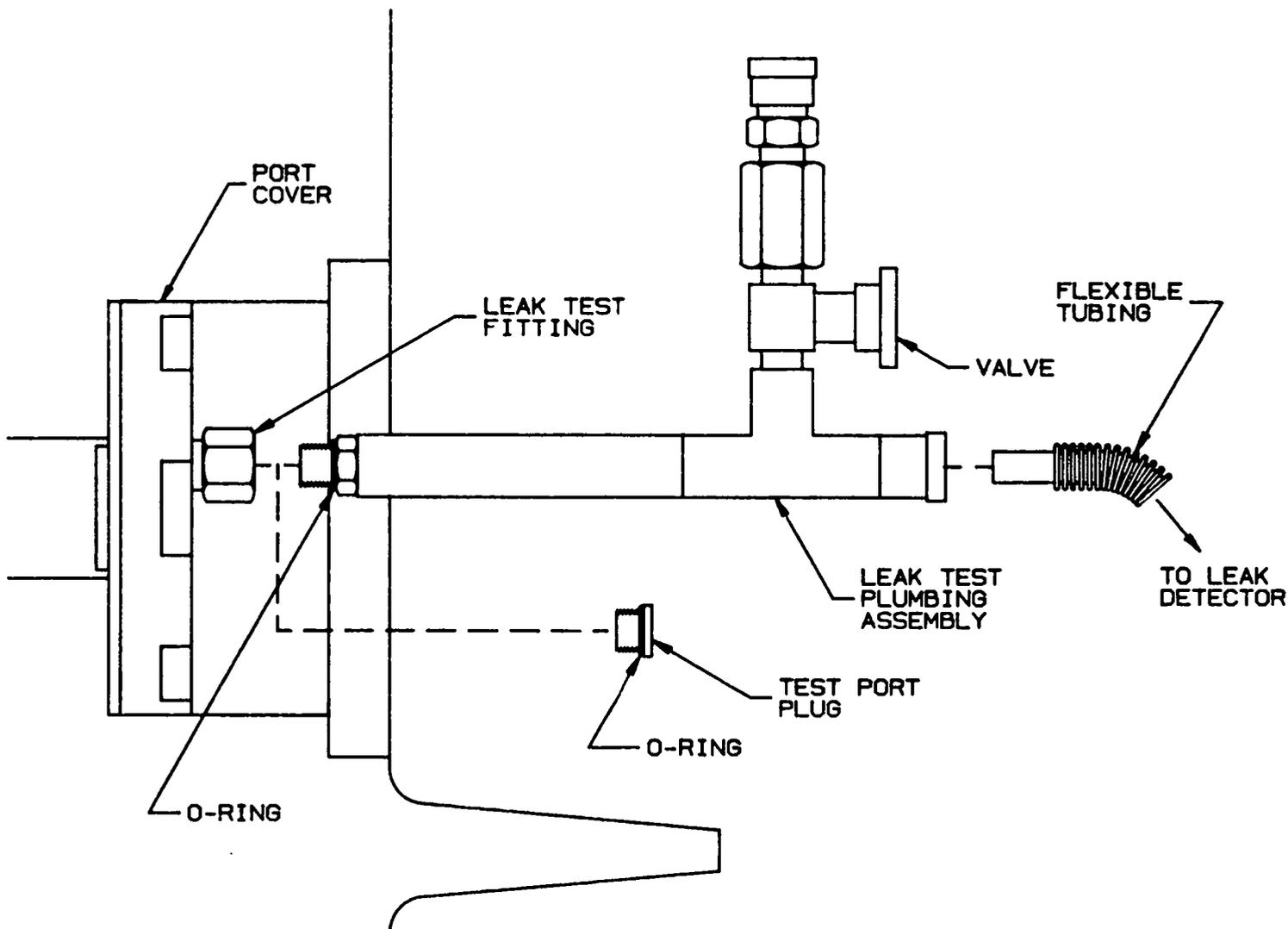


Figure 7.6
Upper Port Seal Leak Test Configuration

NOTE

Excessive pumping time to obtain an acceptable operating pressure or background reading may indicate presence of significant moisture in the test cavity or a leak in the seal. If the pressure and/or background reading gradually decreases, continue pumping, as this indicates the presence of moisture. If the readings are high and shows no improvement over time, a significant leak in the seal assembly is indicated and the seal will have to be replaced.

7.4.6.2 Valve in helium supply and backfill payload cavity to 1 atmosphere of pressure (760 torr). Document operation on worksheet.

7.4.6.3 Monitor leak detector. An acceptable measurement is one that is stable over a time period of two minutes. Record leak rate value on data sheet. This leak rate must be less than 1.0×10^{-4} std cc/s. If leak rate exceeds this value, the port cover must be removed and the seal replaced. See the Operations Manual, Section 4.0 for port cover removal and seal replacement instructions.

NOTE

A calculation, which relates measured leak reading to calibration reading, may be required, depending on make and model of leak detector.

7.4.6.4 Vent leak detector and remove flexible line from plumbing assembly. Remove plumbing assembly from test port. Reinstall plug in test port fitting until fully seated and tight.

7.4.6.5 Remove helium from payload cavity by evacuating with vacuum pump.

7.4.6.6. Remove helium backfill plumbing assembly from lower port quick-connect valve. Leave helium supply, vacuum pump, and pressure gage connected to plumbing assembly.

7.5 Lower Port Cover Seal Test

7.5.1 Introduction

This procedure shall be used when performing a periodic verification test of the BUSS cask lower port seal. This leakage test is performed on an annual basis or before returning the cask to service if it has not been used in more than one year.

This test shall also be performed before the first use of the cask as a fabrication verification test. It is recommended that the test be performed in conjunction with the port seal leak test described in Section 7.4. Performing this test immediately after the upper port leak test will eliminate the need for additional new seal assemblies, as the cask will already be in the required configuration.

Additionally, this test shall be performed after a repair has been made to a closure area of the cask containment boundary, i.e. a seal surface repair.

The procedure consists of leak testing the Helicoflex seal component of the port seal assembly. A helium mass spectrometer is connected to the test cavity via the leak-test port, and the seal test cavity is evacuated. The cask cavity is evacuated and then backfilled with helium to one atmosphere pressure. The presence of helium, as indicated by the mass spectrometer, signifies a leak across the metallic O-ring. The inability to evacuate the test cavity or to maintain a vacuum indicates a gross leak across one or both of the seals of the assembly.

7.5.2 Acceptance Criterion

The leakage rate limit for the test is:

$$L = 1.0 \times 10^{-4} \text{ std-cm}^3/\text{s (helium)}$$

This leakage rate is the allowable maximum rate for 1) the lower port seal and 2) the sum of the rates for the lid, upper port, and lower port seals. This means that while a 1.0×10^{-4} leak is acceptable for this seal, the tests of the lid and upper port seals would have to show zero leakage to meet the 1.0×10^{-4} for the sum of three seal tests. It is therefore desirable to have individual leakage rates in the 10^{-5} range or less.

For each test, a minimum test sensitivity of 1.5×10^{-5} is required.

7.5.3 Documentation

Document all leak test results on a Leak Test Data Sheet (example in Section 10.1) and maintain as part of permanent cask file.

7.5.4 References

American National Standard for Radioactive Material - Leakage Tests on Packages for Shipment, ANSI N14.5, 1987

NOTE

Personnel involved in leak testing the cask should be thoroughly familiar with operation of the mass spectrometer leak detector and with standards and practices defined in ANSI N14.5.

7.5.5 Test Preparation

7.5.5.1 Remove quick-connect valve assembly from lower port following instructions in Section 6.2 of this manual.

7.5.5.2 Remove upper port cover from cask by removing 6 mounting bolts.

7.5.5.3 Install test cover (part no. S94924) on upper port of cask using upper port cover hardware removed above (Figure 7.7).

7.5.5.4 Install helium backfill plumbing assembly (part no. R35032-000) into quick-connect valve of test cover installed on upper port (Figure 7.7). Insert into valve until a snap is felt.

7.5.5.5 Install a new Helicoflex seal assembly on lower port cover, following procedures in Section 4.3 of Operations Manual. Install port cover by centering over lower port in cask body, aligning mounting holes. Hold cover from moving while installing 6 mounting bolts and washers. Using an appropriate torque wrench and a 3/4-in socket, incrementally tighten bolts in a crossing pattern to 10, 30, and then 60 ft-lb. Torque pattern again at 60 ft-lb.

7.5.5.6 Remove plug from test port fitting of lower port, using a 3/16-in Allen wrench or hex driver (Figure 7.8). Install port leak test plumbing assembly (part no. R32035-200) into leak test port by screwing in until fully seated.

7.5.5.7 Attach leak detector to plumbing assembly using a flexible line. Install line to O-ring sealed fitting nearest plumbing assembly "tee" (Figure 7.8). Close valve of plumbing assembly.

7.5.5.8 Open butterfly valve on helium backfill plumbing assembly and evacuate cask cavity to a pressure of 5 torr or less.

7.5.5.9 Prepare mass spectrometer leak detector for operation per manufacturer's instructions. Record standard leak calibration information on data sheet. Using formula supplied with calibration documentation, correct standard leak to standard temperature (0°C). Record corrected value on data sheet.

NOTE

Personnel involved in leak testing the cask should be thoroughly familiar with operation of the mass spectrometer leak detector and with standards and practices defined in ANSI N14.5.

7.5.5.10 Calibrate leak detector using standard leak and its temperature corrected leak rate value. Record detector calibration reading on data sheet.

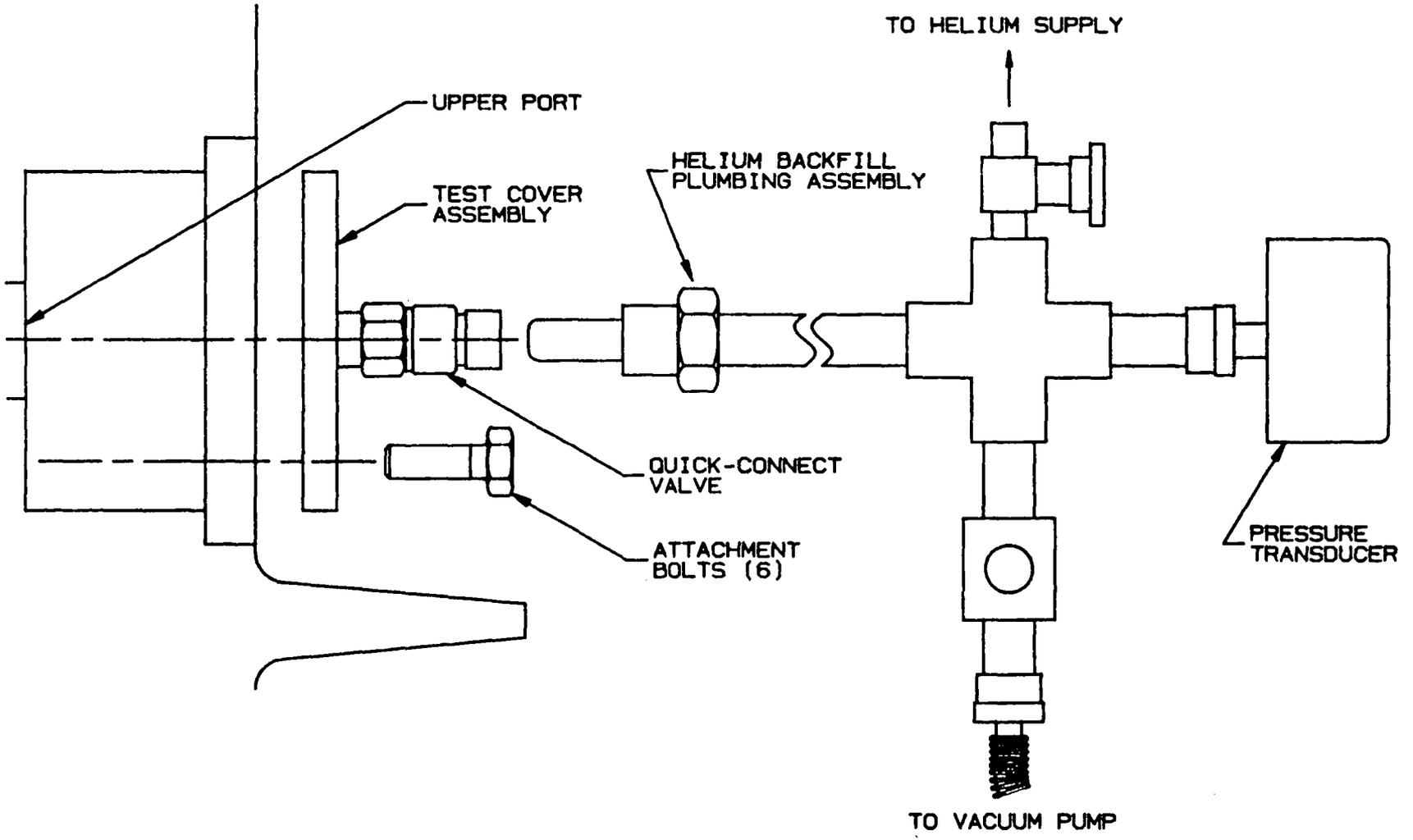


Figure 7.7
Upper Port Test Cover

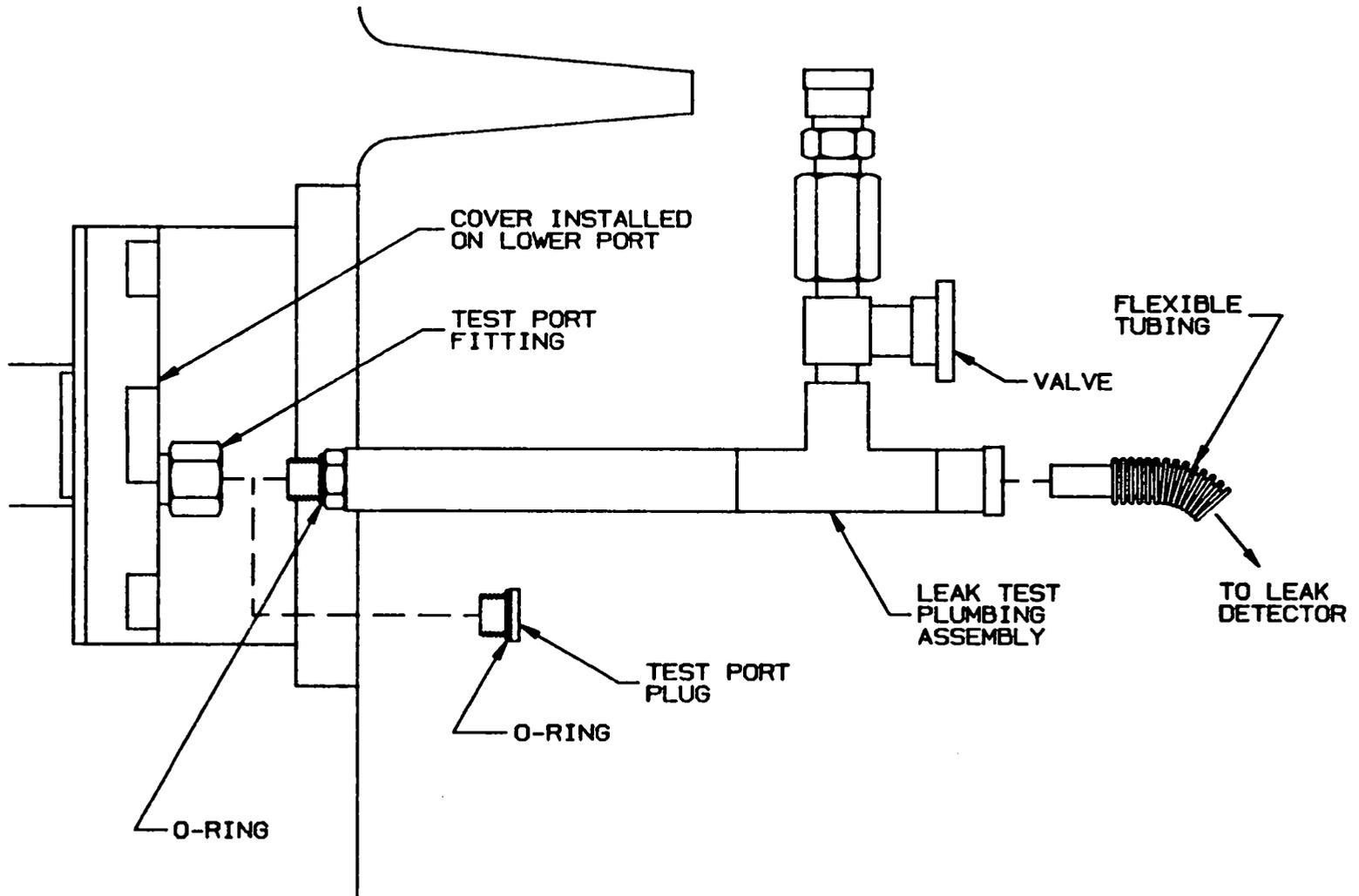


Figure 7.8
Lower Port Seal Leak Test Configuration

7.5.6 Lower Port Seal Test

7.5.6.1 Evacuate seal-test cavity with leak detector. Allow sufficient time for leak detector reading to stabilize. Record this test cavity background reading on worksheet.

NOTE

Excessive pumping time to obtain an acceptable operating pressure or background reading may indicate the presence of significant moisture in the test cavity or a leak in the seal. If the pressure and/or background reading gradually decreases, continue pumping, as this indicates the presence of moisture. If readings are high and show no improvement over time, a significant leak in the seal assembly is indicated and the seal will have to be replaced.

7.5.6.2 Valve in helium supply and backfill payload cavity to 1 atmosphere of pressure (760 torr). Document operation on worksheet.

7.5.6.3 Monitor leak detector. An acceptable measurement is one that is stable over a time period of two minutes. Record leak rate value on data sheet. This leak rate must be less than 1.0×10^{-4} std cc/s. If the leak rate exceeds this value, the lid must be removed and the seal replaced. See the Operations Manual, Section 4.0 for port cover removal and seal replacement instructions.

NOTE

A calculation, which relates measured leak reading to calibration reading, may be required, depending on make and model of leak detector.

7.5.6.4 Vent leak detector and remove flexible line from plumbing assembly. Remove plumbing assembly from test port. Reinstall plug in test port fitting until fully seated and tight.

7.5.6.5 Remove helium from payload cavity by evacuating with vacuum pump.

7.5.6.6. Remove helium supply, vacuum pump, and pressure gage from helium backfill plumbing assembly. Remove helium backfill plumbing assembly from test cover quick-connect valve.

7.5.6.7 Remove test cover from upper port by removing 6 mounting bolts.

7.5.6.8 Install upper port cover (with existing used seal) to upper port and tighten 6 mounting bolts to approximately 20 ft-lb.

7.5.6.9 Remove port cover from lower port of cask.

7.5.6.10 Reinstall quick-connect valve assembly in lower port per Section 6.2 of this manual.

7.5.6.11 Install lower port cover (with existing used seal) to upper port and tighten 6 mounting bolts to approximately 20 ft-lb.

7.6 Total Leak Rate Determination

Sum the final measured leakage rate for the three closure seals. Record the total leak rate on the data sheet. This value must be less than 1.0×10^{-4} cm³/sec (helium).

If total leakage rate is in excess of this value, at least one of the seals will need replacement. Identify seal with highest leakage rate. Perform operations necessary to remove the selected closure and install a new seal assembly per Section 4.0 of the Operations Manual. Replace and retest the closure per the applicable section (7.3, 7.4, or 7.5) above. Record all information on a new data sheet.

If a replaced closure continues to provide an unacceptable leakage rate, remove the closure and carefully examine cask and closure surfaces. Repair surface(s) per Section 9.1 of this manual.

8.0 ANCILLARY EQUIPMENT TEST PROCEDURES

8.1 Introduction

This procedure is used when load testing one or more of the BUSS cask lifting fixtures. All lifting fixtures are load tested at time of fabrication and annually. This procedure is also used to perform a confirmatory test after repairs are made to a lifting device or an overload situation has occurred.

Lifting fixtures covered by this procedure are the horizontal lifting fixture (part no. S49072), vertical lifting fixture (part no. S49069), handling frame (part no. S48501), and lid-lifting fixture (part no. S48590). The horizontal lifting fixture is a Y-shaped stainless steel weldment with a central lifting hole and two quick-release pins in the two arms for cask engagement.

The vertical lifting fixture is a painted carbon steel assembly with two arms bolted and welded to a cross-member that has a central lifting hole. The lower end of each arm terminates in a J-hook for cask trunnion engagement.

The handling frame is a painted carbon steel weldment into which the cask assembly is placed for manipulation. The frame has two vertical posts that support the cask by its trunnions approximately 3-1/2 feet off the ground. The frame also has a screw actuated platform for impact limiter removal and replacement.

The lid-lifting fixture is a stainless steel weldment which, when bolted to the cask lid, provides a lifting point.

8.2 Test Requirements

8.2.1 The load tests are conducted at 150% of the rated capacity of each lifting fixture.

8.2.1.1 The test load is 51,000 pounds for the horizontal lifting fixture that lifts the 33,700-pound assembled BUSS package including the skid.

8.2.1.2 The test load is 36,000 pounds for the vertical lifting fixture that lifts the 23,900-pound cask without the impact limiters.

8.2.1.3 The test load is 45,000 pounds for the cask handling frame that supports the 29,900-pound assembled cask (without the shipping skid).

8.2.1.4 The test load is 2300 pounds for the 1500-pound cask lid.

8.2.2 The test must be conducted with the load applied in the same direction and at the same points as the operational load.

8.2.3 The test load may be applied in one of two configurations:

- A test load may be lifted by the device in a conventional fashion using an overhead crane.
- A test frame and load cell may be used to apply the load.

For either test method, the supplied test fixtures should be used, as these fixtures are designed to safely handle the required load while transmitting the load to the lifting fixtures in the proper configuration.

8.2.4 Load cells and weights must be certified/calibrated.

8.2.5 Fixture welds must be inspected for cracks after the load test. Liquid dye penetrant is the recommended method of inspection.

NOTE

Personnel performing nondestructive examinations should be certified (ASNT or equivalent).

8.3 Documentation

All load-test results are to be documented. Section 9.1 contains example Load Test Data Sheets which may be used. Attach load cell or weight calibration data and post-test dye-penetrant inspection reports to the data sheets.

8.4 References

American National Standard for Radioactive Material - Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds or More, ANSI N14.6, 1986

8.5 Horizontal Lifting Fixture Load Test

8.5.1 Perform visual inspection per Section 4.2 of this procedure. Do not perform load test if obvious damage to fixture is noted.

8.5.2 Attach lift fixture to crane or test frame. The test must be conducted with the load applied in the same direction and at the same points as the operational load. It is recommended that the load-test fixture (part no. R35028-100) be used to load the lift fixture. Figure 8.1 shows the test configuration using this test fixture. Use operational quick-release pins to attach test fixture to lifting fixture.

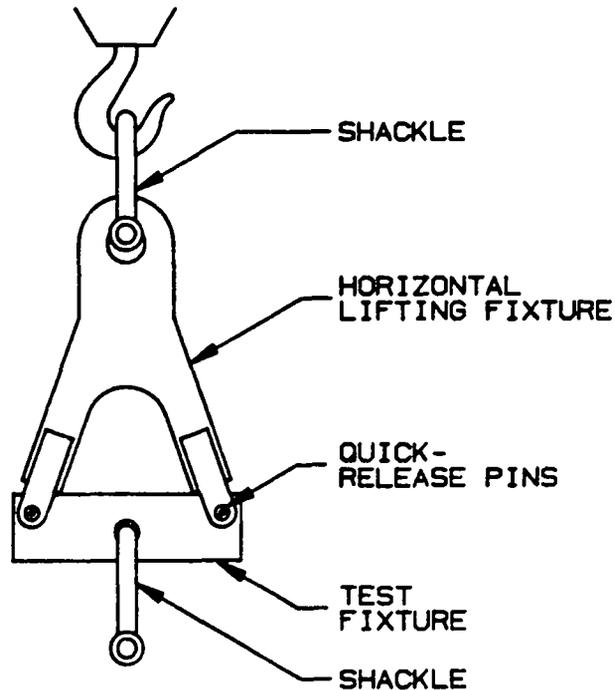


Figure 8.1
Horizontal Lifting Fixture Load Test Configuration

8.5.3 Apply load slowly to 45,000 pounds in increments of approximately 5000 pounds while observing for asymmetric effects or distortion.

CAUTION

Equipment failure during load testing can result in a hazardous condition. Do not perform close-in operations while item is under load.

8.5.4 Increase load to 51,000 (+4000, -0) pounds. Hold maximum load for a minimum period of 10 minutes, and continue to observe test article. Release load and disassemble test set-up.

8.5.5 Perform a dye-penetrant inspection of lifting fixture welds and record data.

8.6 Vertical Lifting Fixture Load Test

8.6.1 Perform visual inspections per Section 4.3 of this procedure. Do not perform load test if obvious damage to fixture is noted.

8.6.2 Attach lift fixture to crane or test frame. The test must be conducted with load applied in the same direction and at the same points as the operational load. It is recommended that load test fixture (part no. R35028-000) be used to load the lift fixture. Figure 8.2 shows test configuration using this test fixture.

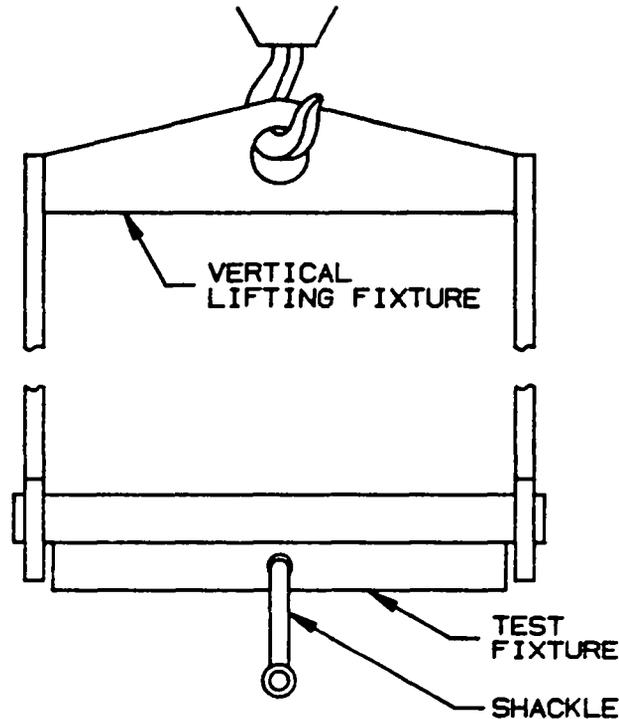


Figure 8.2
Vertical Lifting Fixture Load Test Configuration

8.6.3 Apply load slowly to 30,000 pounds in increments of approximately 5000 pounds while observing for asymmetric effects or distortion.

CAUTION

Equipment failure during load testing can result in a hazardous condition. Do not perform close-in operations while item is under load.

8.6.4 Increase load to 36,000 (+3000, -0) pounds. Hold maximum load for a minimum period of 10 minutes, and continue to observe test article. Release load and disassemble test set-up.

8.6.5 Perform a dye-penetrant inspection of lifting fixture welds and record data.

8.7 Handling Frame Load Test

8.7.1 Perform visual inspections per Section 4.4 of this procedure. Do not perform load test if obvious damage to the fixture is noted.

8.7.2 Locate frame over an anchor point in the floor capable of a 50,000-pound vertical pull (Figure 8.3).

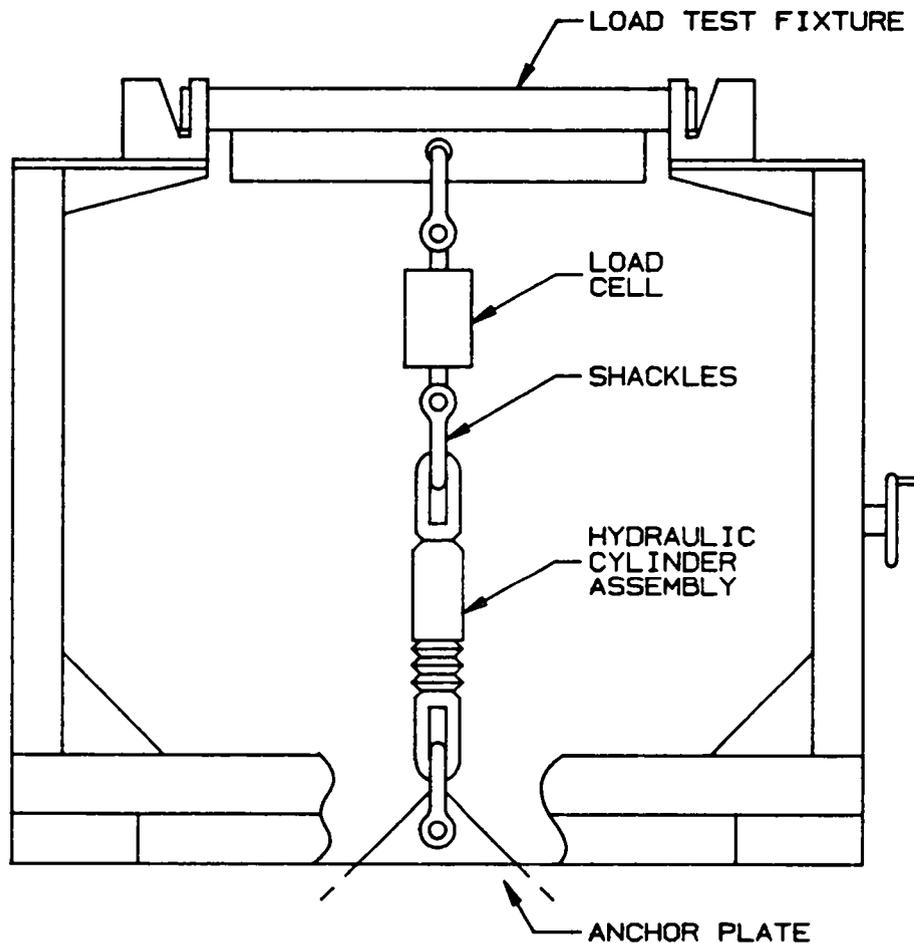


Figure 8.3
Handling Frame Load Test Configuration

8.7.3 Place load test fixture (part no. R35028-000) in trunnion rests of handling frame (Figure 8.3).

8.7.4 Rig the load cell and hydraulic cylinder between load test fixture and anchor point as shown in Figure 8.3. Use 25-ton (1-1/2-in nominal size) shackles for rigging. The load cell is facility-supplied and must be calibrated. The hydraulic cylinder and related hose and manual pump are cask owner supplied.

8.7.5 Apply load to 40,000 pounds in increments of approximately 5000 pounds while observing for asymmetric effects or distortion.

CAUTION

Equipment failure during load testing can result in a hazardous condition. Do not perform close-in operations while item is under load.

8.7.6 Increase load to 45,000 (+4000, -0) pounds. Hold maximum load for a minimum period of 10 minutes, and continue to observe test article. Release load and disassemble test set-up.

8.7.7 Perform a dye-penetrant inspection of welds identified in Section 4.4.3.

8.8 Lid Lifting Fixture Load Test

8.8.1 Perform visual inspection per Section 4.5 of this procedure. Do not perform load test if obvious damage to fixture is noted.

8.8.2 Attach lift fixture(s) to crane or test frame. The test must be conducted with the load applied in the same direction and at the same points as the operational load. It is recommended that two lid lift fixtures be tested simultaneously as shown in Figure 8.4 with each fixture acting as the load test fixture for the other. Attach the two fixtures together using four 1/2-13UNC x 2.5" long grade eight capscrews and nuts. If two lid lift fixtures are not available, a load test fixture or another test configuration will need to be devised.

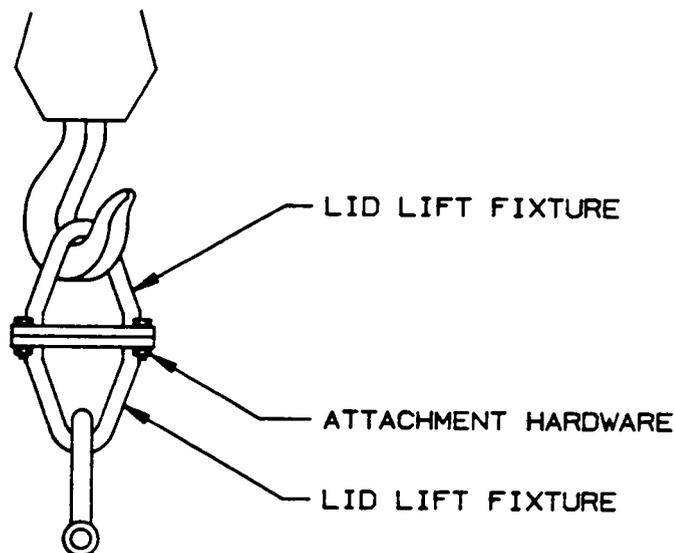


Figure 8.4
Lid Lifting Fixture Load Test Configuration

8.8.3 Apply load to 2000 pounds in increments of approximately 500 pounds while observing for asymmetric effects or distortion.

CAUTION

Equipment failure during load testing can result in a hazardous condition. Do not perform close-in operations while item is under load.

8.8.4 Increase load to 2,300 (+300, -0) pounds. Hold maximum load for a minimum period of 10 minutes, and continue to observe test article. Release load and disassemble test set-up.

8.8.5 Perform a dye-penetrant inspection of lifting fixture welds and record data.

9.0 REPAIR PROCEDURES

9.1 Seal Surface Repairs

9.1.1 Introduction

These procedures are to be used when a seal surface of the cask body, lid, or port cover requires refinishing due to damage.

The metallic Helicoflex seals used in the BUSS cask are extremely sensitive to seal surface finish. A small scratch across the circular lay of the seal can have adverse affects on seal performance. The seal surfaces of the cask body, lid, and port covers require a surface finish in the range of 32 μ in to 125 μ in. Of particular importance is the lay of tooling or finish marks on the surface. These marks must be parallel to the circular seal.

These procedures repair minor surface imperfections and assure a circular lay of finish marks on the seal surfaces. Repair tools are furnished with the cask equipment that may be used to smooth out a minor imperfection in an otherwise good surface. If the damage is major, i.e., a deep scratch or gouge, or a hand-smoothing operation was ineffective, remachining of the damaged surface will be required. Notes on remachining are included in Section 9.1.6. Contact cask caretaker/owner prior to any surface refinish work.

All work must be performed with reference to the original as-built drawings and specifications.

9.1.2 Cask Body Lid Seal Surface

9.1.2.1 Trim a piece of 320- or 400-grit silicon-carbide, water-proof abrasive paper to cover the bottom of the cask body lid seal sanding guide (part no. R35029-100). Attach paper to guide using spray adhesive (3M #77 contact cement or equivalent).

9.1.2.2 Wet lid seal surface and abrasive paper on the sanding guide with demineralized/deionized water. Hold sanding guide above seal surface, placing teflon bumpers against inner bore of cask cavity. Gently lower guide to contact seal surface while holding against cavity bore (Figure 9.1).

9.1.2.3 Sand surface in long, arced strokes, while keeping constant pressure against seal surface and inner bore. Add water to keep surface wet and periodically change the abrasive paper.

9.1.2.4 Wipe seal surface dry with a soft cloth. Inspect surface under a bright light, looking for small scratches that cross the lay of the seal. Repeat sanding as necessary to obtain a smooth finish with circular sanding marks.

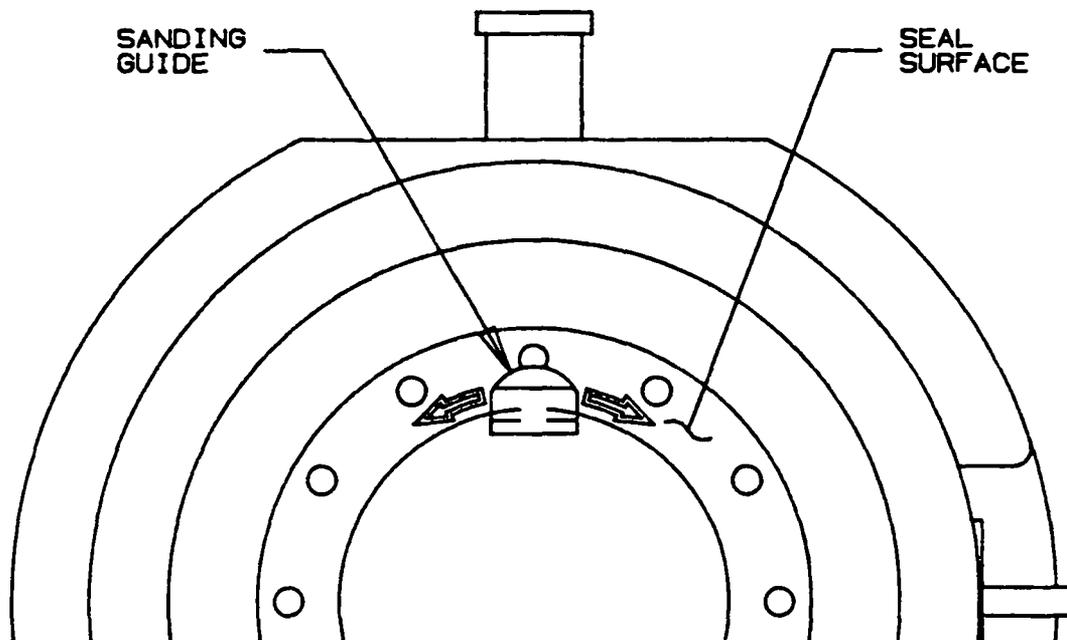


Figure 9.1
Cask Body Lid Seal Surface Refinishing

9.1.2.5 Clean and dry lid bolt holes and threads, removing all water and debris. Thoroughly clean seal surface and adjacent areas with clean, lint-free cloths dampened with alcohol.

9.1.3 Cask Body Port Seal Surface

9.1.3.1 Trim a piece of 320- or 400-grit silicon-carbide, waterproof abrasive paper to cover bottom of the cask body port seal sanding guide (part no. R35029-200). Attach paper to guide using spray adhesive (3M #77 contact cement or equivalent).

9.1.3.2 Wet port seal surface and abrasive paper on sanding guide with demineralized/deionized water. Insert teflon guide pin into bore of the port and place sanding guide against the port seal surface (Figure 9.2).

NOTE

If the port under repair is the lower port, the quick-connect valve must be removed to perform refinishing work. See Section 6.2 for valve removal and replacement operations.

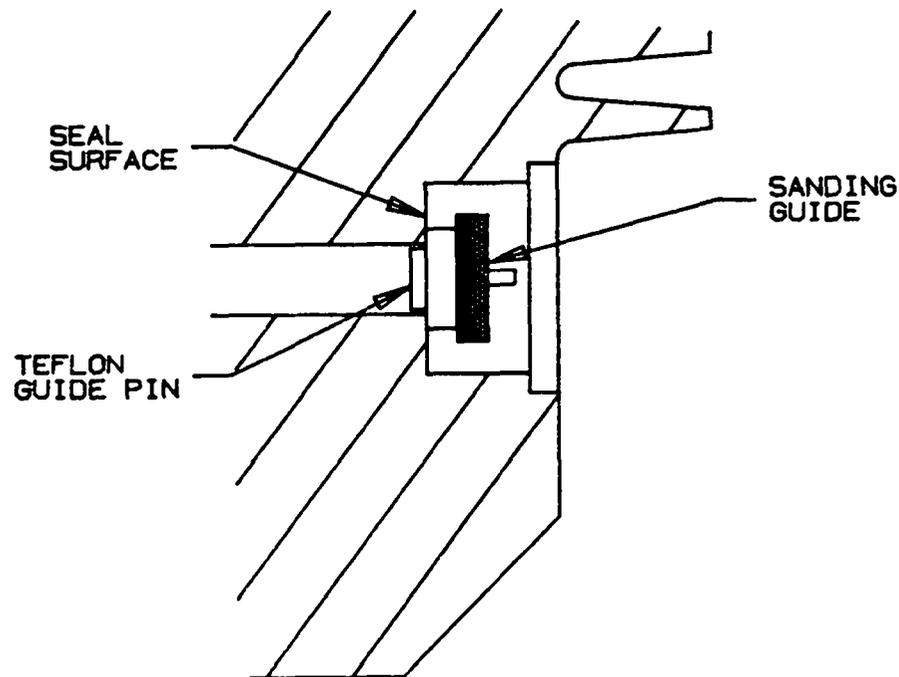


Figure 9.2
Cask Body Port Seal Surface Refinishing

9.1.3.3 Sand surface by twisting sanding guide in alternating directions, while keeping constant pressure against seal surface. Add water to keep surface wet and periodically change abrasive paper.

9.1.3.4 Wipe seal surface dry with a soft cloth. Inspect surface under a bright light, looking for small scratches. Repeat sanding as necessary to obtain a smooth finish with circular sanding marks.

9.1.3.5 Clean and dry port cover holes and threads, removing all water and debris. Thoroughly clean seal surface and adjacent areas with clean, lint-free cloths dampened with alcohol.

9.1.4 Lid Seal Surface

9.1.4.1 Invert lid for refinishing work. A nylon sling may be used though a lid bolt hole to aid in handling.

9.1.4.2 Trim a piece of 320- or 400-grit silicon-carbide, water-proof abrasive paper to cover bottom of lid seal sanding guide (part no. R35029-000). Attach paper to guide using spray adhesive (3M #77 contact cement or equivalent).

9.1.4.3 Wet lid seal surface and abrasive paper on sanding guide with demineralized/deionized water. Place teflon bumpers of sanding guide against hat shaped feature of lid and lower to seal surface (Figure 9.3).

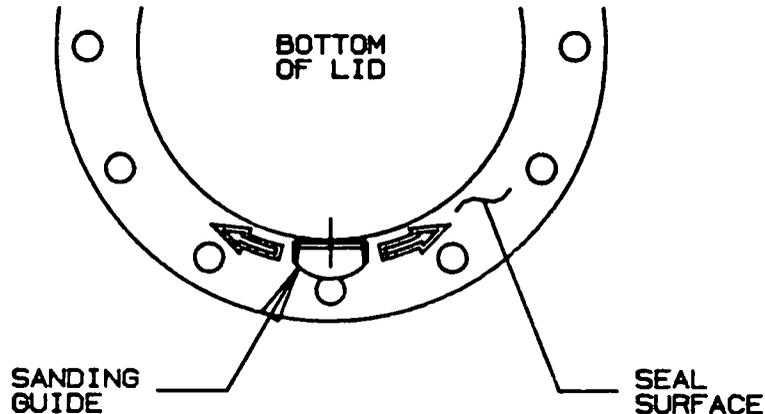


Figure 9.3
Lid Seal Surface Refinishing

9.1.4.4 Sand surface in long, arced strokes, while keeping constant pressure against seal surface and inner bore. Add water to keep surface wet and periodically change abrasive paper.

9.1.4.5 Wipe seal surface dry with a soft cloth. Inspect surface under a bright light, looking for small scratches that cross the lay of the seal. Repeat sanding as necessary to obtain a smooth finish with circular sanding marks.

9.1.4.6 Clean and dry seal mounting holes and threads, removing all water and debris. Thoroughly clean seal surface and adjacent areas with clean, lint-free cloths dampened with alcohol.

9.1.5 Port Cover Seal Surface

9.1.5.1 Mount and true port cover in the chuck of a appropriately sized lathe. Operate the lathe to spin the cover at approximately 100 rpm.

9.1.5.2 Wet cover seal surface and a small piece of 320- or 400-grit silicon-carbide, water-proof abrasive paper with demineralized/ deionized water.

9.1.5.3 Sand seal surface by manually holding the abrasive paper against cover. Add water to keep surface wet and periodically change abrasive paper.

9.1.5.4 Wipe seal surface dry with a soft cloth. Inspect surface under a bright light, looking for small scratches. Repeat sanding as necessary to obtain a smooth finish with circular sanding marks.

9.1.5.5 Clean and dry the seal-mounting holes and threads, removing all water and debris. Thoroughly clean seal surface and adjacent areas with clean, lint-free cloths dampened with alcohol.

9.1.6 Seal Surface Remachining

9.1.6.1 Any remachining of cask components must be authorized by the cask owner/caretaker.

9.1.6.2 All work must be performed by a qualified machine shop capable of handling the specific component. All work must be to the quality level as that of the original effort.

9.1.6.3 Special care must be taken to remove an absolute minimum of material from the component during the machining process (0.005 inch or less).

9.1.6.4 Components must be inspected after machining to assure conformity with critical fabrication drawing dimensions. This includes actual location of the seal surface, i.e., component thickness or dimension from a drawing datum, as well as surface finish. Inspection documentation must be filed in the cask maintenance file.

9.1.6.5 Recommended machining practices are as follows:

- Special care must be taken to ensure extreme accuracy of the set-up centerlines. Even a minor inaccuracy may result in finish marks which are not concentric with the seal when assembled.

- Use a single-point tool for all machining. The goal is to intentionally produce circular tooling marks. A tool with a radius of .015" to .020" is preferred.

- Adjust the feed of the tool to obtain a dimensional surface finish toward the maximum allowable finish value. A 63 finish is preferable to a 32 finish. A radial feed of .008" to .015" is recommended.

9.2 Turnbuckle Repairs

9.2.1 Introduction

This procedure is to be used when an impact limiter or cask tiedown turnbuckle assembly requires rework due to damage or excessive dirt accumulation.

Each turnbuckle configuration consists of a body portion with one right-hand and one left-hand female thread, and rod ends with matching male threads. Repair to these items consists of chasing the damaged thread with the appropriate-sized tap or die.

9.2.1.1 Refer to the following drawings in Volume II of the SARP for as-fabricated information on the turnbuckle assemblies.

- S54773 Cask with Impact Limiters
- S48984 Turnbuckle, Impact Limiter
- S86214 Rod End Bearing, Turnbuckle
- S50032 Cradle, BUSS Cask
- S86271 Turnbuckle, Tiedown
- S86213 Rod Eye, Tiedown

9.2.2 Turnbuckle Thread Repair

9.2.2.1 Disassemble the damaged/dirty rod end from turnbuckle body by unscrewing.

9.2.2.2 Clean any dirt and excess lubricant from both internal and external threads and inspect closely for signs of nicks, wear, or galling. If the threads are galled, i.e., showing signs of seizing, one or both components will have to be replaced.

9.2.2.3 Use a tap (for turnbuckle bodies) or die (for rod ends) to chase the threads. All components have a 1.50-12UNF threads in either right- or left-hand threads. Lubricate threads during chasing operation with a cutting fluid appropriate for the material. (Note: All components are 4130 or 4140 alloy steel with the exception of the impact limiter turnbuckle bodies which are nitronic 60 stainless steel.)

9.2.2.4 Clean cutting fluid from components and lubricate threads with Neverseez or equivalent. Reassemble per Section 2.8 for impact limiter turnbuckles or Section 3.3 for tiedown turnbuckles.

9.3 Replacement of Threaded Inserts

9.3.1 Introduction

9.3.1.1 This procedure is to be used if a threaded insert in the BUSS Cask requires removal and subsequent replacement. Two types of removal and replacement instructions are detailed. Selection of which instructions should be followed are determined by whether a 'standard' or lid bolt insert is involved. All inserts used in the cask assembly are standard-design items from Tridair/Rexnord Corporation (trade name - Keenserts) with the exception of the lid bolt inserts which are of a special design.

Table 9.1 is a guide for replacement insert part numbers, and selection of removal and installation tools.

9.3.1.2 Refer to the following drawings in Volume II of the SARP for as-fabricated information of parts which contain threaded inserts.

- T73684 Body, Cask, BUSS
- T73685 Plug, Drain, BUSS
- T73693 Cask Lid, BUSS
- T48923 Lifting Support #2, Impact Limiter
- T48924 Lifting Support #1, Impact Limiter
- S50052 Basket, Cask Body, 4 Hole
- S50053 Basket, Cask Body, 6 Hole
- S50054 Basket, Cask Body, 12 Hole
- S50055 Basket, Cask Body, 16 Hole

9.3.1.3 Contact cask caretaker/owner for spare inserts and related installation tools. All inserts and installation tools, with the exception of lid bolt inserts and tool, are also available from:

Tridair Industries
Division of Rexnord Specialty Fastener Group
3000 West Lomita Blvd.
Torrance, CA 90505

9.3.2 Lid Bolt Insert Replacement

9.3.2.1 Figure 8.4 shows the steps required to remove and replace a lid bolt insert.

9.3.2.2 Protect seal area around insert by covering it with several layers of duct tape or equivalent.

9.3.2.3 Using a 3/16-in twist drill bit, drill down the center of the two spring pins to a depth of 5/8-in.

9.3.2.4 Use an "E-Z Out" type removal tool to extract remaining portion of the two spring pins.

Table 9.1
Insert and Tool Selection Table

Insert Location	Insert Part No.	Insert Size	Removal Drill Dia	Drill Depth	Install. Tool Part #
Lid	S66575-000	1-1/2"-12	3/16"	5/8"	S94922
Lift Lug	TR24445*	1"-12	1-11/32"	5/16"	THXD1612L
Trunnion	TR24445*	1"-12	1-11/32"	5/16"	THXD1612L
Lid: Lift Fixture	KNH820J-T	1/2"-20	19/32"	3/16"	THD820L
Cask Body: Port	TR24446-820*	1/2"-20	23/32"	3/16"	THDXH820L
Lid: Seal	KNH420J-T	1/4"-20	11/32"	3/16"	THD420L
Port Cover Seal	KNCA0440J-T	#4-40	#29 (.136)	3/32"	TKNC04
Cask Body: Key	TR2444-616	3/8"-16	15/32"	3/16"	THD616L
Cask Body: Therm Cvr	KNQ-25	1/4 Turn Special	11/32"	5/32"	TQ-2A & TQ-2B
Cask Body: Tape Plug	TR24446-820	1/2"-20	19/32"	3/16"	THD820L
Lid: Jack Screws	KNH1210JMXSP	3/4"-10	31/32"	5/16"	THD1210L
Basket: Handle	MS51831CA103	5/16"-18	13/32"	3/16"	THD518L
Impact Limiter	MS51831A-109 (KNH1210J-5P)	3/4"-10	31/32"	5/16"	THD1210L

* - Non-stock, special material: ASME SA320, Grade L43.

9.3.2.5 Use insert installation tool (part No. S94922) to unscrew and remove insert.

9.3.2.6 Thoroughly clean any chips or debris from threads in flange. If necessary, threads may be cleaned with an appropriate-sized thread chaser.

9.3.2.7 Use insert installation tool to install a new threaded insert (part No. S66575). Insert must be installed 0.020" to 0.040" below surface of flange.

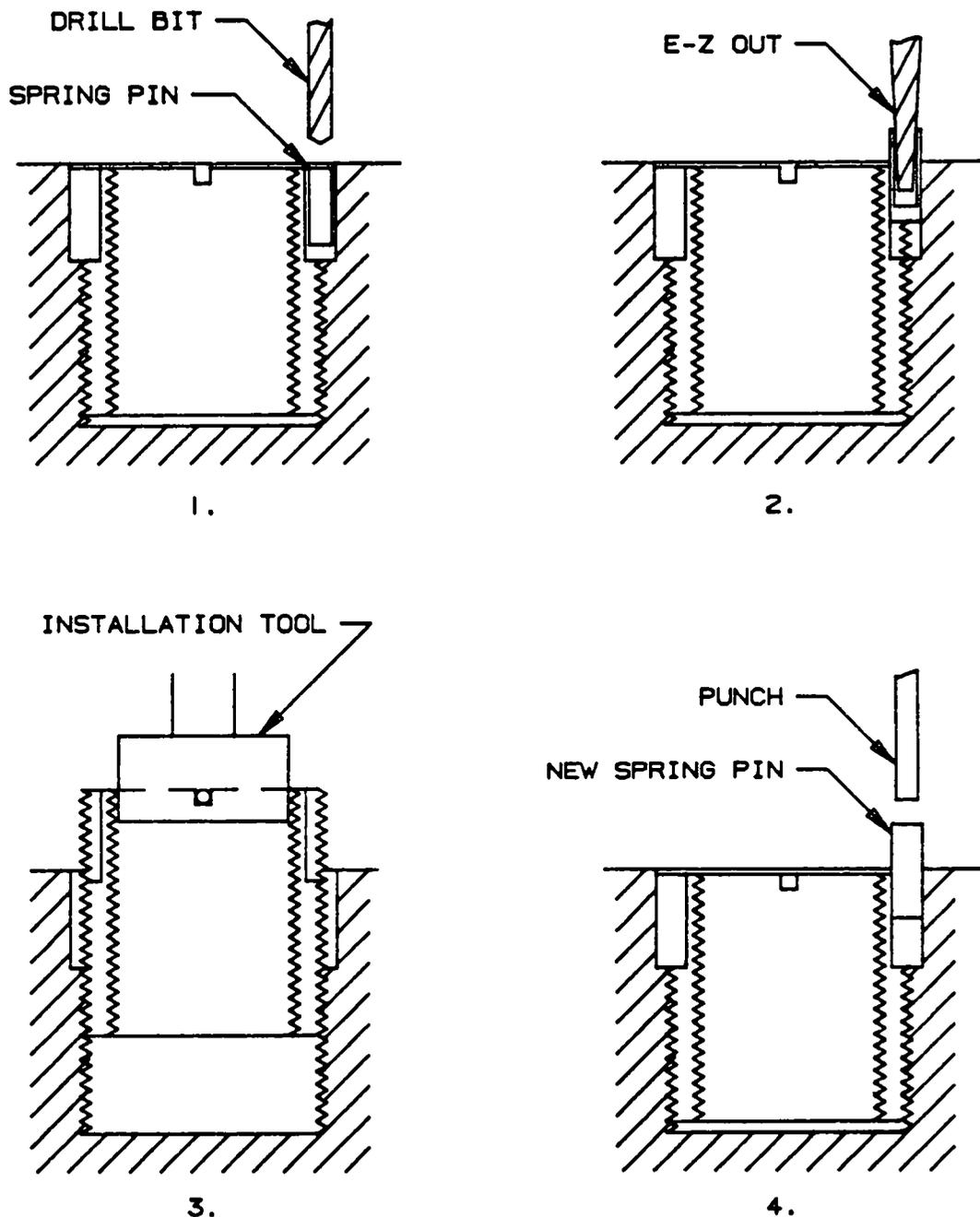


Figure 9.4
Lid Bolt Insert Removal/Replacement Operation

9.3.2.8 Install 2 new spring pins (part No. MS-51923-303) by gently tapping into place. Use a punch to set pin 0.020" to 0.040" below flange surface.

9.3.2.9 Remove protective tape and clean flange of any residual adhesive using denatured alcohol and a soft rag.

9.3.3 Insert Replacement - Standard Designs

9.3.3.1 Determine correct replacement insert and tools required from Table 9.1. Figure 9.5 shows steps in the removal/replacement process.

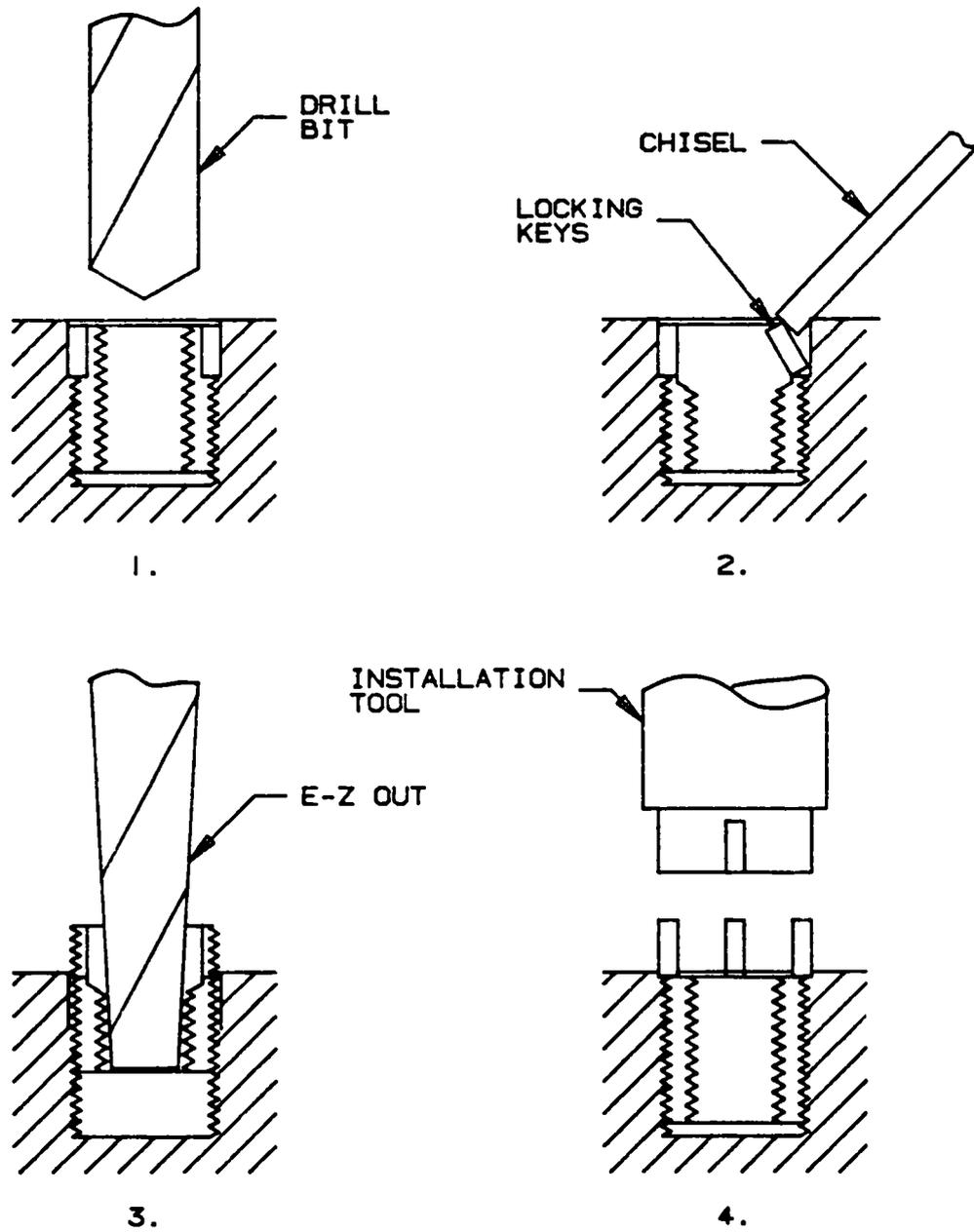


Figure 9.5
Standard Insert Removal/Replacement Operation

9.3.3.3 Protect any adjacent seal surfaces with several layers of duct tape or equivalent.

9.3.3.4 Select proper twist drill size and depth from Table 9.1. Drill down center of insert to remove material between locking keys.

9.3.3.5 Using a small punch, deflect locking keys inwards and break them off.

9.3.3.6 Use an "E-Z Out" type removal tool to extract the remaining portion of the insert.

9.3.3.7 Thoroughly clean any chips or debris from threads in flange. If necessary, threads may be cleaned with an appropriately-sized thread chaser.

9.3.3.8 Install new insert using installation tool.

9.3.3.9 Drive in locking keys using installation tool and hammer.

9.3.3.10 Remove tape and clean surface of any residual adhesive using denatured alcohol and a soft rag.

9.4 Lid Jack Screw Repairs

9.4.1 Introduction

This procedure is to be used when a lid jack screw assembly requires removal from cask lid and subsequent repair, cleaning, or replacement. Maintenance of a jack screw is required when the screw body becomes worn or damaged, or, more likely, when the spring loaded indicator fails to operate smoothly.

9.4.1.1 Refer to the following drawings in Volume II of the SARP for as-fabricated information on the jack-screw assemblies.

- S54758 Lid Assembly, BUSS Cask
- S52562 Lid Lifting Assembly, Cask Lid
- S52563 Lifting Screw, Cask Lid
- S52564 Lifting Screw Tip, Cask Lid
- S52565 Indicator Pin, Cask Lid
- S52566 Spring Retainer, Cask Lid

9.4.2 Jack Screw Removal

9.4.2.1 Back out (counterclockwise) the #6-32 setscrew securing the jack screw using a 1/16-in Allen wrench (Figure 9.6). Turn approximately eight turns.

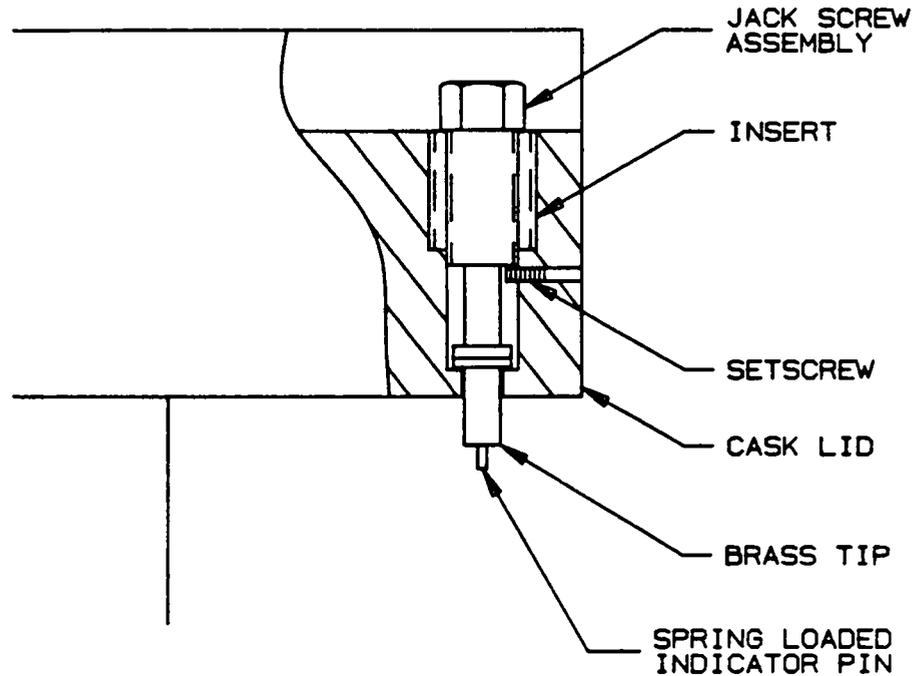


Figure 9.6
Jack Screw Removal

9.4.2.2 Remove jack screw from lid by unscrewing (counter-clockwise). Remove brass jack screw tip that is loose in the bottom of the hole.

9.4.2.3 Examine external threads of jack screw and threaded insert in the lid for wear or damage. Replace a damaged insert per Section 9.3.

9.4.2.4 Check operation of spring-loaded indicator pin for smooth operation. If binding is felt, disassemble the jack screw assembly (Section 9.5).

9.4.2.5 Slide brass jack screw tip over the end of brass indicator pin. Recheck operation of indicator pin. If binding is felt, the problem may be a slight deformation of the end of brass jack screw tip. Ream the hole in the jack screw tip using a #29 twist drill. Alternately, a burr can be removed from the edge of the hole using a small 90° countersink bit. If the end of the brass tip is badly deformed, i.e., mushroomed or bent, replace component.

9.4.3 Jack-Screw Disassembly

9.4.3.1 Remove spring retainer by unscrewing (counterclockwise) using a small spanner wrench or snap ring pliers (Figure 9.7).

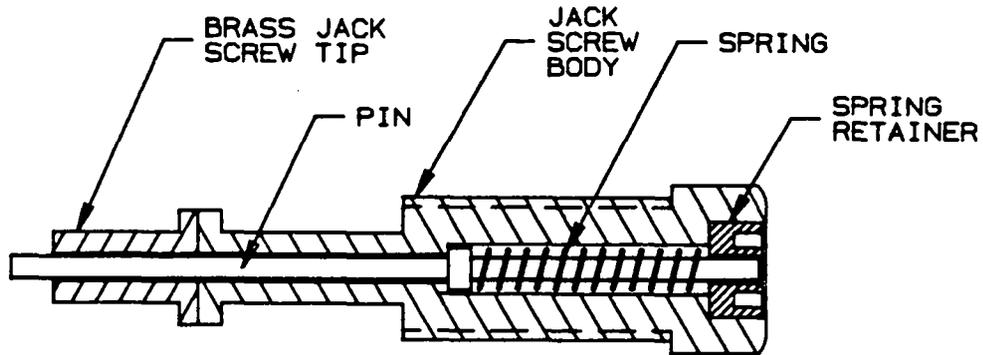


Figure 9.7
Jack-Screw Detail

9.4.3.2 Move indicator pin and spring from the jack screw body. Check the indicator pin for straightness. Replace as required.

9.4.3.3 Clean jack-screw cavity of any accumulated debris. Check debris for contamination. Also clean indicator pin.

9.4.4 Jack-Screw Reassembly

9.4.4.1 Replace indicator pin into the jack-screw body, inserting long end first. When fully inserted, the top of the pin should be flush with the top of the jack screw. If the pin is protruding above top of jack screw (by approximately 3/4") the pin is improperly installed and must be reversed.

NOTE

No lubrication is required in jack screw assembly.

9.4.4.2 Install spring into jack screw body, over the pin. Install spring retainer by screwing into the jack-screw body. Snug retainer.

9.4.4.3 Place brass jack screw tip into the cask lid so that the end protrudes through lid on seal surface side. Install jack-screw assembly into lid by screwing in.

9.4.4.4 Tighten (clockwise) setscrew using a 1-16-in Allen wrench. Snug the screw and then back off approximately one turn.

10.0 APPENDICES

10.1 Example Inspection and Test Checklists

- 10.1.1 Inspection Data Sheet - Cask Body
- 10.1.2 Inspection Data Sheet - Cask Lid and Port Covers
- 10.1.3 Inspection Data Sheet - Baskets
- 10.1.4 Inspection Data Sheet - Impact Limiters
- 10.1.5 Inspection Data Sheet - Skid Assembly and Barrier
- 10.1.6 Inspection Data Sheet - Lifting Fixtures
- 10.1.7 Inspection Data Sheet - Handling Frame
- 10.1.8 Inspection Data Sheet - Basket Guide, Guide Pins, Supports
- 10.1.9 Structural Pressure Test Data Sheet
- 10.1.10 Leak Test Data Sheet
- 10.1.11 Load Test Data Sheet

10.2 Reference Drawings

- 10.2.1 R38610 Handle, Handling Fixture
- 10.2.2 R38611 Step, Side
- 10.2.3 R38612 Step, Front
- 10.2.4 S48501 Handling Fixture, BUSS Cask
- 10.2.5 S48590 Lug, Lifting, Lid, BUSS
- 10.2.6 S48955 Guide Pin #1, Cask Body
- 10.2.7 S48956 Guide Pin #2, Cask Body
- 10.2.8 S49069 Lifting Fixture, BUSS Cask
- 10.2.9 S49070 Strongback
- 10.2.10 S49071 Hook, BUSS
- 10.2.11 S49072 Lifter, BUSS Cask
- 10.2.12 S49073 Basket Guide Assembly, BUSS
- 10.2.13 S49074 Guide, Basket, BUSS
- 10.2.14 S49075 Handle, Basket Guide, BUSS
- 10.2.15 S51100 Guide Pin Nose
- 10.2.16 S52704 Mainframe
- 10.2.17 S52705 Crossframe
- 10.2.18 S52706 End, Cross Frame
- 10.2.19 S52707 Shimpack, Cross Frame
- 10.2.20 S52708 Block, Pillow
- 10.2.21 S52709 Pawl
- 10.2.22 S52710 Race, Lower
- 10.2.23 S52711 Plate, Nut

10.2 Reference Drawings (continued)

10.2.24	S52712	Race, Upper
10.2.25	S52713	Pin, Pivot
10.2.26	S52714	Housing, Bearing
10.2.27	S52715	Shaft, Handwheel
10.2.28	S52716	Shaft
10.2.29	S52717	Shim Pack, Nut
10.2.30	S52718	Handwheel
10.2.31	S52719	Actuator
10.2.32	S52720	Plate, Bearing
10.2.33	S58999	Leg, Standoff
10.2.34	S94921	Tool, BUSS Port Valve
10.2.35	S94922	Tool, Insert Installation
10.2.36	S94924	Test Cover, BUSS Port
10.2.37	R35028	Fixtures, Load Test
10.2.38	R35029	Tools, BUSS Surface Finish
10.2.39	R35032	Vacuum/Pressure Fitting Assemblies

INSPECTION DATA SHEET - CASK BODY

Inspection Date _____ Cask Serial No. _____

<u>Inspection point/item</u>	<u>Section</u>	<u>Initial</u>
Limiters removed, cask disassembled.	2.2.3	_____
Lift lugs, trunnions, and keys removed.	2.2.4	_____
Interior and exterior cleaned and decontaminated.	2.2.5	_____
Inspected for mechanical damage; note locations	2.2.7	_____

Seal surfaces free of scratches.	2.2.8	_____
Lid bolts, inserts and washers inspected.	2.2.9-11	_____
Port cover bolts and inserts inspected.	2.2.12,13	_____
Lug and trunnion bolts and inserts inspected.	2.2.14,15	_____
Thermal shield receptacles inspected.	2.2.16	_____
Guide pins inspected.	2.2.17	_____
Alignment key screws and inserts inspected.	2.2.18	_____
Alignment keys re-installed and screws torqued.	2.2.19	_____
Lift lugs welds NDE inspected; attach results.	2.3.3	_____
Lift lugs re-installed and bolts torqued.	2.3.3	_____
Trunnions NDE inspected; attach results.	2.3.4	_____
Trunnions re-installed and bolts torqued.	2.3.4	_____

Note any remedial actions taken on the above items (repairs, replacements).

Performed by: _____ Title: _____

INSPECTION DATA SHEET - CASK LID AND PORT COVERS

Inspection Date _____ Lid Serial No. _____

Port Cover Serial Nos. _____

Inspection point/item Section Initial

Lid

Interior and exterior cleaned and decontaminated. 2.4.4 _____

Inspected for mechanical damage; note locations 2.4.5 _____

Seal surfaces free of scratches. 2.4.6 _____

Jack screw operation verified. 2.4.7 _____

Seal mounting screws and inserts inspected. 2.4.8 _____

Seal retainers inspected. 2.4.9 _____

Lifting bail bolts and inserts inspected. 2.4.10 _____

Leak test fitting O-rings replaced. 2.4.11 _____

Leak test port unobstructed. 2.4.11 _____

Port Covers

Interior and exterior cleaned and decontaminated. 2.5.4 _____

Seal surfaces free of scratches. 2.5.5 _____

Seal mounting screws and inserts inspected. 2.5.6 _____

Seal retainers inspected. 2.5.7 _____

Leak test fitting O-rings replaced. 2.5.8 _____

Leak test ports unobstructed. 2.5.8 _____

Note any remedial actions taken on the above items (repairs, replacements).

Performed by: _____

Title: _____

INSPECTION DATA SHEET - BASKETS

Inspection Date _____ Cask Serial No. _____

Basket Serial No. _____ Configuration (# holes) _____

Inspection point/item Section Initial

Accessible surfaces cleaned and decontaminated. 2.6.3 _____

Inspected for mechanical damage; note locations 2.6.4 _____

Handle operation verified; bolt torque checked. 2.6.5 _____

Support welds visually inspected; drains clear. 2.6.6 _____

Spacer pins inspected. 2.2.17 _____

Basket Serial No. _____ Configuration (# holes) _____

Inspection point/item Section Initial

Accessible surfaces cleaned and decontaminated. 2.6.3 _____

Inspected for mechanical damage; note locations 2.6.4 _____

Handle operation verified; bolt torque checked. 2.6.5 _____

Support welds visually inspected; drains clear. 2.6.6 _____

Spacer pins inspected. 2.2.17 _____

Note any remedial actions taken on the above items (repairs, replacements).

Performed by: _____

Title: _____

INSPECTION DATA SHEET - IMPACT LIMITERS

Inspection Date _____ Limiter Serial Nos. _____

Inspection point/item Section Initial

Limiters removed from cask body. 2.7.3 _____

Surfaces cleaned and decontaminated. 2.7.4 _____

Limiter weighed; criteria meet 2.7.5 _____

Serial No. _____ Original weight _____

Present weight _____ Net % change _____

Limiter weighed; criteria meet 2.7.5 _____

Serial No. _____ Original weight _____

Present weight _____ Net % change _____

Inspected for mechanical damage; note locations 2.7.6 _____

Eyebolt lifting holes inspected. 2.7.8 _____

Fill cover gaskets replaced. 2.7.9 _____

Turnbuckle attachment lugs and welds inspected. 2.7.10 _____

Circumferential weld visually inspected. 2.7.11 _____

Tapes cleaned, visually inspected, and re-lubed. 2.8.4 _____

Turnbuckle assemblies operation checked, lubed. 2.8.5 _____

Quick-release pins operation verified. 2.8.6 _____

Note any remedial actions taken on the above items (repairs, replacements).

Performed by: _____

Title: _____

INSPECTION DATA SHEET - SKID ASSEMBLY AND BARRIER

Inspection Date _____ Skid Serial No. _____

<u>Inspection point/item</u>	<u>Section</u>	<u>Initial</u>
Block removed from skid; wear strips removed.	3.2.4	_____
Block NDE inspected; attach results.	3.2.5	_____
Wear strip re-installed; screws torqued.	3.2.6	_____
Skid base welds visually inspected.	3.2.7	_____
Block re-mounted to skid base; screws torqued.	3.2.9	_____
Turnbuckle operation checked; threads lubed.	3.3.3	_____
Lower rod ends lubricated.	3.3.4	_____
Rod end thread engagements checked.	3.3.4	_____
Tiedown yoke welds visually inspected.	3.3.5	_____
Tiedown yoke cotter pins verified.	3.3.7	_____
Quick-release pin operation verified.	3.3.8	_____
Barrier sections visually inspected.	3.4.4	_____
Floating nuts inspected and lubed.	3.4.5	_____
Barrier sections re-assembled; screws torqued.	3.4.6	_____

Note any remedial actions taken on the above items (repairs, replacements).

Performed by: _____

Title: _____

INSPECTION DATA SHEET - LIFTING FIXTURES

Inspection Date _____ Fixture Serial Nos. _____

Inspection point/item Section Initial

Horizontal Lifting Fixture

Serial No. _____

Quick-release pins visually inspected. 4.2.3 _____

Lift fixture visually inspected. 4.2.4 _____

Load test performed; attach results. 4.2.5 _____

Welds NDE inspected; attach results. 4.2.6 _____

Vertical Lifting Fixture

Serial No. _____

Paint removed from welds; visually inspected. 4.3.3 _____

Leg bolts removed and inspected. 4.3.4 _____

Leg bolts lubed and re-installed and torqued. 4.3.4 _____

Lift fixture bearing areas inspected. 4.3.5 _____

Support leg weld and bolts checked. 4.3.6 _____

Load test performed; attach results. 4.3.7 _____

Welds NDE inspected; attach results. 4.3.8 _____

Note any remedial actions taken on the above items (repairs, replacements).

Performed by: _____

Title: _____

INSPECTION DATA SHEET - HANDLING FRAME

Inspection Date _____ Fixture Serial No. _____

<u>Inspection point/item</u>	<u>Section</u>	<u>Initial</u>
Paint removed from welds; visually inspected.	4.4.3	_____
Vertical frame members inspected, measured.	4.4.4	_____
Side 1 measurement: _____		
Side 2 measurement: _____		
Platform removed for load test.	4.4.5	_____
Load test performed; attach results.	4.4.6	_____
Welds NDE inspected; attach results.	4.4.7	_____
Platform reassembled in frame.	4.4.8	_____
Platform operation checked; mechanisms lubed.	4.4.9	_____
Turntable disassembled, cleaned, and lubed.	4.4.10	_____
Turntable re-assembled; attachment nut torqued.	4.4.10	_____
Frame welds repainted.	4.4.12	_____

Note any remedial actions taken on the above items (repairs, replacements).

Performed by: _____ Title: _____

INSPECTION DATA SHEET - BASKET GUIDE, GUIDE PINS AND SKID SUPPORTS

Inspection Date _____ Note: these items not serial numbered.

Inspection point/item Section Initial

Basket Guides

Visual inspection for damage performed. 4.6.3 _____

Welds visually inspected. 4.6.4 _____

Handle attachment bolts torqued. 4.6.5 _____

Guide Pins

Guide pin noses visually inspected for damage. 4.7.3 _____

Guide pins checked for straightness, damage. 4.7.4 _____

Trailer Supports

Skid mounting bolts inspected. 5.2.2.3 _____

Support welds and pin visually inspected. 5.2.2.4 _____

Support mounting bolts torqued. 5.2.2.5 _____

Note any remedial actions taken on the above items (repairs, replacements).

Performed by: _____

Title: _____

STRUCTURAL PRESSURE TEST DATA SHEET

Test Date: _____ Cask Serial No. _____

Hydro Pump Type: _____ Manual _____ Power Operated

Hydro Pump Mfg. _____ Model No. _____

Pressure Gage Mfg. _____ Serial No. _____

Cal Expiration Date: _____ Gage Resolution _____

New seals in lid and upper port cover? _____ (initials)

Cavity filled with demin/deion water? _____

Lid and upper port cover bolts properly tightened? _____

Water at thermal equilibrium (min T = 2 hours) _____

Cavity pressure _____ psig (min. test P = 75 psig)

Test start time _____

Test end time _____

Test pressure held for _____ minutes (min. T = 30 minutes)

Cavity pressure at end of test _____

Pressure decay _____

Final Disposition:

Acceptable _____ Unacceptable _____

Comments: _____

Conducted by: _____

Date

Witnessed by: _____

Date

LEAK TEST DATA SHEET

Test Date _____ Cask Serial No. _____

Item/Area Tested _____
(Lid seal, port seal, assembled boundary)

Leak Detector Mfg/Model _____ Serial No. _____

Pressure Gage Mfg/Model _____ Serial No. _____

Temp Indicator Mfg/Model _____ Serial No. _____

Standard Leak Mfg/Model _____ Serial No. _____

Leak Rate of Standard _____

Temperature: Standard _____ Cask _____

Temperature Corrected Standard Leak Rate _____

Leak Detector Background Reading: _____

Leak Detector Calibration Reading: _____

Test Cavity Background Reading: _____

Tracer Gas Cavity Evac Pressure (if applicable) _____

Tracer Gas Backfill Pressure or Flow Rate _____

Start Time: _____ Leak Detector Reading: _____

Stop Time: _____ Leak Detector Reading: _____

Final Calculated Leak Rate: _____

Final Disposition: Acceptable _____ Unacceptable _____

Comments: _____

Conducted by: _____

_____ Date

Witnessed by: _____

_____ Date

LOAD TEST DATA SHEET

Test Date _____ Fixture Serial No. _____

Facility Used: _____

Load Cell Mfg _____ Model _____

Serial No. _____ Cal Exp Date _____

Applied Load: _____

% of Max Working Load _____

Start Time: _____

Stop Time: _____

Test Duration: _____

Final Disposition:

Acceptable _____ Unacceptable _____

Comments or operational problems: _____

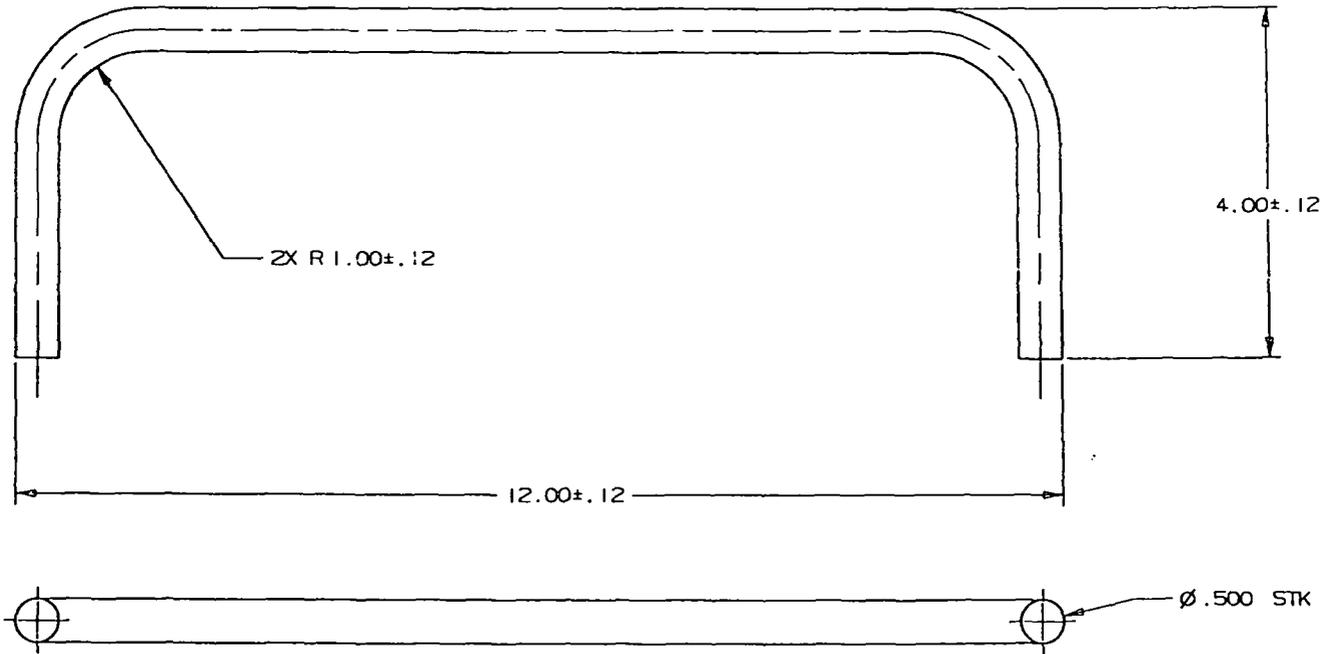
Conducted by: _____ Dept _____ Date _____

Witnessed by: _____ Dept _____ Date _____

NOTES:

1. GENERAL DRAWING REQUIREMENTS ARE DEFINED IN 9900000.
2. MATERIAL: ASTM A36 Ø.50 BAR.

PART NUMBER	REVISIONS						
	ISSUE	SHEET ZONE	PREPARED BY	DESCRIPTION	DATE	CHKD	APRD
R38610-000	A		A. CHAPA D. BRONSKI	2852 6643			D.B.

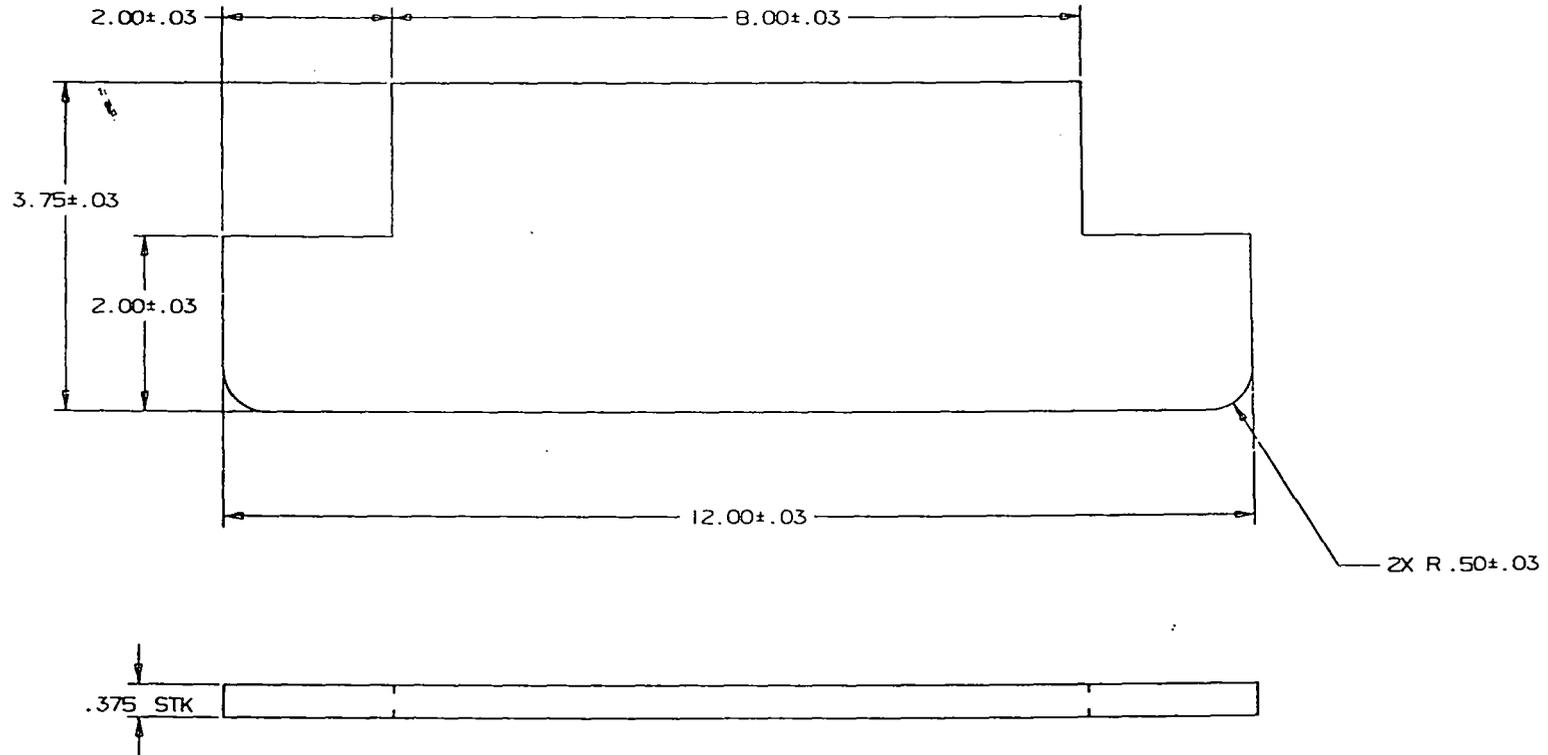


SHEET	1	2	3	4	5	6	TITLE
ISSUE	A						HANDLE, HANDLING FIXTURE (U)
PART CLASSIFICATION							
UNCLASSIFIED							
DRAWING CLASSIFICATION							SIZE
UNCLASSIFIED							C
DRAWING NUMBER							
R38610							
CAGE# 14213							SCALE 1/2
STATUS SA-CHK-5/11/92							SHEET 1 OF 1
ORIGIN SA-ANG-V2.1							

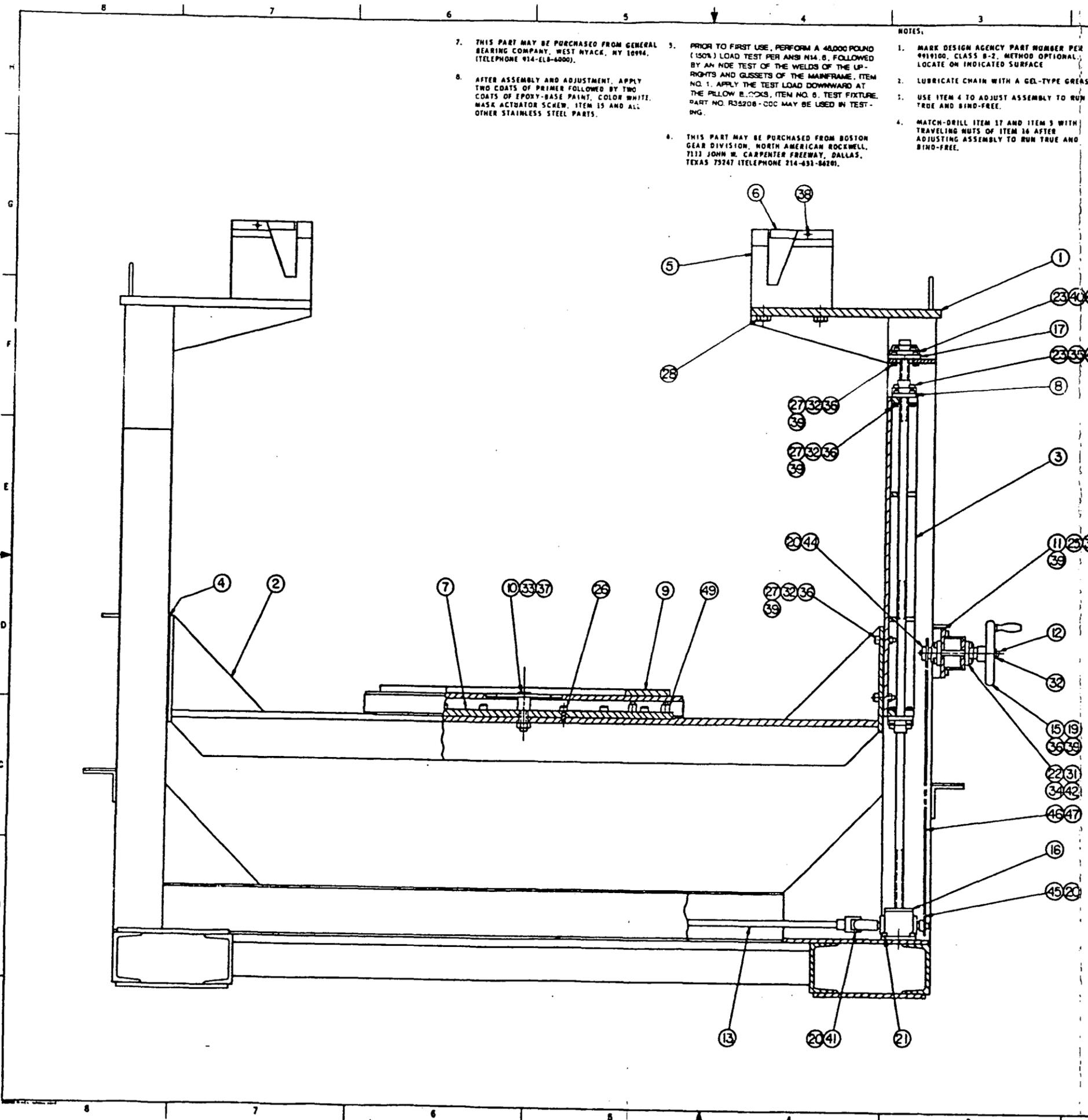
NOTES:

1. GENERAL DRAWING REQUIREMENTS ARE DEFINED IN 9900000.
2. MATERIAL: INLAND 4-WAY PLATES MEDIUM PATTERN, LOW CARBON STEEL.

PART NUMBER	REVISIONS						
	ISS	SHEET ZONE	PREPARED BY	DESCRIPTION	DATE	CHKD	APPD
R38612-000	A		A. CHAPA D. BRONOWSKI	2852 6843			D.B.



SHEET	1	2	3	4	5	6	TITLE
ISSUE	A						STEP, FRONT (U)
PART CLASSIFICATION	UNCLASSIFIED						
DRAWING CLASSIFICATION	UNCLASSIFIED						SIZE: C
	DRAWING NUMBER: R38612						
	CASE: 14213			SCALE: 1/2		SHEET 1 OF 1	
STATUS	SA-CHK-5/11/92				ORIGIN SA-ANS-V2.1		



7. THIS PART MAY BE PURCHASED FROM GENERAL BEARING COMPANY, WEST NYACK, NY 10994, (TELEPHONE 914-EL8-6000).

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

3. PRIOR TO FIRST USE, PERFORM A 40,000 POUND (150%) LOAD TEST PER AMS NIA-8, 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 PELLOW BLOCKS, ITEM NO. 8. TEST FIXTURE, PART NO. R35208-000 MAY BE USED IN TESTING.

4. THIS PART MAY BE PURCHASED FROM BOSTON GEAR DIVISION, NORTH AMERICAN ROCKWELL, 7111 JOHN W. CARPENTER FREEWAY, DALLAS, TEXAS 75247 (TELEPHONE 214-431-8420).

- NOTES:
1. MARK DESIGN AGENCY PART NUMBER PER 919100, 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 18 AFTER ADJUSTING ASSEMBLY TO RUN TRUE AND BIND-FREE.

REV	DESCRIPTION	DATE	BY	CHK
A	ELEY 2899 / EAKES 6322			
B	ADD STEPS & HANDLES TO ITEM 1 R. BAILEY 2831/D. BRONOWSKI 0643	8-7-92	RE	RE
C	ADD ITEM 21, NOTE 8, WAS 5. ADD NEW NOTE 6. ITEM 22 WAS 18 REDD R. BAILEY 2881/D. BRONOWSKI 0643	11/25/93		
D	ITEM 48 WAS 4258-13 R. BAILEY 2881/D. BRONOWSKI 0643	5-2-93		

MATCH DRILL .437-20UNF-28 THRU ITEM 8
4 HOLES 4X

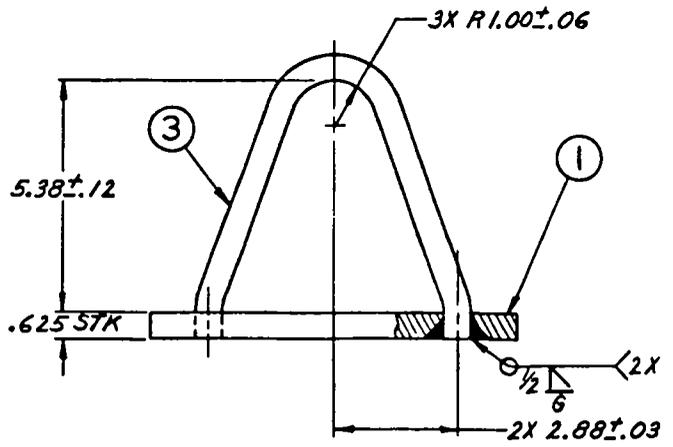
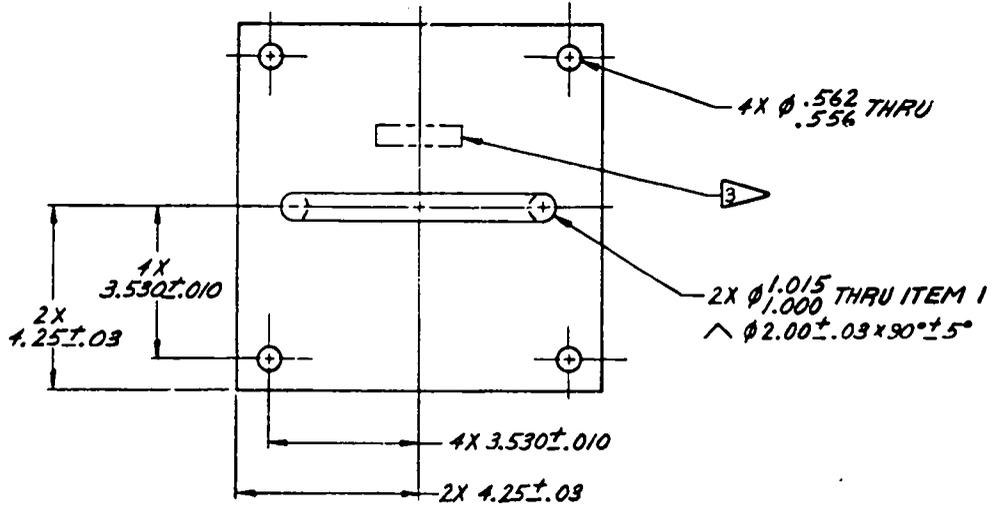
QTY	DESCRIPTION	UNIT	QTY
40	4000-08 BALL TRANSFER	8	50
1	MASTER LINK, #35 ROLLER CHAIN	7	48
ARS 8 35	CHAIN, ROLLER, 1/2 P	7	46
1	HK3A 25-1 SPROCKET, ST 1/2 P, Ø.625 BORE	7	43
1	HK3A 16-1 SPROCKET, ST 1/2 P, Ø.625 BORE	7	44
2	04948-SF BEARING, FLANGED, Ø.100 BORE	7	43
2	06940-SF BEARING, FLANGED, Ø.625 BORE	7	42
2	UJNS-10-10 UNIVERSAL JOINT, Ø.625 BORE	7	41
24	WASHER, LOCK, 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.100		37
41	WASHER, FLAT, Ø.50		36
16	WASHER, FLAT, Ø.438		35
14	WASHER, FLAT, Ø.375		34
1	NUT, HEX, SELF-LOCK, 100-12UNF-28		33
53	NUT, HEX, 50-13UNC-28		32
16	WASHER, LOCK, SPRING, Ø.375		31
			30
			29
8	SCR, HEX HD, SELF-LOCK, 100-12UNC-28 x 2.00 LG		28
32	SCR, SOCK HD, 50-13UNC-3A x 2.00 LG		27
14	SCR, SOCK HD, SELF-LOCK, 50-13UNC-3A x 1.50 LG		26
4	SCR, SOCK HD, 50-13UNC-3A x 1.50 LG		25
			24
24	SCR, SOCK HD, 478-20UNC-3A x 1.00 LG		23
8	SCR, SOCK HD, 375-16UNC-3A x 1.00 LG		22
8	SCREW, HEX HD, 378-10UNC-3A x 1.00 LG		21
6	KEY, .188 x .088 x .75 LG		20
1	KEY, .125 x .125 x .175 LG		19
			18
2	552720-000 PLATE, BEARING		17
2	552719-000 ACTUATOR		16
1	552718-000 HANDWHEEL		15
			14
1	552716-000 SHAFT		13
1	552715-000 SHAFT, HANDWHEEL		12
1	552714-000 HOUSING, BEARING		11
1	552713-000 PIN, PIVOT		10
1	552712-000 RACE, UPPER		9
4	552711-000 PLATE, NUT		8
1	552710-000 RACE, LOWER		7
2	552709-000 PAWL		6
2	552708-000 BLOCK, PELLOW		5
ARS 552707-000 SHIMPACK, CROSS FRAME			4
2	552706-000 END, CROSS FRAME		3
1	552705-000 CROSS FRAME		2
1	552704-000 MAINFRAME		1
NA 9900000	GENERAL REQUIREMENTS		

AGENCY APPROVALS	DATE	BY	CHK
PART IDENTIFICATION			
UNCLASSIFIED			
CLASSIFICATION LEVEL			
UNCLASSIFIED			
REV	DATE	BY	CHK
1	14213		
HANDLING FIXTURE, BUSS CASK (U)			
UNCLASSIFIED			
SCALE 1/4"			

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 G1 OR C-2, METHOD A.
4. PRIOR TO FIRST USE, PERFORM A 2,300 POUND (150%) LOAD TEST PER ANSI N14.8, FOLLOWED BY AN NDE OF THE WELDS.

DESIGN AGENCY PART NUMBER	REVISIONS	DESCRIPTION	PREPARED BY	DATE	CHK	REV
S48590-000	A	R. COOKE @ 765/EAKES 6323	AY/10/84	RE	HRV	
	B	ADDED NOTE 3, SPECTO U/M & FLAGNOTE 3 TO PIC Ø1.015/1.000 WAS .635/.625 CSK WAS Ø1.63, U/M ITEM 3 WAS .625 Ø STOCK R. COOKE @ 765/EAKES 6323	11/15/84	RE		210
	C	ADDED NOTE 4. R. BAILEY 2881 / D. BRONOWSKI 6843				210



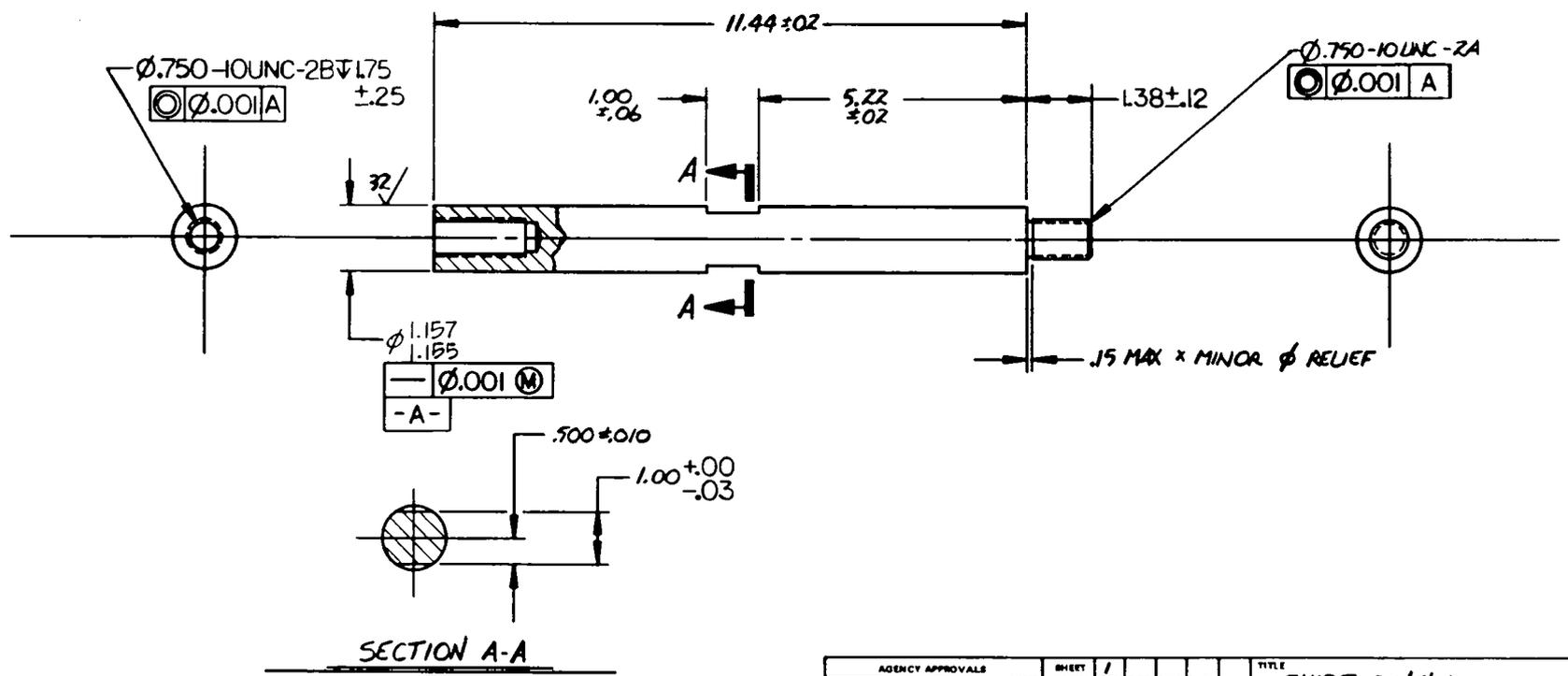
NO	QTY	DESCRIPTION	NOTE	SHEET	ITEM
1	9	Q0-S-763 STEEL, ROD, CRES, TYPE 304, Ø1.00 STK			9
	2				2
1	1	Q0-S-766 STEEL, PLATE, CRES, TYPE 304			1
NA		9919100 MARKING, GENERAL METHODS			
NA		9912119 WELDING			
NA		9904301 PASSIVATION			
NA		9900000 GENERAL REQUIREMENTS			

AGENCY APPROVALS				SHEET	1	1	TITLE
ORD	DATE	APPROVALS	ISSUE	C			LUG, LIFTING, LID
6323	7/24/84	880					(BUSS) (U)
PART CLASSIFICATION				SHEET INDEX			
UNCLASSIFIED							
DWS CLASSIFICATION LEVEL				DWS NUMBER			
UNCLASSIFIED				C1 14213			
				S48590			
				SCALE 1/2			
				SHEET 1 OF 1			

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" 40-43
4. PASSIVATE PER 9904301.

DESIGN AGENCY PART NO.	REVISIONS			ENGR.	
	ISSUE	DESCRIPTION	DATE		CHSR
548955-000	A	PLATZBECKER, 7655/EAKES, 6322	5/11/84	RE	URY
	B	ADDED NOTE 4, 1.38±.12 WAS 1.25 C. JOJOLA (C&D) 7651/EAKES 6323	7/4/84	RE	URY
	C	φ 1.157 WAS φ 1.2513 1.155 1.2509 HOLLING 2053 / EAKES 6322	2/19/85	RE	RE

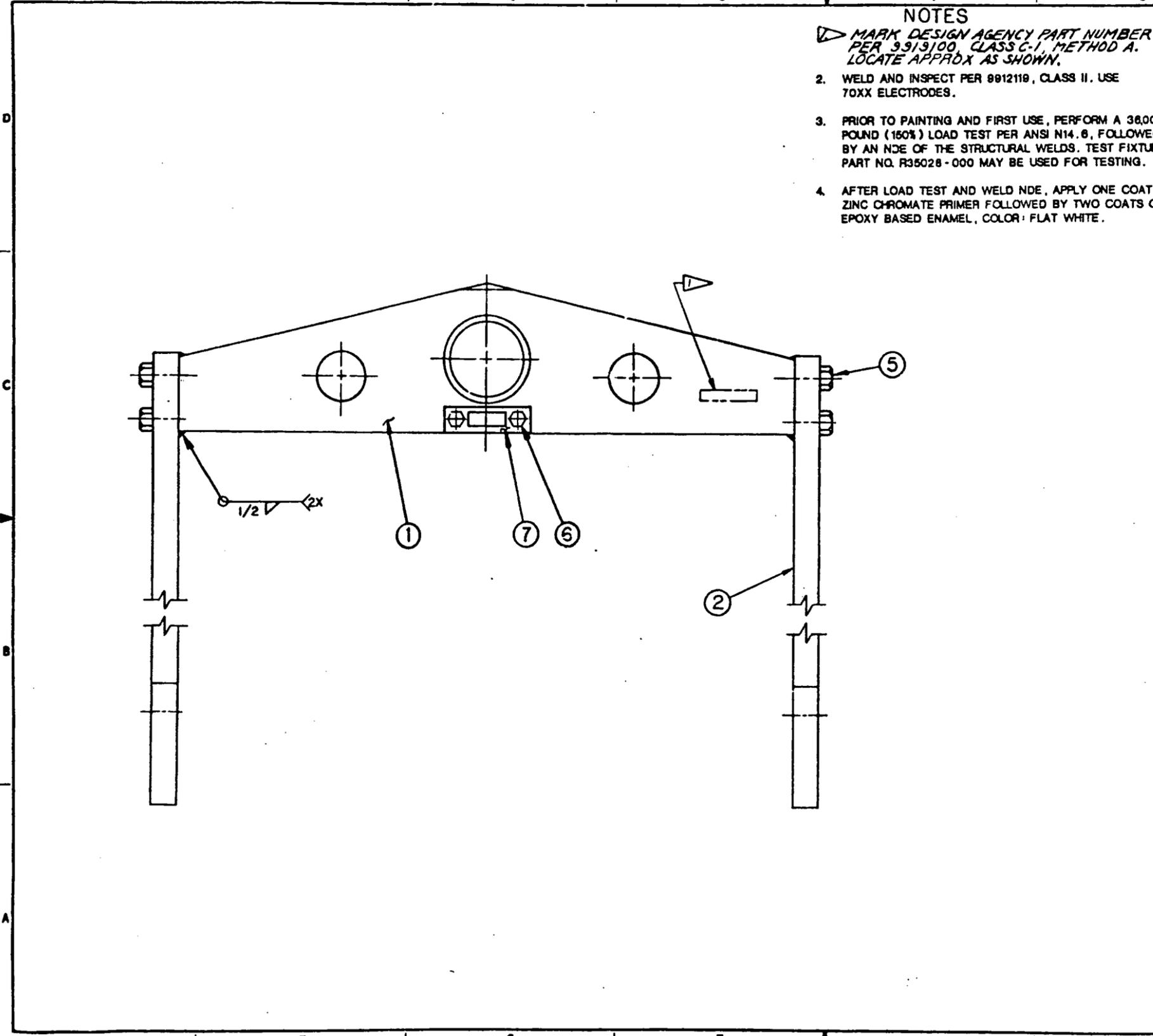


AGENCY APPROVALS			SHEET	1	OF	TITLE			
DWG	DATE	INITIALS					ISSUE	1	2
63:U	5-11-84	CP-QA				GUIDE PIN # 1, CASK BODY, (BUSS)			
PART CLASSIFICATION						SIZE	CODE IDENT NO.	DWG NUMBER	
UNCLASSIFIED									B
DWG CLASSIFICATION LEVEL						SCALE	1/2	SHEET 1	OF 1
UNCLASSIFIED									

NOTES

- 1. MARK DESIGN AGENCY PART NUMBER PER 3913100, CLASS C-1, 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 38,000 POUND (150%) LOAD TEST PER ANSI N14.8, 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 NUMBER NO.		REVISIONS			
ISSUE	DATE	DESCRIPTION	PREPARED BY	DATE	CHKD
A		ROOPE ID 7651 / EAKES 6322		5-23-88	RE
B		ADDED WELDING SYMBOL LARCHULETA, (LAD) 2858 / BRONOWSKI, 6323		11-11	JLM
C		ADD PART NO. FOR ITEM 7. R. BAILEY 2831 / D. BRONOWSKI 6843		8-2-32	DRB
D		ADDED NOTES 2, 3, & 4. REVISED WELD SYMBOL R. BAILEY 2881 / D. BRONOWSKI 6843			DRB

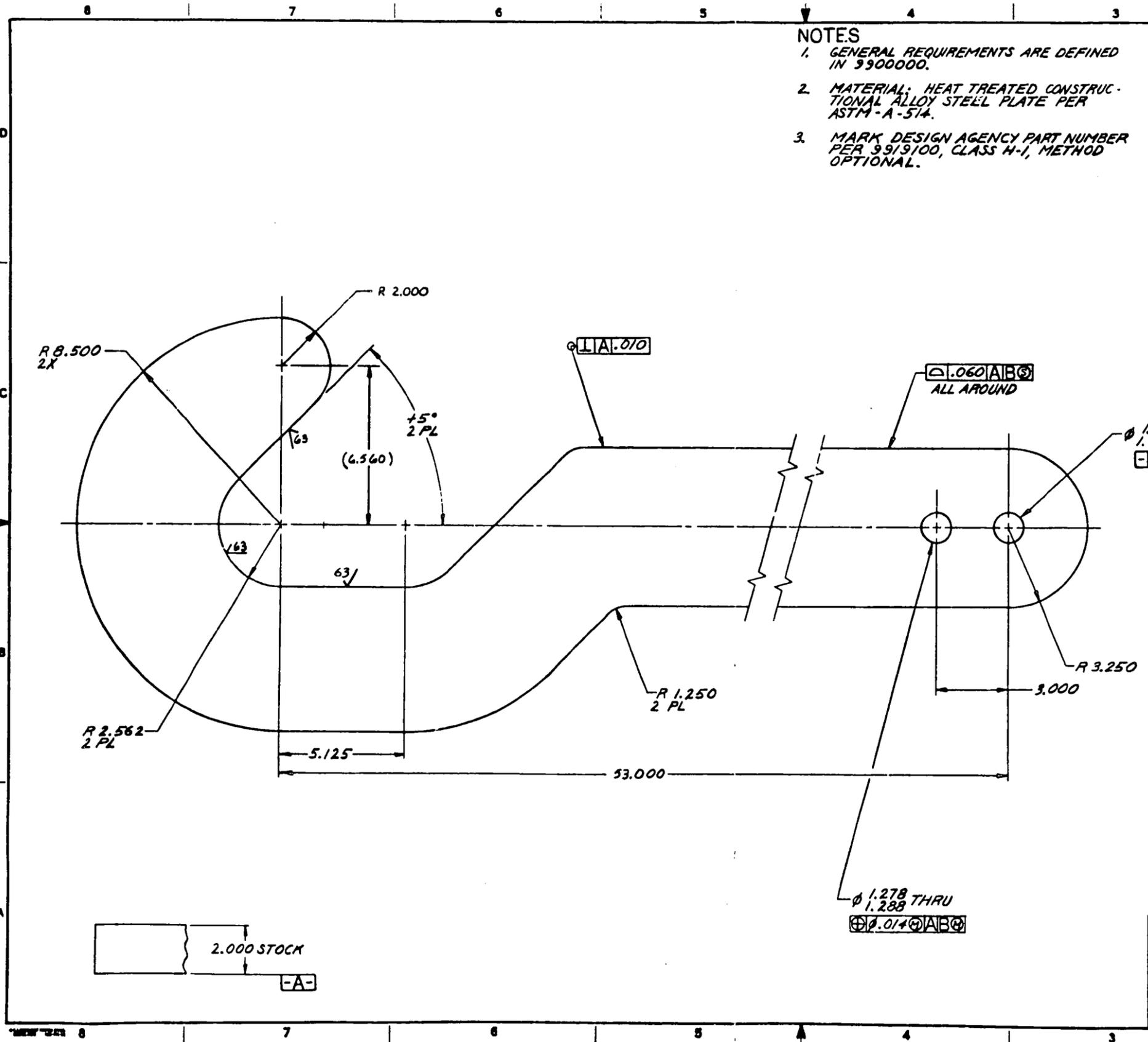


QTY	DESCRIPTION	ITEM
1	S48898-000 LEG, STANDOFF	7
2	MS90728-230 SCR, HEX HD, GRADE 8, Ø 1.00-8UNC-2A X 2.000 LG	8
4	MS90727-278 SCR, HEX HD, GRADE 8, Ø 1.250-12UNF-2A X 3.750 LG	5
		4
		3
2	S49071-000 HOOK	2
1	S49070-000 STRONGBACK	1

NA 3913100	MARKING, GENERAL METHODS
NA 3900000	GENERAL REQUIREMENTS

AGENCY APPROVALS				SHEET INDEX		TITLE	
ORG	DATE	APPROVAL	ISSUE	NO.	OF	LIFTING FIXTURE, BUSS CASK (U)	
						UNCLASSIFIED	
						UNCLASSIFIED	
						SCALE 1/4	SHEET 1 OF 1

S49069

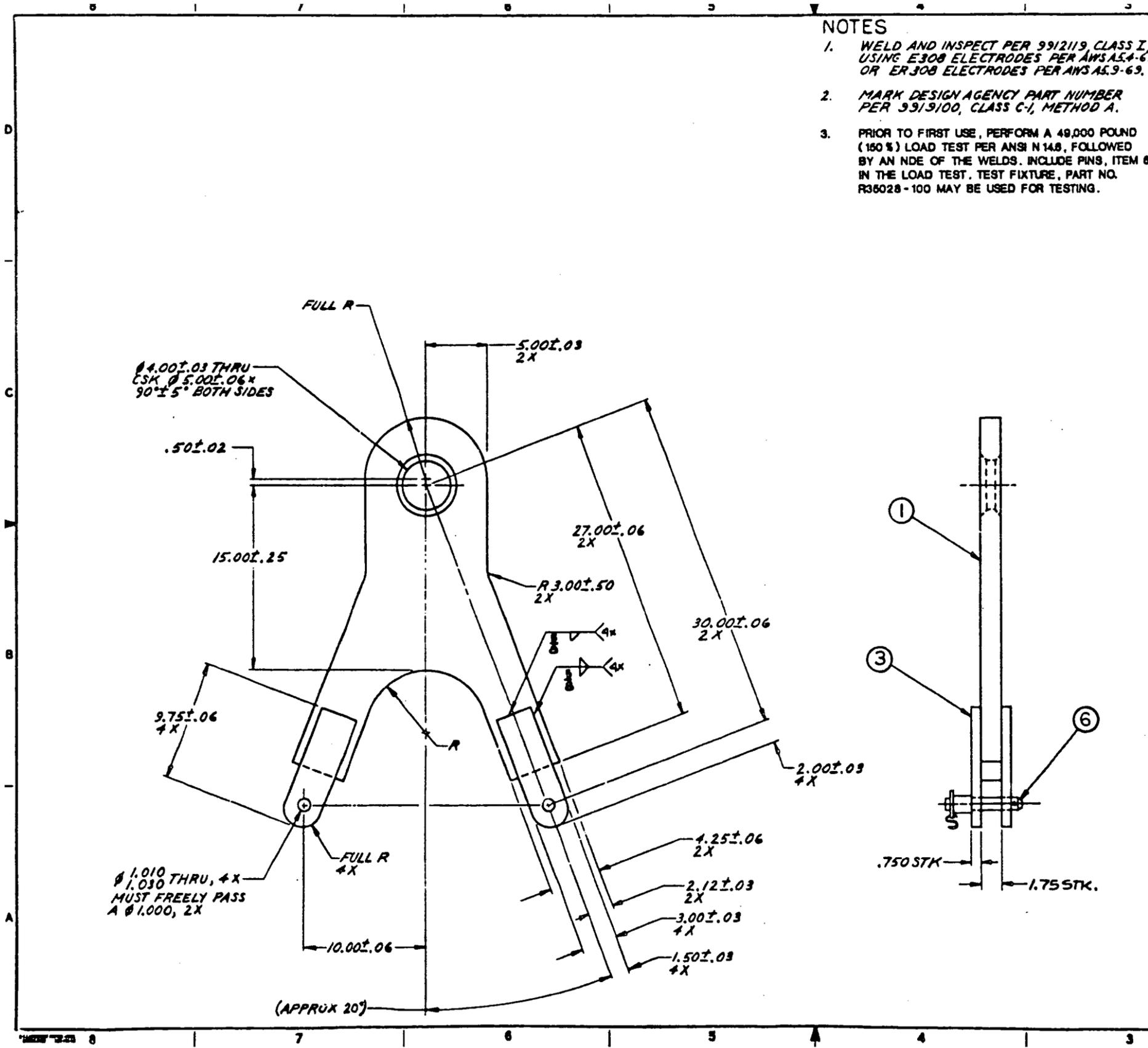


- NOTES**
1. GENERAL REQUIREMENTS ARE DEFINED IN 9900000.
 2. MATERIAL: HEAT TREATED CONSTRUCTIONAL ALLOY STEEL PLATE PER ASTM-A-514.
 3. MARK DESIGN AGENCY PART NUMBER PER 9919100, CLASS H-1, METHOD OPTIONAL.

DESIGN AGENCY PART NUMBER NO.		REVISIONS			
REV	DATE	DESCRIPTION	PREPARED BY	DATE	CHK
A		P COOKE (D7651) / EAKES 6322		5-2-85	RE
B		REVISED LENGTH 53.00 WAS 34.50 / ADDED R 2.000 (DIM 6.560) / J. ARCHULETA (C.D) 2855 / BRONOWSKI, 6323		6-11-85	JLM
C		DELETED MATERIAL GRADE DESIGNATION AND FINISH NOTE 4.			REB
		R. BAILEY 2881 / D. BRONOWSKI 6843			

AGENCY APPROVALS			SHEET /	TITLE
ORG	DATE	APPROVAL	ISSUE C	HOOK, BUSS (U)

S49071



NOTES

1. WELD AND INSPECT PER 9912119 CLASS I, USING E308 ELECTRODES PER AWS A5.4-69 OR ER 308 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 N 14.8, FOLLOWED BY AN NDE OF THE WELDS. INCLUDE PINS, ITEM 6 IN THE LOAD TEST. TEST FIXTURE, PART NO. R38028-100 MAY BE USED FOR TESTING.

DESIGN AGENCY PART NO. 549072-000

REVISIONS		PREPARED BY	DATE	CHKD	APP'D
A	R. COOKE CD 7651 / EAKES 6322	SJS	5/28/73	RB	URY
B	ADDED NOTE 3. R. BAILEY 2881 / D. BRONOWSKI 6643				

QTY	DESCRIPTION	UNIT
2	MS1785-C1635 PIN, QUICK RELEASE Ø1.00X.350 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	

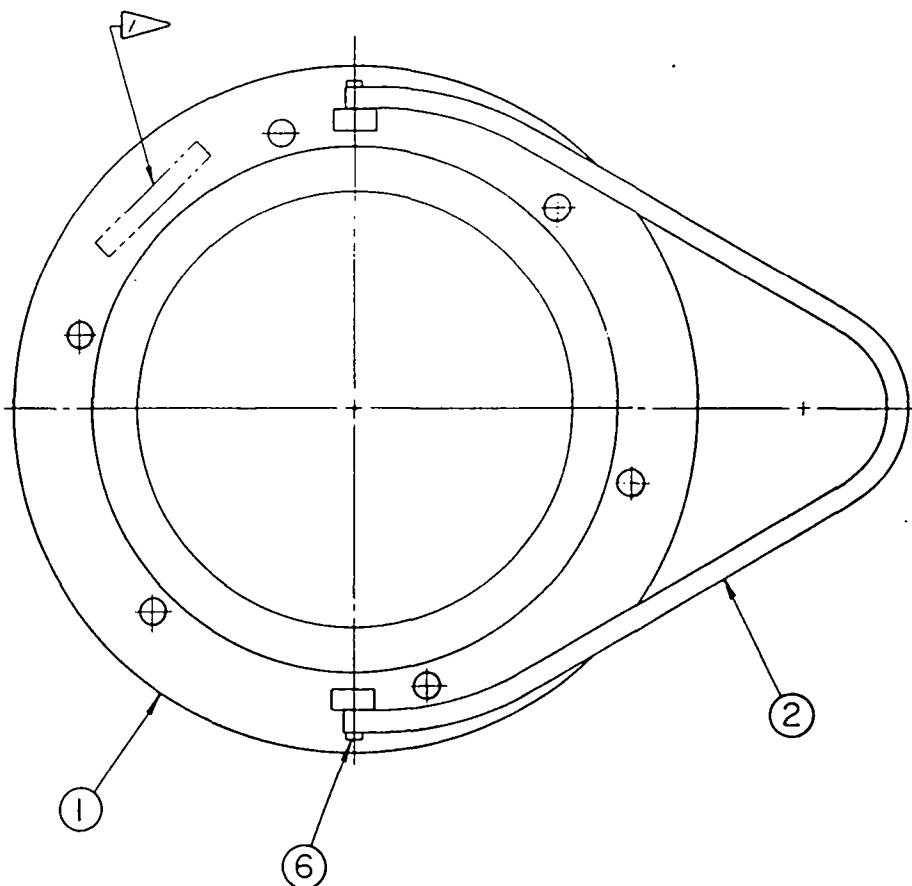
AGENCY APPROVALS				SHEET /		TITLE	
DRS	DATE	APPROVED	ISSUE	1	1	LIFTER, BUSS CASK (U)	
	6/23	4/1/73	PC			PART CLASSIFICATION	
						UNCLASSIFIED	
						DWS CLASSIFICATION LEVEL	
						UNCLASSIFIED	
				SHEET /		DWS NUMBER	
				14		S49072	
				SHEET /		CP /	
				1			

S49072

NOTES

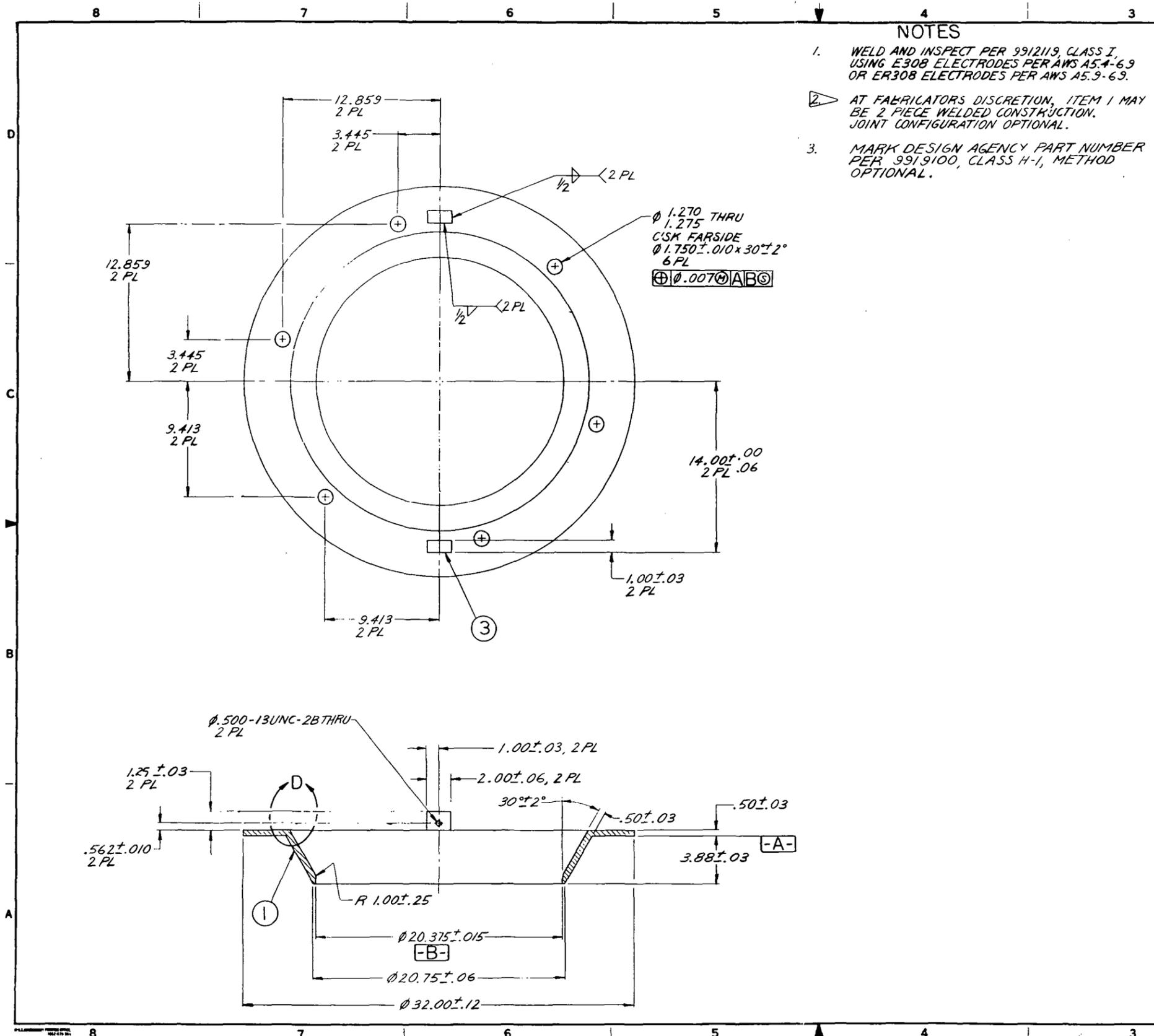
▶ MARK DESIGN AGENCY PART NO.
PER 9919100, CLASS C-1, METHOD A,
LOCATE APPROX. AS SHOWN.

DESIGN AGENCY PART NUMBER NO.		REVISIONS			
ISS	DESCRIPTION	PREPARED BY	DATE	CHK	APP
S49073-000	A	R. COOKE (D7651/EAKES 6322)	3/1/74	RE	HRV



NO.	DESCRIPTION	QTY	UNIT
2	BOLT, SHOULDER, SELF-LOCKING, CRES Ø 5/8 x 1.000 LG		6
			4
			3
1	S49075-000 HANDLE, BASKET GUIDE		2
1	S49074-000 GUIDE, BASKET		1
NA	9919100 MARKING, GENERAL METHODS		
NA	9900000 GENERAL REQUIREMENTS		

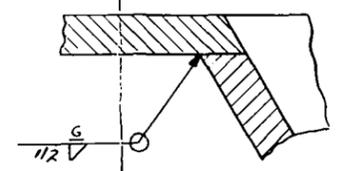
AGENCY APPROVALS				SHEET		TITLE	
ORG	DATE	APPROVALS	ISSUE	INDEX	INDEX	BASKET GUIDE ASSEMBLY, BUSS	
6323	7/2/74	RCO	A			SCALE 1/4	
PART CLASSIFICATION				SHEET INDEX		DWG NUMBER	
UNCLASSIFIED						C114213 S49073	
DWG CLASSIFICATION LEVEL				SHEET		OF	
UNCLASSIFIED				1		1	



NOTES

1. WELD AND INSPECT PER 9912119, CLASS I, USING E308 ELECTRODES PER AWS A5.4-6.9 OR ER308 ELECTRODES PER AWS A5.9-6.9.
2. AT FABRICATORS DISCRETION, ITEM 1 MAY BE 2 PIECE WELDED CONSTRUCTION. JOINT CONFIGURATION OPTIONAL.
3. MARK DESIGN AGENCY PART NUMBER PER 9919100, CLASS H-1, METHOD OPTIONAL.

REV	DESCRIPTION	PREPARED BY	DATE	CHK	APP
A	R COOKE CD 7651/EAKES 6322		7/23/80	RE	HEY
B	ADDED NOTE 3			RE	HEY
	R COOKE CD 7651/EAKES 6322			RE	HEY



DETAIL D
SCALE 1/1
OPTIONAL CONSTRUCTION

NO	QTY	DESCRIPTION	NOTE	SHEET	ITEM
2	QQ-S-766	STEEL, BAR, CRES, TYPE 304		3	
1	QQ-S-766	STEEL, PLATE, CRES, TYPE 304		2	1
NA	9919100	MARKING, GENERAL METHODS			
NA	9912119	WELDS, CRES			
NA	9900000	GENERAL REQUIREMENTS			

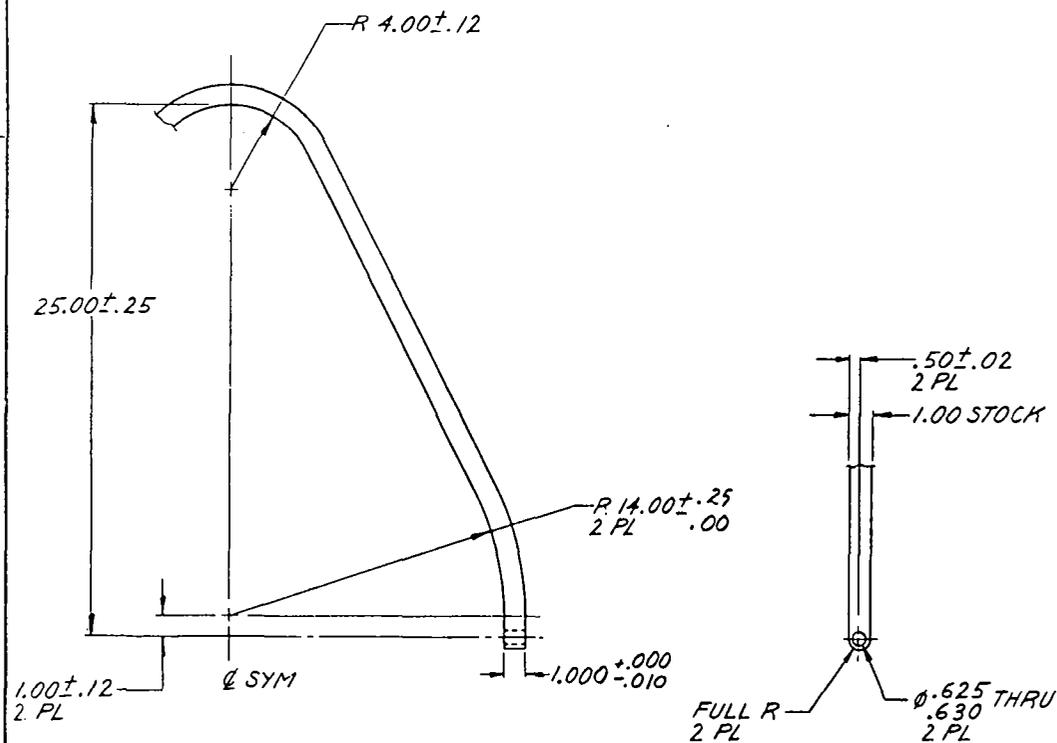
AGENCY APPROVALS	SHEET	TITLE
ORG DATE APPROVALS	ISSUE B	GUIDE, BASKET BUSS
6322 7/23/80		
PART CLASSIFICATION		
UNCLASSIFIED		
DWG CLASSIFICATION LEVEL		
UNCLASSIFIED		
SIZE FROM NO	DWG NUMBER	
D 14213	S49074	
SCALE 1/4" NOTED	SHEET 1 OF 1	

DWG NO S49074

NOTES

1. GENERAL REQUIREMENTS ARE DEFINED IN 9900000.
2. MATERIAL: CORROSION RESISTANT STEEL BAR TYPE 304, PER QQ-S-766.
3. MARK DESIGN AGENCY PART NUMBER PER 9919100, CLASS H-1, METHOD OPTIONAL.

DESIGN AGENCY PART NO.	REVISIONS					
	ISSUE	DESCRIPTION	PREPARED BY	DATE	CHKD	ENGR
S49075-000	A	R COOKE @ 7651/EAKES 6322		2/1/84	RE	HRV
	B	ADDED NOTE 3 R COOKE @ 7651/EAKES 6322		11/10/84	RE	HRV

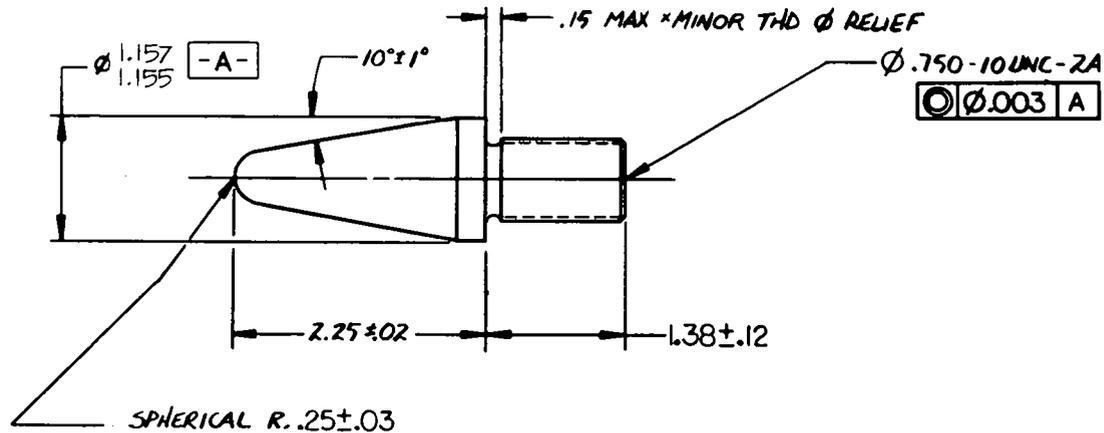


AGENCY APPROVALS				SHEET	TITLE	
ORG	DATE	APPROVALS	ISSUE	1	HANDLE, BASKET GUIDE BUSS	
6323	7/5/84	RCO	B		SHEET INDEX	
					PART CLASSIFICATION	
					UNCLASSIFIED	
					UWG CLASSIFICATION LEVEL	
					UNCLASSIFIED	
					SIZE PSCM NO.	DWG NUMBER
					C14213	S49075
					SCALE	SHEET / OF /
					1/4	1 / 1

NOTES:

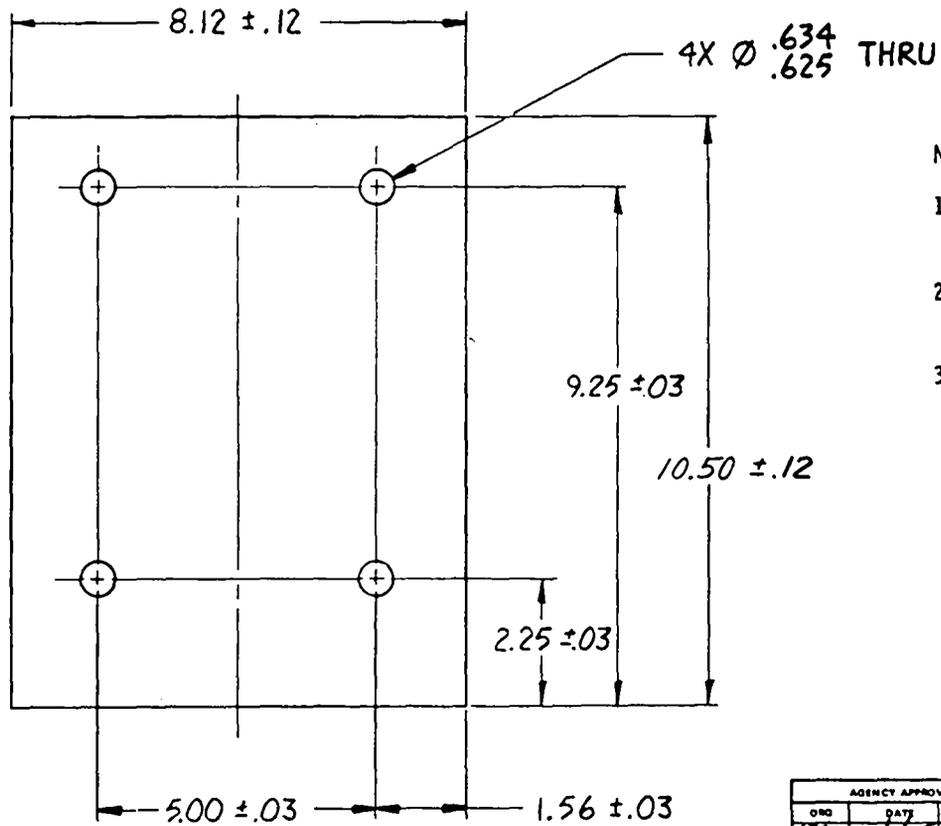
1. GENERAL REQUIREMENTS ARE DEFINED IN 9900000.
2. MARK DESIGN AGENCY PART NO. PER 9919100, CLASS H-1, METHOD A OR B
3. MATERIAL: ROUND, FREE CUTTING BRASS PER ASTM-B-16, HALF HARD.

DESIGN AGENCY PART NUMBER NO.	REVISIONS				
	ISSUE	DESCRIPTION	PREPARED BY	DATE	CHKD. ENGR.
551100-000	A	PLATZBECKER, 7655/EAKES, 6322		5/3/84	RE HRY
	B	L.38±.12 WAS L.25, REDIMENSIONED SPH. R C. JOJOLA (C&D) 7651/EAKES 6323		9/14/84	RE HRY
	C	NOTE 3 WAS TEFLON® PER MIL-P-19468 R. COOKE (C) 7655/EAKES 6322		11/27/84	RE HRY
	D	Ø 1.57 WAS Ø 1.252 1.155 1.250 HOLLING 2853/EAKES 6322		3/19/85	RE RE



AGENCY APPROVALS			SHEET	TITLE	
ORG	DATE	INITIALS	ISSUE	GUIDE PIN NOSE, CASK BODY, (BUSS)	
4310	10/9	SP. OP	D		
			SHEET INDEX		
			PART CLASSIFICATION		
			UNCLASSIFIED		
			DWG CLASSIFICATION LEVEL		
			UNCLASSIFIED		
SIZE		CODE IDENT NO.	DWG NUMBER		
B		14213	551100		
SCALE		1/1	SHEET 1		OF 1

DESIGN AGENCY PART NO.	REVISIONS				
	ISSUE	DESCRIPTION	PREPARED BY	DATE	CHKD ENGR.
S52707-000	A	ELEY 2855 /EAKES 6322		10-9-85	RE JLM



NOTES:

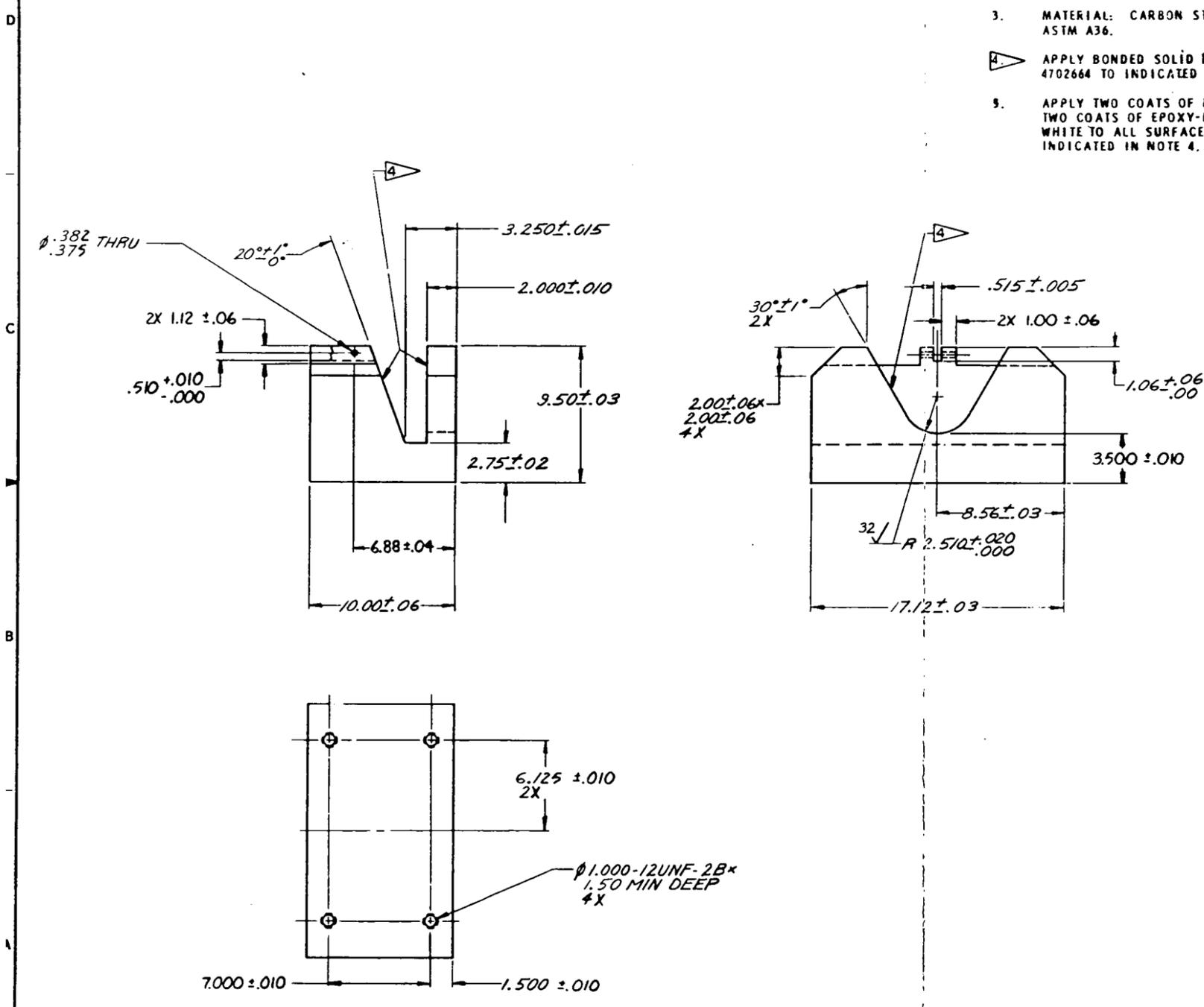
1. GENERAL REQUIREMENTS AND DRAFTING INTERPRETATIONS ARE DEFINED IN 9900000.
2. MATERIAL: LAMINATED OR ONE-PIECE BRASS SHIM STOCK, AS REQUIRED PER ASSEMBLY.
3. MARK DESIGN AGENCY PART NUMBER PER 9919100, CLASS H-1, METHOD OPTIONAL.

AGENCY APPROVALS			SHEET	TITLE	
ORIG	DATE	INITIALS	ISSUE	SHEET INDEX	
6323	9/4/85	JLM	A	SHIM PACK, CROSS FRAME	
			PART CLASSIFICATION		
			UNCLASSIFIED		
			DPO CLASSIFICATION LEVEL		
			UNCLASSIFIED		
2855			SIZE	CODE IDENT NO.	DWG NUMBER
			B	14213	S52707
			SCALE	1/2	SHEET 1 OF 1

NOTES

1. GENERAL REQUIREMENTS ARE DEFINED IN 9900000.
2. MARK DESIGN AGENCY PART NUMBER PER 99191:0, CLASS C-1 OR C-2, METHOD A.
3. MATERIAL: CARBON STEEL PLATE PER ASTM A36.
4.  APPLY BONDED SOLID FILM LUBRICANT PER 4702664 TO INDICATED SURFACES.
5. APPLY TWO COATS OF PRIMER FOLLOWED BY TWO COATS OF EPOXY-BASE PAINT, COLOR WHITE TO ALL SURFACES EXCEPT THOSE INDICATED IN NOTE 4.

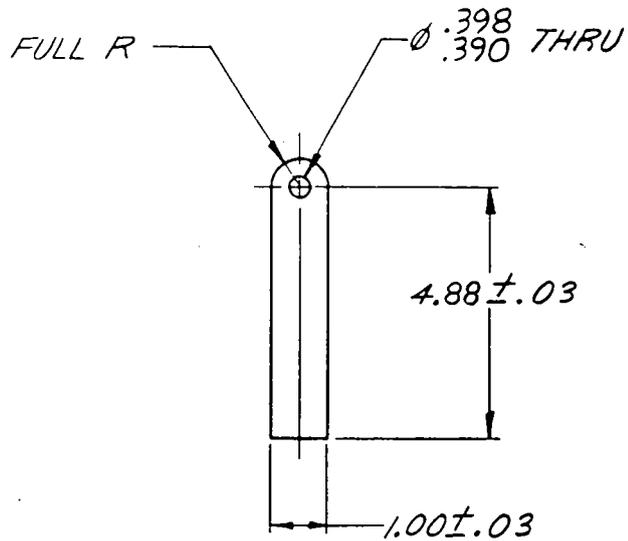
DESIGN AGENCY PART NUMBER NO		REVISIONS			
ISSUE	DATE	DESCRIPTION	PREPARED BY	DATE	CHK
A		ELEY 2855	LEAKES 6322	9-85	REJLM



AGENCY APPROVALS			SHEET /		TITLE	
ORG	DATE	APPROVAL	ISSUE	A	BLOCK, PILLOW	
6323	9/85	LEAKES	SHEET INDEX			
PART CLASSIFICATION					UNCLASSIFIED	
OWG CLASSIFICATION LEVEL					UNCLASSIFIED	
SIZE / FROM NO			DWG NUMBER		SCALE / 4	
2855			D14213		S52708	
			SHEET / OF		1 / 1	

DESIGN NO S52708

DESIGN AGENCY PART NO.	ISSUE	DESCRIPTION	REVISIONS PREPARED BY	DATE	CHK'D	ENGR.
S52709-000	A	ELEY 2855	EAKES 6322	10-9-85	RE	JM



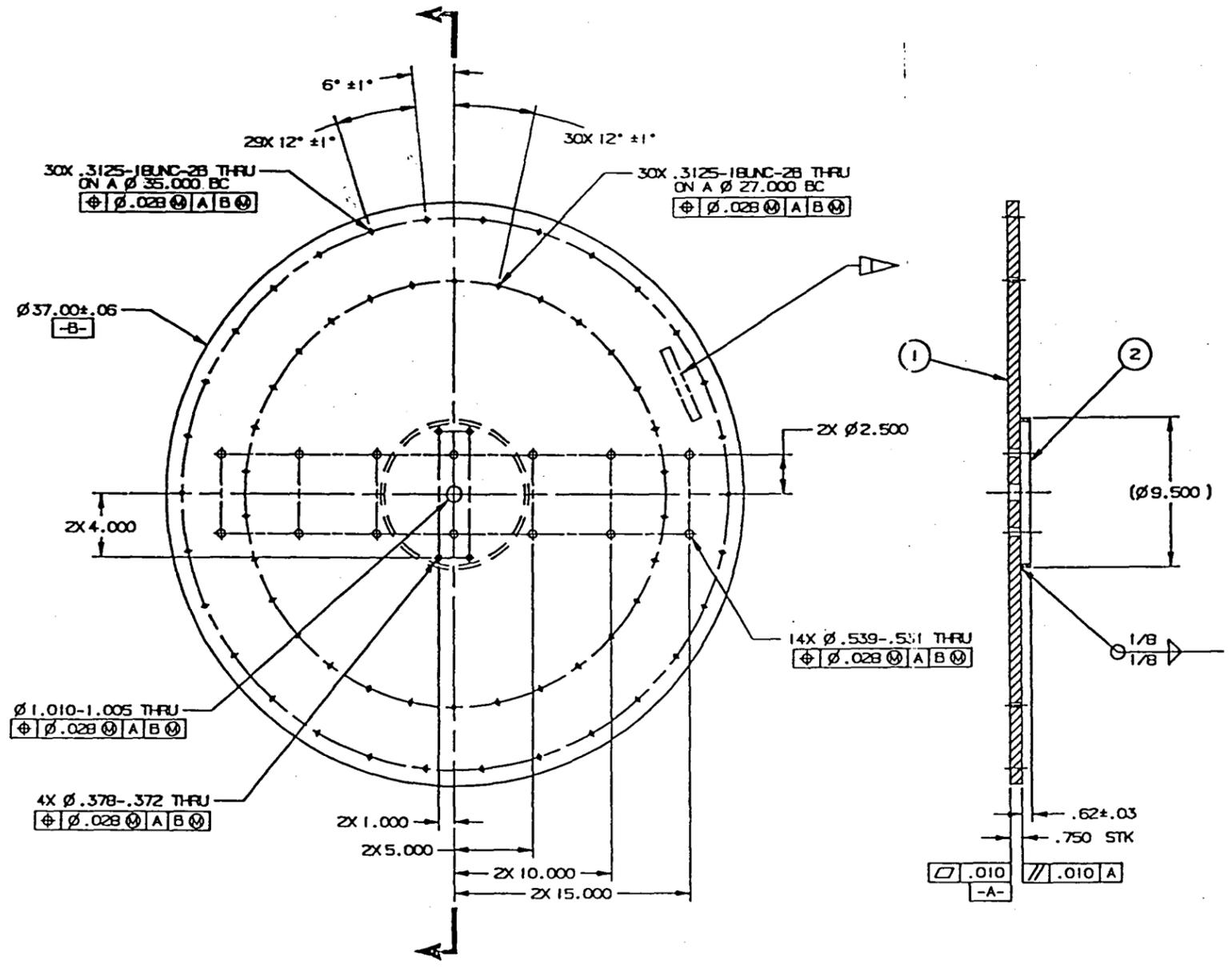
NOTES

1. GENERAL REQUIREMENTS ARE DEFINED IN 9900000.
2. MARK DESIGN AGENCY PART NUMBER PER 9919100, CLASS H-1, METHOD OPTIONAL.
3. MATERIAL: CORROSION-RESISTANT STEEL, TYPE 304, PER QQ-S-766.
4. PASSIVATE PER 9904301.

AGENCY APPROVALS			SHEET	TITLE	
ORG	DATE	INITIALS	ISSUE		
6323	9/6/85	JM	A	PAWL	
			SHEET INDEX		
			PART CLASSIFICATION		
			UNCLASSIFIED		
			ORG CLASSIFICATION LEVEL		
			UNCLASSIFIED		
			SIZE	CODE IDENT NO.	ORG NUMBER
			B	14213	S52709
			SCALE	SHEET 1 OF 1	
			1/2		

NOTES:
 1. MARK DESIGN AGENCY PART NUMBER PER 9919100, CLASS A-2-A OR A-4-A, .250 INCH HIGH CHARACTERS. LOCATE APPROXIMATELY AS SHOWN.
 2. WELD AND INSPECT PER 9912119, CLASS II, USING COATED ELECTRODES PER ASTM A233 ANY CLASS E60XX PER AWS A5.5-69.

DESIGN AGENCY PART NUMBER	REVISIONS						
	ISSUE	SHEET ZONE	PREPARED BY	DESCRIPTION	DATE	CHKD	APVD
SS2710-000	A		ELEY 2855/EAKES 6322				JLM
	B		ADDED L/W & ITEM 2 REVISED & REDRAWN TO CAD R. HOSTEEN, 2883/ D. BRONOWSKI, 6643				DB

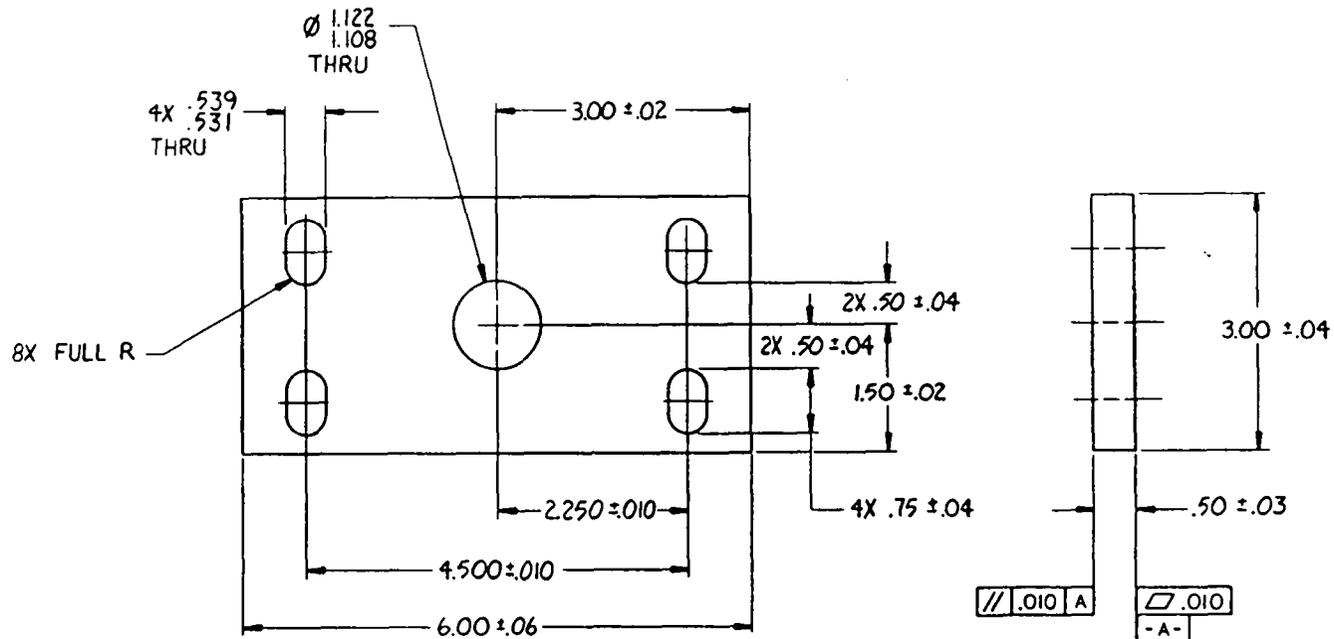


1	ASTM A519	TUBE, STEEL, $\phi 9.500$ O.D. X .250 WALL			2				
1	ASTM A36	STEEL, PLATE, .750 STK			1				
NA	9919100	MARKING, GENERAL METHODS							
NA	9912119	WELDING SPECIFICATION							
NA	9900000	GENERAL REQUIREMENTS							
NO. REV'D	PART/CONTROL NO.	DESCRIPTION/MATERIAL	NOTE	SHEET ZONE	ITEM				
ALT-ALTERNATE	AR-AS RED'D	APG-S RED'D PER ASSY	EM-EXPENSE MATERIAL	NA-DOCUMENT	PL-PROCESS MATERIAL				
AGENCY APPROVALS		SHEET	1	2	3	4	5	6	TITLE
ORG	DATE	APPROVALS	ISSUE	B					RACE, LOWER (U)
6323	9/6/85								
PART CLASSIFICATION		UNCLASSIFIED							
DRAWING CLASSIFICATION		SIZE	DRAWING NUMBER						
UNCLASSIFIED		D	SS2710						
		CAGEC 14213	SCALE	1/4		SHEET 1 OF 1			
2855		STAT.5 SA-REL-5-14-93		ORIGIN SA-AN5-V2.1					

NOTES :

1. GENERAL REQUIREMENTS AND DRAFTING INTERPRETATIONS PER 99000000.
2. MATERIAL: STEEL PLATE PER ASTM A36.
3. MARK DESIGN AGENCY PART NUMBER PER 9919100, CLASS C-1 OR C-2 METHOD A.

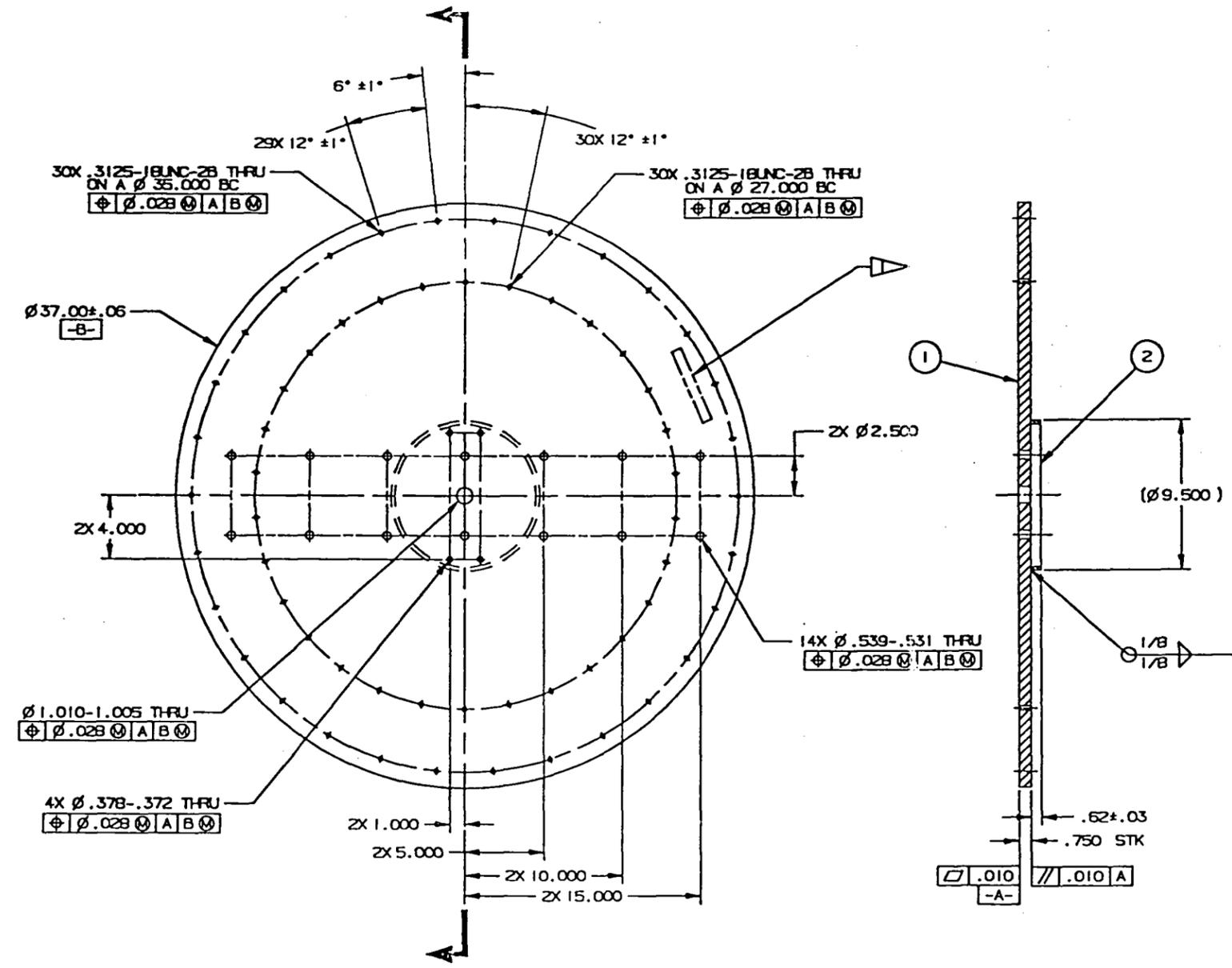
DESIGN AGENCY PART NO.	REV	DESCRIPTION	REVISIONS		
			PREPARED BY	DATE	CHKD
552711-000	A	ELEY 2855 / EAKES	6322	10-2-85	RE JLM



AGENCY APPROVALS				SHEET	TITLE		
ORG	DATE	APPROVALS	ISSUE	1	PLATE, NUT		
6323	7/6/85	XO	A				
				SHEET INDEX			
				PART CLASSIFICATION			
				UNCLASSIFIED			
				DWG CLASSIFICATION LEVEL			
				UNCLASSIFIED			
				SIZE	FORM NO	DWG NUMBER	
				C	14213	552711	
				SCALE	1/1	SHEET	OF
				2855			

NOTES:
 1. MARK DESIGN AGENCY PART NUMBER PER 9919100, CLASS A-2-A OR A-4-A, .250 INCH HIGH CHARACTERS. LOCATE APPROXIMATELY AS SHOWN.
 2. WELD AND INSPECT PER 9912119, CLASS II, USING COATED ELECTRODES PER ASTM A233 ANY CLASS E60XX PER AWS A5.5-69.

DESIGN AGENCY PART NUMBER		REVISIONS				
REV	SHEET ZONE	PREPARED BY	DESCRIPTION	DATE	CHKD	APVD
	A	ELEY 2865/EAKES 6322				JLM
	B	ADDED L/M & ITEM 2 REVISED & REDRAWN TO CAD R. HOSTEEN, 2883/D. BRONOWSKI, 6643				DB

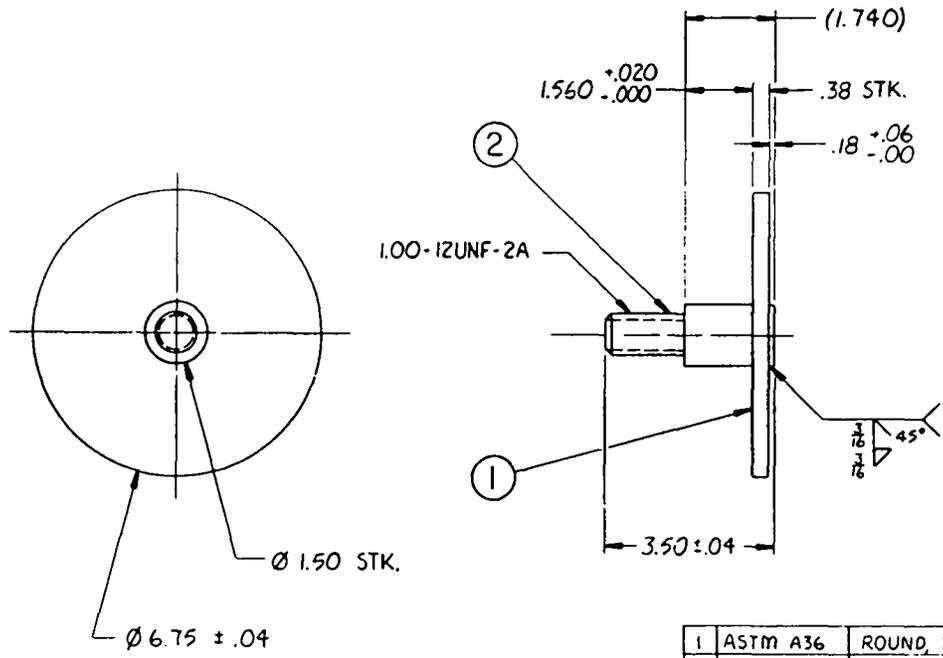


1	ASTM A519	TUBE, STEEL, Ø9.500 O.D. X .250 WALL				2
1	ASTM A36	STEEL, PLATE, .750 STK				1
NA	9919100	MARKING, GENERAL METHODS				
NA	9912119	WELDING SPECIFICATION				
NA	9900000	GENERAL REQUIREMENTS				
NO. REV'D	PART/CONTROL NO.	DESCRIPTION/MATERIAL	NOTE	SHEET ZONE	ITEM	
ALT-ALTERNATE	AR-AS RED'D	ARG-AS RED'D PER ASSY	EM-EXPENSE MATERIAL	NA-DOCUMENT	PIA-PROCESS MATERIAL	
AGENCY APPROVALS		SHEET		1 2 3 4 5 6		TITLE
ORG	DATE	APPROVALS	ISSUE		B	RACE, LOWER (U)
6323	9/6/85		PART CLASSIFICATION		UNCLASSIFIED	
DRAWING CLASSIFICATION		SIZE		DRAWING NUMBER		
UNCLASSIFIED		D		S52710		
CAGEC 14213			SCALE	1/4	SHEET	1 OF 1
STATUS SA-REL-5-14-93			ORIGIN SA-ANS-V2.1			

NOTES :

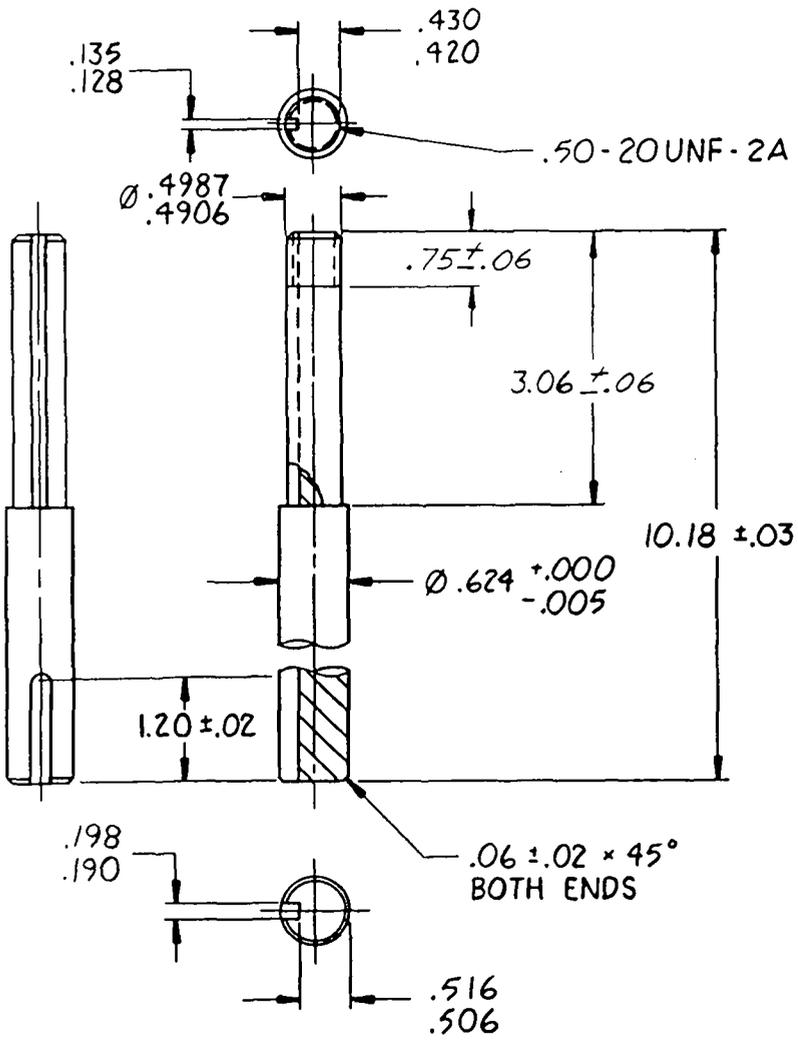
1. APPLY DRY FILM LUBRICANT PER 4702664 TO ENTIRE PART.
2. MARK DESIGN AGENCY PART NUMBER PER 9919100, CLASS H-1, METHOD OPTIONAL.
3. WELD AND INSPECT PER 9912119, CLASS II, USING COATED ELECTRODES PER ASTM A233 ANY CLASS E60XX PER AWS A5.5-69.

DESIGN AGENCY PART NO.	REVISED	DESCRIPTION	PREPARED BY	DATE	CHKD	ENGR
552713-000	A	ELEY 2855/EAKES 6322		10/9/91	RE	JLM



1	ASTM A36	ROUND STEEL, Ø 1.50 STK.			2
1	ASTM A36	PLATE, STEEL, .38 STK.			1
NA	9919100	MARKING, GENERAL METHODS			
NA	9912119	WELDING SPECIFICATIONS			
NA	9900000	GENERAL REQUIREMENTS			
NO REQ	DESIGN AGENCY NUMBER	DESCRIPTION	NOTE	SHEET	ITEM

AGENCY APPROVALS						SHEET INDEX		TITLE	
ORG	DATE	APPROVALS	ISSUE	1	2				
6323	9/4/91	JKO				SHEET INDEX		PIN, PIVOT	
PART CLASSIFICATION						UNCLASSIFIED			
DWG CLASSIFICATION LEVEL						UNCLASSIFIED			
SCALE						1/2			
DWG NUMBER						G114213		552713	
SHEET						1		OF 1	



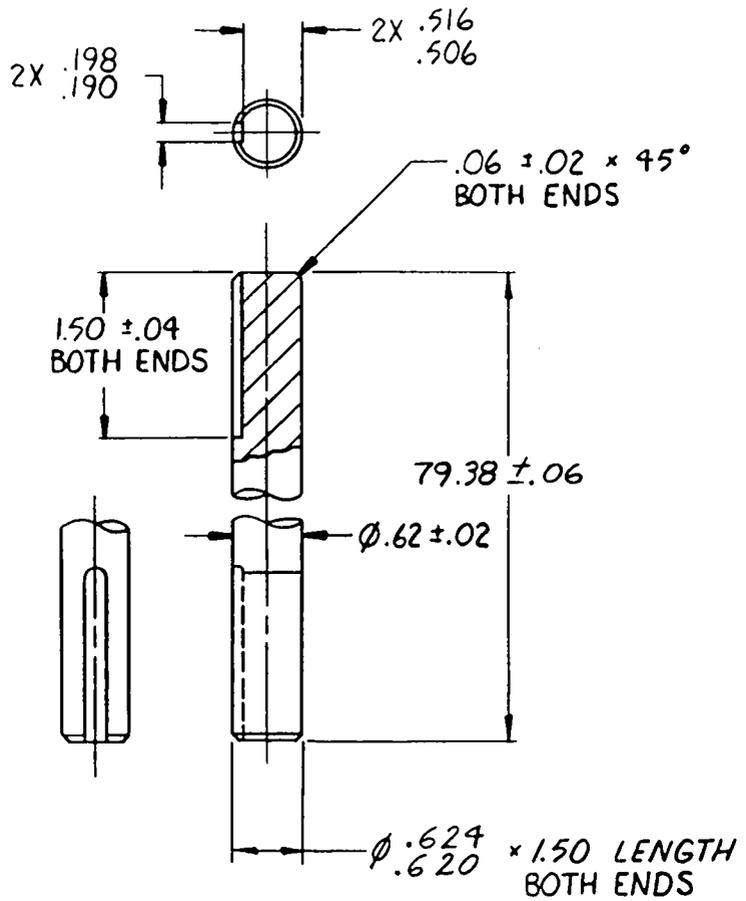
DESIGN AGENCY PART NUMBER NO.	REVISIONS		DATE	CHKD	ENGR.
S52715-000	ISSUE	DESCRIPTION	PREPARED BY		
	A	ELEY 2855	LEAKES 6322	10-9-85	RE JLM

NOTES

1. GENERAL REQUIREMENTS ARE DEFINED IN 9900000.
2. MARK DESIGN AGENCY PART NUMBER PER 9919100, CLASS H-1, METHOD OPTIONAL.
3. MATERIAL: CORROSION-RESISTANT STEEL, TYPE 304, 304L PER ASTM-A-276, COND A.
4. PASSIVATE PER 9904301.

AGENCY APPROVALS			SHEET		TITLE	
ORG	DATE	INITIALS	ISSUE	ISSUE	SHAFT, HAND WHEEL	
6323	9/6/85	SLA	A			
PART CLASSIFICATION					SIZE	
UNCLASSIFIED					B	
ORG CLASSIFICATION LEVEL					CODE IDENT NO.	
UNCLASSIFIED					14213	
2832					DWG NUMBER	
					S52715	
					SCALE	
					NONE	
					SHEET 1	
					OF 1	

DESIGN AGENCY PART NUMBER NO.	ISSUE	DESCRIPTION	DATE	CHKD	ENGR.
S52716-000	A	ELEY 2855 / EAKES 6322	10-9-95	RE	JLM

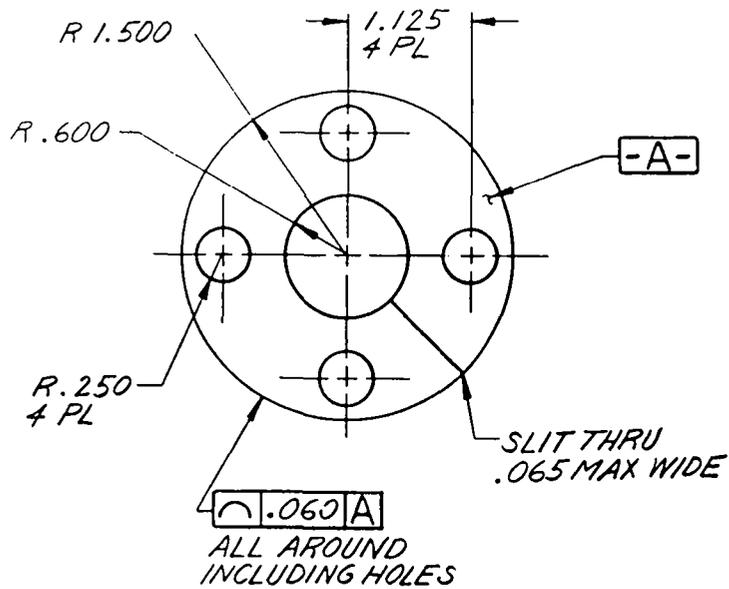


NOTES

1. GENERAL REQUIREMENTS ARE DEFINED IN 9900000.
2. MARK DESIGN AGENCY PART NUMBER PER 9919100, CLASS H-1, METHOD OPTIONAL.
3. MATERIAL: CORROSION-RESISTANT STEEL, TYPE 304, 304L PER ASTM-A-276, COND A.
4. PASSIVATE PER 9904301.

AGENCY APPROVALS			SHEET	TITLE	
DRG	DATE	INITIALS	ISSUE	SHAFT	
6323	9/6/95	JK	A		
			SHEET INDEX		
			PART CLASSIFICATION		
			UNCLASSIFIED		
			DRG CLASSIFICATION LEVEL		
			UNCLASSIFIED		
			SIZE	CODE IDENT NO.	DRG NUMBER
			B	14213	S52716
			SCALE	SHEET 1 OF 1	
			1/1		

DESIGN AGENCY PART NUMBER NO.		REVISIONS				
ISSUE	DESCRIPTION	PREPARED BY	DATE	CHKD	ENGR.	
S52717-000	A	R COOKE CD 7651/EAKES 6322	2/1/86			



NOTES

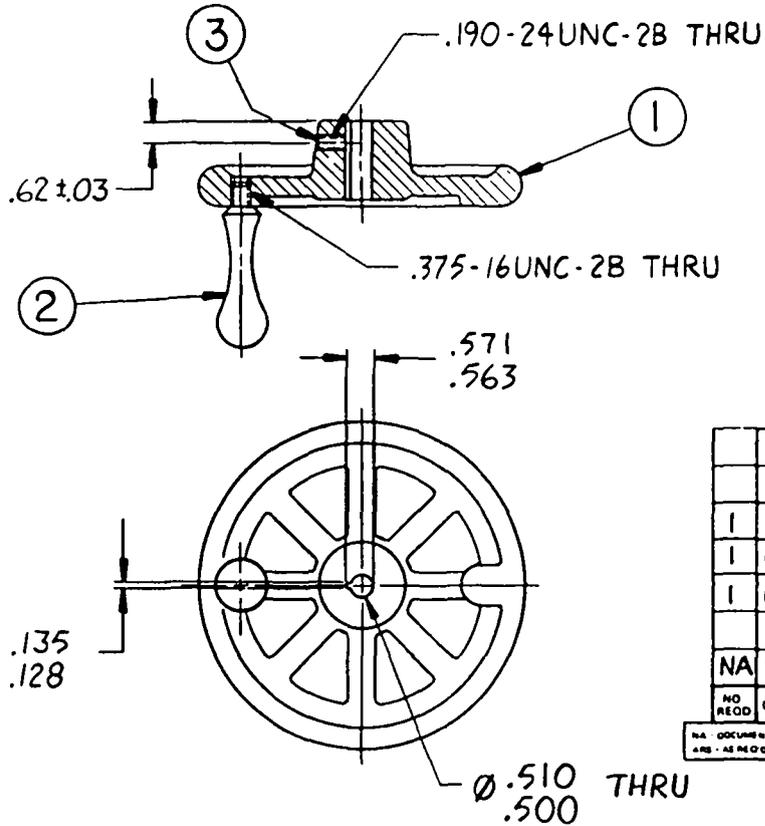
1. GENERAL REQUIREMENTS ARE DEFINED IN 9900000.
2. MATERIAL. LAMINATED BRASS SHIM STOCK.
3. MARK DESIGN AGENCY PART NUMBER PER 9919100, CLASS H-1, METHOD OPTIONAL.

AGENCY APPROVALS			SHEET		TITLE	
ORG	DATE	INITIALS	ISSUE	INDEX	SHIM PACK, NUT	
			A			
			PART CLASSIFICATION		SIZE	
			UNCLASSIFIED		B	CODE IDENT NO.
			DWG CLASSIFICATION LEVEL		14213	DWG NUMBER
			UNCLASSIFIED		S52717	
			SCALE		1/1	SHEET 1 OF 1

NOTES:

- MAY BE PURCHASED FROM CARR LANE MFG. CO., 4200 CARR LANE COURT, ST. LOUIS, MO 63119 (OR EQUIVALENT).

DESIGN AGENCY PART NUMBER NO.	REVISIONS					
	ISSUE	DESCRIPTION	PREPARED BY	DATE	CHKD	ENGR.
S52718-000	A	ELEY 2855 / EAKES 6322		10-9-85	RE	JUM

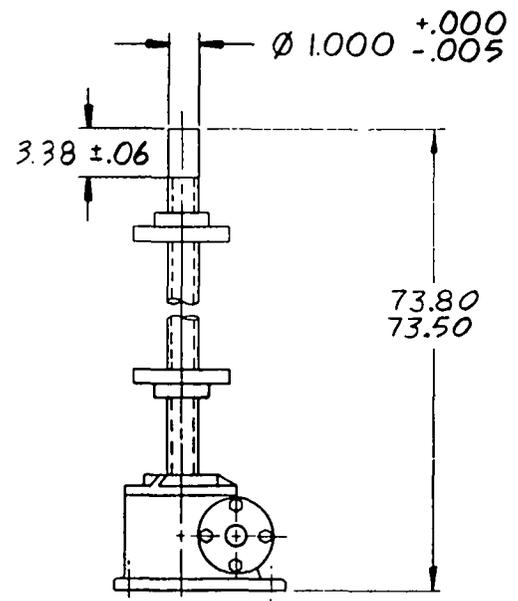


NO	REQD	DESIGN AGENCY NUMBER	DESCRIPTION	NOTE	SHEET ZONE	ITEM
1			SCREW, SET, .190-24UNC-2A x .50 LG.			3
1		CL-2-RH	HANDLE, REVOLVING			2
1		CL-10HWSF	HANDWHEEL, FINISHED			1
NA	9900000		GENERAL REQUIREMENTS			

AGENCY APPROVALS				SHEET	TITLE
ORG	DATE	INITIALS	ISSUE		
6323	9/6/85	JJA	A		HAND WHEEL
PART CLASSIFICATION					
UNCLASSIFIED					
ORG CLASSIFICATION LEVEL					
UNCLASSIFIED					
2855					

ORG NUMBER	CODE IDENT NO.	ORG NUMBER
	B 14213	S52718
SCALE	NONE	SHEET 1 OF 1

DESIGN AGENCY PART NUMBER NO.	REVISIONS					
	TABLE	DESCRIPTION	PREPARED BY	DATE	CHKD	ENGR.
S52719-000	A	ELEY 2855 /EAKES 6322		10-9-85	RE	JLM



NOTES

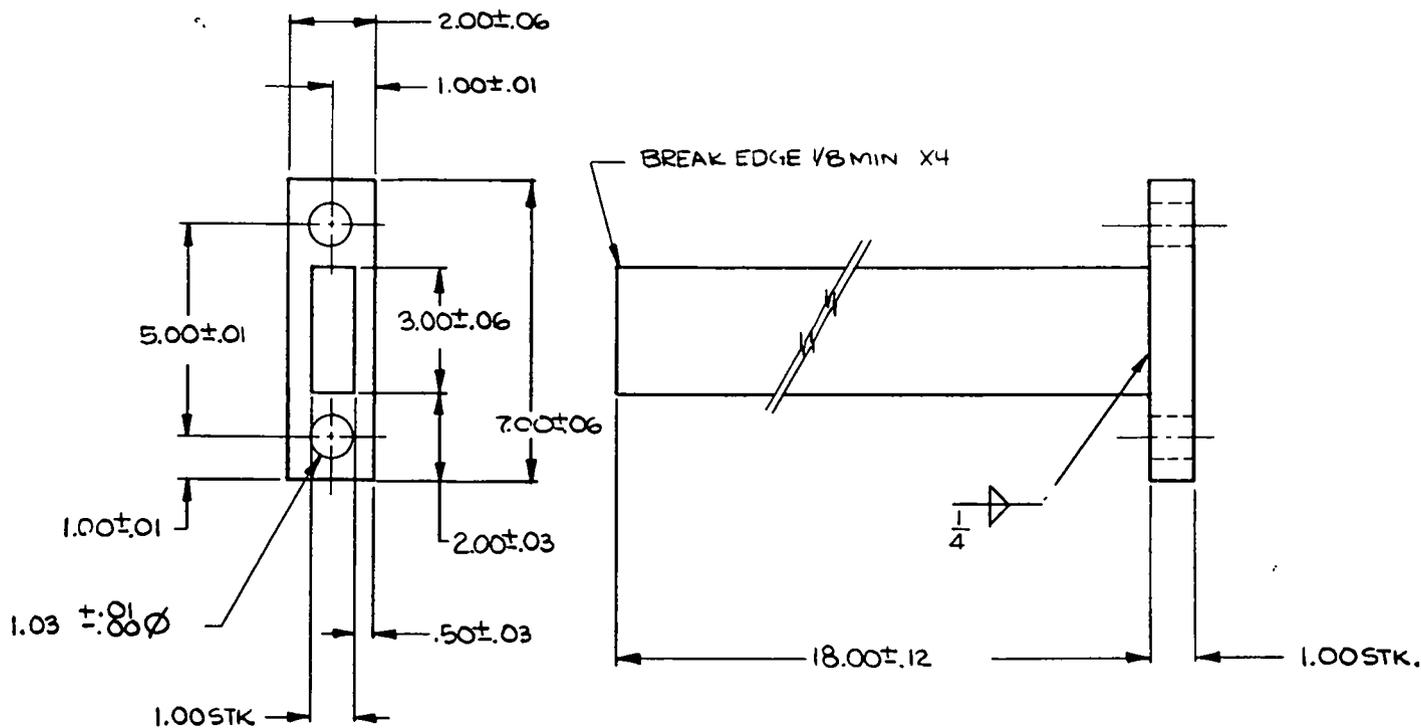
1. GENERAL REQUIREMENTS ARE DEFINED IN 9900000.
2. THIS DRAWING DEFINES AN ACTUATOR WITH NON-STANDARD SCREW LENGTH, AS MAY BE OBTAINED FROM: TEMPLETON, KENLY & CO., SIMPLEX DIV., 2525 GARDNER RD., BROADVIEW, ILL 60153. WORM GEAR ACTUATOR WITH 2 TRAVELING NUTS AND PLAIN SHAFT END
ACTUATOR F/N - J2, UPRIGHT
NUT P/N - J2

AGENCY APPROVALS			SHEET	TITLE	
ORG	DATE	INITIALS	TABLE	ACTUATOR	
6325	9/4/85	202	A		
			SHEET INDEX		
			PART CLASSIFICATION		
			UNCLASSIFIED		
			DWG CLASSIFICATION LEVEL		
			UNCLASSIFIED		
2855			SIZE	CODE IDENT NO.	DWG NUMBER
			B	14213	S52719
			SCALE	NONE	SHEET 1 OF 1

NOTES:

1. MATERIAL: PLATE, STEEL, LOW CARBON

DESIGN AGENCY		REVISIONS		
PART OR CONTROL NO.	REV	DESCRIPTION	PREPARED BY	DATE
558999-000	A	REAKES G322/R.YOSHIMURA	5/1/82	RE

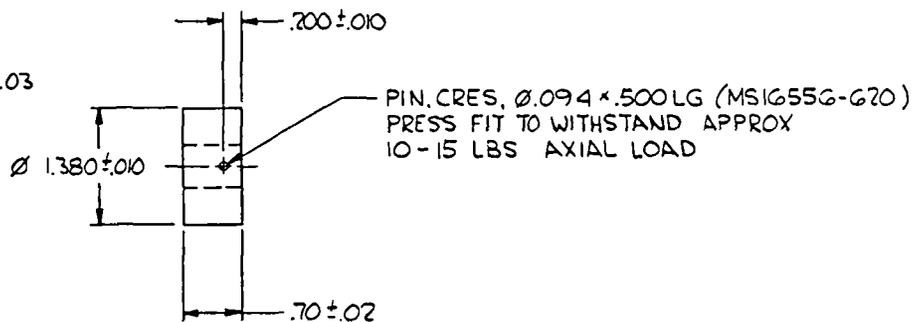
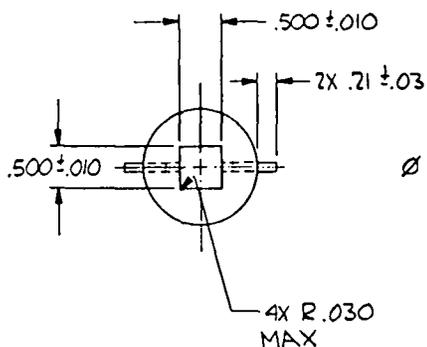


AGENCY APPROVALS			SHEET		TITLE	
ORG	DATE	APPROVALS	ISSUE	INDEX		
G323			A		LEG, STANDOFF	
PART CLASSIFICATION					UNCLASSIFIED	
DWG CLASSIFICATION LEVEL					UNCLASSIFIED	
SIZE FROM NO			DWG NUMBER			
C 14213			558999			
SCALE 1/2			SHEET 1 OF 1			

NOTES

1. GENERAL REQUIREMENTS PER 9900000.
2. PASSIVATE PER 9904301.
3. MATL: STEEL, STAINLESS, TYPE 304 PER ASME 240.

DESIGN AGENCY		REVISIONS					
PART OR SHEET NO	ISSUE	DESCRIPTION	PREPARED BY	DATE	CHKD	ENGR	
S94972-000	A	J. GUILLEN 2855/D BRONOWSKI 6323			JRS	HAY	

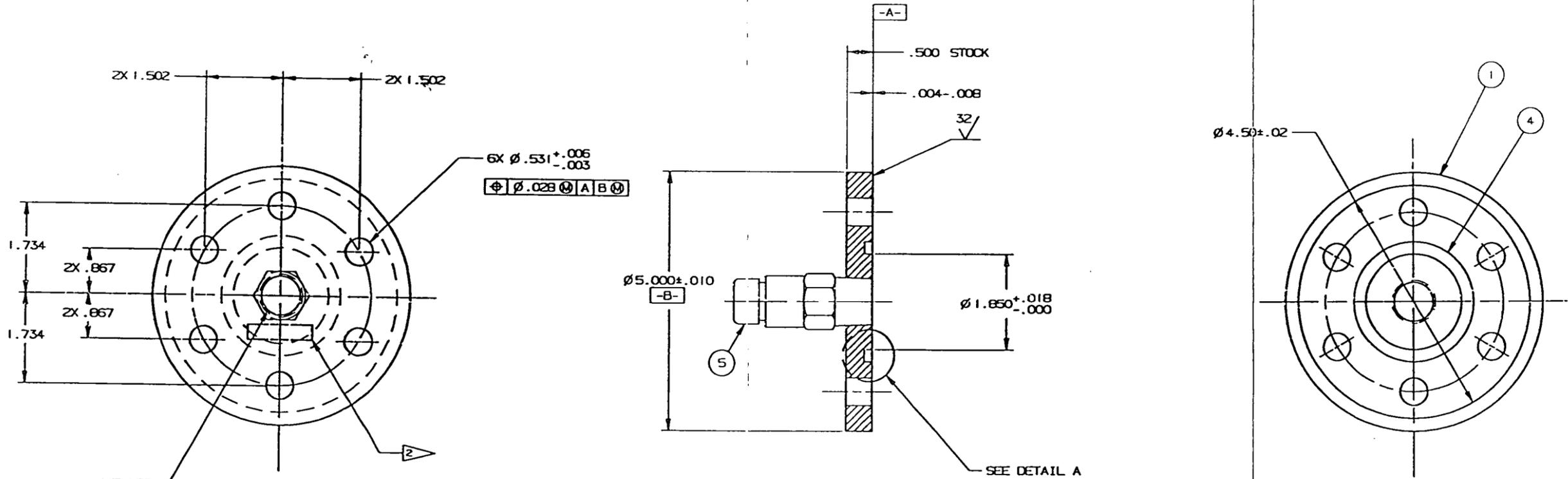


AGENCY APPROVALS				SHEET INDEX				TITLE	
ORG	DATE	APPROVALS	ISSUE	1				TOOL, INSERT INSTALLATION	
6323	7/11/77	JRS	A						
6323	5/11/78	JRS						UNCLASSIFIED	
DWG CLASSIFICATION LEVEL								SIZE/FSCM NO	DWG NUMBER
UNCLASSIFIED								C 14213	S94972
SCALE 1/1								SHEET 1 OF 1	

NOTES:

- PASSIVATE PER 9904301.
- MARK DESIGN AGENCY PART NO. PER 9919100, CLASS C-1-A. LOCATE APPROX AS SHOWN.
- ALL SURFACES TO BE $\sqrt{63}$ MIN. UNLESS OTHERWISE SPECIFIED.

DESIGN AGENCY PART NUMBER	REVISIONS						
	ISS	SHEET ZONE	PREPARED BY	DESCRIPTION	DATE	CHKR	APVD
SS4924-000	B			CONVERTED TO CAD. REMOVED 2 O-RING GROOVE, ADDED NEW O-RING GROOVE. B. BRONKEMA, 2852/ D. BRONOWSKI, 6643			DB



1	SS-008-B-BPM	FITTING, QUICK-CONNECT, SWAGELOC			5		
1	2-328V747-75	O-RING, Ø 1.850 I.D.			4		
					3		
					2		
1		STEEL, STAINLESS, TYPE 304			1		
NA	9919100	MARKING, GENERAL METHODS					
NA	9900000	GENERAL REQUIREMENTS					
NO. REQ'D	PART/CONTROL NO.	DESCRIPTION/MATERIAL	NOTE	SHEET ZONE	ITEM		
ALT-ALTERNATE	AR-AS RED'D	ARS-AS RED'D PER ASSY	EN-EXPENSE MATERIAL	NA-DOCUMENT	PM-PROCESS MATERIAL		
SHEET	1	2	3	4	5	6	TITLE
ISSUE	B						TEST COVER, BUSS PORT (U)
PART CLASSIFICATION		UNCLASSIFIED					
DRAWING CLASSIFICATION		SIZE	DRAWING NUMBER				
UNCLASSIFIED		D	S94924				
CAGEC 14213			SCALE	1/1		SHEET 1 OF 1	
STATUS SA-CHK-05-20-92			ORIGIN SA-ANS-V2.1				

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