

Recovery Guide for TRU Waste Packages

U.S. Department of Energy

Revision 6

Effective Date: June 2011



This document supersedes DOE/CBFO-94-1007, Rev. 5.

This document has been submitted as required to:

Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831
(865) 576-8401

Additional information about this document may be obtained by calling the WIPP Information Center at 1-800-336-9477. Copies may be obtained by contacting the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22101.

Copies of this document are also available

On the Waste Isolation Pilot Plant (WIPP) Home Page:

<http://www.wipp.ws>

Click on WIPP Transportation

Click on Recovery Guide for TRU Waste Packages

Upon written request to:

U.S. Department of Energy
Carlsbad Field Office
P.O. Box 3090
Carlsbad, New Mexico 88221

By calling:
1-800-336-9477

//signature on file//

J. R. Stroble, Director
Office of the National TRU Program

23 June 2011

Date

RECORD OF REVISION

<u>Revision</u>	<u>Reason for Revision/Change</u>
5	This revision constitutes a complete revision of each page; therefore, no change bars are included.
6	This revision adds section 5.0 for the recovery of a TRUPACT-III, removes all reference to CNS 10-160B and revises the text to 10-160B, and corrects other minor errors in the document.

TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS	8
1.0 INTRODUCTION	9
1.1. Purpose	9
1.2. Scope.....	10
1.3. Roles and Responsibilities.....	10
1.4. Recovery Events.....	12
1.5. Recommended Package Hoisting, Rigging, and Recovery Equipment ...	14
1.5.1. Package Hoisting Equipment.....	14
1.5.2. Recovery Equipment	14
1.6. Package and Transporter Disposition.....	15
1.7. Restoration Activities	15
2.0 TRUPACT-II OR HALFPACT RECOVERY	16
2.1. Method of Recovery.....	16
2.2. Recommended Rigging and Recovery Equipment	16
2.3. Transfer to Alternate Trailer	18
2.3.1. Vertical Transfer in an Upright Position to a TRUPACT-II or HalfPACT Replacement Trailer.....	18
2.3.2. Horizontal Transfer to Non-TRUPACT-II/HalfPACT Trailer	25
2.3.3. Recovery Lifting Techniques.....	27
3.0 RH-TRU 72-B RECOVERY	44
3.1. Method of Recovery.....	44
3.2. Recommended Equipment	45
3.3. Transfer of RH-TRU 72-B to Alternate Trailer	46
3.4. Horizontal Transfer to Non-RH-TRU 72-B Trailer	47
3.4.1. Horizontal Lift Using the Web Sling	47
3.4.2. Securing a RH-TRU 72-B Package to a Recovery Trailer	48
3.5. Recovery Lifting Techniques.....	48
3.5.1. Vertical Position to Horizontal Lifting Using Rigging and Slings...	48
4.0 10-160B RECOVERY	52
4.1. Method of Recovery.....	52
4.2. Recommended Equipment	52
4.3. Transfer of 10-160B to Alternate Trailer.....	53
4.4. Recovery Lifting Techniques.....	54
4.4.1. Removing a Cask from a Trailer and Transferring to Secondary Trailer	54
5.0 TRUPACT-III RECOVERY	57
5.1. Method of Recovery.....	57
5.2. Recommended Equipment	58
5.3. Transfer of TRUPACT-III to Alternate Trailer	60

5.3.1. Transfer to a Replacement TRUPACT-III Trailer	60
5.3.2. TRUPACT-III Secured on a TRUPACT-III Trailer	63
5.4. Recovery Lifting Techniques.....	63
6.0 REFERENCES	65

LIST OF FIGURES

Figure 1.3-1 – DOE Regional Coordinating Offices.....	11
Figure 2.3-1 – Using Lift Sling Alignment Strap for TRUPACT-II or HalfPACT Recovery.....	29
Figure 2.3-2 – Vertical Lift of a TRUPACT-II Using a Lift Sling Alignment Strap	30
Figure 2.3-3 – Weld-On Lug Detail.....	31
Figure 2.3-4 – Vertical Lift of a TRUPACT-II or HalfPACT using a Three-Legged Lifting Sling	32
Figure 2.3-5 – Cam Handle Tiedown Assembly Disk Spring Arrangement	33
Figure 2.3-6 – Cam Handle Assembly.....	34
Figure 2.3-7 – Initial Cam Handle Assembly on Trailer	35
Figure 2.3-8 – Complete Cam Handle Tiedown Assembly.....	36
Figure 2.3-9 – Screw Jack Tiedown – Components.....	37
Figure 2.3-9a – Screw Jack Tiedown – Dimensions	38
Figure 2.3-10 – Horizontal Package Transport Securement	39
Figure 2.3-11 – Rigging for Horizontal Package Lifting (Web Sling)	40
Figure 2.3-12 – Horizontal Package Lifting with Weld-On Lugs	41
Figure 2.3-13 – Horizontal Lift and Securement of a TRUPACT-II Using Weld-On Lugs.....	42
Figure 2.3-14 – Recovery Lifting Techniques for Tipping Package	43
Figure 2.3-15 – TRUPACT-II Package Rotation Using Weld-On Lugs.....	44
Figure 3.2-1 – RH-TRU 72-B Secured on Recovery Trailer	49
Figure 3.3-1 – Horizontal Recovery Lift RH-TRU 72-B.....	50
Figure 3.5-1 – Vertical Lift RH-TRU 72-B Recovery	51
Figure 4-1 – 10-160B Cask	56
Figure 4-2 – 10-160B Transporter	57
Figure 5.3.1-1 – TRUPACT-III Tiedown Frame	61

Figure 5.3.1-2 – TRUPACT-III Tiedown	62
Figure 5.3.1-3 – TRUPACT-III Secured on TRUPACT-III Trailer	63
Figure 5.3.2-1 – TRUPACT-III on a Lowboy Trailer Prior to Being Secured.....	64

LIST OF TABLES

Table 2.2-1 – TRUPACT-II and HalfPACT Recovery Equipment List	17
Table 3.2-1 – RH-TRU 72-B Recovery Equipment List	45
Table 4.2-1 – 10-160B Recovery Equipment List.....	53
Table 5.2-1 – TRUPACT-III Recovery Equipment List	59

ACRONYMS AND ABBREVIATIONS

AWS	American Welding Society
CBFO	Carlsbad Field Office
CFR	<i>Code of Federal Regulations</i>
CH	contact-handled
CMR	WIPP Central Monitoring Room
CMRO	WIPP Central Monitoring Room Operator
CVSA	Commercial Vehicle Safety Alliance
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EM	DOE Office of Environmental Management
EPA	U.S. Environmental Protection Agency
ft	foot
IART	U.S. Department of Energy Carlsbad Field Office Incident/Accident Response Team
IC	Incident Commander
in	inch
lb	pound
MOC	management and operating contractor
NRC	U.S. Nuclear Regulatory Commission
OSHA	Occupational Safety and Health Administration
RAP	Radiological Assistance Program
RCO	Regional Coordinating Office for RAP
RH	remote-handled
SCRA	Specialized Carrier and Rigging Association
SWL	safe working load
TRU	transuranic
TRUPACT-II	Transuranic Package Transporter Model II
WIPP	Waste Isolation Pilot Plant

1.0. INTRODUCTION

Permanent disposal of the defense-generated transuranic (TRU) radioactive waste now in temporary storage at generator sites requires shipment of the waste to the Waste Isolation Pilot Plant (WIPP) in Carlsbad, New Mexico. In addition, waste management efforts at those generator sites may require intersite and intrasite shipments. TRU waste is shipped by commercial motor vehicle, in U.S. Nuclear Regulatory Commission (NRC)-certified packaging. This recovery guide establishes guidance for recovery of TRU waste packages/packages.

The U.S. Department of Energy (DOE) Office of Environmental Management (EM) has made the decision not to use rail shipment as the primary mode of transportation for TRU waste shipments. However, the DOE has reserved the right to use this option on a case-by-case basis. Use and recovery of rail shipments will be negotiated and coordinated as necessary.

Roles and responsibilities associated with a TRU waste transportation incident are identified in detail in DOE Carlsbad Field Office (CBFO) document, *TRU Waste Transportation Plan* (DOE/CBFO 98-3103).

In the transportation field, the terms "packaging" and "package" have different meanings. "Packaging" refers to a shipping container with no radioactive payload. "Package" refers to the packaging (shipping container) loaded with the radioactive payload. Recovery operations are handled the same regardless of the contents. To simplify discussions about recovery operations, "package" will be used throughout this guide when referring to the shipping container.

To assist in the response to an incident, the DOE has established an Incident/Accident Response Team (IART). The IART is a CBFO-managed emergency response team consisting of a CBFO IART team leader, the CBFO or management and operating contractor (MOC) Public Information Officer, MOC transportation and packaging engineers, and other technical personnel as necessary. The team is on call any time a shipment using the CBFO transportation system is in progress. The team is available to assist the Incident Commander (IC) in charge at an incident.

1.1. Purpose

It is expected that the initial response to a TRU waste incident will be by state, tribal, or local emergency response agencies followed, if required, by the appropriate regional DOE Radiological Assistance Program (RAP) Team. The IART from Carlsbad, New Mexico, will also deploy as required. The purpose of this guide is to assist those responding agencies in identifying steps, considerations, and methods for recovering a TRU waste package. Specific details for each task or function are left to the on-scene personnel and are not listed in this document. Aspects of the package recovery and movement operation can be performed by IART members, personnel from other government agencies, and/or personnel from the private sector.

1.2. Scope

This document provides guidance on selecting the equipment and method to recover a package. The information is intended to apply to all recovery situations, but may require on-scene modifications due to actual conditions. If an incident occurs that brings into question the transportation system's roadworthiness, or the package's containment integrity, the Central Monitoring Room Operator (CMRO) at the WIPP site should be contacted immediately. This contact should be made so that the IART may be made available for technical guidance and assistance, along with the carrier personnel and other applicable personnel.

DOE-owned, NRC-certified Type B packages – TRUPACT-II (Transuranic Package Transporter Model II), TRUPACT-III, HalfPACT, RH-TRU 72-B, and 10-160B – are used for TRU contact-handled (CH) and remote-handled (RH) waste transportation, and are addressed in this guide. As additional packages are certified, sections will be added to this document to address recovery methods.

A copy of this guide shall be kept in the driver's compartment of each of the carrier tractors and inside the toolbox of each package trailer. In addition, each DOE RAP Team Regional Coordinating Office, the DOE National Nuclear Safety Administration Service Center in Albuquerque, New Mexico, and the WIPP Central Monitoring Room (CMR) shall have a copy of this recovery guide. Each regional state or tribal-designated location shall be notified by e-mail when an updated version of this guide is available on the WIPP Home Page at http://www.wipp.energy.gov/Documents_Transportation.htm.

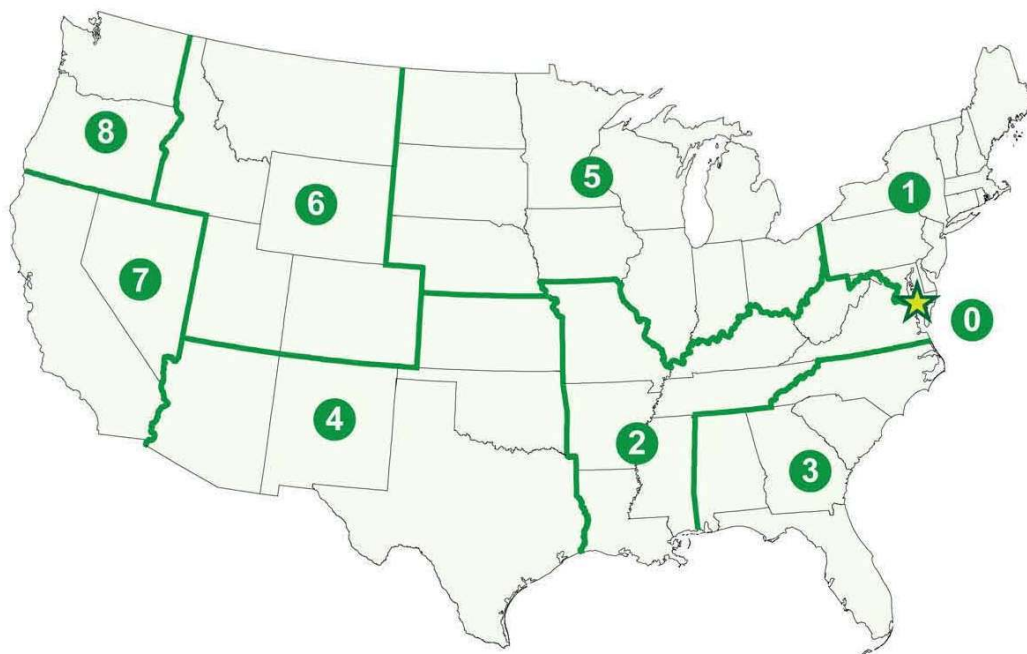
1.3. Roles and Responsibilities

In case of a transportation incident, many agencies will share responsibilities as the incident evolves. The goal of the DOE is to save lives, protect property, prevent further damage, recover the package, and take steps to restore the scene to its former state (before the incident occurred).

State governments have statutory responsibility for command and control at an incident scene. Accordingly, the IART serves as a technical advisor to the IC for the proper recovery of the package. Recovery operations are the responsibility of the carrier, with the assistance/direction of the IART. The carrier is directly responsible for the acquisition of the crane services, tractors, trailers, wreckers, and spill cleanup services. Carrier drivers are trained in the use of this recovery guide.

DOE assistance is available to emergency responders by calling the CMRO (preferred method) or nearest DOE Regional Coordinating Office (RCO). RCO locations, addresses, and telephone numbers are shown in Figure 1.3-1. The RCO dispatches the nearest DOE RAP Team if required. A RAP team is required only if the containment of the package is in question and radiation is detected outside of the package. The

RAP Team's function is to advise the IC of the radiological consequences of the incident and the proper steps to protect the responders, the public, and the environment.



Regional Coordinating Office	Address	Telephone for Assistance
0 National Capitol Region	Washington, D.C.	(202) 586-8100
1 Brookhaven Area Office	53 Bell Avenue Upton, Long Island, NY 11973	(631) 344-2200
2 Oak Ridge Operations Office	P.O. Box 2001 Oak Ridge, TN 37831	(865) 576-1005
3 Savannah River Operations Office	P.O. Box A Aiken, SC 29802	(803) 725-3333
4 NNSA Service Center	P.O. Box 5400 Albuquerque, NM 87115-5400	(505) 845-4667
5 Chicago Operations Office	9800 S. Cass Avenue Argonne, IL 60439	(630) 252-4800
6 Idaho Operations Office	850 Energy Drive Idaho Falls, ID 83401-1563	(208) 526-1515
7 Livermore Site Office	P.O. Box 808, L-293 Livermore, CA 94551	(925) 422-8951
8 Richland Operations Office	P.O. Box 550, A5-55 Richland, WA 99352	(509) 373-3800

Figure 1.3-1 – DOE Regional Coordinating Offices

1.4. Recovery Events

Should a package be damaged as a result of an incident, the guidance contained in Title 49 *Code of Federal Regulations* (CFR), *Transportation*, should be followed:

"When a package of radioactive materials is damaged during the course of public highway transportation, 49 CFR §177.854 authorizes the further movement of the package, under specified conditions. Under §177.854(b), packages that cannot be overpacked may be repaired in accordance with the safest practice known and available. If the repair to the package is adequate to prevent a release to the environment or the contamination of other lading on the vehicle, the package may be shipped to a facility for further repair, repackaging or disposal, as appropriate.

"Additionally, under the provisions of §177.843, a vehicle in which radioactive material has been spilled may not be returned to service until the radiation dose rate at any accessible surface is less than 0.5 millirem per hour and there is no significant [above the established limits of 22 alpha and 220 dpm/cm² beta gamma DOT limits (DOE limits are 20 dpm/cm² alpha and 200 dpm/cm² beta)] removable surface contamination. Movement in accordance with §177.854 does not require an exemption or any other form of approval by the Department.

"If, due to the extent of the damage, the package cannot comply with the conditions specified in §177.854, this Department may issue an emergency exemption in accordance with 49 CFR §107.117. This section authorizes the issuance of an emergency exemption by DOT provided that 'an emergency exists and that there is adequate justification for the exemption.'

"The information required to be submitted is found in 49 CFR §107.105. An exemption will specify the controls that must be used during transportation to move a package safely to its destination."

The U.S. Department of Transportation (DOT) will coordinate packaging exemptions with the NRC.

If a package separated from its transporter is an obstacle to the orderly flow of traffic, and radiation levels do not exceed DOT limits, the package may be moved to the side of the road to allow traffic to pass. The IC should use care during handling or movement to prevent further damage to the package that may endanger the integrity of the package. The IART may be used for guidance during the movement of the package.

Each recovery operation will vary depending upon conditions found at the incident scene, the type of package involved, availability of recovery equipment, and the type of replacement transport that is required. Listed below is a typical sequence of events:

1. The incident occurs; state, tribal, or local authorities are notified. Normally, notification would be made by a call from the driver or a 911 call. The authorities respond and notify the WIPP CMRO in Carlsbad, New Mexico (575-885-6883, 575-234-8125, or 575-234-8457).
2. The WIPP CMRO notifies the CBFO IART team leader and the carrier. The IART team leader notifies the remainder of the IART for assembly at the CBFO in Carlsbad, New Mexico. When directed by the IART team leader, responsibility for communications with and about the impacted shipment can be transferred from the CMRO to the IART team location.
3. The IART responds initially to the incident by direct contact with the IC via telephone or by contacting the driver by telephone who then communicates with the IC. After evaluation by the IART team leader or upon request, the IART may travel to the scene either by motor vehicle (if within a reasonable driving distance) or by charter or commercial aircraft. The IART team leader will normally request that the IC or designee complete an On-Scene TRU Package Crash Status Report (located at the rear of this guide).
4. If on scene, the IART team leader reports to the IC to receive a status report.
5. From a safe distance, the IC or carrier representative begins to plan the recovery operation and gather required equipment. Unless there are other hazard considerations, injured personnel can and should be evacuated as soon as possible.
6. When the IC declares the incident scene safe for entry, the recovery personnel approach the tractor, trailer, and package, and observe/inspect each to assess the corrective actions required.
7. Depending on the findings of the IART/response personnel, the carrier is advised of the appropriate recovery equipment and replacement parts, and if a replacement tractor and/or trailer is required.
8. If the trailer is damaged to the extent that it must be replaced, then the packages must be transferred to replacement trailers. Refer to the instructions in this guide appropriate to the type of package(s) being transferred to the replacement trailer(s).

1.5. Recommended Package Hoisting, Rigging, and Recovery Equipment

Various lifting techniques are available for recovering TRU waste packages should they be separated from the transporter. The incident/accident conditions will determine the type of equipment and method used to recover the package(s). The primary objective is to ensure the safety of all personnel involved in these recovery processes.

1.5.1. Package Hoisting Equipment

As previously stated, the on-scene conditions will determine the type of equipment used to lift a TRU waste package, and the condition of the package(s) and transporter will determine what type of tractor and trailer are used in the recovery. If the recovery operation requires the use of a mobile crane for the TRUPACT-II, HalfPACT, and RH-TRU 72-B, it is recommended that a mobile crane with a minimum capacity of 50 tons-with two boom hooks and a drag cable be used. If the operation for TRUPACT-IIs or HalfPACTs requires a forklift, it should be rated at a minimum of 20,000 pounds (lb) at 5 feet (ft), with 7-ft lifting tines. If the transport trailer cannot be used, the use of a 40,000-lb capacity flatbed trailer with suitable commercial side-mounted tiedowns is recommended for the TRUPACT-II and HalfPACT, and a 45,000-lb capacity flatbed with suitable commercial side-mounted tiedowns is recommended for the RH-TRU 72-B. If recovering a 10-160B or TRUPACT-III, a mobile crane with a minimum capacity of 75 tons is recommended for lifting the cask and/or components, and a low-boy trailer of 72,000-lb capacity with suitable commercial side-mounted tiedowns is recommended for transport.

1.5.2. Recovery Equipment

Availability of recovery equipment will impact the method selected. The DOE has made it the contractual responsibility of the TRU waste carriers to secure the required equipment to recover TRU waste packages and to cleanup the incident site.

Recovery equipment recommendations are located in the appropriate section for each type of TRU waste package. Equipment and personnel (see the following lists) should be obtained from the nearest qualified commercial vendor. Mobile crane specifications are the minimum required. The Specialized Carrier and Rigging Association (SCRA) may be able to assist in locating a crane service if one cannot be found in the Yellow Pages for the area in which the incident occurred. The SCRA is located at 2750 Prosperity Avenue, Suite 620, Fairfax, VA 22031-4312; phone (703) 698-0291; fax (703) 698-0297; home page <http://www.scranet.org>. Should the carrier drivers be incapacitated, the IC, in coordination with the CMRO or the IART team leader, should contact the carrier's dispatcher or office to initiate procurement of the recovery equipment.

Each carrier tractor is equipped with a lift sling alignment strap for use in recovery of the TRUPACT-II or HalfPACT. In addition, some tractors carry optional lifting lugs for weld-on applications.

1.6. Package and Transporter Disposition

Transportation vehicles used to transport TRU packages must comply with all applicable DOT requirements, including placarding, and must pass a Commercial Vehicle Safety Alliance (CVSA) standard vehicle inspection.

A carrier with a current U.S. Environmental Protection Agency (EPA) identification number for the transport of hazardous materials should be used to transport a recovered package. Replacement carrier drivers should be from a firm with a valid EPA identification number and should be hazardous-materials qualified. Any replacement carrier should also have the minimum level of financial liability insurance (five million dollars) required for highway route-controlled quantities of radioactive material. If a highway route-controlled quantity of radioactive material is involved in the shipment, replacement drivers must be trained per 49 CFR Part 397, Subpart D.

If the IC determines that immediate removal of the waste package is necessary to protect human health or the environment, the IC may authorize the shipment of the waste by transporters who do not have EPA identification numbers, and by drivers who are not hazardous materials qualified or do not have radioactive route-controlled training, and without preparation of a manifest.

If the load is to be transported without qualified drivers, the DOT should be notified of the emergency. The DOT telephone number is **(202) 366-1863**. (During recovery operations of TRU waste packages, the CBFO Transportation Manager or IART team leader should communicate the status and strategy to the DOT, when appropriate, as conditions change.)

If lifting lugs are attached to the package(s), the lugs should be rendered inoperable prior to transport. This may be accomplished by tagging and taping in such a manner as to cover the lifting hole.

An inspection of the vehicle may be required by the state in which the incident occurred, prior to movement. This would normally be coordinated with the state police.

A commercial Class 8 wrecking service should accomplish recovery of the damaged transporter (trailer) and tractor. The carrier or its representative will arrange subsequent return of the trailer to DOE custody. The trailer will normally be returned to Carlsbad or a designated repair facility.

1.7. Restoration Activities

The goal of the DOE is to restore the environment affected by the incident to its previous condition. It is the carrier's responsibility to ensure that restoration activities are carried out in accordance with its contract with the CBFO. The IART team leader, or designee, will provide guidance for this activity. A carrier subcontractor under the direction of the carrier may perform any cleanup required. Cleanup activities will be

conducted in cooperation with the state or tribal authority to ensure proper cleanup levels.

2.0. TRUPACT-II OR HALFPACT RECOVERY

This section provides guidance regarding the equipment and steps necessary to recover a TRUPACT-II or a HalfPACT after an incident. The information is intended to apply to all recovery situations, but on-site modifications may be required due to actual conditions. If an incident occurs that brings into question the transportation system's roadworthiness or package integrity, the CMRO at the WIPP site should be contacted immediately so that the IART can be notified to respond to the event as appropriate, as specified in section 1.4, along with the carrier and other necessary personnel.

2.1. Method of Recovery

The recovered TRUPACT-II or HalfPACT will be sent to a location designated by the CBFO Manager or the IART team leader. In all cases, an evaluation will be made as to whether the package involved in the incident has been compromised, and no longer complies with the conditions of the NRC Certificate of Compliance.

If a package separated from its transporter is an obstacle to the orderly flow of traffic, and radiation levels do not exceed DOT limits, the package may be moved to the side of the road to allow traffic to pass. Movement of the package should be conducted in a manner that maintains control of the package and minimizes damage that may impact containment integrity.

2.2. Recommended Rigging and Recovery Equipment

Table 2.2-1 provides a listing of recovery equipment that may aid in the recovery of a TRUPACT-II or HalfPACT. Equipment should be obtained from the nearest qualified commercial vendor by the carrier responsible for the recovery. Should the carrier drivers be incapacitated, the IC, in coordination with the CMRO or the IART team leader, should contact the carrier's dispatcher or office to initiate procurement of the recovery equipment.

Since tiedown devices attached to the package must meet NRC stress requirements for the container, no attempt will be made to attach any device/lug to the container for use as a tiedown. If the estimated time required to get a replacement TRUPACT-II/HalfPACT trailer to the recovery scene is beyond a reasonable time, the horizontal transport method on a standard flatbed or a low-boy trailer may be used. The IART team leader and the IC will determine reasonable time limits.

Hoisting slings and lift components must have current load certification labels/tags attached or documented and must be checked prior to use in the recovery operation. Hooks should be equipped with safety clips to prevent the sling from slipping from the hook.

Table 2.2-1 – TRUPACT-II and HalfPACT Recovery Equipment List

Equipment available in each carrier tractor:	
Suggested Quantities	Description
1	Lift sling alignment strap (normally one each in tractor)
3	Weld-on lifting lugs (optional equipment)
Equipment to be procured, if required, for use at a recovery scene:	
1	Tractor
1	Portable welder, 225 amp, operator and 3/32-dia. 308L-16 AC/DC coating welding rods (optional equipment)
1	Oxy/acetylene torch with tanks, regulator, and operator (optional equipment)
1	Mobile crane, minimum 50-ton capacity, with two boom hooks and drag cable (minimum)
1	Forklift, rated at a minimum of 20,000 lb at 5 ft, with 7-ft lifting tines (optional equipment)
3	Flatbed trailer, 40,000-lb capacity with suitable commercial side-mounted tiedown structure (deck to have a significant wood area in which to fasten [nail] blocking and bracing) or WIPP CH replacement trailer. Normally 1 trailer per TRUPACT or HalfPACT
6	Nylon or cable slings, 5 ft, 2 eye loops, 10-ton safe working load (SWL)
6	Nylon or cable slings, 15 ft, 2 eye loops, 10-ton SWL
4	Nylon or cable slings, 30 ft, 2 eye loops, 10-ton SWL
2	Chain slings, three equal length legs with grab hooks, 10-ft leg length, large pear ring, 10-ton SWL
6	Steel coil chain, 1/2-inch, 25 ft long with a hook at each end
6	Chain binder, 1/2-inch coil chain capacity with a hook on each end
6	Nylon rigging strap, 25 ft, 7-1/2-ton SWL, eye loops on both ends
12	Nylon web tiedown straps, 25 ft long (2,500-lb minimum working load)
10	Shackles, 5-ton SWL
10	Shackles, 10-ton SWL
3	Snatch blocks, 10-ton SWL
3	Come-along hoists, 5-ton SWL
4	4 in x 4 in x 8 ft timbers
8	Wood blocks 6 in x 4 in x 4 in
1	Wrench/tools, to release tiedowns

Important:

Equipment used in the recovery operation must meet minimum Occupational Safety and Health Administration (OSHA) safety regulations (e.g., 29 CFR Part 1910, Chapters H, I, Appendix E, Subparts N, O, P, Q, and S, as well as applicable American National Standards Institute Management and Certification Standards).

Each carrier tractor is equipped with a lift sling alignment strap to ensure availability of some recovery equipment at the scene. The carrier will furnish any required lifting lugs. Hoisting slings and lift components must have current proof load certification labels/tags or documentation attached and should be checked prior to use.

Nighttime operation will require portable lighting. Additional equipment, such as shovels, picks, axes, sledgehammers, and so forth, may be required, and should be obtained from the nearest commercial vendor.

2.3. Transfer to Alternate Trailer

Any number of conditions may exist at the incident scene. For example,

The trailer may be damaged, resting in an upright position with TRUPACT-IIs or HalfPACTs attached;

The trailer may be overturned with TRUPACT-IIs or HalfPACTs attached; or

One or more of the TRUPACT-IIs or HalfPACTs may have become separated from the trailer.

The approach to be taken in the recovery effort will depend upon existing conditions. Transfer of the package to a replacement trailer may be required. To make the transfer, a proven lifting technique should be used (as defined in section 2.3.1), appropriate for the type of replacement trailer available.

2.3.1. Vertical Transfer in an Upright Position to a TRUPACT-II or HalfPACT Replacement Trailer

This section provides guidance to be used when the TRUPACT-IIs or HalfPACTs are in an upright position and are being transferred to a government-furnished replacement trailer.

Transfer by use of a forklift (rated at a minimum of 20,000 lb at 5 ft, with 7-ft lifting tines) is the preferred method for transferring the TRUPACT-II or HalfPACT from a defective trailer to the replacement trailer. If conditions at the incident scene do not allow use of a forklift, the special lift sling alignment strap found in the tractor can be used in conjunction with a mobile crane. Use of this sling precludes the requirement to weld lifting lugs on a TRUPACT-II or HalfPACT and is the desired method of lifting. When more than one TRUPACT-II or HalfPACT is loaded onto a trailer, the heaviest package should be placed in the front position, next heaviest in the middle position, and lightest in the rear position. The steps for vertical transfer are listed below.

2.3.1.1. CAM Handle Tiedown Release (Vertical Transfer)

Prior to TRUPACT-II or HalfPACT removal, all tiedowns must be disengaged.

2.3.1.1.1. Tiedown Release Mechanisms Accessible and Operable

Step 1: Release the tiedown tensioning mechanism by removing the security locking device (padlock, spring pin, or lockwire) and loosening the 3/4-inch tiedown nuts.

Step 2: Lift or pivot the release handle up toward the TRUPACT-II or HalfPACT base to release the tension.

Step 3: Pull the tiedown U-bolt out and off the tiedown lug on the TRUPACT-II or HalfPACT.

2.3.1.1.2. Tiedown Release Mechanisms Inaccessible or Inoperable

Step 1: Remove the U-bolt on each TRUPACT-II or HalfPACT tiedown mechanism by use of a 3/4-inch wrench or by cutting the tiedown U-bolt.

2.3.1.2. Screw Jack Tiedown Release from Packaging

Step 1: Pull the lock handle assembly and rotate it off the ACME bolt head.

Step 2: Loosen the ACME bolt enough for the top bracket to clear the TRUPACT-II or HalfPACT tiedown lug.

Step 3: Raise the top bracket and rotate it outward over the TRUPACT-II or HalfPACT tiedown lug.

Step 4: Set the top bracket onto the trailer bracket below the TRUPACT-II or HalfPACT tiedown lug.

Step 5: Locate the tiedown as far to the outer side of the trailer as possible to allow maximum access when placing TRUPACT-II or HalfPACT back on trailer.

2.3.1.3. Vertical Transfer

2.3.1.3.1. Forklift (rated at 20,000 lb at 5 ft, with 7-ft lifting tines)

Step 1: Verify tiedowns released, using the instructions provided in section 2.3.1.1.

Step 2: Rotate the four forklift pocket covers to the up position or remove the four covers and give them to the carrier driver.

Step 3: Position the forklift with the forks in the forklift pockets of the TRUPACT-II or HalfPACT.

Warning: To avoid injury, personnel must stand clear of, and to the side of, the package and forklift while the package is elevated and the forklift is in motion.

Step 4: Lift the TRUPACT-II or HalfPACT off the defective trailer and move it to the replacement trailer.

Step 5: Position the TRUPACT-II or HalfPACT directly above the tiedowns on the replacement trailer with the vent port positioned on the driver's side.

Step 6: Lower the TRUPACT-II or HalfPACT onto the replacement trailer.

Step 7: Verify that tiedown lugs are aligned with the four tiedown assemblies. It may be necessary to jockey the forklift to align the four tiedown assemblies.

Step 8: Remove the forklift from the TRUPACT-II or HalfPACT.

Step 9: Install tiedowns, using the instructions provided in section 2.3.1.4.

2.3.1.3.2. Mobile Crane – Using Lift Sling

The following steps should be used to handle the package if conditions at the incident scene do not allow a forklift to be used, or if the TRUPACT-IIs or HalfPACTs are damaged and separated from the trailer.

Step 1: Attach the lift sling alignment strap to the package by aligning the loops on the strap directly in line above the forklift lifting pockets, as shown in Figure 2.3-1.

Warning: To avoid injury, personnel must maintain a safe distance from the suspended package at all times.

Note: A tag line may be attached to the package prior to lifting.

- Step 2: Feed the lifting sling through the forklift pockets and up through the loops on the alignment strap, as shown in Figure 2.3-2. Pads may be required to protect the lifting sling at the forklift pockets. Attach the lifting sling eyes to the crane hook and apply tension to the sling. Lift the TRUPACT-II or HalfPACT clear to check that it is suspended correctly and securely.
- Step 3: Use the minimum lift height required to place the TRUPACT-II or HalfPACT on the replacement trailer.
- Step 4: Secure the vertical TRUPACT-II or HalfPACT to the replacement trailer with the standard tiedown assemblies using the instructions provided in section 2.3.1.4 or section 2.3.1.5, as required.

2.3.1.3.3. Mobile Crane – Using Lifting Lugs

The following steps should be used if it is necessary to use welded lifting lugs for vertical transfer of the TRUPACT-II or HalfPACT to a replacement trailer.

- Step 1: Retrieve three weld-on lifting lugs from the carrier tractor, if available. Lugs are shown in Figure 2.3-3. If lifting lugs are not available and this is the only method by which the TRUPACT-II or HalfPACT can be recovered, the carrier shall acquire the necessary equipment.

Warning: Personnel must take appropriate safety measures to prevent eye damage or burns to the welder or bystanders, and to prevent fire from sparks and hot welding materials.

Note: If the TRUPACT has been painted, grind the area to be welded to produce a good welding surface.

- Step 2: Attach the lugs to the TRUPACT-II or HalfPACT via the shielded metal arc welding process as shown in Figure 2.3-4, using standard American Welding Society (AWS) industry practices. While welding the lugs to the TRUPACT-II or HalfPACT, the welding operator should use best practices to minimize heat buildup in the heat-affected zone. Welding methods and materials should be approved by the CBFO through the IART.

Natural cooling of welded areas is required. Do not cool with liquids. Caution must be taken that adequate cooling has taken place before any attempt is made to lift the TRUPACT-II or HalfPACT using these lugs.

Step 3: Attach a three-legged, equal-length lifting sling from the lifting lugs to the mobile crane hook, as shown in Figure 2.3-4.

Warning: To avoid injury, personnel must maintain a safe distance from the suspended package at all times.

Note: A tag line may be attached to the package prior to lifting.

Step 4: Slowly increase tension on the lifting slings until the TRUPACT-II or HalfPACT is just clear of the trailer, and verify that the package is suspended correctly and securely.

Step 5: Using the minimum lift height required, place the TRUPACT-II or HalfPACT on the replacement trailer.

Step 6: Secure the vertically positioned TRUPACT-II or HalfPACT to the replacement trailer with the standard tiedowns using the instructions provided in section 2.3.1.4 or 2.3.1.5.

2.3.1.4. CAM Handle Tiedown Installation

Step 1: If the tiedown is unassembled, position the retainer block on a clean surface with the counter bore side up. Place six disk springs ("Belleville") on the retainer block arranged as shown in the arrangement in Figure 2.3-5. Place the compression plate spring guides through both stacks of the disk springs.

Step 2: Place the pivot shaft into the cam handle, as shown in Figure 2.3-6.

Step 3: On a tiedown bracket assembly on the trailer with a TRUPACT-II or HalfPACT positioned, slide the U-bolt through the two slots in the bracket. Place the retainer block assembly over the U-bolt ends and into position, as shown in Figure 2.3-7.

Step 4: Place the cam handle and pivot shaft assembly over the U-bolt ends with the pivot shaft flat surfaces facing down and the square protrusion of the cam handle facing the bracket, as shown in Figure 2.3-8. Slide a 1/2-inch-diameter stainless steel washer onto each U-bolt end.

Step 5: Secure the pivot shaft and cam handle assembly in place with two 1/2-inch 13 UNC-2B Nylock hex nuts. Install nuts finger tight.

- Step 6: With the cam handle in the down position, tighten the nuts evenly until the compression plate makes contact with the bracket slotted plate.
- Step 7: Adjust the tiedown assembly by verifying that the gap between the disk spring retainer block and the 5/16-inch-thick compression plate is between 0.070 inches and 0.100 inches with the Go/No-Go gauge (in tool box of the tractor).
- Step 8: If the gap is larger than 0.100 inches or less than 0.070 inches, tighten or loosen the 1/2-inch hex nuts equally. To increase the gap, loosen the hex nuts equally.
- Step 9: If the gap is within tolerance, attach the spring retained Klik-pin® or padlock locking device through the tiedown locking tab.

2.3.1.5. Screw Jack Tiedown Installation (see Figures 2.3-9 and 2.3-9a)

2.3.1.5.1. Screw Jack Tiedown Installation on Trailer

- Step 1: Loosen the ACME bolt to spread the front and back ACME bolt blocks apart.
- Step 2: Remove the two 1/2-inch locknuts from the tiedown hex bolts.
- Step 3: Place the tiedown upright on a flat surface.
- Step 4: Unscrew the tiedown hex bolts from the bottom block and remove the top bracket and the tiedown hex bolts, being careful not to lose the load washers.
- Step 5: Hold the tiedown assembly under the trailer tiedown plate with the lock handle assembly to the outside of the trailer, and slide the hex bolts through the tiedown plate, compression plate, load washers, and top block.
- Step 6: Thread the bolts into the bottom block.
- Step 7: Verify that both tiedown hex bolts have approximately the same amount of thread protruding through the bottom of the bottom block.
- Step 8: Install the Nylock nuts to lock the bolts in place.

2.3.1.5.2. Screw Jack Tiedown Installation on Packaging

- Step 1: Loosen the ACME bolt enough for the top bracket to clear the TRUPACT-II or HalfPACT tiedown lug.
- Step 2: Raise the top bracket and rotate it inward over the packaging tiedown lug. Be sure the curved part of the top bracket contact area is captured in the groove on top of the TRUPACT-II or HalfPACT tiedown lug.
- Step 3: Adjust the ACME bolt until the distance between the top block and the bottom block is at least 3 inches but not more than 3-1/4 inches. It may be necessary to adjust the hex bolts counter-clockwise to achieve this distance. This sets the tiedown at the low end of the operating range. The ACME bolt now has full travel to compress the load washers. A tape measure or other uncalibrated measuring device may be used for this measurement.
- Step 4: Adjust the two hex bolts evenly until the top side of the compression plate begins to contact the bottom side of the trailer tiedown plate. Do not use an ACME bolt to eliminate gap between compression plate and trailer tiedown plate, as this will eliminate the travel required to compress the load washers. Do not use hex bolts to achieve the Go/No-Go gap between compression plate and compression block.
- Step 5: Tighten the ACME bolt until space between top and bottom tiedown blocks is at least 3 inches BUT not greater than 3-1/4 inches, while the gap between the compression plate and the top block is between 0.070 inches and 0.100 inches.
- Step 6: Ensure the Nylock nuts are fully seated against the bottom block and that each hex bolt has approximately the same number of threads protruding through the locknut.
- Step 7: Ensure the bottom of the tiedown bolt is flush with the bottom of the locknut to prevent inadvertent loosening of the locknut.
- Step 8: Adjust the ACME bolt so the flat sides of the head are vertical.
- Step 9: Pull the lock handle assembly and rotate it over the ACME bolt head. This step also applies to trailer positions without TRUPACT-IIs or HalfPACTs.

2.3.2. Horizontal Transfer to Non-TRUPACT-II/HalfPACT Trailer

This section provides guidance to be used when the TRUPACT-II or HalfPACT to be transferred is not in an upright position or when the transfer will be made to a trailer not designed for the TRUPACT-II or the HalfPACT. The TRUPACT-II or HalfPACT will be placed horizontally on the trailer, attached by four tiedown straps per package. The horizontal lift may be made by use of the web sling or by welding lifting lugs to the side of the TRUPACT-II or HalfPACT. (Note: Lifting lugs, if available, may be used.)

2.3.2.1. Horizontal Lift Using the Web Sling

Step 1: Place the lifting straps under the TRUPACT-II or HalfPACT, as shown in Figure 2.3-10. Take note of the strap's approximate location in the sketch relative to the TRUPACT-II or HalfPACT center of gravity.

Warning: To avoid injury, personnel must maintain a safe distance from the suspended package at all times.

Note: A tag line may be attached to the package prior to lifting.

Step 2: Using the mobile crane, slowly apply tension to the lifting straps until taut and stabilized.

Step 3: Slowly increase lifting tension on the lifting straps until the TRUPACT-II or HalfPACT is just clear of the ground, and verify that the TRUPACT-II or HalfPACT is secure and horizontal.

Step 4: Continue lifting to the minimum height required and position the TRUPACT-II or HalfPACT on the recovery trailer, as shown in Figure 2.3-11. Ensure the bottom of the TRUPACT-II or HalfPACT is facing toward the tractor.

Step 5: Secure the TRUPACT-II or HalfPACT to the recovery trailer in the horizontal position using the instructions provided in section 2.3.2.3.

2.3.2.2. Horizontal Lifting Using Weld-On Lugs

Step 1: Retrieve three weld-on lifting lugs from the carrier tractor, if available. Lugs are illustrated in Figure 2.3-3. If lifting lugs are not available and this is the only method by which the TRUPACT-II or HalfPACT can be recovered, the carrier shall acquire the necessary equipment, including the lugs.

Warning: Personnel must take appropriate safety measures to prevent eye damage or burns to the welder or bystanders, and to prevent fire from sparks and hot welding materials.

Note: If the TRUPACT-II or HalfPACT has been painted, grind the area to be welded to produce a good welding surface.

- Step 2: Attach the lugs to the TRUPACT-II or HalfPACT via the shielded metal arc welding process as shown in Figure 2.3-4, using good industry practices. While welding the lugs to the TRUPACT-II or HalfPACT, the welding operator should use best practices to minimize heat buildup in the heat-affected zone. In an emergency situation, an AWS-qualified welder should be used. Prior to welding being done on a TRUPACT-II or HalfPACT, the CBFO should approve the methods and materials.

Natural cooling of welded areas is required. Do not cool with liquids. Caution must be taken that adequate cooling has taken place before any attempt is made to lift the TRUPACT-II or HalfPACT using these lugs.

- Step 3: Attach lifting slings to the lugs and to the crane hook.

Warning: To avoid injury, personnel must maintain a safe distance from the suspended package at all times.

Note: A tag line may be attached to the package prior to lifting.

- Step 4: Slowly increase lifting tension on the slings until the TRUPACT-II or HalfPACT is just clear of the ground, and verify that the TRUPACT-II or HalfPACT is suspended securely.
- Step 5: Continue lifting to the height required and position the TRUPACT-II or HalfPACT on the recovery trailer, as shown in Figure 2.3-12. Ensure that the bottom of the TRUPACT-II or HalfPACT is facing toward the tractor. A photograph of a TRUPACT-II being secured to a recovery trailer is shown in Figure 2.3-13.
- Step 6: Secure the TRUPACT-II or HalfPACT to the recovery trailer in the horizontal position using the instructions provided in section 2.3.2.3.

2.3.2.3. Securing a TRUPACT-II or HalfPACT to a Recovery Trailer (Horizontal Transport)

Step 1: Verify the TRUPACT-II or HalfPACT is properly positioned and in the horizontal transport position on the recovery trailer, as shown in Figure 2.3-11. Position the TRUPACT-II or HalfPACT on the trailer with wood blocks fastened to the trailer deck, as shown in Figure 2.3-11.

Note: Four web tiedown straps (minimum 2,500-lb working load each) will be required.

Step 2: Attach one end of a web strap to a trailer tie point along the side of the trailer at the midpoint of the TRUPACT-II or HalfPACT.

Step 3: Bring the strap over the top of the TRUPACT-II or HalfPACT and secure the loose end to the trailer strap tensioning device.

Step 4: Using the strap tensioner, take up the slack in the strap until the strap feels taut to the touch.

Step 5: Spacing the straps equidistantly along the package, repeat steps 2 through 4 for the second, third, and fourth straps.

Step 6: Any lifting lugs attached per this guide should be rendered inoperable prior to transport. This condition may be accomplished by tagging and taping in such a manner as to cover the lifting hole.

2.3.3. Recovery Lifting Techniques

Depending on the proposed transport method, the following steps may be used to change the orientation of the TRUPACT-II or HalfPACT:

Warning: Do not use lid lift points to lift the TRUPACT-II or HalfPACT.
--

2.3.3.1. Vertical Position to Horizontal Lifting Using Weld-On Lugs

Step 1: For TRUPACT-II or HalfPACT recovery, weld-on lifting lugs, if available, may be attached to the lid of the TRUPACT-II or HalfPACT, as shown in Figure 2.3-14. If lifting lugs are not available and this is the only method by which the TRUPACT-II or HalfPACT can be recovered, the carrier shall acquire the necessary equipment.

Warning: To avoid injury, personnel must maintain a safe distance from the suspended package at all times.

Note: A tag line may be attached to the package prior to lifting.

Step 2: Attach a one-leg lifting sling to the mobile crane hook and the upper lid-mounted lifting lug. Attach a second sling to the bottom lug on the same side and then to the mobile crane drag line. Lifting by the lug attached to the lid, use the drag line to control transfer to the horizontal position. Slowly increase tension on the lid sling to tip the TRUPACT-II or HalfPACT from vertical to horizontal position. TRUPACT-II package rotation is shown in Figure 2.3-15.

Step 3: Stop lifting when the TRUPACT-II or HalfPACT is balanced.

Step 4: Use the drag line to rotate the TRUPACT-II or HalfPACT to center over the trailer and lower the mobile crane hook to lay the package down in the horizontal position.

2.3.3.2. Transfer from Horizontal Position to Vertical Position

Step 1: For package recovery, weld-on lifting lugs, if available, may be attached to the lid of the TRUPACT-II or HalfPACT, as shown in Figure 2.3-14. If lifting lugs are not available and this is the only method by which the TRUPACT-II or HalfPACT can be recovered, the carrier shall acquire the necessary equipment.

Step 2: Attach a one-leg sling to the main lifting lug.

Warning: To avoid injury, personnel must maintain a safe distance from the suspended package at all times.

Step 3: Attach the drag line to the secondary lug. Slowly apply tension to the main lifting lug until the TRUPACT-II or HalfPACT is balanced. Rotate the TRUPACT-II or HalfPACT over the center of the trailer using the secondary lug.

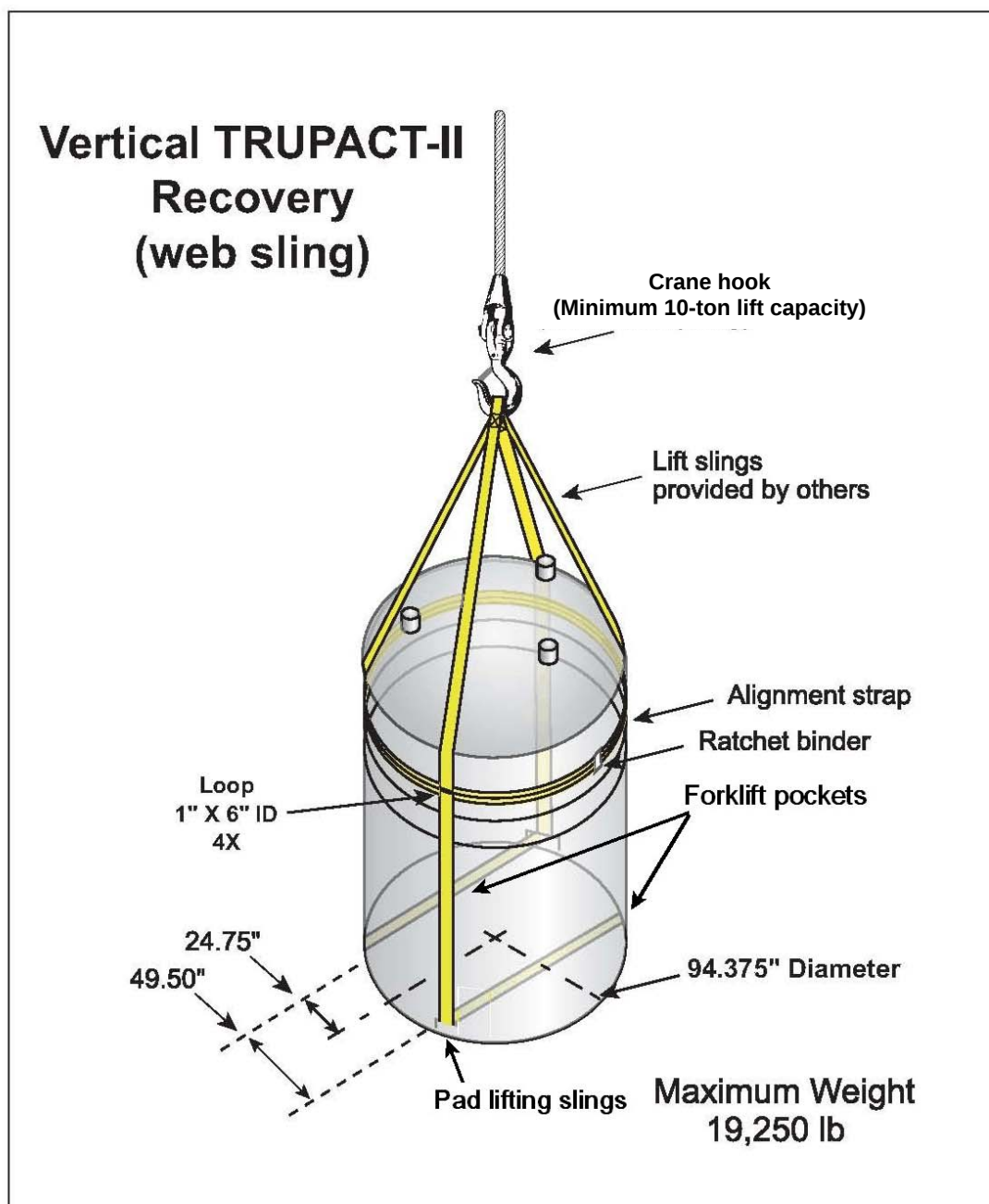
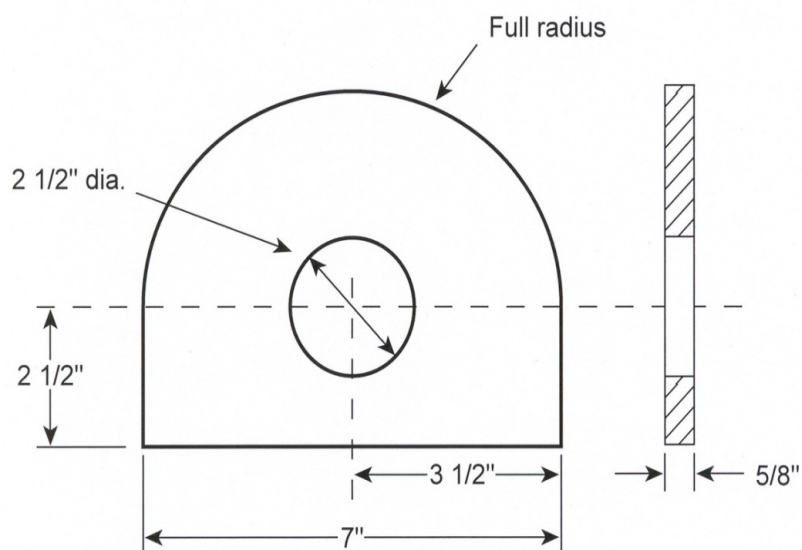


Figure 2.3-1 – Using Lift Sling Alignment Strap for TRUPACT-II or HalfPACT Recovery



Figure 2.3-2 – Vertical Lift of a TRUPACT-II Using a Lift Sling Alignment Strap
Sling is fed through the forklift pockets and up through the loops on the alignment strap.



Material - Type 304 Stainless Steel

Thickness - 5/8" (Use of Carbon Steel may be approved by CBFO)

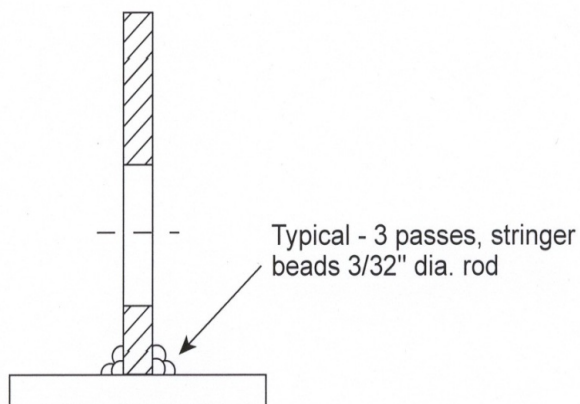


Figure 2.3-3 – Weld-On Lug Detail

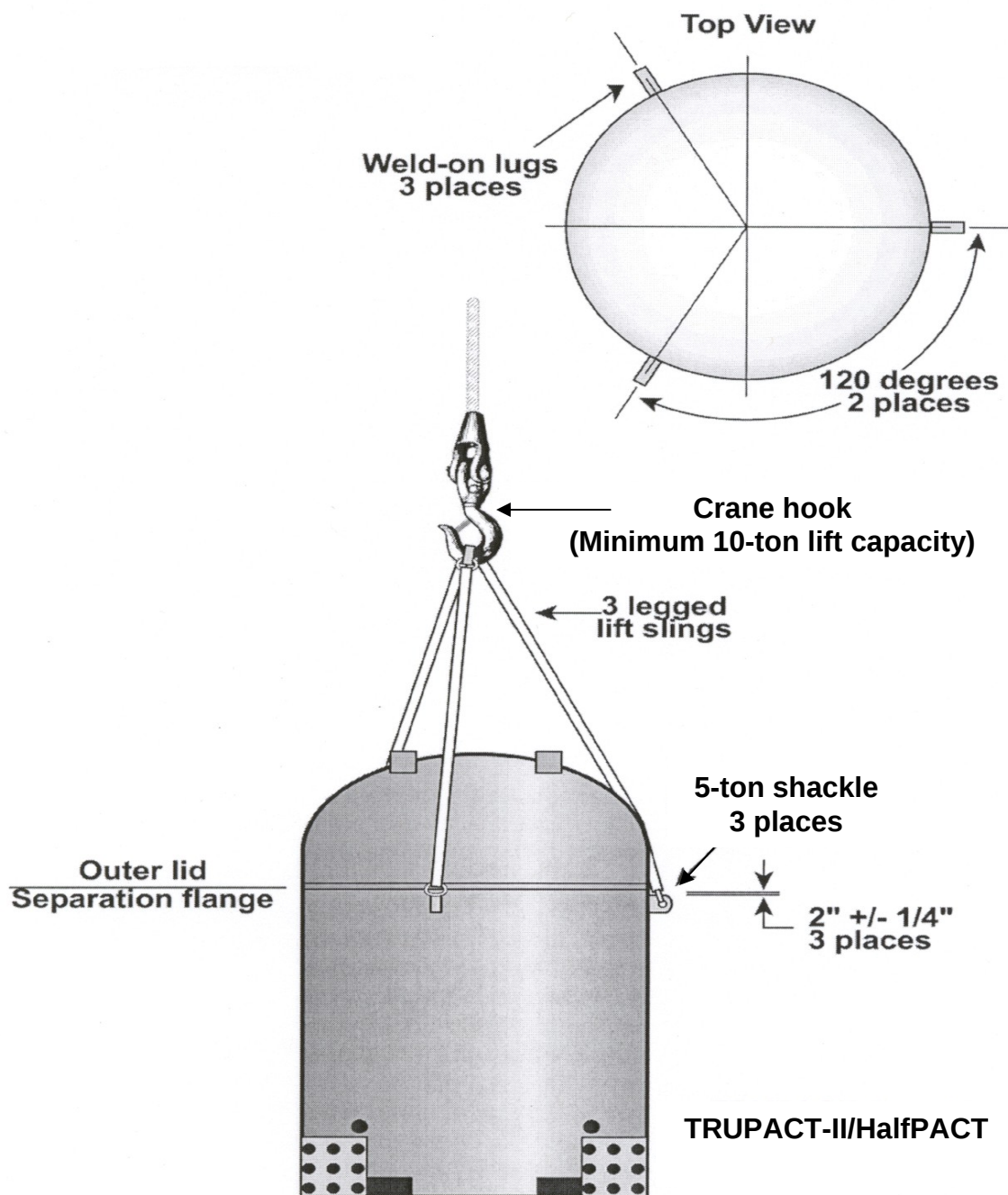


Figure 2.3-4 – Vertical Lift of a TRUPACT-II or HalfPACT using a Three-Legged Lifting Sling

Sling is attached from the lifting lugs to the hook on the mobile crane.

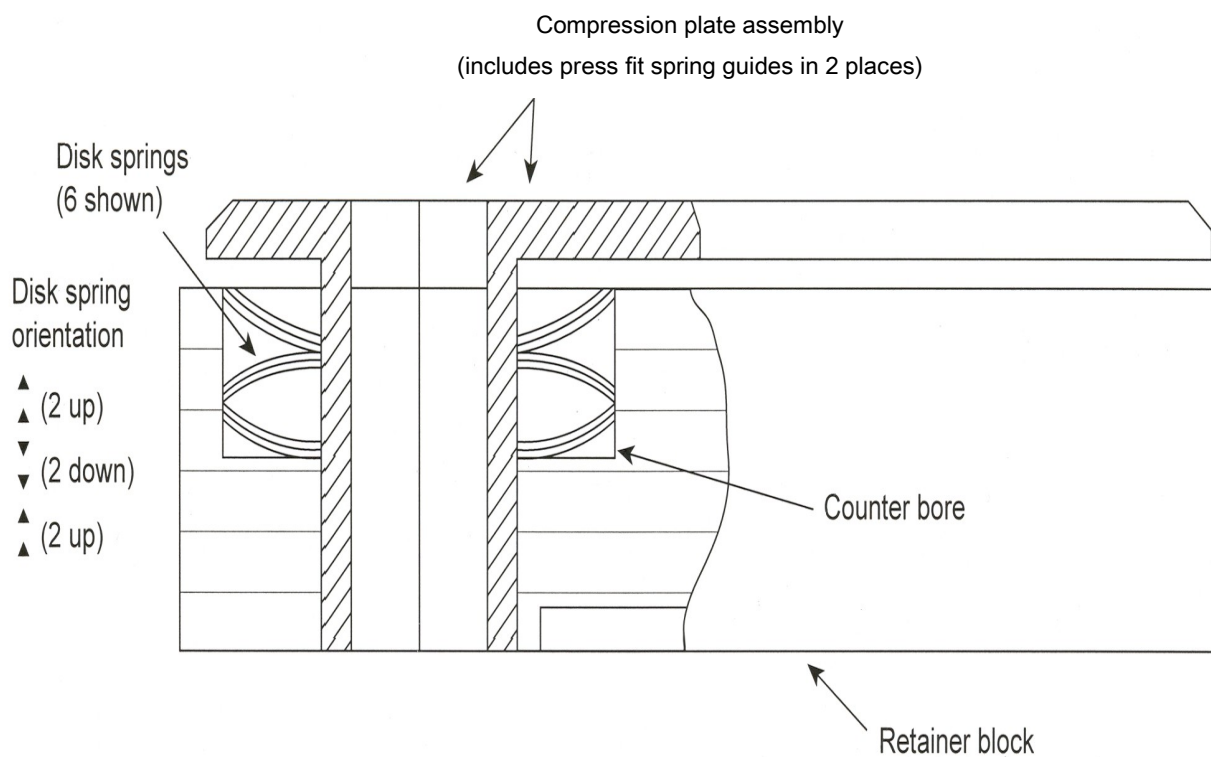


Figure 2.3-5 – Cam Handle Tiedown Assembly Disk Spring Arrangement

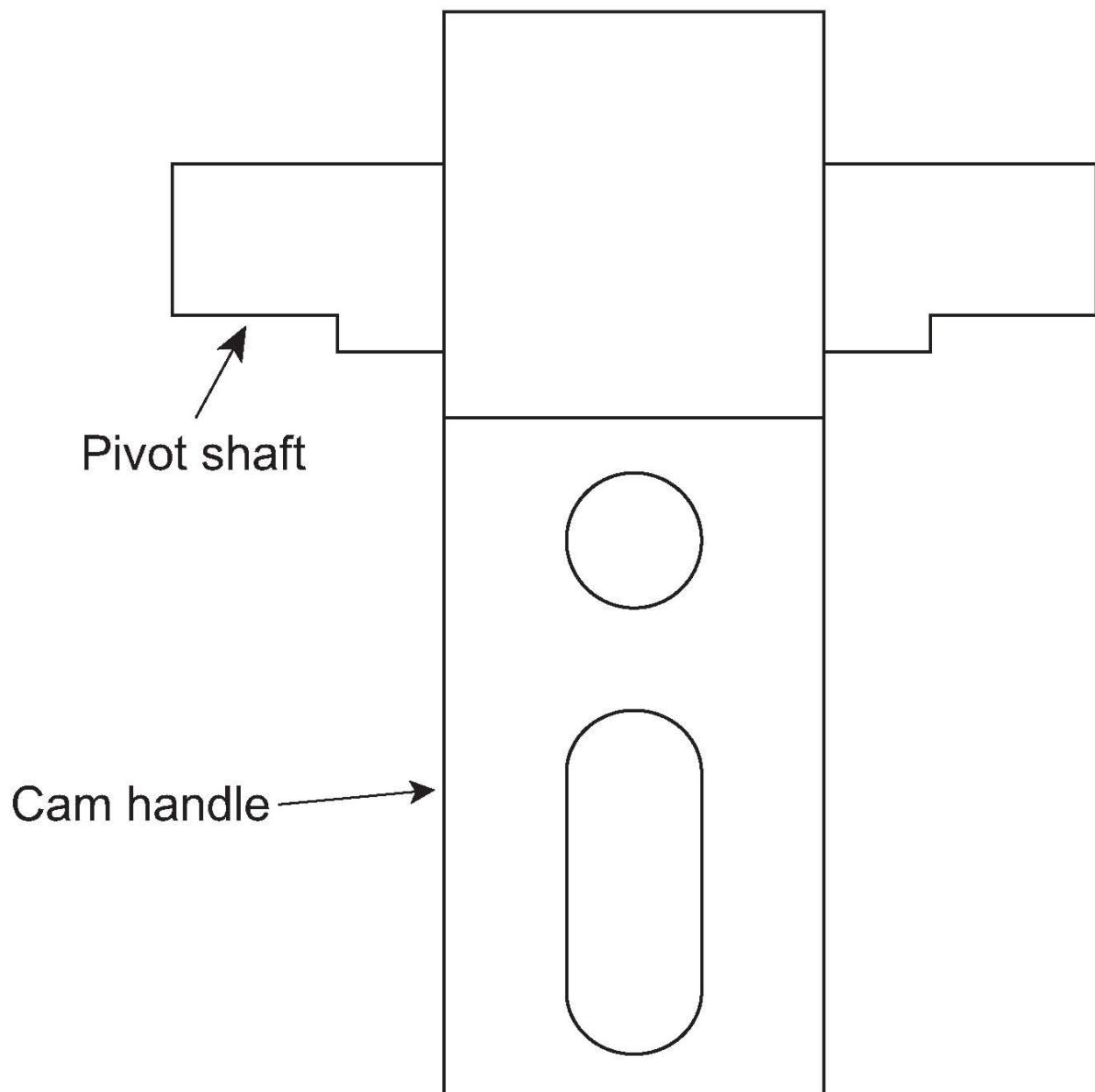


Figure 2.3-6 – Cam Handle Assembly

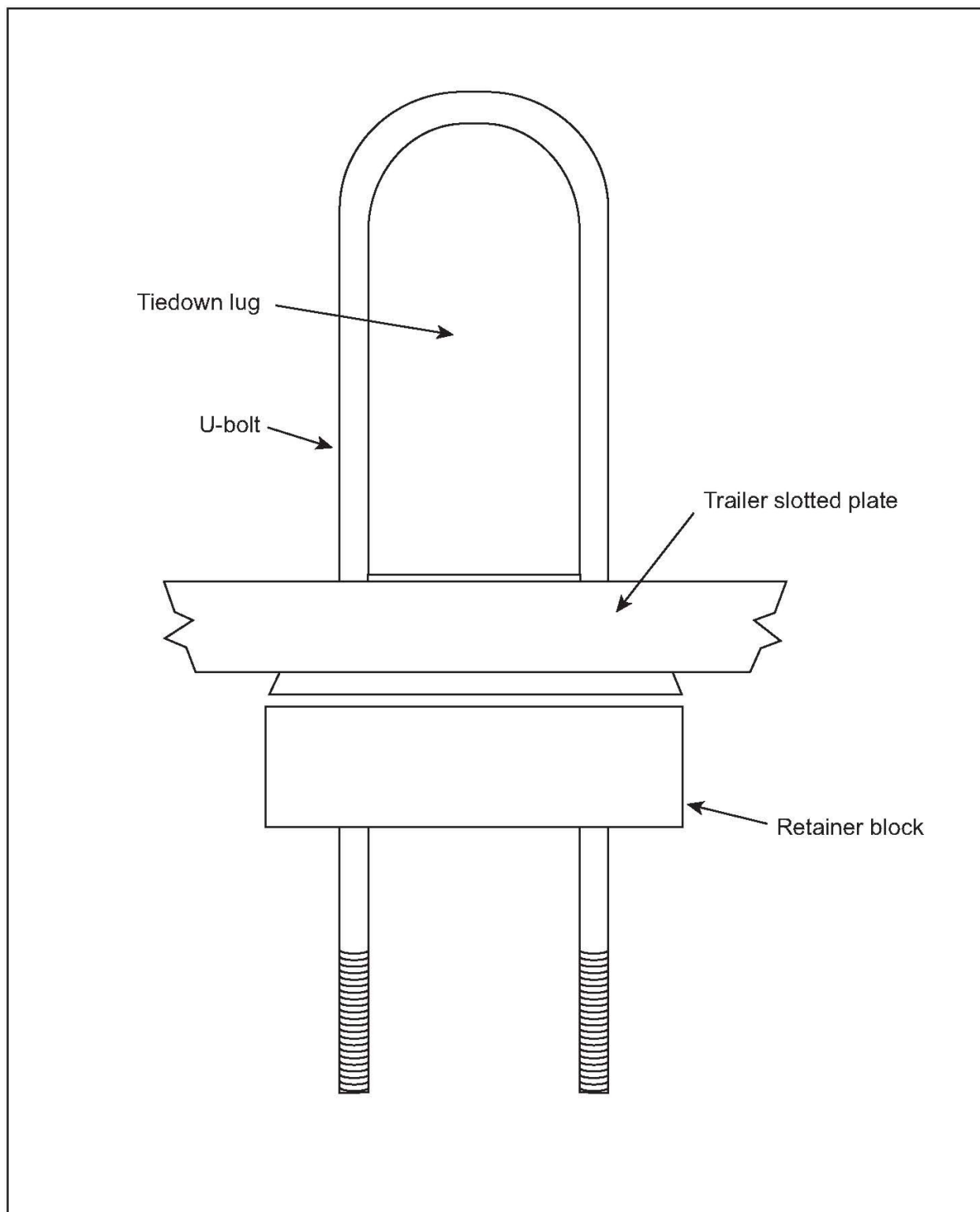


Figure 2.3-7 – Initial Cam Handle Assembly on Trailer

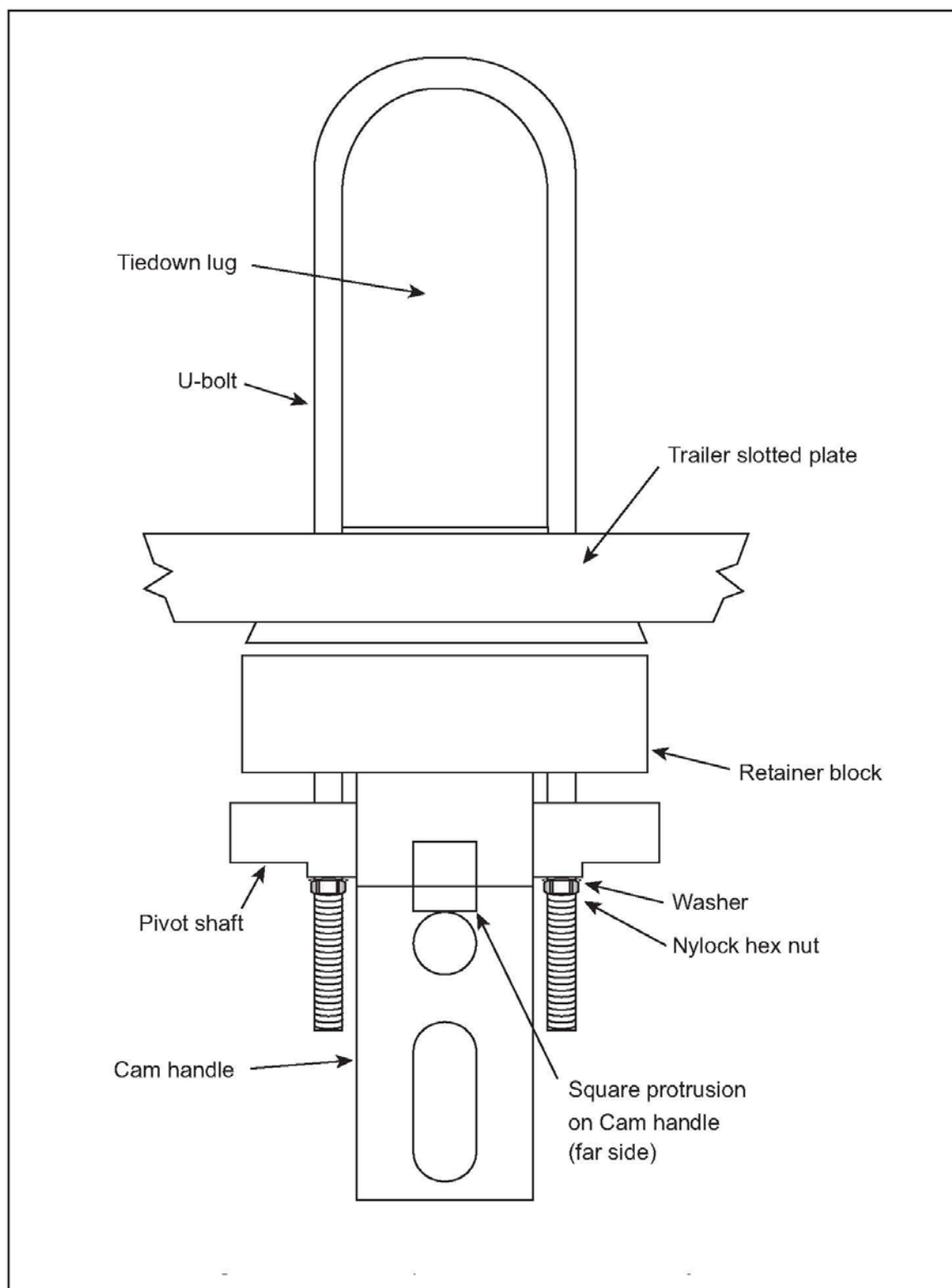


Figure 2.3-8 – Complete Cam Handle Tiedown Assembly

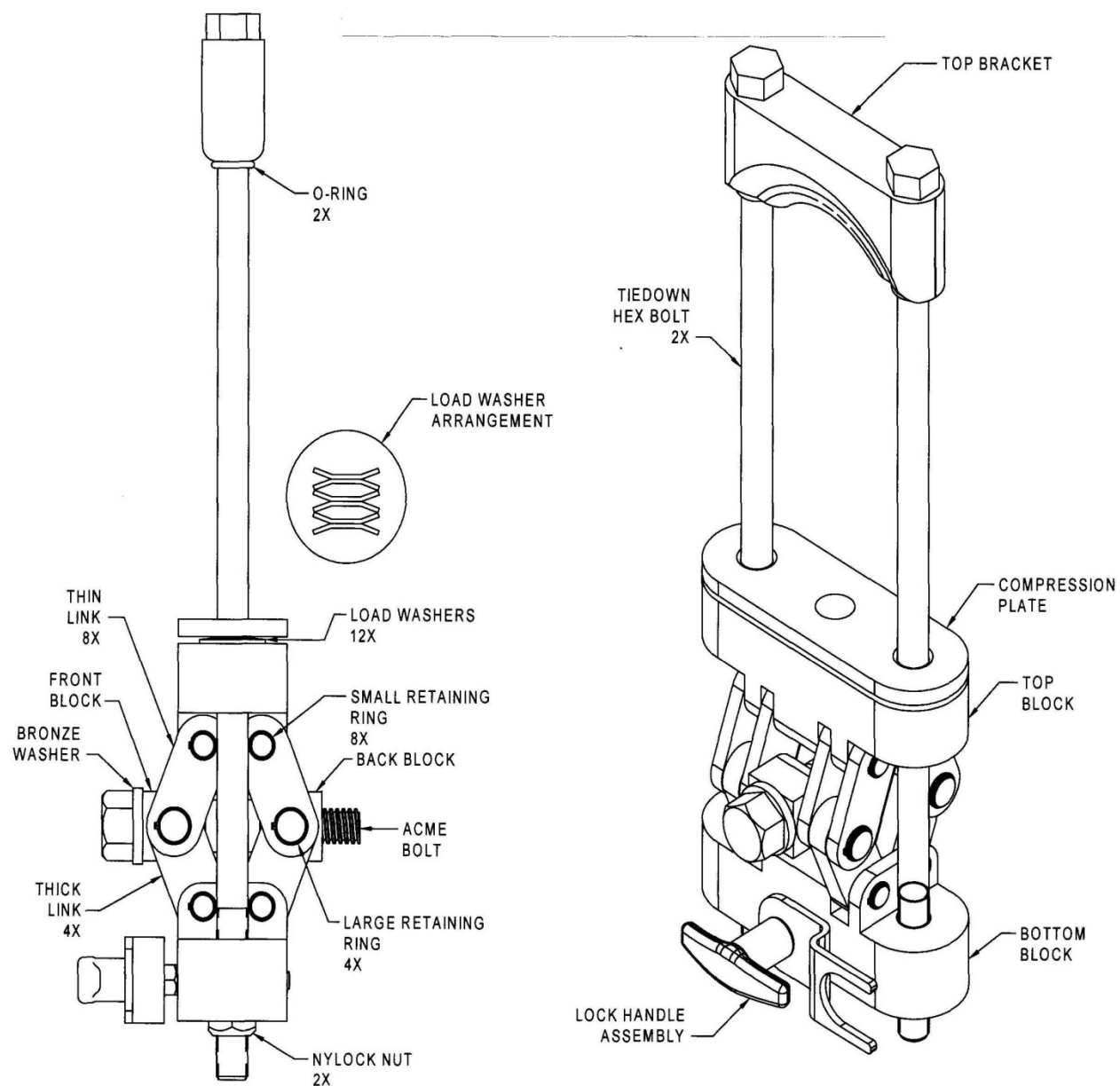


Figure 2.3-9 – Screw Jack Tiedown – Components

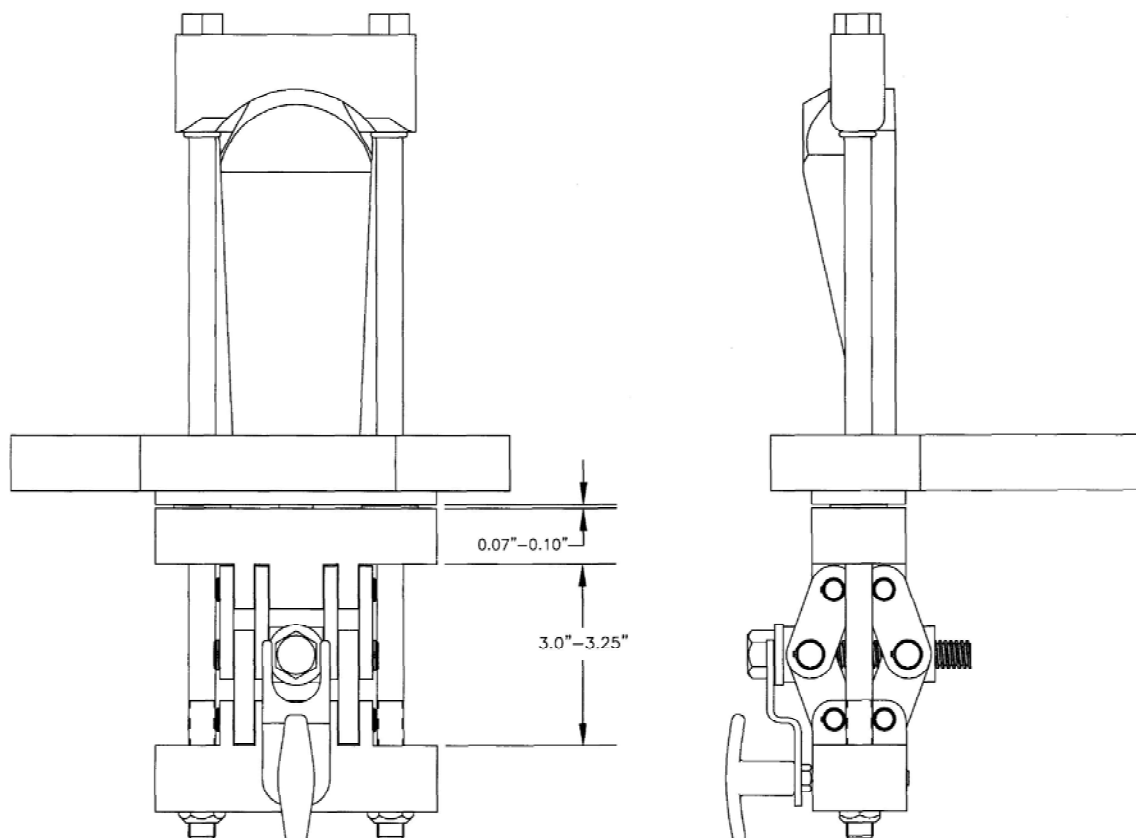


Figure 2.3-9a – Screw Jack Tiedown – Dimensions

Horizontal Package Transport Securing

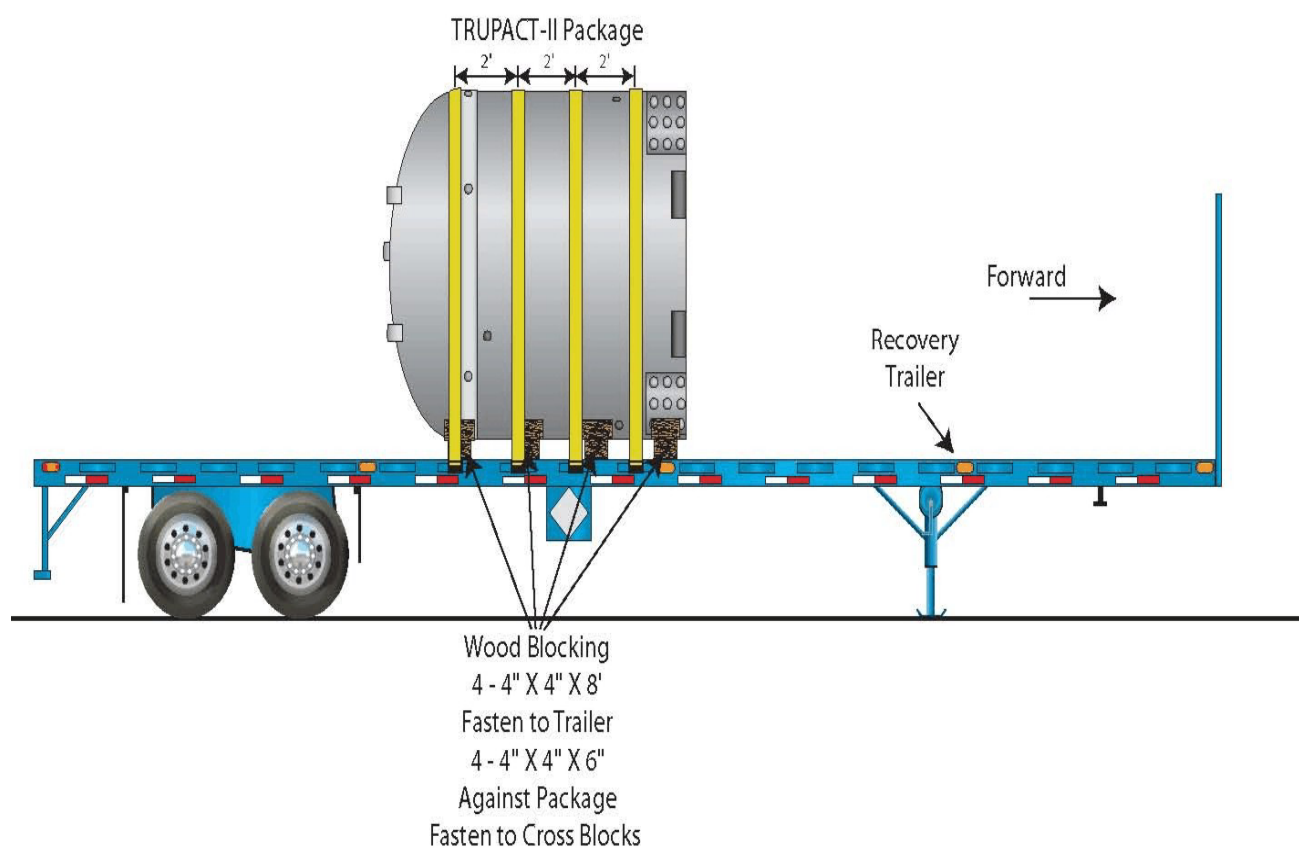


Figure 2.3-10 – Horizontal Package Transport Securement

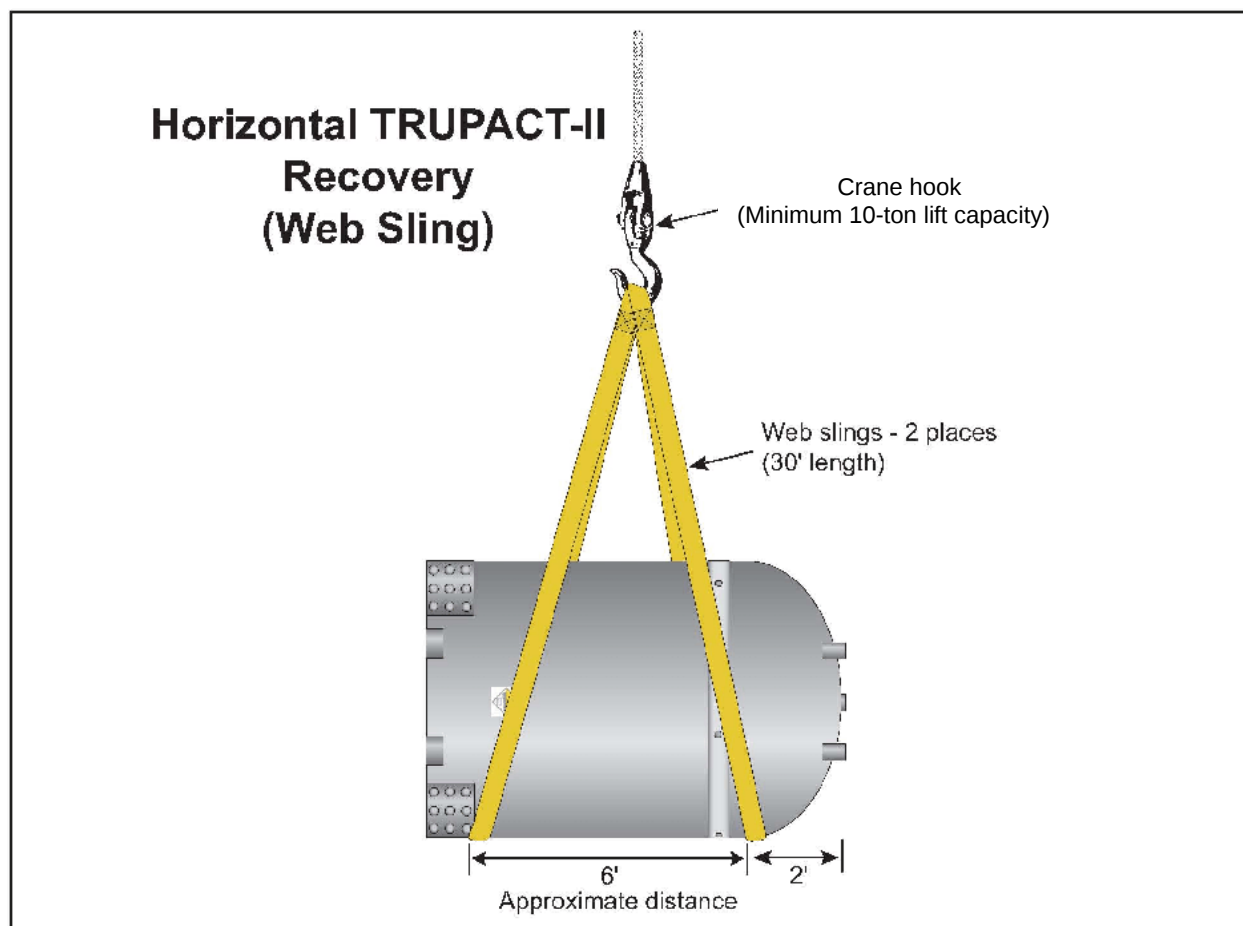


Figure 2.3-11 – Rigging for Horizontal Package Lifting (Web Sling)

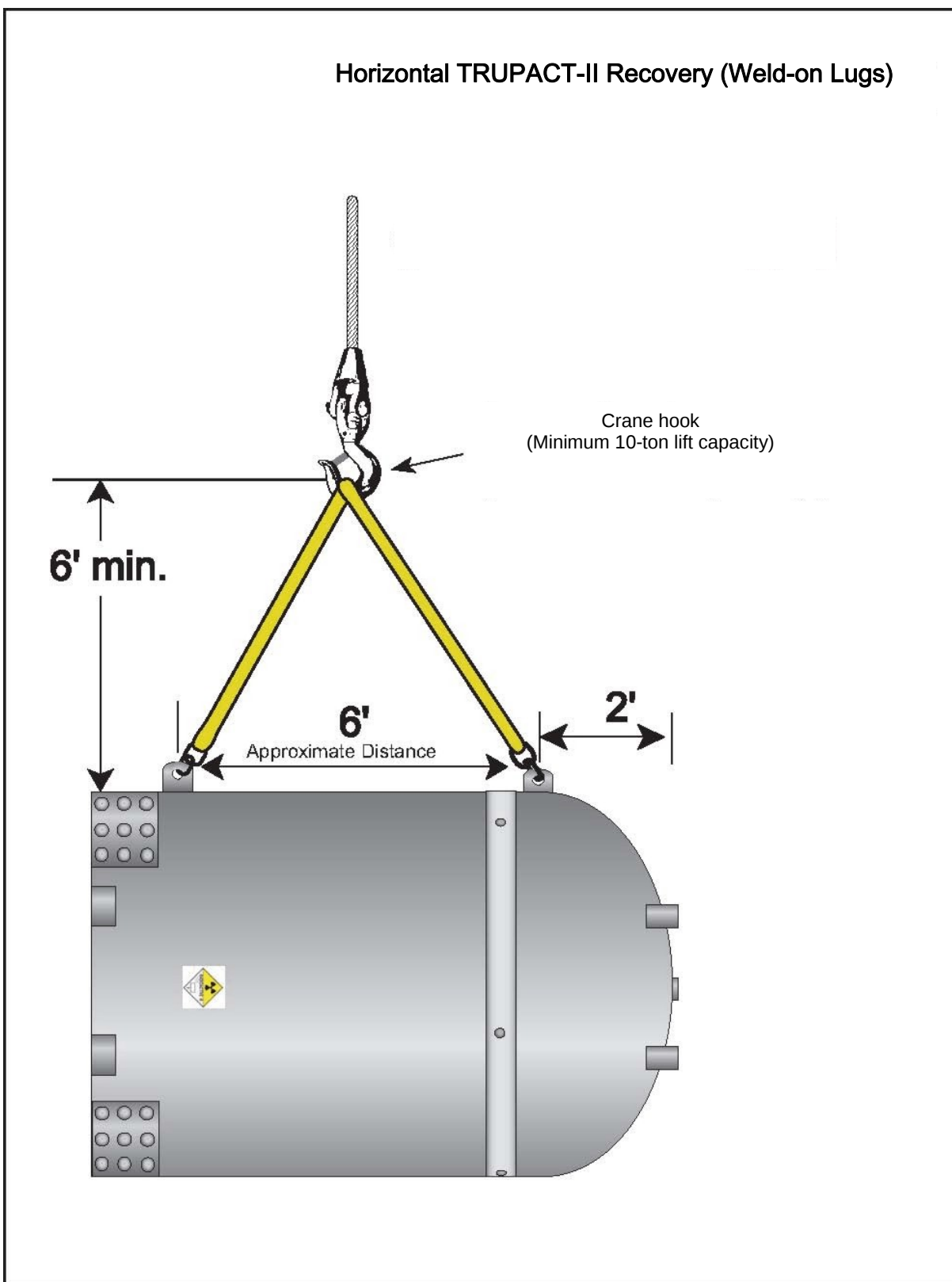


Figure 2.3-12 – Horizontal Package Lifting with Weld-On Lugs



Figure 2.3-13 – Horizontal Lift and Securement of a TRUPACT-II Using Weld-On Lugs

Lifting cables are attached to the lugs and to the crane hook.

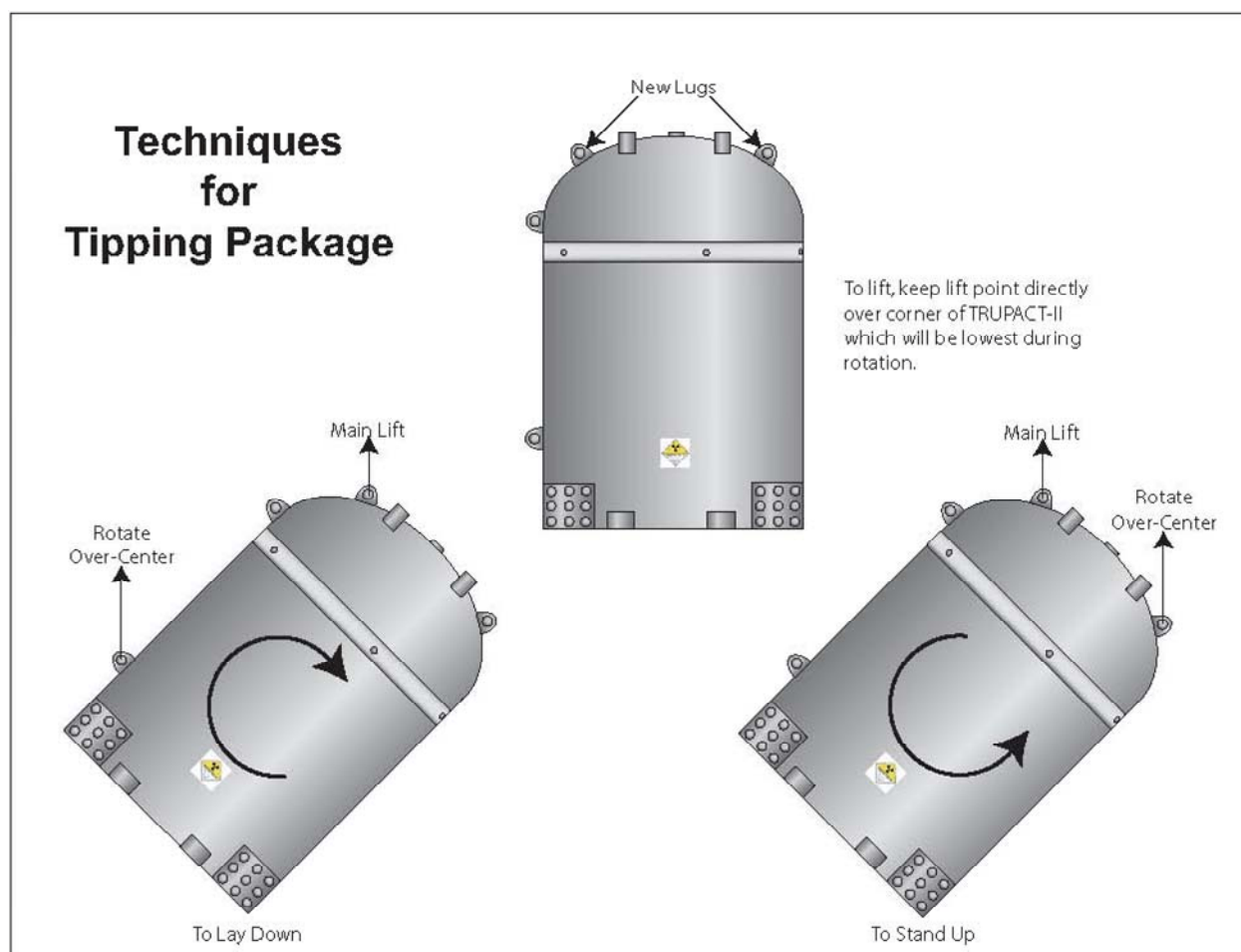


Figure 2.3-14 – Recovery Lifting Techniques for Tipping Package



Figure 2.3-15 – TRUPACT-II Package Rotation Using Weld-On Lugs

3.0. RH-TRU 72-B RECOVERY

This section provides guidance regarding the equipment and steps necessary to recover an RH-TRU 72-B after an incident. The information is intended to apply to all recovery situations, but on-site modifications may be required due to actual conditions. If an incident occurs that brings into question the transportation system's roadworthiness or package integrity, the CMRO at the WIPP site should be contacted immediately so that the IART can be notified to respond to the event as appropriate, as specified in section 1.4, item 3, along with the carrier and other necessary personnel. Each incident will be treated individually, and any recovery or movement of equipment should be under the guidance of the IART.

3.1. Method of Recovery

The recovered RH-TRU 72-B will be sent to a location designated by the CBFO Manager, or as directed by the IART team leader. In all cases, an evaluation will be made as to whether or not the package involved in the incident has been compromised and no longer complies with the conditions of the NRC Certificate of Compliance.

In the event the trailer is damaged beyond local repair, transfer of the RH-TRU 72-B will be accomplished by personnel using current trailer unloading and loading procedures.

If an RH-TRU 72-B is separated from its transporter and is an obstacle to the orderly flow of traffic, and if radiation levels do not exceed DOT limits, the package may be moved to the side of the road to allow traffic to pass. Movement of the RH-TRU 72-B will be conducted under the guidance of the IART team leader or a designee and/or this document. Short movements will probably be needed to maintain control of the RH-TRU 72-B. The IC should use extreme care during handling to prevent further damage that may endanger the integrity of the RH-TRU 72-B.

3.2. Recommended Equipment

The recovery equipment shown in Table 3.2-1 may aid in the recovery of an RH-TRU 72-B. Equipment required should be obtained from the nearest qualified commercial vendor. Should the carrier drivers be incapacitated, the IC, in coordination with the CMRO or the IART team leader, should contact the carrier's dispatcher or office to initiate procurement of the recovery equipment.

Since tiedown devices attached to the RH-TRU 72-B must meet NRC stress requirements for the container, no attempt will be made to attach any device/lug to the container for use as a tiedown. If the estimated time required to get a replacement RH-TRU 72-B trailer to the recovery scene is beyond what is deemed reasonable or if it is determined that the trunnions of the RH-TRU 72-B are not usable, the horizontal transport method on a standard flat bed or a low-boy trailer may be used (see Figure 3.2-1). The IART team leader and the IC will determine reasonable time limits.

Hoisting slings and lift components must have current proof load certification labels/tags attached or documented and must be checked prior to use in the recovery operation. Hooks should be equipped with safety clips to prevent the sling from slipping from the hook. In all cases, standard hoisting and rigging techniques shall be used (see Figures 3.3-1 and 3.5-1).

Table 3.2-1 – RH-TRU 72-B Recovery Equipment List

Quantity	Description
Equipment to be procured, if required, for use at a recovery scene:	
1	Mobile crane, minimum 50-ton capacity, with two boom hooks and drag cable (minimum)
1	Tractor
2	Flatbed trailer, 45,000-lb capacity with suitable commercial side-mounted tiedown structure. (Deck to have a significant wood area in which to fasten [nail] blocking and bracing.)
6	Nylon or cable slings, 5 ft, 2 eye loops, with safety clips, 25-ton SWL
6	Nylon or cable slings, 15 ft, 2 eye loops, with safety clips, 25-ton SWL
4	Nylon or cable slings, 30 ft, 2 eye loops, with safety clips, 25-ton SWL

Table 3.2-1 – RH-TRU 72-B Recovery Equipment List

Quantity	Description
6	Steel coil chain, 1/2-inch, 25 ft long with a hook at each end
6	Chain binder, 1/2-inch coil chain capacity with a hook on each end
6	Nylon rigging strap, 25 ft, eye loops on both ends, 7-1/2 ton SWL
4	Nylon web tiedown straps, 25 ft long (5,000-lb minimum working load)
10	Shackles, 5-ton SWL
10	Shackles, 10-ton SWL
3	Snatch blocks, 10-ton SWL
3	Come-along hoists, 5-ton SWL
4	4 in x 4 in x 8 ft timber
18	Wood blocks, 6 in x 8 in x 24 in, 1-1/2 inch bevel on one 6-inch side
1	Chainsaw, if required
1	Spreader bar and end attachments (optional – one is available from the WIPP, Carlsbad, NM)

Important:

All equipment used in the recovery operation must meet minimum OSHA safety requirements.

Hoisting slings and rigging components should be acquired by the carrier or the carrier's contractors. The hoisting slings and rigging components must have current proof load certification labels/tags attached and must be checked prior to use for lifting in the recovery operation.

Nighttime recovery operation will require portable lighting. Additional equipment, such as shovels, picks, axes, and sledgehammers, may be required and should be obtained from the nearest commercial vendor.

3.3. Transfer of RH-TRU 72-B to Alternate Trailer

Any number of circumstances may exist at the incident scene. For example,

The trailer may be damaged, resting in an upright position with the RH-TRU 72-B attached;

The trailer may be overturned with the RH-TRU 72-B attached; or

The RH-TRU 72-B may have become separated from the trailer.

The approach to be taken in the recovery effort depends upon existing conditions.

Transfer of the RH-TRU 72-B to a replacement trailer may be required. To make the transfer, a proven lifting technique, appropriate for the type of alternate trailer available, must be used (see Figure 3.3-1).

If the RH-TRU 72-B trailer has overturned and the cask has remained on the trailer, it may be advantageous and safer to upright the cask and trailer together. The removal of the load securement devices may present challenges if the trailer is not upright. If the equipment is available, it may be possible to transport the damaged trailer and RH-TRU 72-B together on a heavy-load trailer.

3.4. Horizontal Transfer to Non-RH-TRU 72-B Trailer

This section provides instructions to be used when the RH-TRU 72-B is to be transferred to a standard flatbed trailer. The RH-TRU 72-B will be placed horizontally on the trailer, attached by a minimum of four tiedown straps. The horizontal lift may be made using a web sling as described below.

Warning: Do not use impact limiter lifting lugs to lift cask.

3.4.1. Horizontal Lift Using the Web Sling

Note: If a spreader bar of appropriate length and load rating is available, it should be used. A spreader bar is available from WIPP.

- Step 1: Place the lifting slings under the RH-TRU 72-B, as shown in Figure 3.3-1. Take note of the sling's approximate location in the sketch relative to the RH-TRU 72-B trunnions.

Warning: To avoid injury, personnel must maintain a safe distance from the suspended package at all times.

Note: A tag line may be attached to the package prior to lifting.

- Step 2: Using the mobile crane, slowly apply tension until the lifting slings are taut and stabilized.
- Step 3: Slowly increase lifting tensions on the lifting slings until the RH-TRU 72-B is just clear of the ground, and verify that the RH-TRU 72-B is secure and horizontal.
- Step 4: Continue lifting to the minimum height required and position the RH-TRU 72-B package on the recovery trailer as shown in Figure 3.2-1.

- Step 5: Secure the RH-TRU 72-B package to the recovery trailer in the horizontal position in accordance with the following section.

3.4.2. Securing a RH-TRU 72-B Package to a Recovery Trailer

- Step 1: Verify that the RH-TRU 72-B is properly positioned on the recovery trailer, as shown in Figure 3.2-1. Secure the RH-TRU 72-B in position on the trailer with wood blocks fastened to the trailer deck, as shown in Figure 3.2-1.

Note: Four web tiedown straps (minimum 5,000 lb working load each) will be required.

- Step 2: Attach the web straps to a trailer tie point along the side of the trailer along the length of the RH-TRU 72-B as shown in the illustration.
- Step 3: Bring the straps over the top of the RH-TRU 72-B and secure the loose end of each strap to a trailer strap tensioning device.
- Step 4: Using the strap tensioning device, take up the slack in each strap until all straps are taut to the touch.

3.5. Recovery Lifting Techniques

3.5.1. Vertical Position to Horizontal Lifting Using Rigging and Slings

Warning: To avoid injury, personnel must maintain a safe distance from the suspended package at all times.
--

- Step 1: Using a long sling choke around the RH-TRU 72-B just below the highest trunnion, attach the sling to the mobile crane hook. A second sling should be attached to one of the bottom trunnions, then to the mobile crane drag line. Lifting by the sling choke around the body of the RH-TRU 72-B, use the drag line to control the transfer of the RH-TRU 72-B to the horizontal position. Slowly increase tension on the lift sling to tip the RH-TRU 72-B from vertical to horizontal position, as shown in Figure 3.5-1.
- Step 2: Stop lifting when the RH-TRU 72-B is balanced.
- Step 3: Use the drag line to rotate the RH-TRU 72-B center and lower the mobile crane hook to lay the RH-TRU 72-B down in the horizontal position.

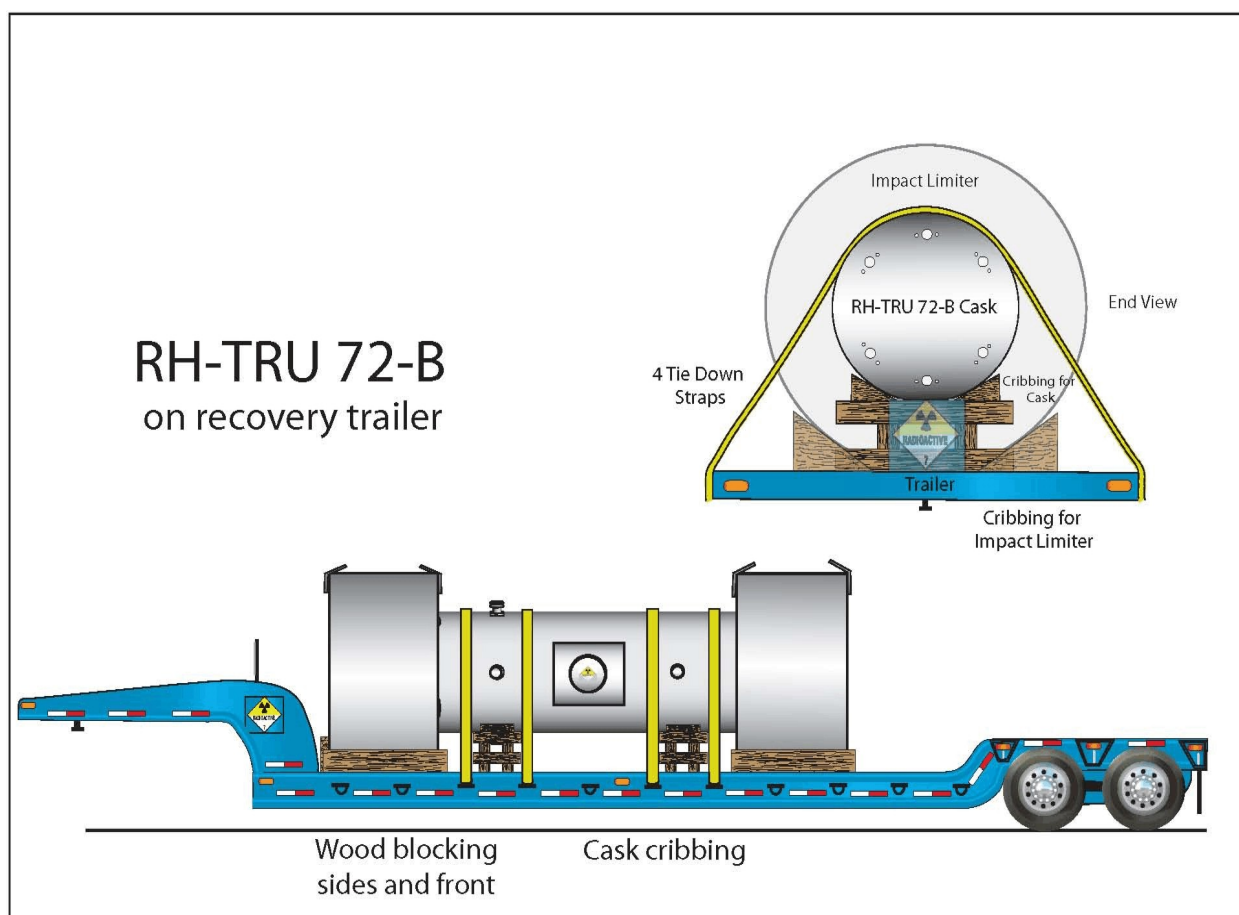


Figure 3.2-1 – RH-TRU 72-B Secured on Recovery Trailer

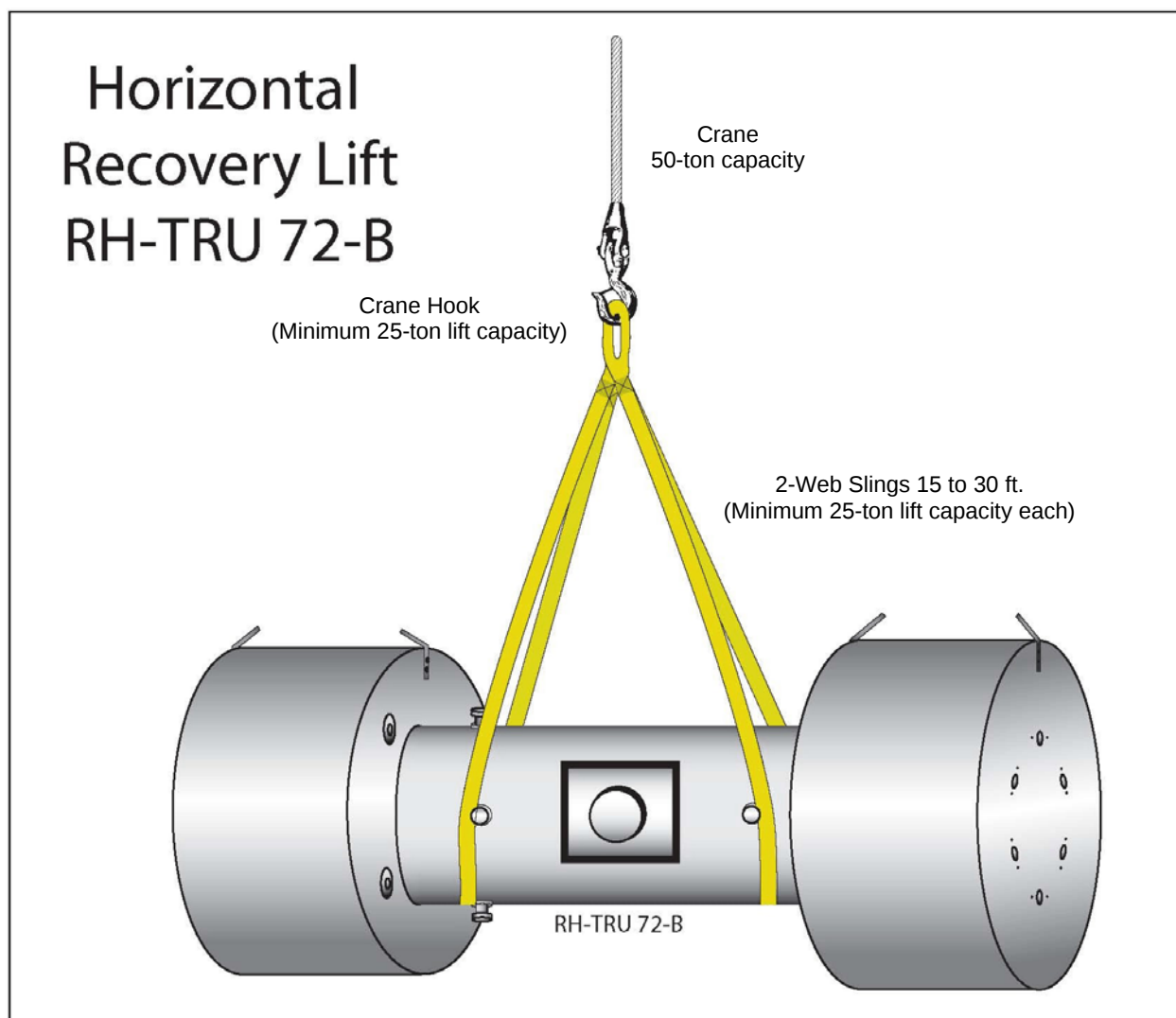


Figure 3.3-1 – Horizontal Recovery Lift RH-TRU 72-B

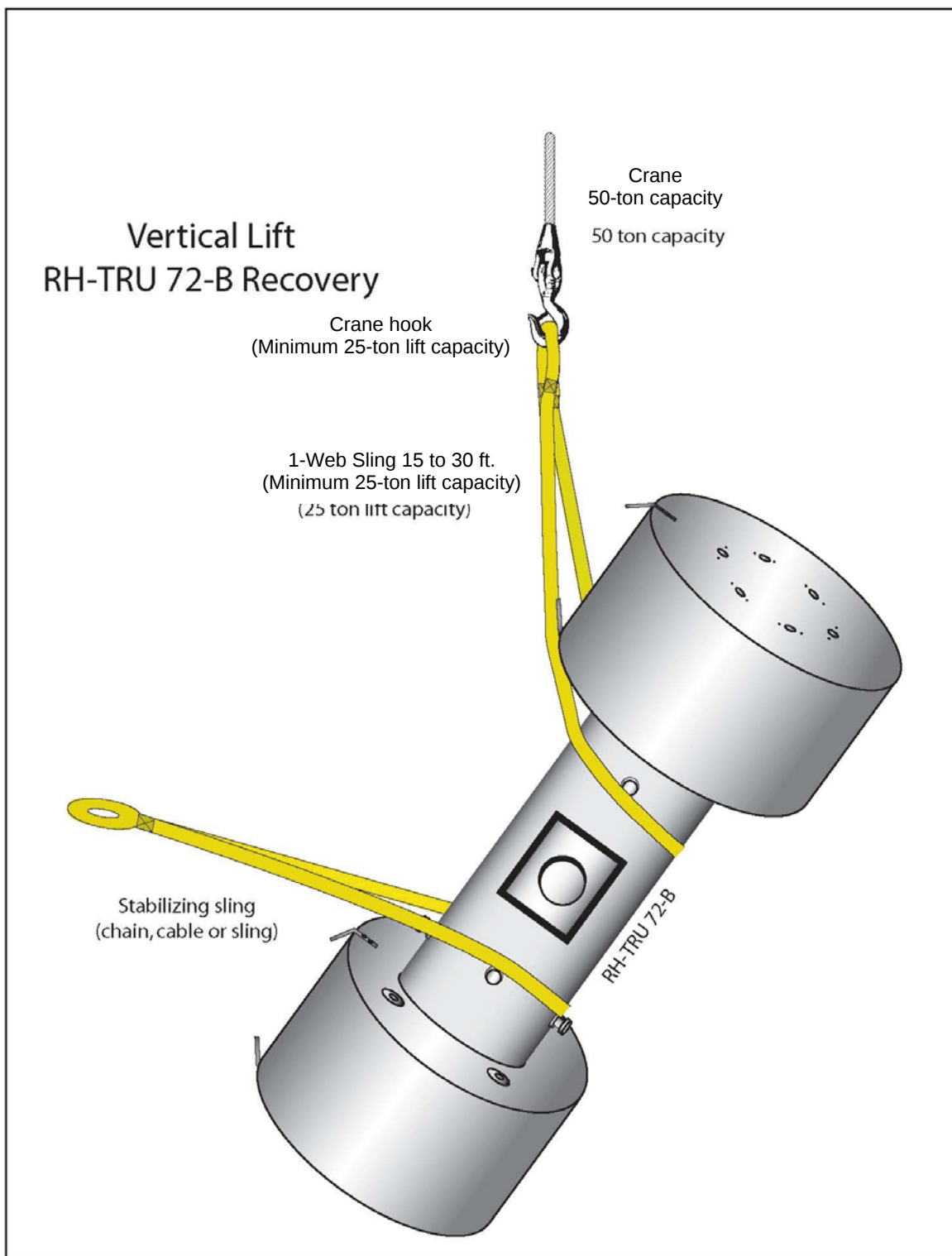


Figure 3.5-1 – Vertical Lift RH-TRU 72-B Recovery

4.0. 10-160B RECOVERY

This section provides guidance regarding the equipment and steps necessary to recover a 10-160B as a result of an incident. The information is intended to apply to all recovery situations, but on-site modifications may be required due to actual conditions. If an incident occurs that brings into question the roadworthiness of the transportation system or package integrity (see Figures 4-1 and 4-2), the CMRO at the WIPP site should be contacted immediately. This contact should be made so that the IART can be notified to respond to the event as appropriate, as specified in section 1.4, item 3, along with the carrier and other necessary personnel. The IART should be consulted for technical guidance for the recovery or movement of radiological packages.

4.1. Method of Recovery

The recovered 10-160B will be sent to a location designated by the CBFO Manager, or as directed by the IART team leader. In all cases, an evaluation will be made as to whether the 10-160B involved in the incident has been compromised and no longer complies with the conditions of the NRC Certificate of Compliance.

In the event the trailer is damaged beyond local repair, transfer of the 10-160B will be accomplished by personnel using current cask trailer unloading and loading procedures.

If a 10-160B separated from its transporter is an obstacle to the orderly flow of traffic, and if radiation levels do not exceed DOT limits, the 10-160B may be moved to the side of the road to allow traffic to pass. Movement of the 10-160B will be conducted under the guidance of the IART team leader or a designee, or this document. Short movements will probably be needed to maintain control of the 10-160B. The IC should use extreme care during handling to prevent further damage that may endanger the integrity of the 10-160B.

4.2. Recommended Equipment

Note: If removal of a 10-160B from a trailer is necessary, the IART may coordinate with Energy Solutions, the NRC certificate holder.

The recovery equipment shown in Table 4.2-1 may aid in the recovery of a 10-160B. Equipment required should be obtained from the nearest qualified vendor. Should the carrier drivers be incapacitated, the IC, in coordination with the CMRO or the IART team leader, should contact the carrier's dispatcher or office to initiate procurement of the recovery equipment.

Since tiedown devices attached to the 10-160B must meet NRC stress requirements for the cask, no attempt shall be made to attach any unapproved device/lug to the container for use as a tiedown.

Hoisting slings and lift components must have current proof load certification labels/tags attached or documented and must be checked prior to use in the recovery operation. Hooks should be equipped with safety clips to prevent the sling from slipping from the hook. In all cases, standard hoisting and rigging techniques shall be used.

Table 4.2-1 – 10-160B Recovery Equipment List

Quantity	Description
As Required	Cranes capable of lifting cask and/or components with a minimum capacity of 75 tons
As Required	Lifting and loading hardware
As Required	Calibrated torque wrenches ranging from 12 ft-lb to 400 ft-lb
	Socket wrenches with a 1-7/8 inch socket for lift lug bolts
1	Tractor
1	Lowboy trailer, 72,000-lb capacity with suitable commercial side-mounted tiedown structure (deck to have a significant wood area in which to fasten [nail] blocking and bracing)
As Required	Lifting sling(s) compatible with cask impact limiter
4	Nylon or cable slings, two eye loops, with safety clips, 25-ton SWL, and rigging as required to connect the cables to cask lifting lugs and/or impact limiter lifting lugs. Note: Cables must have a true angle, with respect to the horizontal, of not less than 60 degrees.

Important:

All equipment used in the recovery operation must meet minimum OSHA safety requirements.

Hoisting slings and rigging components must be acquired by the carrier or his contractor. The hoisting slings and rigging components must have current proof load certification labels/tags attached and be checked prior to use in the recovery operation.

Nighttime recovery operations will require portable lighting. Additional equipment, such as shovels, picks, axes, and sledgehammers, may be required and should be obtained from the nearest commercial vendor.

4.3. Transfer of 10-160B to Alternate Trailer

Any number of circumstances may exist at the incident scene. For example,

The trailer may be damaged, resting in an upright position with the package attached;

The trailer may not be in an upright position with the package attached; or

The package may have become separated from the trailer.

The approach to be taken in the recovery effort depends upon existing conditions. Transfer of the package to a replacement trailer may be required. To make the transfer, a proven lifting technique, appropriate for the type of alternate trailer available, must be used.

4.4. Recovery Lifting Techniques

Note: If removal of the 10-160B from the trailer is necessary, authorization must be obtained from the CBFO. Instructions contained here are taken from Energy Solutions Procedure TR-OP-046, Handling Procedure for Transport Cask 10-160B, Certificate of Compliance Number 9204.

4.4.1. Removing a Cask from a Trailer and Transferring to Secondary Trailer

- Step 1: Position the trailer and 10-160B within reach and safe load limit of the crane.
- Step 2: Be sure the trailer is level (visual determination).
- Step 3: Prepare the 10-160B for removal from the trailer by loosening and removing the tiedowns.
- Step 4: Note the alignment mark on the bottom impact limiter and 10-160B side. This mark is necessary to ensure proper placement when 10-160B is returned to the bottom impact limiter.
- Step 5: Remove the impact limiter using Steps 5.1.2.1 through 5.1.2.1.7 in **(Energy Solutions)** Procedure TR-OP-046.
- Step 6: If the cask is loaded, check the torque on the primary and secondary lid bolts and ensure that all bolts are torqued to 300 +1-30 ft-lb. DO NOT break anti-tamper seals to check torque.
- Step 7: Remove cask lifting lugs from the trailer's storage rack.
- Step 8: Install lifting lugs on the cask and torque bolts to 200 +1-20 ft-lb. Normally, two lift lugs will be used for lifting the 10-160B, but if redundant lift capability is required, install four lift lugs.

Warning: To avoid injury, personnel must maintain a safe distance from the suspended package at all times.
--

Note: A tag line may be attached to the package prior to lifting.

Caution: To avoid damage, a cask must not be lifted by the lifting lugs on the secondary lid.

Note: Slings or cables used for lifting the 10-160B must have a true angle, with respect to the horizontal, of not less than 60°.

- Step 9: Lift the 10-160B from the bottom impact limiter.
- Step 10: Position the 10-160B on a firm, level, supported area.
- Step 11: Detach the crane hook.
- Step 12: Inspect the bottom impact limiter for damage and, as appropriate, place the impact limiter on the replacement trailer.
- Step 13: Prepare mounting surfaces on the bottom impact limiter and 10-160B.
- Step 14: Lift the 10-160B and place it in the bottom impact limiter, using the alignment mark made when the 10-160B was removed from the impact limiter.
- Step 15: Detach the crane hook, rigging, and lifting lugs from the 10-160B and store properly.
- Step 16: Replace the 10-160B tiedown ratchet binders and tighten.
- Step 17: Replace the upper impact limiter following steps 5.1.2.6 through 5.1.2.6.6 in Energy Solutions Procedure TR-OP-O46.

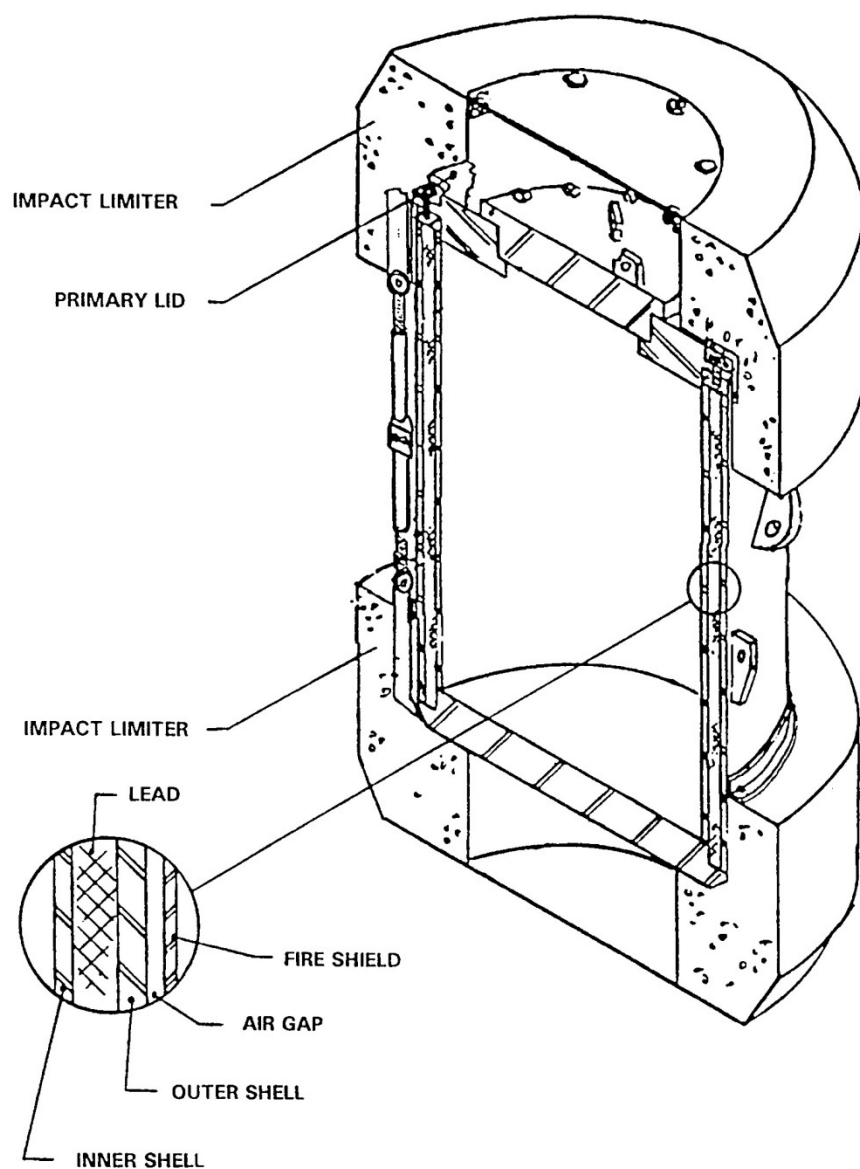


Figure 4-1 – 10-160B Cask



Figure 4-2 – 10-160B Transporter

5.0. TRUPACT-III RECOVERY

This section provides guidance regarding the equipment and steps necessary to recover a TRUPACT-III as a result of an incident. The information is intended to apply to all recovery situations, but on-site modifications may be required due to actual conditions. If an incident occurs that brings into question the roadworthiness of the transportation system or package integrity (see Figure 5-2), the CMRO at the WIPP site should be contacted immediately. This contact should be made so that the IART can be notified to respond to the event as appropriate, as specified in section 1.4, item 3, along with the carrier and other necessary personnel. The IART should be consulted for technical guidance for the recovery or movement of radiological packages.

5.1. Method of Recovery

The recovered TRUPACT-III will be sent to a location designated by the CBFO Manager, or as directed by the IART team leader. In all cases, an evaluation will be

made as to whether or not the package involved in the incident has been compromised and no longer complies with the conditions of the NRC Certificate of Compliance.

In the event the trailer is damaged beyond local repair, transfer of the TRUPACT-III will be accomplished by personnel using current trailer unloading and loading procedures.

If a TRUPACT-III is separated from its transporter and is an obstacle to the orderly flow of traffic, and if radiation levels do not exceed DOT limits, the package may be moved to the side of the road to allow traffic to pass. Movement of the TRUPACT-III will be conducted under the guidance of the IART team leader or a designee and/or this document. Short movements will probably be needed to maintain control of the TRUPACT-III. The IC should use extreme care during handling to prevent further damage that may endanger the integrity of the TRUPACT-III.

5.2. Recommended Equipment

The recovery equipment shown in Table 5.2-1 may aid in the recovery of a TRUPACT-III. Equipment required should be obtained from the nearest qualified commercial vendor. Should the carrier drivers be incapacitated, the IC, in coordination with the CMRO or the IART team leader, should contact the carrier's dispatcher or office to initiate procurement of the recovery equipment.

Since tiedown devices attached to the TRUPACT-III must meet NRC stress requirements for the container, no attempt will be made to attach any device/lug to the container for use as a tiedown. If the estimated time required to get a replacement TRUPACT-III trailer to the recovery scene is beyond what is deemed reasonable, the horizontal transport method on a standard flat bed or a low-boy trailer may be used (see Figure 5.2-1). The IART team leader and the IC will determine reasonable time limits.

Hoisting slings and lift components must have current proof load certification labels/tags attached or documented and must be checked prior to use in the recovery operation. Hooks should be equipped with safety clips to prevent the sling from slipping from the hook. In all cases, standard hoisting and rigging techniques shall be used.

Table 5.2-1 – TRUPACT-III Recovery Equipment List

Quantity	Description
Equipment to be procured, if required, for use at a recovery scene:	
1	Mobile crane, 75-ton capacity, with two boom hooks, and drag cable (minimum)
1	Tractor
2	Flatbed trailer or low-boy trailer, 72,000-lb capacity with suitable commercial side-mounted tiedown structure.
4	Nylon or cable slings, 40 ft, 2 eye loops, 30-ton SWL
4	ISO container lifting lugs such as TANDEMLOC model 20901AA-4PA
6	Chain binder, 1/2-inch coil chain capacity with a hook on each end
6	G70 chain ½ inch x 30 ft , 11,300-lb WLL
1	4-leg wire or chain bridle rated at a minimum of 30 tons with at least 10 ft legs (45 degree sling angle should be achieved with 10 ft legs)
4	Nylon rigging strap, 30 ft, eye loops on both ends,
8	Nylon web tiedown straps min 4 inch, 30 ft long (5,000-lb minimum working load)
4	Shackles, minimum 20-ton SWL
3	Come-along hoists, 5-ton SWL
4	6 in x 6 in x 8 ft timber
1	Chainsaw, if required
1-2	Ladders 15-20 ft high or lift (used to position rigging and tiedowns)
1	Spreader bar and end attachments or ISO H lift fixture (optional)

Important:

Caution: Not all ISO lifting lugs are approved for side or angle lifts. Use lugs in accordance with manufacturers guidance.

All equipment used in the recovery operation must meet minimum OSHA safety requirements.

Hoisting slings and rigging components should be acquired by the carrier or the carrier's contractors. The hoisting slings and rigging components must have current proof load certification labels/tags attached and must be checked prior to use for lifting in the recovery operation.

Nighttime recovery operations will require portable lighting. Additional equipment, such as shovels, picks, axes, and sledgehammers, may be required and should be obtained from the nearest commercial vendor.

5.3. Transfer of the TRUPACT-III to Alternate Trailers

Prior to the transfer of any TRUPACT-III, all four tiedowns and the tiedown frame must be released and removed from the package.

1. To release the tension on the tiedown connecting rods, turn the handle of the ratcheting turnbuckle to the right. Partially release the tension in each tiedown by rotating the ratchet rightward until the indicator mark is at the bottom of the acceptable range. Repeat on the tiedown at the opposite corner.
2. Repeat until all four tiedowns have been partially loosened.
3. Remove the clevis pin joining the jaw end of the connecting rod to the eyebolt end of the turnbuckle and allow the turnbuckle and spring box to pivot downward and hang free.
4. Repeat until all four tiedowns are released. Remove the connecting rods and store out of the way.
5. Remove the frame by slowly lifting the frame vertically off the package. The frame weighs approximately 1500 lbs.
6. Once the frame is removed, install the ISO lifting lugs on the TRUPACT-III.

5.3.1. Transfer to a Replacement TRUPACT-III Trailer

The trailer shall be inspected and prepared in accordance with *TRUPACT-III Trailer Operation and Maintenance Manual*, WP 08-PT.18. The tiedown frame must be removed from the trailer and the corner brackets on the trailer verified clean and free of debris and foreign material.

1. Using a crane, lift the TRUPACT-III onto the replacement trailer.
2. Verify the TRUPACT-III is properly positioned.
3. Install the tiedown frame. See Figure 5.3.1-1.
4. Engage the hooks and connecting rods of the tiedowns on each corner of the frame.
5. Raise the lower portion of the tiedown (turnbuckle and spring box) and insert eyebolt of the turnbuckle into the jaw of the connecting rod. Repeat for each connecting rod. See step 4.17, WP 08-PT.18.

6. Apply partial tension to each tiedown initially. Rotate the ratcheting turnbuckle handle leftward until the spring shaft begins to move and the slack is removed from the tiedown linkages. Repeat on the tiedown at the opposite corner, followed by the remaining tiedowns.
7. Apply tension to each tiedown using the ratcheting turnbuckle until the indicator mark on the spring shaft lines up with the indicator pin on the spring box. See Figure 5.3.1-2.

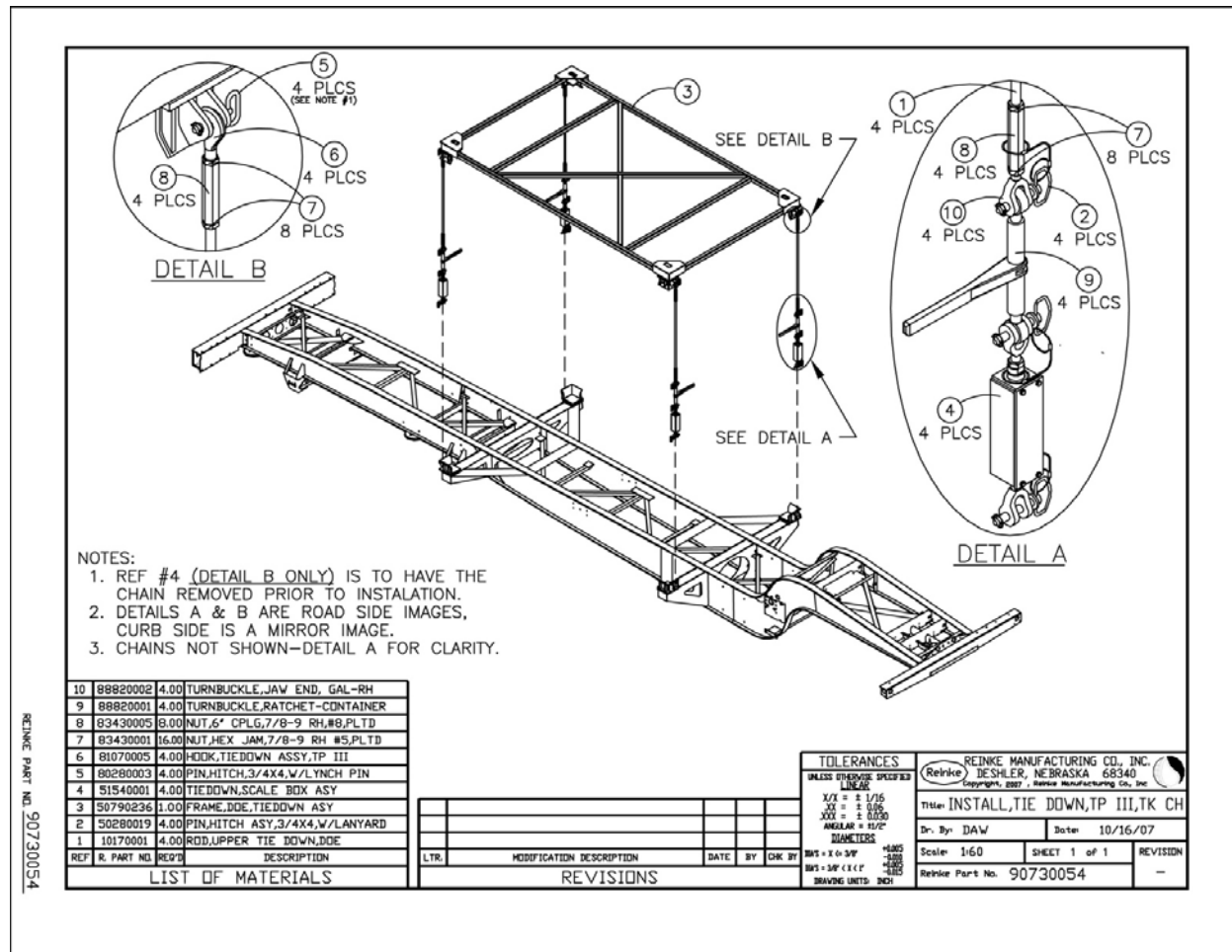


Figure 5.3.1-1 – TRUPACT-III Tiedown Frame

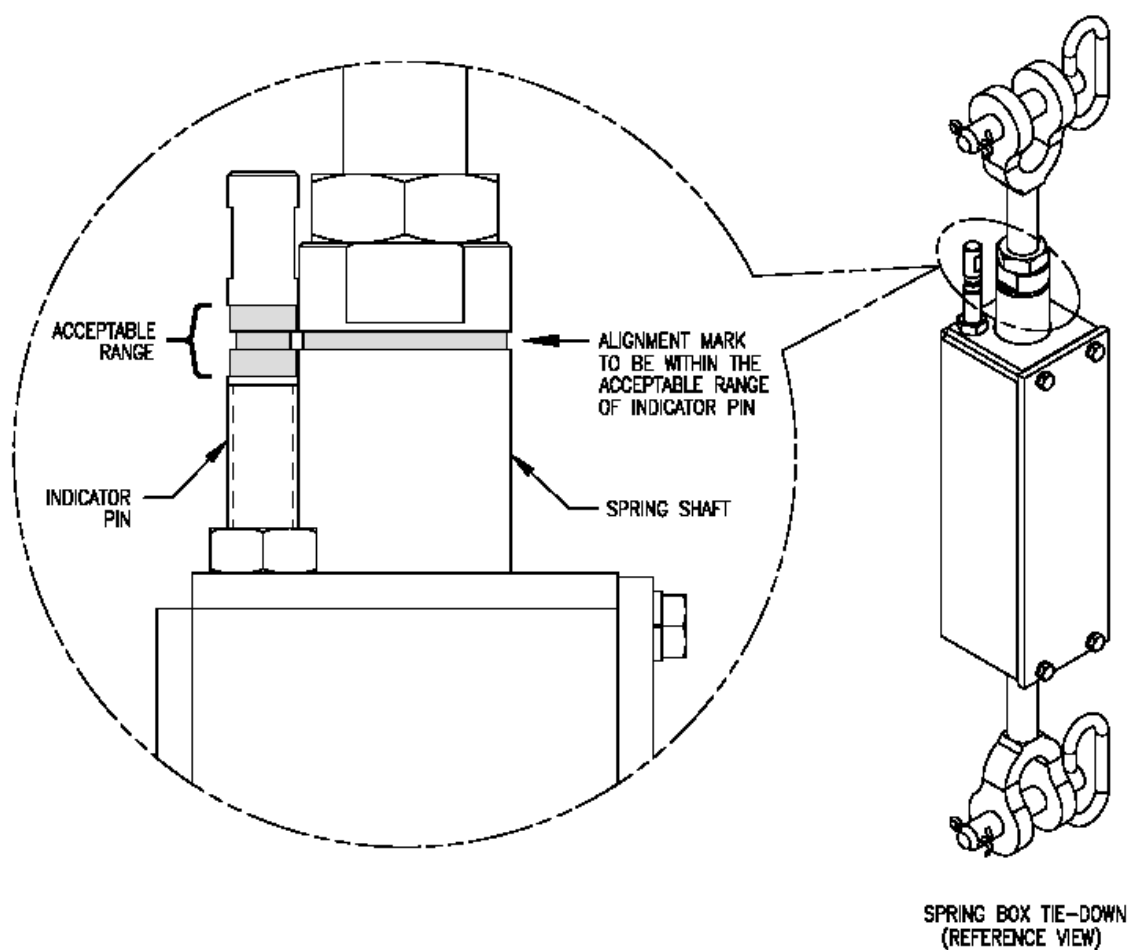


Figure 5.3.1-2 – TRUPACT-III Tiedown



Figure 5.3.1-3 – TRUPACT-III Secured on TRUPACT-III Trailer

5.3.2. Transfer to a Flatbed or Low-boy Trailer

1. Inspect the trailer. The GVW rating on the trailer should be at least 65,000 pounds.
2. Place at least 4 - 6 inch by 6 inch by 8 ft timbers on the trailer, spaced to receive the TRUPACT-III.
3. Position the TRUPACT-III on the timbers with the lid end facing the rear and tie-down using 6 - 8 nylon web tiedown straps 4 inches wide with a minimum safe working load of at least 5000 pounds. The straps may need to be padded on the edges of the TRUPACT-III. Use chain only if web straps are not available. See Figure 5.3.2-1.



**Figure 5.3.2-1 TRUPACT-III on a Lowboy Trailer Prior to Being Secured
(Note ISO container lugs installed on bottom corners.)**

5.4. Recovery Lifting Techniques

Caution: Due to the weight and sharp corners, rigging may need to be protected by adding padding to the corners.

The only qualified lift points are the eight ISO corners. Lifting lugs could be welded on. However, the paint must be removed and the proper welding filler and techniques used on the duplex stainless steel.

Obtain four ISO corner lift lugs qualified for angle pulls. Attach rigging and rotate the package to a vertical position (four ISO corners on the top and the lid impact limiter lifting points up).

Connect the appropriate rigging, 4-leg lifting bridle, to the ISO lugs installed in the corners. Lift the TRUPACT-III and place it on the trailer and secure as described in section 5.3.2. See Figure 5.3.2-1.

6.0. REFERENCES

29 CFR Part 1910, Occupational Safety and Health Standards

49 CFR, Transportation

DOE Order 5530.3, *Radiological Assistance Program*

American National Standards Institute, Management and Certification Standards

American Society of Mechanical Engineers, Boiler and Pressure Vessel Code,
Section IX, Welding and Brazing Qualifications

DOE/CBFO 98-3103, *TRU Waste Transportation Plan*

On-Scene TRU Package Crash Status Report

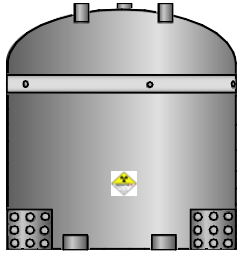
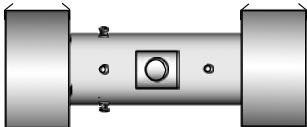
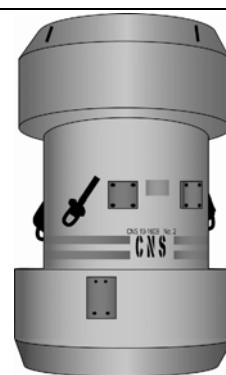
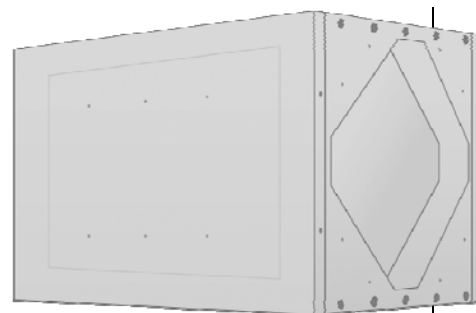
Accident Date	Time	Number of Packages	Was a Radiation Survey Done?	Type of Package
MM/DD/YEAR	☐ AM ☐ PM	On Trailer _____ Off Trailer _____	☐ Yes ☐ No (If yes, please record results below)	☐ TRUPACT-II ☐ HalfPACT ☐ RH-TRU 72-B ☐ 10-160B ☐ TRUPACT-III
Weather Conditions:				
Describe Condition of Package: Number painted on package _____ (Dents, Tears, Scuffs, Gouges, Holes, etc.) Describe damage.			Circle areas of damage for each package.	
Describe Condition of Package: Number painted on package _____ (Dents, Tears, Scuffs, Gouges, Holes, etc.) Describe damage.			 TRUPACT-II	
Describe Condition of Package: Number painted on package _____ (Dents, Tears, Scuffs, Gouges, Holes, etc.) Describe damage.				
Describe Condition of Package: Number painted on package _____ (Dents, Tears, Scuffs, Gouges, Holes, etc.) Describe damage.				
Disposition of Tractor: Describe condition and location.				
Disposition of Tractor: Describe condition and location. (Inspect tiedown system on trailer if packages remained on trailer.)			 HalfPACT	
			 RH-TRU 72-B	

Diagram of Accident Scene:



10-160B



TRUPACT-III