

# CH Packaging Operations Manual

  
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**RECORD OF REVISION**Revision   Reason for Revision/Change

- |   |  |
|---|--|
| 0 | New CH Packaging Operations Manual. This document supercedes DOE/WIPP 93-1001 and must be used in conjunction with DOE/WIPP 02-3183, CH Packaging Program Guidance, and DOE/WIPP 02-3185, CH Packaging Maintenance Manual. |
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**M&O CONTRACTOR TECHNICAL REVIEW ORGANIZATIONS**

WASTE HANDLING OPERATIONS

PACKAGING TRANSPORTATION

QUALITY ASSURANCE

**CBFO REVIEW ORGANIZATIONS**

NATIONAL TRU PROGRAMS

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## 1.0 PAYLOAD PREPARATION

### CAUTION

If the payload pallet will be placed on a square pallet for subsequent movement by forklift, care must be taken to ensure all three pockets used for lifting with the Adjustable Center of Gravity Lift Fixture (ACGLF) rest on a flat surface. Failure to ensure this may result in pallet damage due to the weight of the ACGLF driving the pallet lift point through the pallet.

### NOTE

This section provides the user with instructions for assembling a payload. Sections 1.2, 1.3, and 1.4 and the steps within must be completed, but may be performed in any order as long as radiological control steps are not bypassed.

## 1.1 Basic Information

1.1.1 Introduction - This procedure provides instructions for assembling the following CH packaging payload:

- Drum payload assembly
- Standard Waste Box (SWB) assembly
- Ten-Drum Overpack (TDOP)

1.1.2 References

#### BASELINE

- U.S. Department of Energy, Safety Analysis Report for the TRUPACT-II Shipping Package
- U.S. Department of Energy, Safety Analysis Report for the HalfPACT Shipping Package

1.1.3 Equipment

- SWB ratchet straps or turnbuckles
- Drum payload pallet
- Guide tubes
- Stretch wrap
- Slip sheets
- Reinforcement plates

- 1.1.4 Prerequisite Actions - Each waste container shall be verified to meet CH packaging requirements before shipment.

## 1.2 Preparing Drum Payload Assembly

- 1.2.1 Place clean pallet, right side up (i.e., large diameter plate on top), for use as the bottom support of the drum payload assembly on floor or stretch wrap machine.
- 1.2.2 Place slip sheet on top of pallet.
- 1.2.3 Verify guide-tube holes on slip sheet and pallet are aligned.

---

### NOTE

The diameter of all drums, including the locking ring, must be less than or equal to 24 in. This dimension should not include the locking bolt. Tapping the locking ring with a hammer while torquing lock ring nut may assist in ensuring drum is tightly closed. The diameter of each layer of drums should not exceed 72 in.

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### NOTE

If shipping less than fourteen loaded drums, empty dunnage drums must be used to form the payload while adhering to weight management practices (see Figure 1.1). Dunnage drums shall have open vent ports (i.e., not filtered or plugged).

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- 1.2.4 Verify at least one filter is installed in each loaded drum.
- 1.2.5 Verify all waste drums are properly labeled (bar code, shipping category, etc.) at three locations about 120 degrees apart.

---

### NOTE

In step 1.2.6, at least one label on each drum (except the middle) must be visible when drums are assembled into a payload assembly.

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- 1.2.6 Place seven drums on slip sheet using weight distribution shown in Figure 1.1.
- 1.2.7 Verify locking bolt on each drum is positioned between drum gaps that do not contain guide tubes.
- 1.2.8 Verify heaviest seven-pack is on bottom of drum payload assembly (see Figure 1.1).
- 1.2.9 Document step 1.2.8 completion per site requirements.

- 1.2.10 Stretch wrap upper portion of drums with nine wraps so wraps extend down the sides of the drums a maximum of 22 in. with **NO** overlap on top of drums.
- 1.2.11 Place reinforcing plate on top.
- 1.2.12 Verify guide tube holes are aligned with bottom slip sheet/pallet holes by inserting and removing guide tubes and adjusting assembly as required.
- 1.2.13 Apply nine additional wraps of stretch wrap so there is overlap on top of drums (see Figure 1.2. Drum Payload Assembly, Typical).
- 1.2.14 Place slip sheet on top of bottom layer of drums (on top of reinforcing plate) **AND** align white stripe with the one on lower assembly.
- 1.2.15 Verify guide tube holes are aligned with bottom slip sheet/pallet holes (if desired, guide tubes may be inserted to help maintain pallet alignment).

---

**NOTE**

In step 1.2.16, at least one label on each drum (except the middle) must be visible when drums are assembled into a payload assembly.

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- 1.2.16 Place seven drums on slip sheet using weight distribution shown in Figure 1.1.
- 1.2.17 Verify locking bolt (on each drum) is positioned between drum gaps which will not contain guide tubes.
- 1.2.18 Stretch wrap upper portion of drums with nine wraps so wraps extend down the sides of drums a maximum of 22 in. with **NO** overlap on top of drums.
- 1.2.19 Place reinforcing plate on top.
- 1.2.20 Verify guide tube holes are aligned with bottom slip sheet/pallet holes by inserting and removing guide tubes and adjusting assembly as required.
- 1.2.21 Apply nine additional wraps of stretch wrap so there is overlap on top of drums.
- 1.2.22 Verify at least one label on each drum (except the middle) is visible when drums are assembled into payload assembly.

1.2.23 If not already installed, insert guide tube(s) into drum payload assembly adjusting upper assembly (as required).

1.2.24 If beta-gamma and alpha surveys are required, survey using site-specific procedures.

### 1.3 Preparing SWB Payload Assembly

1.3.1 Verify at least two filters are installed in each SWB and the remaining ports are plugged (if not filtered).

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#### NOTE

If shipping only one loaded SWB, a second empty dunnage SWB must be used in the top position to form the payload. To allow for pressure changes, dunnage SWB shall have open vent ports (i.e., not filtered or plugged).

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1.3.2 Verify SWBs are properly labeled (e.g., bar code, shipping category).

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#### NOTE

An SWB forklift adapter may be used in lieu of a crane/ACGLF.

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1.3.3 Place heaviest SWB on floor.

1.3.4 Document step 1.3.3 completion per site requirements.

### SIGN-OFF

#### CAUTION

Operator shall verify two ACGLF counterweights are at 180 degrees and 000 degrees **BEFORE** lifting ACGLF or lid.

1.3.5 Place second SWB on top of first and align SWB edges.

1.3.6 Attach SWB turn buckles or adjustable slings (in three places) to top and bottom SWBs as follows:

- One on each outer lift clip on one side
- One on the middle clip on the opposite side (see Figure 1.3).

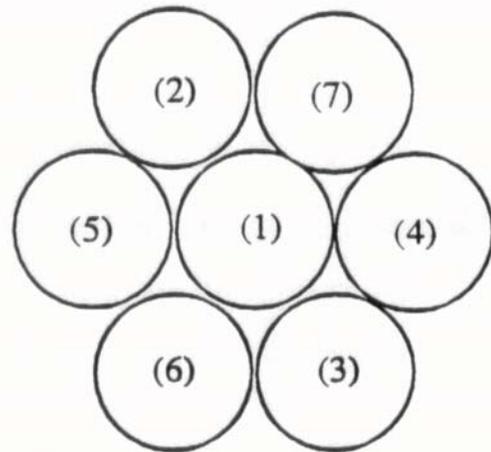
- 1.3.7 If beta-gamma and alpha surveys are required, survey using site-specific procedures.
- 1.4 Preparing TDOP Payload Assembly
  - 1.4.1 Verify at least nine filters are installed and the remaining port is plugged (if not filtered).
  - 1.4.2 Verify the TDOP is properly labeled (e.g., bar code, shipping category).
  - 1.4.3 If beta-gamma and alpha surveys are required, survey using site-specific procedures.

Figure 1.1 Drum Placement

The following drum placement is recommended for two seven-pack assemblies:

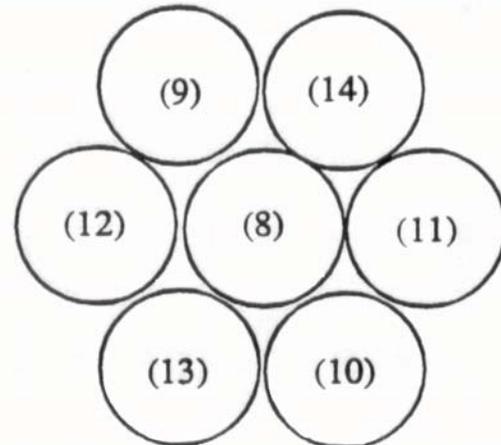
**Assembly of First Layer of Seven Drums**

<u>Position</u>	<u>Weight</u>
1	Heaviest drum
2	Next heaviest drum
3	Third heaviest drum
4	Fourth heaviest drum
5	Fifth heaviest drum
6	Sixth heaviest drum
7	Last drum



**Assembly of Second Layer of Seven Drums**

<u>Position</u>	<u>Weight</u>
8	Heaviest drum
9	Next heaviest drum
10	Third heaviest drum
11	Fourth heaviest drum
12	Fifth heaviest drum
13	Sixth heaviest drum
14	Last drum

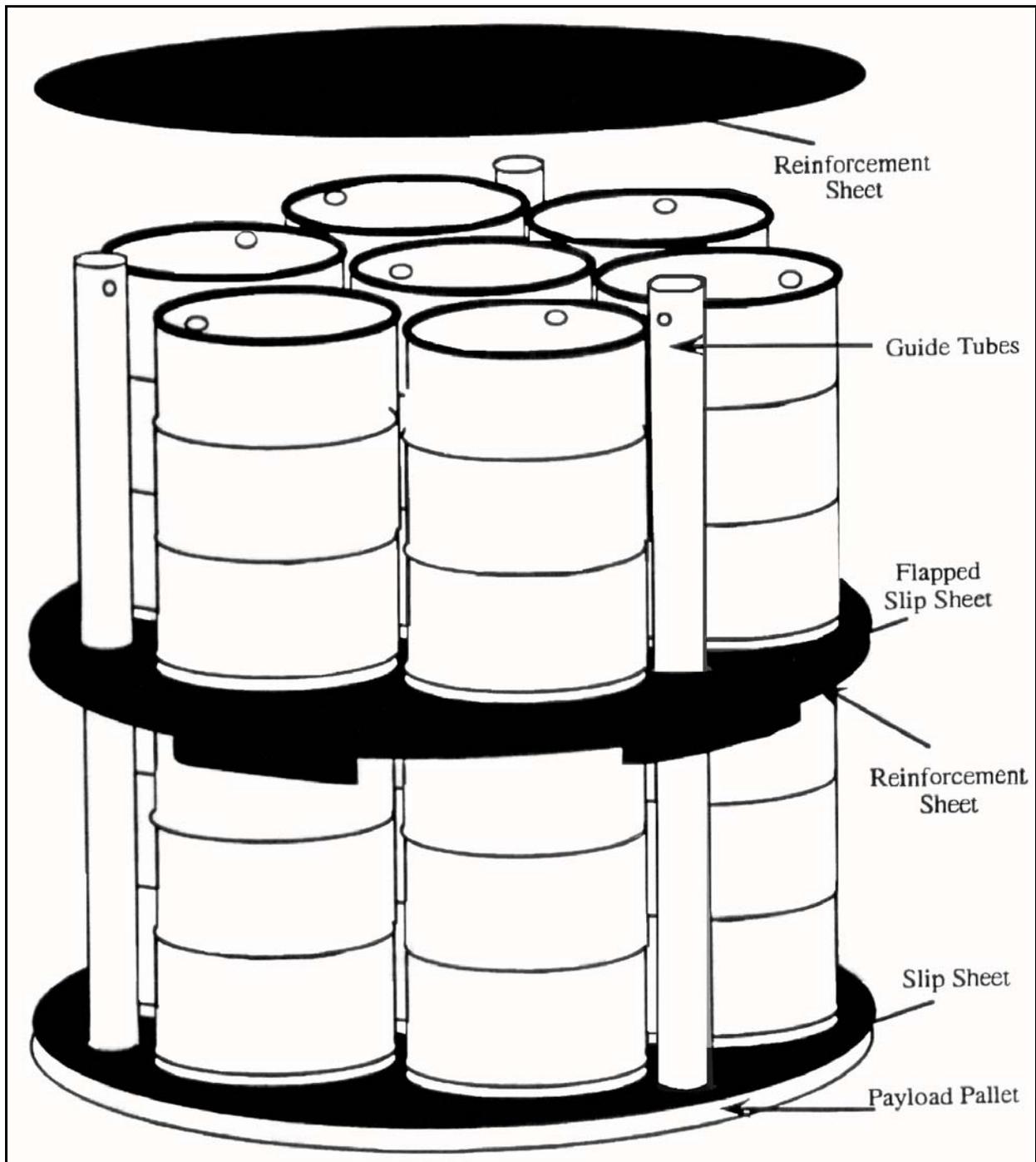


Not to scale

Note: If dunnage is used, it may be placed as needed.

Note: Verify heaviest drum assembly will comprise the lower layer of seven drums.

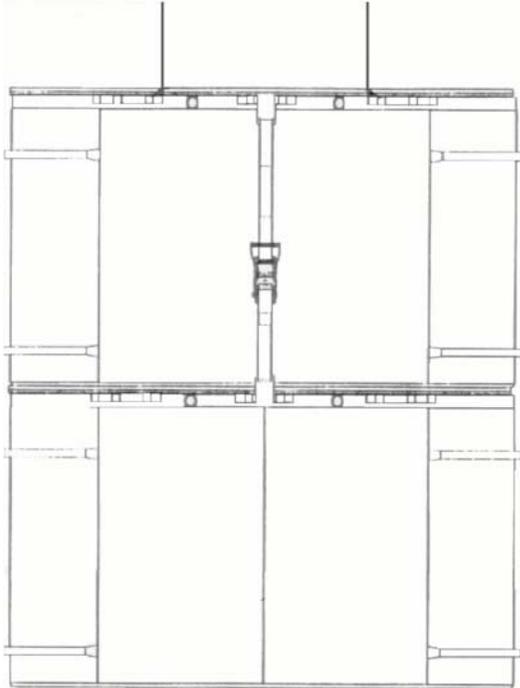
Figure 1.2 Drum Payload Assembly, Typical



Not to scale

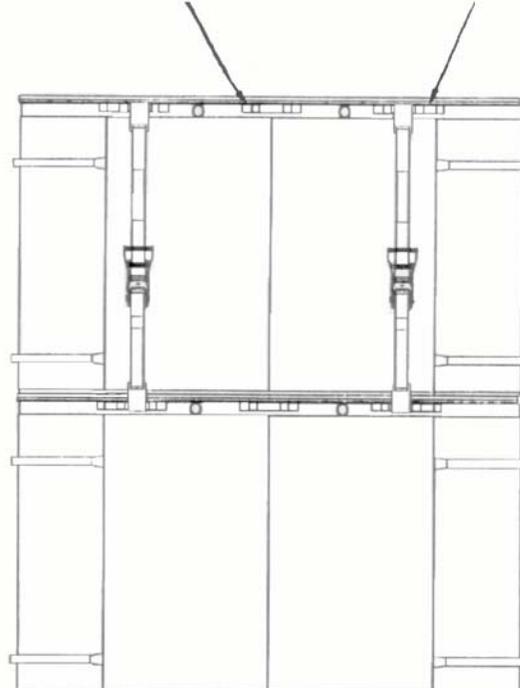
Figure 1.3 SWB Adjustable Lifting Slings

The SWB Lift Fixture attaches to these clips.



The SWB Lift Fixture attaches to this clip.

Connect 2 SWB's with 3 slings and tighten per Mfgr. Instructions.



Two SWBs connected with SWB adjustable slings - one sling either side.

Inspection - Before each use, each SWB adjustable sling assembly shall be visually inspected to verify the webbing red wear indicator threads are not exposed due to abrasion.

Before lifting, the ratchet buckle shall be visually inspected to verify the ratchet teeth are securely engaged and there are nominally three wraps (or 1-1/2 turns) of webbing around the mandrel.

Two SWBs connected with SWB adjustable slings - two slings opposite side.

The assembly shall also be checked to verify the webbing is in tension before each loading operation and before each unloading operation.

Annual Inspection - Each SWB sling assembly including webbing, ratchet buckle, and hooks shall be inspected for signs of excessive wear, cracking, or physical damage. If the webbing, ratchet buckle, or hooks are excessively worn, cracked, or damaged, the assembly shall **NOT** be used. Annual inspection shall be recorded.

## 2.0 NORMAL OPERATING INSTRUCTIONS

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### **NOTE**

Torquing of components that are replaced using the minor maintenance work instructions may be completed during assembly step and do not require a second or repeat torque when using minor maintenance form.

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### **NOTE**

Transport trailer operations, package loading and unloading from transport trailers, hoisting and rigging, equipment checkout and shutdown, and component inspection activities must be performed, but may be performed in any order as long as radiological control steps are not bypassed.

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## 2.1 Basic Information

2.1.1 Introduction - This procedure provides operating instructions for the following CH packaging:

- TRUPACT-II
- HalfPACT

2.1.2 References

- 49 CFR 172, U.S. Department of Transportation
- 49 CFR 173, U.S. Department of Transportation
- U.S. Department of Energy, Safety Analysis Report for the TRUPACT-II Shipping Package
- TRUPACT-II Certificate of Compliance No. 9218
- U.S. Department of Energy, Safety Analysis Report for the HalfPACT Shipping Package
- HalfPACT Certificate of Compliance No. 9279
- TRUPACT-II Authorized Methods for Payload Control (TRAMPAC)
- DOE/WIPP 02-3183, CH Packaging Program Guidance
- DOE/WIPP 02-3185, CH Packaging Maintenance Manual

### 2.1.3 Equipment

- Measuring and Test Equipment
  - Pressure/vacuum gauge, 30-in. Hg to 30 psig
  - Torque wrench with 55 to 65 pound inches (lb-in) range
  - Torque wrench with 30 to 50 pound feet (lb-ft) range
  - Crane load cell
- Other Equipment
  - Inner Containment Vessel (ICV) / Outer Containment Vessel (OCV) vent port plug removal/pressure relief tool
  - Miscellaneous hardware and vacuum assembly connections
  - Vacuum pump
  - ICV/OCV outer vent port plug removal and installation tool
- Consumable Materials
  - Vacuum grease
  - Nickel bearing lubricant
  - Denatured alcohol
  - Rags

### 2.1.4 Precautions and Limitations

Failure to rotate the counterweights on Adjustable Center of Gravity Lift Fixture (ACGLF) to the balance position may cause ACGLF to swing uncontrollably.

## 2.2 Packaging (Empty) Receipt

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### **NOTE**

The packaging loading/unloading operation shall only be performed in a dry environment. In the event of precipitation during outdoor operations, the OCV and ICV cavities shall be covered to prevent precipitation from entering the package interior cavities. If precipitation does enter the interior cavities, all free-standing water shall be removed before shipment and liquid handled according to the sites waste management procedures.

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- 2.2.1 Record OCA serial number on Attachment 1, CH Packaging Receipt and Inspection Data Sheet.

### **SIGN-OFF**

2.2.2 Verify site representative performed the following:

- Released packaging for loading
- Validated shipping documents
- Inspected packaging for damage
- Checked nameplate to verify packages are proper for contents being shipped

**SIGN-OFF**

2.2.3 Verify packaging maintenance is current by checking maintenance labels adjacent to name plate.

**SIGN-OFF**

2.2.4 Check for presence of LEAK TEST REQUIRED tag near OCA vent port.

2.2.5 If LEAK TEST REQUIRED tag is present, remove tag and forward to supervisor so a leak test report will be sent to the WIPP M&O CH Packaging Maintenance Engineer.

**CAUTION**

A physical check should be made to verify air bags on trailer have fully inflated before trailer is moved. Failure to do so may cause the tires to rub on bottom of rear package.

2.2.6 Position transport trailer in designated parking area.

2.2.7 Lower trailer jacks (landing gear) ensuring trailer is level.

2.2.8 Install wheel chocks.

2.2.9 Install trailer stands on free-standing trailers.

2.3 Releasing Tie-downs and Removal of Packaging from Trailer

2.3.1 **IF** packaging will **NOT** be removed from trailer for loading operations,  
**THEN GO TO** step 2.4.

- 2.3.2 **IF** packaging will be removed from trailer,  
**THEN** perform the following:
- [ A ] Loosen tie-down adjusting nuts.
  - [ B ] Lift tie-down assemblies from tie-down lugs.
  - [ C ] Rotate away from lugs.
  - [ D ] Lower completely to trailer brackets.
- 2.3.3 Rotate forklift pocket covers (4) to UP position,  
**OR** remove covers and store in designated area.
- 2.3.4 If required, dry packaging before transport to designated area.

**CAUTION**

Forklift tip-back beyond level may damage package exterior surface.

- 2.3.5 Transfer packaging to designated area.
- 2.4 OCA Lid Removal
- 2.4.1 Prepare OCA lid by removing the following:
- OCA lid lift pocket covers
  - OCV lock ring bolts (6)
  - OCA test port access plug and thermal plug
  - OCA vent port access plug and thermal plug
- 2.4.2 Remove OCV seal test port plug.
- 2.4.3 Remove OCV vent port cover.
- 2.4.4 Remove OCV vent port plug.
- 2.4.5 Attach crane to ACGLF.
- 2.4.6 Lower ACGLF legs into lift pockets on OCA lid using crane.
- 2.4.7 Verify ACGLF legs are locked.
- 2.4.8 Install OCV vent port tool.
- 2.4.9 Connect vacuum line to vent port tool.

- 2.4.10 Start vacuum pump and evacuate to 3-in. Hg minimum.
- 2.4.11 Rotate OCV lock ring to UNLOCKED position.
- 2.4.12 Stop vacuum pump.
- 2.4.13 Disconnect vacuum line from vent port tool.
- 2.4.14 Remove vent port tool.
- 2.4.15 Let OCV vent to atmosphere.

**CAUTION**

Operator shall verify two ACGLF counterweights are at 180 degrees and 000 degrees **BEFORE** lifting ACGLF or lid.

**CAUTION**

Do **NOT** exceed 7,500-lb load cell reading when weight of ACGLF is zeroed out. Do **NOT** exceed 10,000-lb load cell reading when weight of ACGLF is included.

- 2.4.16 Remove OCA lid.
- 2.4.17 **IF** lid does not lift off,  
**THEN** perform the following:
  - [ A ] Contact supervisor.
  - [ B ] **GO TO** step 3.2,  
**OR** step 3.3, attempt to remove lid and **RETURN TO**  
step 2.4.18.
- 2.4.18 Place OCA lid on storage stand.

## 2.5 ICV Lid Removal

### CAUTION

Operator shall verify two ACGLF counterweights are at 180 degrees and 000 degrees **BEFORE** lifting ACGLF or lid.

- 2.5.1 Attach crane to ACGLF.
- 2.5.2 Lower ACGLF legs into lift pockets on ICV lid using crane.
- 2.5.3 Verify ACGLF legs are locked.
- 2.5.4 Prepare ICV lid by removing the following:
  - ICV lock ring bolts (3)
  - ICV vent port cover
  - ICV seal test port plug
- 2.5.5 Remove ICV outer vent port plug.
- 2.5.6 Remove ICV inner vent port plug.
- 2.5.7 Install ICV vent port tool.
- 2.5.8 Connect vacuum line to vent port tool.
- 2.5.9 Start vacuum pump and evacuate to 3-in. Hg minimum.
- 2.5.10 Rotate ICV lock ring to UNLOCKED position.
- 2.5.11 Stop vacuum pump.
- 2.5.12 Disconnect vacuum line from vent port tool.
- 2.5.13 Remove vent port tool.
- 2.5.14 Vent ICV to atmosphere.

**CAUTION**

Do **NOT** exceed 5,000-lb load cell reading when weight of ACGLF is zeroed out. Do **NOT** exceed 7,500-lb load cell reading when weight of ACGLF is included.

2.5.15 Remove ICV lid using ACGLF and crane.

2.5.16 **IF** lid does not lift off ICV,  
**THEN** perform the following:

[ A ] Contact supervisor.

[ B ] **GO TO** step 3.2,  
**OR** step 3.3, attempt to remove lid and **RETURN TO**  
step 2.5.17.

2.5.17 Place ICV lid on storage stand.

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**NOTE**

Use of the ACGLF with short legs to remove items from the ICV is **NOT** permitted.

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2.5.18 Remove any payload pallets, guide tubes, slip sheets, reinforcement sheets, dunnage containers, etc.

2.6 Preloading/Shipping Operational Checks and Examinations

2.6.1 Radiological Control Technician (RCT), **IF** surveys for items in step 2.7.1, step 2.8.1, or step 2.9.1 have been completed previously **AND** results are below contamination limits, **THEN** enter applicable data for each step on Attachment 1.

2.6.2 RCT, **IF** surveys have **NOT** been completed previously, **THEN GO TO** step 2.7, step 2.8, or step 2.9 as applicable.

**NOTE**

Steps 2.7 through 2.13 (and sub-steps in those steps) **MUST** be completed, but may be performed in any order as long as radiological control steps are not bypassed.

**2.7 OCA Lid Inspection and Cleaning**

- 2.7.1 RCT, **IF** survey has not been completed previously, **THEN** survey interior and exterior of OCA lid and record applicable data on Attachment 1.

**SIGN-OFF**

- 2.7.2 Inspect OCA lid for the following:

- Visible deformation
- Dents or abnormal flat spots > ½ inch
- Abnormal scratches or gouges
- Obvious punctures, tears, or cracks in exposed welds
- Plastic burn out plugs (3) in place and intact
- Fiberglass tubes in place
- Distortions or cracks on or around lifting attachments
- Lid lift pocket covers attached and serviceable
- OCV locking Z-flange screws in place and tight
- Guide plates and screws in place and tight

- 2.7.3 Remove foreign material from the following:

- Lock ring
- Sealing surfaces
- Test port access threads

- 2.7.4 Initial Attachment 1 to document OCA lid components and hardware are satisfactory.

**SIGN-OFF****2.8 ICV Lid Inspection and Cleaning**

- 2.8.1 RCT, **IF** survey has **NOT** been completed previously, **THEN** survey interior and exterior of ICV lid and record applicable data on Attachment 1.

**SIGN-OFF**

- 2.8.2 Inspect ICV lid for the following:

- Visible deformation
- Punctures
- Abnormal scratches or gouges
- Distortions on or around lifting attachments
- Upper spacer and screws installed and tight
- Foam debris seal installed and intact
- Lock ring undamaged

- 2.8.3 Remove foreign material from the following:
- Lock ring flange
  - Debris seal
  - Sealing surfaces
- 2.8.4 Inspect ICV wiper O-ring for the following:
- O-ring cleanliness (no visible dirt or debris)
  - Damage (voids, cracks, and gouges)
- 2.8.5 **IF** O-ring is damaged,  
**THEN GO TO** work instruction WI-CH.02, replace O-ring and  
**RETURN TO** step 2.8.7.
- 2.8.6 **IF** O-ring is removed for inspection/cleaning,  
**THEN** apply vacuum grease, as required, before installing.
- 2.8.7 Initial Attachment 1 to document ICV lid components and hardware are satisfactory.

**SIGN-OFF**

## 2.9 OCA Body Inspection and Cleaning

- 2.9.1 RCT, **IF** survey has **NOT** been completed previously,  
**THEN** survey OCA body exterior and ICV body interior and record applicable data on Attachment 1.

**SIGN-OFF**

- 2.9.2 Remove upper and lower main O-rings and set aside for cleaning and inspection.
- 2.9.3 Inspect OCA body for the following:
- Obvious punctures or tears
  - Obvious cracks in exposed welds
  - Dents or abnormal flat spots > ½ inch
  - Abnormal scratches or gouges
  - Burn out plugs (6) in place and intact
  - Forklift pocket inserts (8) intact and threads undamaged
  - Lock ring threaded inserts (6) intact and threads undamaged
  - Tears or excessive wear on ceramic fiber gasket
- 2.9.4 Remove foreign material from the following:
- Test port threads
  - Vent port threads
  - Lock ring flange
  - O-ring grooves
  - Sealing surfaces

- 2.9.5 Initial Attachment 1 to document OCA body inspection is satisfactory.

## **SIGN-OFF**

### 2.10 OCA Components Inspection and Cleaning

- 2.10.1 Clean and inspect the following for deformation, scratches or burrs:

- OCV vent port plug and O-rings
- OCV vent port cover and O-rings
- OCV test port plug and O-ring
- Lock ring bolts (6)
- OCA test port access plug
- OCA vent port access plug

- 2.10.2 **IF** O-rings are damaged,  
**THEN GO TO** WI-CH.01, replace O-ring(s) and **RETURN TO** step 2.10.4.

- 2.10.3 Apply a light coat of vacuum grease to the following:

- OCV vent port plug threads and sealing O-ring
- OCV vent port cover threads and sealing O-ring
- OCV test port plug threads and O-ring

- 2.10.4 Verify annulus debris shield is installed and intact.

- 2.10.5 Lightly coat the following with nickel bearing lubricant:

- OCA lock ring bolt threads (6)
- OCA test port access plug threads
- OCA vent port access plug threads

- 2.10.6 Clean and inspect upper and lower main O-rings for tears, nicks, flat spots or cracks.

- 2.10.7 **IF** O-rings are damaged,  
**THEN GO TO** WI-CH.02, replace O-ring(s) and **RETURN TO** step 2.10.10.

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### **NOTE**

Lubrication and installation of upper and lower main O-rings may be performed after step 2.16.16, but prior to step 2.18.

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- 2.10.8 Lubricate upper and lower main O-rings with a light coat of vacuum grease.

- 2.10.9 Install upper and lower main O-rings.

2.10.10 Initial Attachment 1 to document OCA component and hardware inspections are satisfactory.

### **SIGN-OFF**

#### 2.11 ICV Body Inspection and Cleaning

2.11.1 Remove upper and lower main O-rings and set aside for cleaning and inspection.

2.11.2 Remove foreign material from the following:

- Test port threads
- Vent port threads
- Lock ring flange
- O-ring grooves
- Filter ports
- Sealing surfaces

2.11.3 Inspect the following for deformation, scratches, or burrs:

- Upper and lower O-ring grooves
- Vent port threads
- Seal test port threads
- Lock ring flange
- Lower spacer installed with no tears in skin
- Lower spacer fasteners installed

2.11.4 Initial Attachment 1 to document ICV body inspection is satisfactory.

### **SIGN-OFF**

#### 2.12 ICV Components Inspection and Cleaning

2.12.1 Clean and inspect the following for deformation, scratches, or burrs:

- ICV vent port cover and seal
- ICV vent port outer plug and O-ring
- ICV vent port inner plug and O-ring
- ICV seal test port plug and O-ring
- ICV lock ring bolts (3)

2.12.2 **IF** O-rings are damaged, **THEN GO TO** WI-CH.01, replace O-ring(s) and **RETURN TO** step 2.12.4.

2.12.3 Apply a light coat of vacuum grease to the following:

- ICV vent port cover threads (and O-ring if installed)
- ICV vent port outer plug threads and O-ring
- ICV vent port inner plug threads and O-ring
- ICV seal test port plug threads and O-ring

- 2.12.4 Coat ICV lock ring bolt threads (3) lightly with nickel bearing lubricant.
- 2.12.5 Clean upper and lower main O-rings and inspect for tears, nicks, flat spots or cracks.
- 2.12.6 **IF** O-rings are damaged,  
**THEN GO TO** WI-CH.02, replace O-ring(s) and **RETURN TO** step 2.12.8.

---

**NOTE**

Lubrication and installation of upper and lower main O-rings may be performed after step 2.16.16, but prior to step 2.17.

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- 2.12.7 Lubricate upper and lower main O-rings with a light coat of vacuum grease.
- 2.12.8 Install upper and lower main O-rings.
- 2.12.9 Initial Attachment 1 to document ICV components and hardware inspections are satisfactory.

**SIGN-OFF**

## 2.13 ICV Cavity Inspection

- 2.13.1 Inspect ICV cavity for water by performing one of the following:
- Insert a rod through the hole in lower spacer assembly
  - Visual inspection

---

**NOTE**

Disposal of absorbent material and water will be at direction of RCT.

---

- 2.13.2 **IF** water is inside ICV,  
**THEN** perform one of the following:
- Remove water through center hole of lower spacer assembly using wet/dry vacuum
  - Attach absorbent material to rod and insert in hole in center of lower spacer assembly
- 2.13.3 **IF** water is inside ICV,  
**THEN GO TO** step 3.1, perform Abnormal Operations and **RETURN TO** step 2.13.4.
- 2.13.4 Initial Attachment 1 to document ICV is free of water.

**SIGN-OFF**

## 2.14 Pre-loading Operations

Verify all pre-loading cleaning and inspections are complete.

### **SIGN-OFF**

## 2.15 Packaging Receipt and Inspection Data Sheet Validation

Supervisor, review/validate and sign Attachment 1.

### **SIGN-OFF**

## 2.16 Loading Payload Assembly

---

### **NOTE**

For shipments to WIPP, shipper should verify each payload container number has been entered into WIPP Waste Information System (WWIS) and verify shipment has been approved by WIPP WWIS Data Administrator. The verification is needed to preclude losing a portion of the allowable 60-day shipping period.

---

2.16.1 Record OCA serial number on Attachment 2.

### **SIGN-OFF**

2.16.2 Verify payload is assembled using requirements delineated in TRAMPAC and initial Attachment 2.

### **SIGN-OFF**

### **CAUTION**

Operator shall verify two ACGLF counterweights are at 180 degrees and 000 degrees **BEFORE** lifting ACGLF or lid.

2.16.3 Attach appropriate legs/adaptor to ACGLF.

2.16.4 Lower ACGLF long legs into drum payload assembly guide tubes using crane and ACGLF until red stripes are no longer visible, **OR** lower SWB or TDOP adaptor until no load is indicated on crane load cell.

2.16.5 Lock ACGLF legs, **OR** attach SWB lift fixture to upper SWB or TDOP adaptor to TDOP as applicable.

- 2.16.6 Raise payload 2 to 6 in.
- 2.16.7 If necessary, balance payload using counter weight controls at ACGLF console until a reading of  $\pm 0.5$  degrees is obtained.
- 2.16.8 Record payload assembly weight (i.e., drum [or SWBs, TDOP] + pallet + guide tubes + slip sheets) on Attachment 2.

**SIGN-OFF**

- 2.16.9 Obtain packaging weight from WIPP WWIS Packaging Reference Data Table.
- 2.16.10 Record empty packaging weight on Attachment 2.

**SIGN-OFF**

- 2.16.11 Add two previously recorded weight values to calculate the total package weight and record on data sheet.

**SIGN-OFF**

- 2.16.12 Verify total loaded package weight does not exceed the limits below:
- TRUPACT-II 19,250 lb
  - HalfPACT 18,100 lb
- 2.16.13 Raise and position payload assembly over ICV cavity using crane and ACGLF.
- 2.16.14 Verify payload is centered over ICV **BEFORE** lowering load.

**CAUTION**

Care should be exercised to avoid hitting, scraping, or binding the payload assembly against ICV body flange and internal surface.

- 2.16.15 Lower payload assembly into ICV.
- 2.16.16 Record weight positions of ACGLF on top of payload near leg opposite the electrical junction boxes.

**CAUTION**

Operator shall verify two ACGLF counterweights are at 180 degrees and 000 degrees **BEFORE** lifting ACGLF or lid.

2.16.17 Remove ACGLF/adaptor from payload.

**2.17 ICV Lid Installation**

2.17.1 Match ICV lid and body serial numbers and record ICV serial number on data sheet.

**SIGN-OFF**

2.17.2 Record torque wrench serial numbers and calibration due date on Attachment 2.

**SIGN-OFF****CAUTION**

Operator shall verify two ACGLF counterweights are at 180 degrees and 000 degrees **BEFORE** lifting ACGLF or lid.

2.17.3 Attach crane to ACGLF.

2.17.4 Lower ACGLF legs into lifting pockets on ICV lid using crane.

2.17.5 Verify ACGLF legs are locked.

2.17.6 Align UNLOCKED arrows and install ICV lid onto ICV body using crane and ACGLF.

2.17.7 Install ICV vent port tool into ICV vent port.

2.17.8 Connect vacuum line to ICV vent port tool.

**CAUTION**

Vacuum should not exceed 15-in. Hg when evacuating ICV cavity.

2.17.9 Start vacuum pump and evacuate to 3-in. Hg minimum.

2.17.10 Rotate ICV lock ring to LOCKED position.

2.17.11 Stop vacuum pump.

2.17.12 Disconnect vacuum line from vent port tool.

2.17.13 Remove ICV vent port tool.

2.17.14 Install ICV inner vent port plug.

2.17.15 Torque inner vent port plug to 55 to 65 lb-in.

**SIGN-OFF**

2.17.16 Install ICV lock ring bolts (3).

2.17.17 Torque each ICV lock ring bolt to 28 to 32 lb-ft.

**SIGN-OFF**

2.17.18 Perform ICV preshipment leakage rate test per Section 4.0.

**SIGN-OFF****2.18 OCA Lid Installation**

2.18.1 Match OCA lid and body serial numbers.

2.18.2 Record OCA serial number on Attachment 2.

**SIGN-OFF**

**CAUTION**

Operator shall verify two ACGLF counterweights are at 180 degrees and 000 degrees **BEFORE** lifting ACGLF or lid.

- 2.18.3 Lower ACGLF legs into lifting pockets on OCA lid using crane.
- 2.18.4 Verify ACGLF legs are locked.
- 2.18.5 Install OCA lid onto OCA body.
- 2.18.6 Verify OCV vent port plug is retracted into OCV vent port tool.
- 2.18.7 Install OCV vent port tool into OCV vent port.
- 2.18.8 Connect vacuum line to OCV vent port tool.
- 2.18.9 Start vacuum pump and evacuate to 3-in. Hg minimum.
- 2.18.10 Rotate OCV lock ring to LOCKED position.
- 2.18.11 Stop vacuum pump.
- 2.18.12 **IF** existing connection will be used for OCV leak test,  
**THEN GO TO** step 2.18.14.
- 2.18.13 Disconnect vacuum line from vent port tool.
- 2.18.14 Install OCA lock ring bolts (6).
- 2.18.15 Torque each OCA lock ring bolt to 28 to 32 lb-ft.

**SIGN-OFF**

- 2.18.16 **GO TO** Section 4.0, perform OCV preshipment leakage rate test and **RETURN TO** step 2.18.17.

**SIGN-OFF**

- 2.18.17 Install OCA lid lift pocket covers.
- 2.18.18 Install tamper-indicating security seal in both lock ring bolt on OCA lock ring assembly and OCA vent port access plug.

2.18.19 Record tamper-indicating security seals serial numbers on Attachment 2.

### **SIGN-OFF**

2.18.20 Supervisor, review/validate and sign Attachment 2.

2.19 Installation of Package onto Transport Trailer

### **NOTE**

When loading packages on trailer, or loading payload into packaging that is already on trailer, the following options may be used. Weight is not a factor for positioning until weight difference is 2,000 lb or more.

<i>TRAILER FRONT</i>	<i>*1. Heaviest</i>	<i>Medium</i>	<i>Lighter</i>	<i>TRAILER REAR</i>
	<i>2. Heaviest</i>	<i>Lighter</i>	<i>Medium</i>	
	<i>*3. Heaviest</i>	<i>Lighter</i>	<i>None</i>	
	<i>4. Lighter</i>	<i>Heaviest</i>	<i>None</i>	
	<i>5. Heaviest</i>	<i>None</i>	<i>None</i>	
<i>The asterisk indicates the preferred, but not mandatory, method.</i>				

2.19.1 Record the following on Attachment 3:

- Shipment number
- Trailer number
- Package number(s)

### **SIGN-OFF**

2.19.2 Verify trailer inspection is current.

2.19.3 Record trailer inspection date on Attachment 3.

### **SIGN-OFF**

2.19.4 Inspect tie-downs for the following:

- Damage
- Defects

2.19.5 **IF** packaging was removed for loading operations,  
**THEN** perform the following:

- [ A ] Position transport trailer in designated area.
- [ B ] Lower trailer jacks (landing gear), ensuring trailer is level.
- [ C ] Install wheel chocks.
- [ D ] Install jack stands on free-standing trailers.

**CAUTION**

Tip-back may damage package exterior surface.

- [ E ] Transport package to transport trailer.
- [ F ] Load package designated for position #1 onto trailer with vent port on driver side of trailer.
- [ G ] If applicable, load package designated for position #2 onto trailer with vent port on driver side of trailer.
- [ H ] If applicable, load package designated for position #3 onto trailer with vent port on driver side of trailer.
- [ I ] Install four tie-down assemblies for each package loaded on trailer.
- [ J ] Install package forklift pocket access covers.

2.19.6 Record package positions and weights on Attachment 3.

**SIGN-OFF**

2.19.7 Record total weight of all loaded packages as payload weight on Attachment 3.

**SIGN-OFF**

2.19.8 Verify package(s) is in compliance with 49 CFR 172, Subpart D Marking; Subpart E, Labeling; and Subpart F, Placarding.

**SIGN-OFF**

2.19.9 Complete information transfer to shipping papers as required for specific shipment.

2.19.10 Verify shipping papers are in accordance with 49 CFR 172, Subpart C.

**SIGN-OFF**

2.19.11 Initial for trailer loading complete on Attachment 3.

**SIGN-OFF**

2.19.12 Supervisor, review/validate and sign data sheet.

**SIGN-OFF**

2.20 Package (Loaded) Receipt

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**NOTE**

The package unloading operation shall only be performed in a dry environment. In the event of precipitation during outdoor unloading or loading operations, OCV and ICV cavities shall be covered to prevent precipitation from entering the interior cavities. If precipitation does enter interior cavities, all free-standing water shall be removed before shipment and liquid handled according to the site's waste management procedures.

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2.20.1 Record OCA serial number on Attachment 4.

**SIGN-OFF**

2.20.2 Verify site representative has performed the following:

- Validated shipping documents
- Inspected package(s) for damage
- Released package(s) for unloading

**SIGN-OFF**

2.20.3 Survey package for external radiation and contamination using site-specific procedures.

**SIGN-OFF**

**CAUTION**

A physical check shall be made to verify air bags on the trailer have fully inflated before trailer is moved. Failure to do so may cause the tires to rub on bottom of rear TRUPACT-II.

2.20.4 Position transport trailer in designated area.

2.20.5 Lower trailer jacks (landing gear), ensuring trailer is level.

2.20.6 Install wheel chocks.

2.20.7 Install trailer stands on free-standing trailers.

**2.21 Releasing Tie-downs and Removal of Package from Trailer**

2.21.1 **IF** package will **NOT** be removed from trailer,  
**THEN GO TO** step 2.22.

2.21.2 **IF** package will be removed from trailer,  
**THEN** perform the following:

[ A ] Loosen tie-down adjusting nuts.

[ B ] Lift tie-down assemblies from tie-down lugs.

[ C ] Rotate U-bolts away from lugs.

[ D ] Lower U-bolts completely to trailer brackets.

2.21.3 Rotate four forklift pocket covers to UP position,  
**OR** remove four covers and store in designated area.

2.21.4 If required, dry package before transport to designated area.

**CAUTION**

Tip-back may damage package exterior surface.

2.21.5 Transfer package to unloading area.

## 2.22 OCA Lid Removal

- 2.22.1 Remove and dispose of security seals.
- 2.22.2 If seal is broken or missing, follow applicable site policy.
- 2.22.3 Remove the following components to prepare OCA lid for removal:
  - OCA lid lift pocket covers
  - OCA test port access plug and thermal plug
  - OCA vent port access plug and thermal plug
- 2.22.4 Remove OCV vent port cover.
- 2.22.5 Install OCV vent port tool.
- 2.22.6 Retrieve OCV vent port plug into vent port tool.
- 2.22.7 Connect vacuum line to vent port tool.
- 2.22.8 Start vacuum pump and evacuate to 3-in. Hg minimum.
- 2.22.9 Remove OCA lock ring bolts (6)
- 2.22.10 Rotate OCV Lock ring to UNLOCKED position.
- 2.22.11 Stop vacuum pump.
- 2.22.12 Disconnect vacuum line from vent port tool.
- 2.22.13 Remove vent port tool.
- 2.22.14 Attach ACGLF to crane.

### CAUTION

Operator shall verify two ACGLF counterweights are at 180 degrees and 000 degrees **BEFORE** lifting ACGLF or lid.

- 2.22.15 Lower ACGLF legs into lift pockets on OCA lid using crane.
- 2.22.16 Verify ACGLF legs are locked.

**CAUTION**

Do **NOT** exceed 7,500-lb load cell reading when weight of ACGLF is zeroed out. Do **NOT** exceed 10,000-lb load cell reading when weight of ACGLF is included.

2.22.17 Raise OCA lid slowly about 6 in above the top of ICV lid, **OR** as directed by Rad Con Tech (RCT).

2.22.18 **IF** lid does not lift off, **THEN** perform the following:

[ A ] Contact supervisor.

[ B ] **GO TO** step 3.2 or step 3.3, Abnormal Operations; attempt to remove lid, and **RETURN TO** step 2.22.19.

**HOLD POINT**

2.22.19 RCT, survey OCA lid interior surface and ICV lid exterior surface for radiation/contamination following site-specific procedures.

**SIGN-OFF**

2.22.20 Place OCA lid on storage stand.

2.22.21 Remove OCV seal test port plug.

2.23 ICV Lid Removal

**CAUTION**

Operator shall verify two ACGLF counterweights are at 180 degrees and 000 degrees **BEFORE** lifting ACGLF or lid.

2.23.1 Lower ACGLF legs into lifting pockets on ICV lid using crane.

2.23.2 Verify ACGLF legs are locked.

2.23.3 Remove ICV vent port cover.

2.23.4 Remove ICV outer vent port plug.

2.23.5 Install ICV vent port tool.

2.23.6 Connect vacuum hose to vent port tool.

2.23.7 Retrieve ICV inner vent port plug into ICV vent port tool.

### CAUTION

Vacuum should not exceed 15-in. Hg when attempting to open ICV.

2.23.8 Start vacuum pump and evacuate to 3-in. Hg minimum.

2.23.9 Remove the following:

- ICV lock ring bolts (3)
- ICV seal test port plug

2.23.10 Rotate ICV lock ring to UNLOCKED position.

2.23.11 Stop vacuum pump.

2.23.12 Disconnect vacuum line from ICV vent port tool.

### HOLD POINT

2.23.13 RCT, survey for radiation/contamination using site-specific procedures.

### SIGN-OFF

2.23.14 Remove ICV vent port tool and ICV inner vent port plug.

### CAUTION

Do **NOT** exceed 5,000-lb load cell reading when weight of ACGLF is zeroed out. Do **NOT** exceed 7,500-lb load cell reading when weight of ACGLF is included.

2.23.15 Raise ICV lid slowly to clear ICV body and hold it about 2 ft above the top of ICV body flange,  
**OR** as directed by RCT.

2.23.16 **IF** lid does not lift off ICV,  
**THEN** perform the following:

[ A ] Contact Supervisor.

[ B ] **GO TO** step 3.2,  
**OR** step 3.3, Abnormal Operations; attempt to remove lid, and  
**RETURN TO** step 2.23.17.

**HOLD POINT**

2.23.17 RCT, survey ICV lid interior surface and top of payload for radiation/contamination using site-specific procedures.

**SIGN-OFF**

2.23.18 Place ICV lid on storage stand.

**2.24 Unloading Payload Assembly**

2.24.1 Attach appropriate legs/adaptor to ACGLF.

**CAUTION**

Operator shall verify two ACGLF counterweights are at 180 degrees and 000 degrees **BEFORE** lifting ACGLF or lid.

2.24.2 Engage payload using crane and ACGLF.

2.24.3 Lock ACGLF legs into payload pallet,  
**OR** connect lifting clips to SWB or TDOP as applicable.

2.24.4 Position ACGLF counterweights to predetermined positions as marked on top of payload.

2.24.5 Raise payload less than 1 ft **AND**, if necessary, further balance payload using counterweight controls at ACGLF console until a balance of  $\pm 0.5$  degrees is obtained on both axis.

**NOTE**

Perform step 2.24.6, step 2.24.7, and step 2.24.8 concurrently to remove payload.

2.24.6 Monitor ACGLF indicated balance and adjust counterweights as needed.

2.24.7 Raise payload assembly slowly.

2.24.8 Inspect payload for damage.

**SIGN-OFF**

**HOLD POINT**

- 2.24.9 RCT, survey payload assembly as it is raised for radiation/contamination using site-specific procedures.

**SIGN-OFF**

- 2.24.10 If payload is damaged, follow site-specific procedures.

- 2.24.11 Place payload assembly in designated area.

- 2.24.12 Supervisor review/validate and sign Attachment 4.

**2.25 Packaging Operational Checks and Examinations**

- 2.25.1 Record OCA serial number on Attachment 5.

**SIGN-OFF**

- 2.25.2 Record torque wrench serial numbers and calibration due date on Attachment 2.

**SIGN-OFF**

- 2.25.3 Verify packaging maintenance is current by checking maintenance labels adjacent to name plate.

**SIGN-OFF**

- 2.25.4 RCT, **IF** surveys for items in step 2.26.1, step 2.27.1, or step 2.28.1 have been completed previously **AND** results are below contamination limits, **THEN** enter applicable data for each step on Attachment 5.

- 2.25.5 RCT, **IF** surveys have **NOT** been completed previously, **THEN GO TO** step 2.26, step 2.27, or step 2.28 as applicable.

**NOTE**

Steps 2.26 through 2.32 (and the included substeps) must be completed, but may be performed in any order as long as radiological control steps are not bypassed.

**2.26 OCA Lid Inspection and Cleaning**

- 2.26.1 RCT, **IF** survey has **NOT** been completed previously, **THEN** survey OCV lid interior and exterior and record applicable data on Attachment 5.

**SIGN-OFF**

- 2.26.2 Inspect OCA lid for the following:

- Visible deformation
- Dents or abnormal flat spots > ½ inch
- Abnormal scratches or gouges
- Obvious punctures, tears, or cracks in exposed welds
- Plastic burn out plugs (3) in place and intact
- Fiberglass tubes in place
- Distortions or cracks on or around lifting attachments
- Lid lift pocket covers attached and serviceable
- Z-ring screws in place and tight
- Guide plates and screws in place and tight

- 2.26.3 Remove foreign material from the following:

- Lock ring flange
- Sealing surfaces
- Test port access threads

- 2.26.4 Verify arrow above seal test port aligns with UNLOCKED arrow on lock ring.

- 2.26.5 Initial Attachment 5 to document OCA lid components and hardware are satisfactory.

**SIGN-OFF****2.27 ICV Lid Inspection and Cleaning**

- 2.27.1 RCT, **IF** survey has **NOT** been completed previously, **THEN** survey ICV lid interior and exterior and record applicable data on Attachment 5.

**SIGN-OFF**

2.27.2 Inspect ICV lid for the following:

- Visible deformation
- No punctures
- Abnormal scratches or gouges
- Distortions on or around lifting attachments
- Upper spacer and screws installed and tight
- Foam debris seal intact and undamaged
- Lock ring undamaged

2.27.3 Remove foreign material from the following:

- Lock ring flange
- Debris seal
- Sealing surfaces

2.27.4 Inspect ICV wiper O-ring for the following:

- O-ring cleanliness (no visible dirt or debris)
- Damage (voids, cracks, and gouges)

2.27.5 **IF** O-ring is damaged,  
**THEN GO TO** WI-CH.02, replace O-ring and **RETURN TO**  
step 2.27.7.

2.27.6 **IF** O-ring is removed for cleaning,  
**THEN** apply a light coat of vacuum grease before installing.

2.27.7 Initial Attachment 5 to document ICV lid components and hardware are satisfactory.

### **SIGN-OFF**

2.28 OCA Body Inspection and Cleaning

2.28.1 RCT, **IF** survey was **NOT** completed previously,  
**THEN** survey OCA body exterior and ICV body interior and record  
applicable data on Attachment 5.

### **SIGN-OFF**

2.28.2 Remove upper and lower main O-rings and set aside for cleaning  
and inspection.

2.28.3 Inspect OCA body for the following:

- Obvious punctures or tears
- Obvious cracks in exposed welds
- Dents or abnormal flat spots > ½ inch

- Abnormal scratches or gouges
- Burn out plugs (6) in place and intact
- Forklift pocket threaded inserts (8) intact
- Lock ring threaded inserts (6) intact
- Tears or excessive wear on ceramic fiber gasket
- Lock ring stop undamaged

2.28.4 Remove foreign material from the following:

- Test port and threads
- Vent port and threads
- Lock ring flange
- Sealing surfaces

2.28.5 Initial Attachment 5 to document OCA body inspection is satisfactory.

## **SIGN-OFF**

### 2.29 OCA Components Inspection and Cleaning

2.29.1 Clean and inspect the following for deformation, scratches, or burrs:

- OCV vent port cover and O-rings
- OCA vent port access plug
- OCV vent port plug and O-rings
- OCA test port access plug
- OCV test port plug and O-ring
- Lock ring bolts (6)

2.29.2 **IF** O-rings are damaged,  
**THEN GO TO** WI-CH.01, replace O-ring(s) and **RETURN TO**  
step 2.29.4.

2.29.3 Apply a light coat of vacuum grease to the following:

- OCV vent port plug threads and sealing O-ring
- OCV vent port cover threads and sealing O-ring
- OCV test port plug threads and O-ring

2.29.4 Verify annulus debris shield is intact and installed

2.29.5 Apply a light coat of nickel bearing lubricant to the following:

- OCA lock ring bolt threads (6)
- OCV test port access plug threads
- OCA vent port access plug threads

- 2.29.6 Clean upper and lower main O-rings and inspect for tears, nicks, flat spots or cracks.
- 2.29.7 **IF** O-rings are damaged, **THEN GO TO** WI-CH.02, replace O-ring(s) and **RETURN TO** step 2.29.9.
- 2.29.8 Lubricate upper and lower main O-rings with a light coat of vacuum grease.
- 2.29.9 Install upper and lower main O-rings.
- 2.29.10 Initial Attachment 5 to document OCA component and hardware inspections are satisfactory.

### **SIGN-OFF**

#### 2.30 ICV Body Inspection and Cleaning

- 2.30.1 Remove upper and lower main O-rings and set aside for cleaning and inspection.
- 2.30.2 Remove foreign material from the following:
- Test port threads
  - Vent port threads
  - O-ring grooves
  - Filter ports
  - Sealing surfaces
  - Lock ring flange
- 2.30.3 Inspect the following for deformation, scratches, or burrs:
- Upper and lower O-ring grooves
  - Vent port threads
  - Seal test port threads
  - Lock ring flange
  - Lower spacer installed with no tears in skin
  - Lower spacer fasteners installed
- 2.30.4 Initial Attachment 5 to document ICV body inspection is satisfactory.

### **SIGN-OFF**

## 2.31 ICV Components Inspection and Cleaning

2.31.1 Clean and inspect the following for deformation, scratches, or burrs:

- ICV vent port cover and seal
- ICV vent port outer plug and O-ring
- ICV vent port inner plug and O-ring
- ICV seal test port plug and O-ring
- ICV lock ring bolts (3)

2.31.2 **IF** O-rings are damaged,  
**THEN GO TO** WI-CH.01, replace O-ring(s) and **RETURN TO**  
step 2.31.4.

2.31.3 Apply a light coat of vacuum grease to the following:

- ICV vent port cover threads (and O-ring if installed)
- ICV outer vent port plug threads and O-ring
- ICV inner vent port plug threads and O-ring
- ICV seal test port plug threads and O-ring

2.31.4 Apply a light coat of nickel bearing lubricant to threads of ICV lock ring bolts (3).

2.31.5 Clean and inspect upper and lower main O-rings for tears, nicks, flat spots or cracks.

2.31.6 **IF** O-rings are damaged,  
**THEN GO TO** WI-CH.02, replace O-ring(s) and **RETURN TO**  
step 2.31.9.

2.31.7 Lubricate upper and lower main O-rings with a light coat of vacuum grease.

2.31.8 Install upper and lower main O-rings.

2.31.9 Initial Attachment 5 to document ICV components and hardware inspections are satisfactory.

## **SIGN-OFF**

### 2.32 ICV Cavity Inspection

2.32.1 Inspect ICV cavity for water by performing one of the following:

- Insert a rod through the hole in lower spacer assembly
- Visual inspection

**NOTE**

Disposal of absorbent material and water will be at direction of RCT.

2.32.2 **IF** water is inside ICV,  
**THEN** remove water as follows:

- Remove water through center hole of lower spacer assembly using wet/dry vacuum
- Attach absorbent material to rod and insert in hole in center of lower spacer assembly

2.32.3 **GO TO** step 3.1, perform Abnormal Operations and **RETURN TO** step 2.32.4.

2.32.4 Initial Attachment 5 to document ICV is free of water.

**SIGN-OFF**

2.32.5 Verify all preshipment inspections are complete.

**SIGN-OFF**

2.33 ICV Lid Installation

2.33.1 Match ICV lid and body serial numbers.

2.33.2 Record ICV serial number on Attachment 5.

**SIGN-OFF**

2.33.3 Attach ACGLF to crane.

**CAUTION**

Operator shall verify two ACGLF counterweights are at 180 degrees and 000 degrees **BEFORE** lifting ACGLF or lid.

2.33.4 Lower ACGLF legs into lifting pockets on ICV lid using crane.

2.33.5 Verify ACGLF legs are locked.

2.33.6 Align UNLOCKED arrows and install ICV lid onto ICV body using crane and ACGLF.

- 2.33.7 Install ICV vent port tool into ICV vent port.
- 2.33.8 Connect vacuum line to ICV vent port tool.
- 2.33.9 Start vacuum pump and evacuate to 3-in. Hg minimum.
- 2.33.10 Rotate ICV lock ring to LOCKED position.
- 2.33.11 Stop vacuum pump.
- 2.33.12 Disconnect vacuum line from vent port tool.
- 2.33.13 Remove ICV vent port tool.
- 2.33.14 Let ICV vent to atmosphere.
- 2.33.15 Install ICV inner vent port plug.
- 2.33.16 Torque ICV inner vent port plug to 55 to 65 lb-in.

**SIGN-OFF**

- 2.33.17 Install ICV outer vent port plug.
- 2.33.18 Torque ICV outer vent port plug to 55 to 65 lb-in.

**SIGN-OFF**

- 2.33.19 Install ICV seal test port plug.
- 2.33.20 Torque ICV seal test port plug to 55 to 65 lb-in.

**SIGN-OFF**

- 2.33.21 Install ICV vent port cover.
- 2.33.22 Torque ICV vent port cover to 55 to 65 lb-in.

**SIGN-OFF**

- 2.33.23 Install ICV locking ring bolts (3)
- 2.33.24 Torque each ICV locking ring bolt to 28 to 32 lb-ft.

**SIGN-OFF**

## 2.34 OCA Lid Installation

2.34.1 Match OCA lid and body serial numbers.

2.34.2 Record OCA serial number on Attachment 5.

### **SIGN-OFF**

2.34.3 Install OCV seal test port plug.

2.34.4 Torque OCV seal test port plug to 55 to 65 lb-in.

### **SIGN-OFF**

### **CAUTION**

Operator shall verify two ACGLF counterweights are at 180 degrees and 000 degrees **BEFORE** lifting ACGLF or lid.

2.34.5 Lower ACGLF legs into lifting pockets on OCA lid using crane.

2.34.6 Verify ACGLF legs are locked.

2.34.7 Install OCA lid onto OCA body.

2.34.8 Install OCV vent port tool into OCV vent port.

2.34.9 Connect vacuum line to OCV vent port tool.

2.34.10 Start vacuum pump and evacuate to 3-in. Hg minimum.

2.34.11 Rotate OCV lock ring to LOCKED position.

2.34.12 Stop vacuum pump.

2.34.13 Disconnect vacuum line from vent port tool.

2.34.14 Remove OCV vent port tool.

2.34.15 Let OCV vent to atmosphere.

2.34.16 Install OCV vent port plug.

2.34.17 Torque OCV vent port plug to 55 to 65 lb-in.

### **SIGN-OFF**

2.34.18 Install OCV vent port cover.

2.34.19 Torque OCV vent port cover to 55 to 65 lb-in.

**SIGN-OFF**

2.34.20 Install OCA seal test port thermal plug and access plug.

2.34.21 Torque OCA seal test port access plug to 35 to 45 lb-ft.

**SIGN-OFF**

2.34.22 Install OCA vent port thermal plug and access plug.

2.34.23 Torque OCA vent port access plug to 35 to 45 lb-ft.

**SIGN-OFF**

2.34.24 Install OCA lock ring bolts (6).

2.34.25 Torque each OCA lock ring bolt to 28 to 32 lb-ft.

**SIGN-OFF**

2.34.26 Install OCA lid lift pocket covers.

2.34.27 Verify preshipment preparations complete and unit is ready for transport.

**SIGN-OFF**

2.34.28 Supervisor, review/validate and sign Attachment 5.

**SIGN-OFF**

## 2.35 Installation of Packaging onto Transport Trailer

**NOTE**

When loading packaging(s) on trailer the following options may be used.  
Weight is not a factor for positioning until weight difference is  $\geq 2,000$  lb.

<i>TRAILER FRONT</i>	<i>*1. Heaviest</i>	<i>Medium</i>	<i>Lighter</i>	<i>TRAILER REAR</i>
	<i>2. Heaviest</i>	<i>Lighter</i>	<i>Medium</i>	
	<i>*3. Heaviest</i>	<i>Lighter</i>	<i>None</i>	
	<i>4. Lighter</i>	<i>Heaviest</i>	<i>None</i>	
	<i>5. Heaviest</i>	<i>None</i>	<i>None</i>	
<i>The asterisk indicates the preferred, but not mandatory method.</i>				

2.35.1 Record the following on Attachment 6:

- Shipment number
- Trailer number
- Packaging number(s)

**SIGN-OFF**

2.35.2 Verify trailer inspection is current.

2.35.3 Record trailer inspection date on Attachment 6.

**SIGN-OFF**

2.35.4 Inspect tie-downs for the following:

- Damage
- Defects

2.35.5 **IF** TRUPACT-II was removed for unloading operations,  
**THEN** perform the following:

- [ A ] Position transport trailer in designated area.
- [ B ] Lower trailer jacks (landing gear) ensuring trailer is level.
- [ C ] Install wheel chocks.
- [ D ] Install jack stands on free-standing trailers.

**CAUTION**

Tip-back may damage package exterior surface.

- [ E ] Transport packaging to transport trailer.
- [ F ] Load packaging designated for position #1 onto trailer with vent port on driver side of trailer.
- [ G ] If applicable, load packaging designated for position #2 onto trailer with vent port on driver side of trailer.
- [ H ] If applicable, load packaging designated for position #3 onto trailer with vent port on driver side of trailer.
- [ I ] Install four tie-down assemblies for each packaging loaded on trailer.
- [ J ] Install packaging forklift pocket access covers.

2.35.6 Record packaging serial number(s) and weights on Attachment 6.

**SIGN-OFF**

2.35.7 Record total weight of all loaded packaging as payload weight on Attachment 6.

**SIGN-OFF**

2.35.8 Verify shipment is in compliance with 49 CFR 172, Subpart D, Marking; Subpart E, Labeling; and Subpart F, Placarding.

**SIGN-OFF**

2.35.9 Complete information transfer to shipping documents as required for the specific shipment.

2.35.10 Verify shipping papers are in accordance with 49 CFR 172, Subpart C.

**SIGN-OFF**

2.35.11 Initial for trailer loading complete on Attachment 6.

**SIGN-OFF**

2.35.12 Supervisor, review/validate and sign data sheet.

### **SIGN-OFF**

## 3.0 ABNORMAL OPERATIONS

3.1 Empty ICV Assembly Removal - (if water found in ICV or annual maintenance only)

3.1.1 Verify ICV lid has been installed and locked.

3.1.2 Attach crane to ACGLF.

### **CAUTION**

Operator shall verify two ACGLF counterweights are at 180 degrees and 000 degrees respectively.

3.1.3 Lower ACGLF legs into lifting pockets of ICV lid using crane.

3.1.4 Verify ACGLF legs are locked.

3.1.5 If annulus foam ring is present, remove and set aside for later use.

3.1.6 Remove empty ICV assembly from OCV body using crane and ACGLF.

---

### **NOTE**

If required by site-specific policy to ensure personnel safety, RCT shall survey OCV interior for radiation/contamination **BEFORE** initiating OCV inspection process.

---

3.1.7 Inspect visually, **OR** swab for presence of water in bottom of OCV.

3.1.8 If free-standing water is **NOT** observed in bottom of OCV body, **GO TO** step 3.1.12.

**CAUTION**

Operator shall obtain protective clothing and equipment before entering OCV cavity. Operator also shall enter the OCV cavity using precautions to preclude damage to OCV body sealing flange.

- 3.1.9 Use wet/dry vacuum and/or absorbent materials to remove free-standing water.

**NOTE**

Cleaning and waste materials should be managed according to site waste management procedures.

- 3.1.10 Remove equipment and exit OCV cavity using precautions not to damage OCV body sealing flange.
- 3.1.11 Verify OCV is free of standing water.

**CAUTION**

Operator shall verify two ACGLF counterweights are at 180 degrees and 000 degrees respectively.

**NOTE**

When step 3.1.12 is complete, ICV vent port should be within one foot either way of OCV vent port.

- 3.1.12 Reinstall ICV assembly into OCV body using crane and ACGLF.
- 3.1.13 If annulus foam ring was removed in step 3.1.5, reinstall annulus foam ring.
- 3.2 Using Heat Guns
- 3.2.1 Heat ICV or OCV lid O-rings (as necessary) for up to 1 hour using heat guns.

**CAUTION**

Operator shall verify two ACGLF counterweights are at 180 degrees and 000 degrees respectively.

**CAUTION**

When lifting ICV lid, do **NOT** exceed 5,000-lb load cell reading when weight of ACGLF is zeroed out. Do **NOT** exceed 7,500-lb load cell reading when weight of ACGLF is included.

**CAUTION**

When lifting OCA lid, do **NOT** exceed 7,500-lb load cell reading when weight of ACGLF is zeroed out. Do **NOT** exceed 10,000-lb load cell reading when weight of ACGLF is included.

3.2.2 Attempt to raise lid using the slowest possible speed.

3.2.3 Raise lid as directed by RCT and **RETURN TO** normal operations.

### 3.3 Pressurizing with Nitrogen or Compressed Air

3.3.1 Obtain the following:

- Nitrogen bottle with  $\geq$  500-lb pressure or other air source capable of being regulated in 1-psi increments
- Pressure Assembly
- If not already installed, ICV/OCV vent port tools, as applicable.

3.3.2 Perform the following for compressed air or nitrogen:

[ A ] Assemble Pressure Assembly (see Figure 3.1, Flow Diagram for Nitrogen Bottle/Compressed Air ICV/OCA Lid Pressurization, for example of a pressure system).

[ B ] If not already installed, install vent port tool hand tight.

[ C ] Connect Pressure Assembly to quick disconnect on vent port tool.

[ D ] Close valve V-1.

[ E ] Close valve V-2.

[ F ] Close valve V-3.

[ G ] Verify supply valve is closed.

[ H ] Verify back pressure relief valve is fully backed off.

[ I ] Verify pressure regulator is fully backed off.

[ J ] Connect supply line and regulator to nitrogen-bottle or compressed air source.

[ K ] Adjust pressure slowly to 1 psi.

3.3.3 Verify counterweights are at 180 degrees and 000 degrees.

**WARNING**

The ICV or OCV should not be pressurized above 2 psi to avoid personnel injury. Do **NOT** pressurize a loaded ICV unless precautions are taken to prevent possible contamination when lid is raised.

**CAUTION**

When lifting ICV lid, do **NOT** exceed 5,000-lb load cell reading when weight of ACGLF is zeroed out. Do **NOT** exceed 7,500-lb load cell reading when weight of ACGLF is included.

**CAUTION**

When lifting OCA lid, do **NOT** exceed 7,500-lb load cell reading when weight of ACGLF is zeroed out. Do **NOT** exceed 10,000-lb load cell reading when weight of ACGLF is included.

- 3.3.4 Attempt to lift lid using crane at the slowest rate possible while monitoring load cell.
- 3.3.5 Perform the following while attempting to lift lid with crane:
  - [ A ] Open supply valve and adjust regulator to  $\leq 2$  psi.
  - [ B ] Adjust back pressure relief valve to relieve at 2.0 psi.
  - [ C ] Open valve V-2.
  - [ D ] Throttle valve V-3, keeping pressure  $\leq 2$  psi.
  - [ E ] When lid becomes loose, close V-3.
  - [ F ] Close supply valve.
  - [ G ] Open V-1 and V-3 to depressurize assembly.
  - [ H ] Disconnect pressure assembly from vent port tool.

[ I ] Disconnect vent port tool and survey tool if applicable.

[ J ] Disconnect supply line and regulator from nitrogen bottle or compressed air source.

3.3.6 Raise lid as directed by RCT **AND** continue with normal operations.

3.3.7 **IF** after pressurizing to 2 psi lid still does not lift,  
**THEN** contact the WIPP M&O Contractor CH Packaging  
Maintenance Engineer.

#### 3.4 Venting

---

##### **NOTE**

In the event a sealed package cannot be shipped within the time frame set forth in the TRUPACT-II or HalfPACT Packaging SAR, the package must be vented.

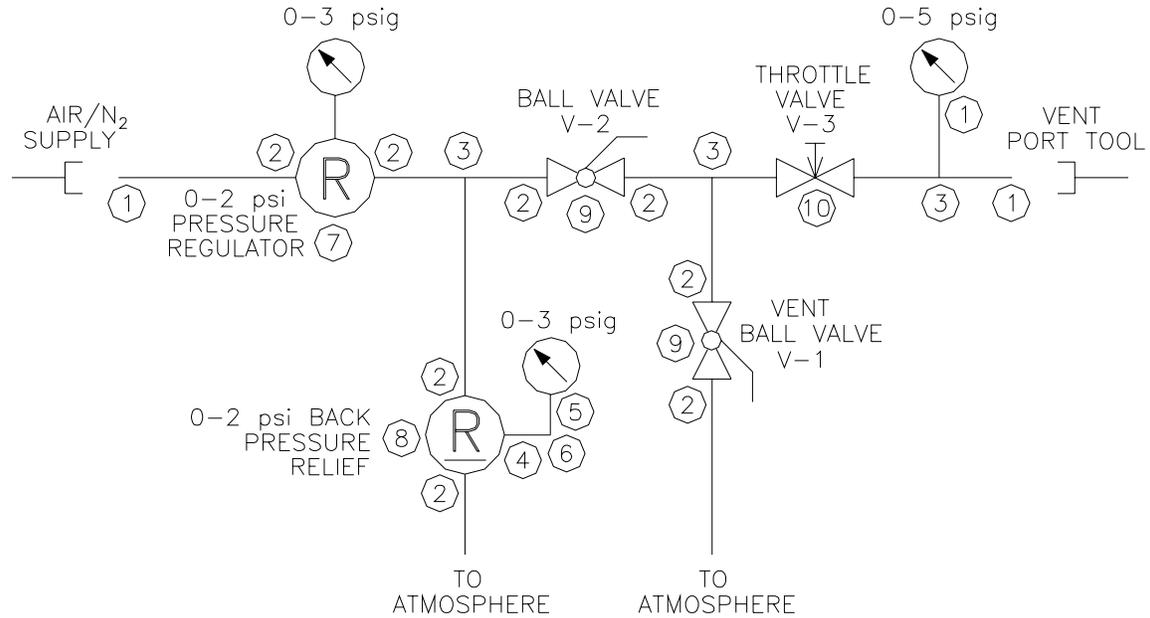
---

3.4.1 **IF** venting is required,  
**THEN** perform applicable steps 2.22 and 2.23.

3.4.2 Wait three minutes.

3.4.3 **GO TO** step 2.17, reinstall lids using steps 2.17 and 2.18.

Figure 3.1 - Flow Diagram for Nitrogen Bottle/Compressed Air ICV/OCA Lid Pressurization



ITEM #	DESCRIPTION
(1)	3/8" X 1/4" FEMALE STRAIGHT ADAPTER
(2)	3/8" X 3/8" MALE STRAIGHT ADAPTER
(3)	3/8" TEE CONNECTOR
(4)	1/4" MALE STRAIGHT ADAPTER
(5)	1/4" FEMALE STRAIGHT ADAPTER
(6)	1/4" 90° ELBOW ADAPTER
(7)	0-2 psi PRESSURE REGULATOR
(8)	0-2 psi BACK PRESSURE RELIEF
(9)	3/8" BALL VALVE
(10)	3/8" NEEDLE VALVE

## 4.0 PRESHIPMENT LEAKAGE RATE TESTING

### 4.1 Basic Information

4.1.1 Introduction - This procedure provides instructions for performing ICV and OCV preshipment leakage rate tests on the following packaging seals, using a nondestructive helium (He) leak test:

- ICV upper main O-ring seal
- ICV outer vent port plug O-ring seal
- OCV upper main O-ring seal
- OCV vent port plug O-ring seal

### 4.1.2 References

- U.S. Department of Energy, Safety Analysis Report for the TRUPACT-II Shipping Package
- U.S. Department of Energy, Safety Analysis Report for the HalfPACT Shipping Package
- DOE/WIPP 02-3183, CH Packaging Program Guidance
- DOE/WIPP 02-3185, CH Packaging Maintenance Manual
- ANSI N 14.5, 1997, Radioactive Materials Leakage Tests on Packages for Shipment
- ASNT, Recommended Practice No. SNT-TC-1A, June 1980
- WP 13-RP.01, Test Report for WP 13-QA1082 Procedure Qualification

### 4.1.3 Equipment

#### MEASURING AND TEST EQUIPMENT

- Varian 938-41 or 959 Helium Leak Detector with 7 to 14 cfm mechanical vacuum pump
- Roughing pump
- Helium leak standard for calibrating leak detector
- Pressure/vacuum gauge, 30-in. Hg to 30 psig
- Temperature measuring device

- Ambient atmospheric pressure measuring device
- Watch or stopwatch, digital or sweep second hand (no calibration required)
- Torque wrench with 55 to 65 lb-in range
- Torque wrench with 30 to 50 lb-ft range

#### SPECIAL TEST EQUIPMENT

- ICV/OCV vent port plug removal/pressure relief tools
- ICV/OCV vent port plug/cover removal and installation tools
- ICV/OCV seal leak check tools
- ICV/OCV leak detection tools
- Miscellaneous hardware and test connections

#### CONSUMABLE MATERIALS

- Welding grade helium (with certificate of conformance)
- Argon or nitrogen (purge gas)

#### 4.1.4 Precautions and Limitations

- The following leak test procedure may be used, or each user may develop and qualify a procedure in accordance with the guidelines of ANSI N14.5, 1997. Sites that opt to qualify their own leak test procedure must submit them to the WIPP M&O CH Packaging Maintenance Engineer for approval.
- Leak testing of CH packaging shall be performed by personnel qualified in accordance with the American Society for Nondestructive Testing Practice No. SNT-TC-1A, June 1980 edition and supplement.
- This procedure is qualified per WP 13-RP.01, Test Report for WP 13-QA1082 Procedure Qualification for the Varian 938-41 and 959 MSLD and test line configuration defined in that report. CH packaging users adopting this leak test must not deviate from the test configuration(s) used to qualify the procedure.
- The helium leak detector shall be calibrated to a minimum sensitivity of  $1.3 \times 10^{-7}$  standard cubic centimeters per second (scc/s) He.
- The leakage rate acceptance criteria of  $\leq 1.0 \times 10^{-7}$  scc/s of air equates to a leakage rate of  $\leq 2.6 \times 10^{-7}$  scc/s He. The He leakage rate is only valid for a component of  $\geq 4.4^\circ\text{C}$ . The

acceptable He leakage rate increases with temperature, but as a conservative measure, an acceptance criteria of  $\leq 2.6 \times 10^{-7}$  scc/s He will be used.

#### 4.1.5 Prerequisite Actions

- Verify air flow through leak check and leak detection tools.
- Verify packaging surface is free of contaminants that might mask a leak. The interior and exterior surfaces shall be dry.

### 4.2 ICV Upper Main O-Ring Seal

#### 4.2.1 Record the following on Attachment 7:

- ICV body serial number (S/N)
- ICV lid S/N
- Date of leak test
- Helium leak detector S/N and model
- Pressure/vacuum gauge S/N and calibration due date
- Thermometer S/N and calibration due date
- Torque wrench S/Ns and calibration due dates
- Standard leak S/N and calibration due date
- Barometer S/N and calibration due date

### **SIGN-OFF**

---

#### **NOTE**

Steps 4.2.15 through 4.2.19 may be performed in parallel with steps 4.2.2 through 4.2.14.

---

4.2.2 Measure ICV surface temperature.

4.2.3 If temperature is less than 4.4° C, stop test until surface temperature  $\geq 4.4^\circ$  C.

4.2.4 Record surface temperature on Attachment 7.

### **SIGN-OFF**

4.2.5 Verify outer vent port plug is retracted into ICV vent port plug removal/pressure relief tool.

4.2.6 Install ICV vent port tool into ICV vent port.

4.2.7 Attach vacuum pump assembly and He gas supply to vent port tool (see Figure 4.1).

- 4.2.8 Open isolation valve to vacuum pump.
- 4.2.9 Start vacuum pump.
- 4.2.10 Record ambient atmospheric pressure ( $P_{atm}$ ) on Attachment 7.

**SIGN-OFF**

- 4.2.11 Evacuate ICV vent port cavity to 90% vacuum (90% of atmospheric pressure) or better,  
**THEN** close isolation valve **AND** stop vacuum pump.
- 4.2.12 Record vacuum reading ( $V1$ ) on Attachment 7.

**SIGN-OFF**

- 4.2.13 Calculate He concentration correction factor (CCF) as follows:

$$CCF = \frac{P_{atm}}{V1}$$

- 4.2.14 Record CCF on Attachment 7.

**SIGN-OFF**

- 4.2.15 Perform pretest calibration of leak detector (to the temperature-corrected standard leak value) and record results on Attachment 7.

**SIGN-OFF**

- 4.2.16 Install ICV seal leak check tool in ICV seal test port.
- 4.2.17 Connect leak detector to ICV leak check tool (see Figure 4.1).
- 4.2.18 Verify isolation valve open.
- 4.2.19 Evacuate space between O-ring seals through ICV seal test port.

---

**NOTE**

To measure a  $\leq 2.6 \times 10^{-7}$  scc/s He leakage rate, the indicated He background will be allowed to stabilize at  $2.6 \times 10^{-7}$  scc/s He or less and remain below the limit for a minimum of 3 minutes.

---

- 4.2.20 Record He background (RB) on Attachment 7.

**SIGN-OFF**

- 4.2.21 Open He valve and backfill cavity with He to a pressure slightly greater than atmospheric pressure (+1 psi, -0 psi).
- 4.2.22 Close He valve.
- 4.2.23 Record backfill pressure reading on Attachment 7.

**SIGN-OFF**

- 4.2.24 Begin timing for 3-minute dwell time.
- 4.2.25 Monitor pressure gauge and add He as required to maintain He atmosphere in the cavity.

---

**NOTE**

A dwell time of 3 minutes will be used to determine leakage rate of ICV upper main O-ring seal.

---

- 4.2.26 Record measured leakage rate (RT) after 3-minute dwell time on Attachment 7.

**SIGN-OFF**

---

**NOTE**

Steps 4.3.1 through 4.3.6 may be performed in parallel with steps 4.2.27 through 4.2.37.

---

- 4.2.27 Remove test assembly from leak detector.
- 4.2.28 Install calibrated leak to leak detector.
- 4.2.29 Perform post-test calibration of leak detector and record results on Attachment 7.

**SIGN-OFF**

---

**NOTE**

If the background reading (RB) is larger than the leak rate reading (RT), then the background reading will not be subtracted from the leak rate reading and this (RT) becomes the actual leakage rate reading.

---

- 4.2.30 If there is no difference in the post-test calibration from the pretest calibration, use the following equation: subtract the He background at the start of test (RB) from the He background at end of test (RT). The leakage rate is  $(RT - RB) \times CCF$ . This equals the leakage rate for this segment of the test.

- 4.2.31 If post-test calibration is less than pretest calibration, use the following calculation:  $(RT + \text{calibration difference} - RB) \times CCF$ . This equals the leakage rate for this segment of the test under this condition of recalibration.
- 4.2.32 If post-test calibration is more than pretest calibration, use the following calculation:  $(RT - \text{calibration difference} - RB) \times CCF$ . This equals the leakage rate for this segment of the test under this condition of recalibration.
- 4.2.33 If the acceptance criterion is satisfied ( $\leq 2.6 \times 10^{-7}$  scc/s of He), this segment of the test procedure is complete.

---

**NOTE**

The leakage rate acceptance criterion is  $\leq 2.6 \times 10^{-7}$  scc/s He.

---

- 4.2.34 **IF** ICV upper main O-ring seal leakage rate is  $> 2.6 \times 10^{-7}$  scc/s He, **THEN** perform the following:
- [ A ] Isolate leak path.
  - [ B ] **GO TO** WI-CH.02, replace O-ring seal(s) and/or repair seal surface(s) per WI-CH.12; repeat leak test.
  - [ C ] If after repeated testing it is apparent the seal cannot pass the test, prepare nonconformance report (NCR) and record on Attachment 7.

**SIGN-OFF**

- 4.2.35 Remove ICV seal leak check tool and associated leak test equipment from ICV seal test port.
- 4.2.36 Install ICV seal test port plug.
- 4.2.37 Torque ICV seal test port plug to 55 to 65 lb-in and record on Attachment 7.

**SIGN-OFF**

### 4.3 ICV Outer Vent Port Plug O-Ring Seal

---

#### **NOTE**

The following test should be performed immediately after Section 4.2 while the He atmosphere is still present in the ICV vent port cavity and to minimize He saturation of O-rings before test completion.

---

- 4.3.1 Disconnect vacuum pump assembly and He supply from ICV vent port tool.
- 4.3.2 Install ICV outer vent port plug.
- 4.3.3 Remove vent port tool.
- 4.3.4 Torque ICV outer vent port plug to 55 to 65 lb-in and record on Attachment 7.

#### **SIGN-OFF**

- 4.3.5 Purge vent port to flush out residual helium.
  - 4.3.6 Install a clean (helium-free) ICV leak detection tool in ICV vent port.
- 

#### **NOTE**

If step 4.3.7 begins within 1 hour of completing the ICV upper main O-ring seal leak test, **THEN** the pretest calibration is not required. The post-test calibration result can be used for the ICV outer vent port plug O-ring seal pretest calibration.

---

- 4.3.7 Perform pretest calibration of leak detector (to the temperature-corrected standard leak value).
- 4.3.8 Record pretest calibration results on Attachment 7.

#### **SIGN-OFF**

- 4.3.9 Connect leak detector to ICV leak detection tool (see Figure 4.2).
- 4.3.10 Verify isolation valve is **OPEN**.
- 4.3.11 Evacuate ICV leak detection tool.

**NOTE**

To measure a  $\leq 2.6 \times 10^{-7}$  scc/s He leakage rate with a He atmosphere already present, indicated He background will be  $\leq 2.6 \times 10^{-7}$  scc/s He **BEFORE** the start of the dwell time.

Dwell time for ICV vent port plug O-ring seal test is 3 minutes. An initial indication does **NOT** necessarily indicate a leak. Some residual He may still be detected.

- 4.3.12 Record measured leakage rate (RT) after 3-minute dwell time on Attachment 7.

**SIGN-OFF**

- 4.3.13 Remove test assembly from leak detector.
- 4.3.14 Install calibrated leak to leak detector.
- 4.3.15 Perform post-test calibration of leak detector and record results on Attachment 7.

**SIGN-OFF**

- 4.3.16 Calculate ICV vent port plug O-ring seal leakage rate as follows:
- 4.3.17 If there is no difference in the post-test calibration from the pretest calibration, the He background at end of test (RT) x CCF equals the leakage rate for this segment of the test.
- 4.3.18 If post-test calibration is less than pretest calibration, use the following calculation: (RT + calibration difference) x CCF. This equals the leakage rate for this segment of the test under this condition of recalibration.
- 4.3.19 If post-test calibration is more than pretest calibration, use the following calculation: (RT - calibration difference) x CCF. This equals the leakage rate for this segment of the test under this condition of recalibration.
- 4.3.20 If the acceptance criterion is satisfied ( $\leq 2.6 \times 10^{-7}$  scc/s of He), this segment of the test procedure is complete.

**NOTE**

The leakage rate acceptance criterion is  $\leq 2.6 \times 10^{-7}$  scc/s He.

4.3.21 **IF** ICV outer vent port plug O-ring seal leakage rate is  $> 2.6 \times 10^{-7}$  scc/s He,  
**THEN** perform the following:

[ A ] Isolate leak path.

[ B ] **GO TO** WI-CH.01, replace O-ring seal(s) and/or repair seal surface(s) per WI-CH.12, repeat leak test.

[ C ] If after repeated testing it is apparent the seal cannot pass test, prepare NCR and record on Attachment 7.

**SIGN-OFF**

4.3.22 Remove ICV leak detection tool from ICV vent port.

4.3.23 Install ICV vent port cover.

4.3.24 Torque ICV vent port cover to 55 to 65 lb-in.

**SIGN-OFF**

4.3.25 **RETURN TO** step 2.18.

4.4 OCV Upper Main O-Ring Seal

4.4.1 Record the following on Attachment 8:

- OCV body S/N
- OCV lid S/N
- Date of leak test
- Helium leak detector S/N and model
- Pressure/vacuum gauge S/N and calibration due date
- Thermometer S/N and calibration due date
- Torque wrench S/Ns and calibration due dates
- Standard leak S/N and calibration due date
- Barometer S/N and calibration due date

**SIGN-OFF**

**NOTE**

Steps 4.4.12 through 4.4.17 may be performed in parallel with steps 4.4.2 through 4.4.11.

4.4.2 Measure OCV surface temperature and record on Attachment 8.

**SIGN-OFF**

4.4.3 If temperature is less than 4.4° C, stop test until surface temperature  $\geq 4.4^{\circ}$  C.

4.4.4 Attach vacuum pump assembly and He gas supply to vent port tool (see Figure 4.3).

4.4.5 Open isolation valve to vacuum pump.

4.4.6 Start vacuum pump

4.4.7 Record ambient atmospheric pressure ( $P_{atm}$ ) on Attachment 8.

**SIGN-OFF**

4.4.8 Evacuate OCV cavity to 90% vacuum (90% of atmospheric pressure) or better, **THEN** close isolation valve **AND** stop vacuum pump.

4.4.9 Record vacuum reading ( $V_1$ ) on Attachment 8.

**SIGN-OFF**

4.4.10 Calculate He concentration correction factor as follows:

$$CCF = \frac{P_{atm}}{V_1}$$

4.4.11 Record CCF on Attachment 8.

**SIGN-OFF**

4.4.12 Perform pretest calibration of leak detector (to the temperature-corrected standard leak value).

4.4.13 Record pretest calibration results on Attachment 8.

**SIGN-OFF**

4.4.14 Install OCV seal leak check tool in OCV seal test port.

- 4.4.15 Connect leak detector to OCV leak check tool (see Figure 4.3).
- 4.4.16 Verify isolation valve open.
- 4.4.17 Evacuate space between O-ring seals through OCV seal test port.

---

**NOTE**

To measure a  $2.6 \times 10^{-7}$  scc/s He leakage rate, the indicated He background will be allowed to stabilize at  $\leq 2.6 \times 10^{-7}$  scc/s He and remain below the limit for a minimum of 3 minutes.

---

- 4.4.18 Record He background (RB) on Attachment 8.

**SIGN-OFF**

- 4.4.19 Open He valve and backfill OCV cavity with He to a pressure slightly greater than atmospheric pressure (+1 psi, -0 psi).
- 4.4.20 Close He valve.
- 4.4.21 Record backfill pressure reading on Attachment 8.

**SIGN-OFF**

- 4.4.22 Begin timing for 3-minute dwell time.
- 4.4.23 Monitor pressure gauge and add He as required to maintain He atmosphere in the cavity.

---

**NOTE**

A dwell time of 3 minutes will be used to determine leakage rate of OCV upper main O-ring seal.

---

- 4.4.24 Record measured leakage rate (RT) after 3-minute dwell time on Attachment 8.

**SIGN-OFF**

---

**NOTE**

Steps 4.5.1 through 4.5.6 may be performed in parallel with steps 4.4.25 through 4.4.36.

---

- 4.4.25 Remove test assembly from leak detector.
- 4.4.26 Install calibrated leak to leak detector.

- 4.4.27 Perform post-test calibration of leak detector and record results on Attachment 8.

### **SIGN-OFF**

- 4.4.28 Calculate OCV main O-ring seal leakage rate as follows:

---

#### **NOTE**

If the background reading (RB) is larger than the leak rate reading (RT), then the background reading will not be subtracted from the leak rate reading and this (RT) becomes the actual leakage rate reading.

---

- 4.4.29 If there is no difference in the post-test calibration from the pretest calibration, use the following equation: subtract the He background at the start of test (RB) from the He background at end of test (RT). The leakage rate is  $(RT - RB) \times CCF$ . This equals the leakage rate for this segment of the test.
- 4.4.30 If post-test calibration is less than pretest calibration, use the following calculation:  $(RT + \text{calibration difference} - RB) \times CCF$ . This equals the leakage rate for this segment of the test under this condition of recalibration.
- 4.4.31 If post-test calibration is more than pretest calibration, use the following calculation:  $(RT - \text{calibration difference} - RB) \times CCF$ . This equals the leakage rate for this segment of the test under this condition of recalibration.
- 4.4.32 If acceptance criterion is satisfied ( $\leq 2.6 \times 10^{-7}$  scc/s of He), this segment of the test procedure is complete.

---

#### **NOTE**

The leakage rate acceptance criterion is  $\leq 2.6 \times 10^{-7}$  scc/s He.

---

- 4.4.33 **IF** OCV main O-ring seal leakage rate is  $> 2.6 \times 10^{-7}$  scc/s He, **THEN** perform the following:
- [ A ] Isolate leak path.
  - [ B ] **GO TO** WI-CH.02, replace O-ring seal(s) and/or repair seal surface(s) per WI-CH.12, and repeat leak test.
  - [ C ] If after repeated testing it is apparent the seal cannot pass test, prepare NCR and record on Attachment 8.

### **SIGN-OFF**

- 4.4.34 Remove OCV seal leak check tool and associated leak test equipment from OCV seal test port.
- 4.4.35 Install OCV seal test port plug.
- 4.4.36 Torque OCV seal test port plug to 55 to 65 lb-in and record on Attachment 8.

**SIGN-OFF**

## 4.5 OCV Vent Port Plug O-Ring Seal

---

**NOTE**

The following test should be performed immediately after Section 4.4, while the He atmosphere is still present in the OCV cavity and to minimize He saturation of the O-rings before test completion.

---

- 4.5.1 Disconnect vacuum pump assembly and He supply from OCV vent port tool.
- 4.5.2 Install OCV vent port plug.
- 4.5.3 Remove vent port tool.
- 4.5.4 Torque OCV vent port plug to 55 to 65 lb-in. and record on Attachment 8.

**SIGN-OFF**

- 4.5.5 Purge vent port to flush out residual helium.
- 4.5.6 Install a clean (helium-free) OCV leak detection tool in OCV vent port.

---

**NOTE**

If step 4.5.7 begins within 1 hour of completing the OCV upper main O-ring seal leak test, **THEN** the pretest calibration is not required. The post-test calibration result can be used for the OCV outer vent port plug O-ring seal pretest calibration.

---

- 4.5.7 Perform pretest calibration of leak detector (to the temperature-corrected standard leak value).
- 4.5.8 Record pretest calibration results on Attachment 8.

**SIGN-OFF**

- 4.5.9 Connect leak detector to OCV leak detection tool (see Figure 4.4).
- 4.5.10 Verify isolation valve is **OPEN**.
- 4.5.11 Evacuate OCV leak detection tool.

---

**NOTE**

To measure a  $\leq 2.6 \times 10^{-7}$  scc/s He leakage rate with a He atmosphere already present, the indicated He background will be  $\leq 2.6 \times 10^{-7}$  scc/s He before the start of the dwell time.

Dwell time for OCV vent port plug O-ring seal test is 3 minutes. An initial indication does **NOT** necessarily indicate a leak. Some residual He may still be detected.

---

- 4.5.12 Record measured leakage rate (RT) after 3-minute dwell time on Attachment 8.

**SIGN-OFF**

- 4.5.13 Remove test assembly from leak detector.
- 4.5.14 Install calibrated leak to leak detector.
- 4.5.15 Perform post-test calibration of leak detector and record results on Attachment 8.

**SIGN-OFF**

- 4.5.16 Calculate OCV vent port plug O-ring seal leakage rate as follows:
- 4.5.17 If there is no difference in the post-test calibration from the pretest calibration, the He background at end of test (RT) x CCF equals the leakage rate for this segment of the test.
- 4.5.18 If post-test calibration is less than pretest calibration, use the following calculation: (RT + calibration difference) x CCF. This equals the leakage rate for this segment of the test under this condition of recalibration.
- 4.5.19 If post-test calibration is more than pretest calibration, use the following calculation: (RT - calibration difference) x CCF. This equals the leakage rate for this segment of the test under this condition of recalibration.
- 4.5.20 If acceptance criterion is satisfied ( $\leq 2.6 \times 10^{-7}$  scc/s of He), this segment of the test procedure is complete.

**NOTE**

The leakage rate acceptance criterion is  $\leq 2.6 \times 10^{-7}$  scc/s He.

- 4.5.21 **IF** OCV vent port plug O-ring seal leakage rate is  $> 2.6 \times 10^{-7}$  scc/s He,  
**THEN** perform the following:
- [ A ] Isolate leak path.
  - [ B ] **GO TO** WI-CH.01, replace O-ring seal(s) and/or repair seal surface(s) per WI-CH.12, and repeat leak test.
  - [ C ] If after repeated testing it is apparent the seal cannot pass test, prepare an NCR and record on Attachment 8.

**SIGN-OFF**

- 4.5.22 Remove OCV leak detection tool from OCV vent port.
- 4.5.23 Install OCV vent port cover.
- 4.5.24 Torque OCV vent port cover to 55 to 65 lb-in. and record on Attachment 8.

**SIGN-OFF**

- 4.5.25 Install OCV seal test port thermal plug and access plug.
- 4.5.26 Torque OCV seal test port access plug to 35 to 45 lb-ft and record on Attachment 8.

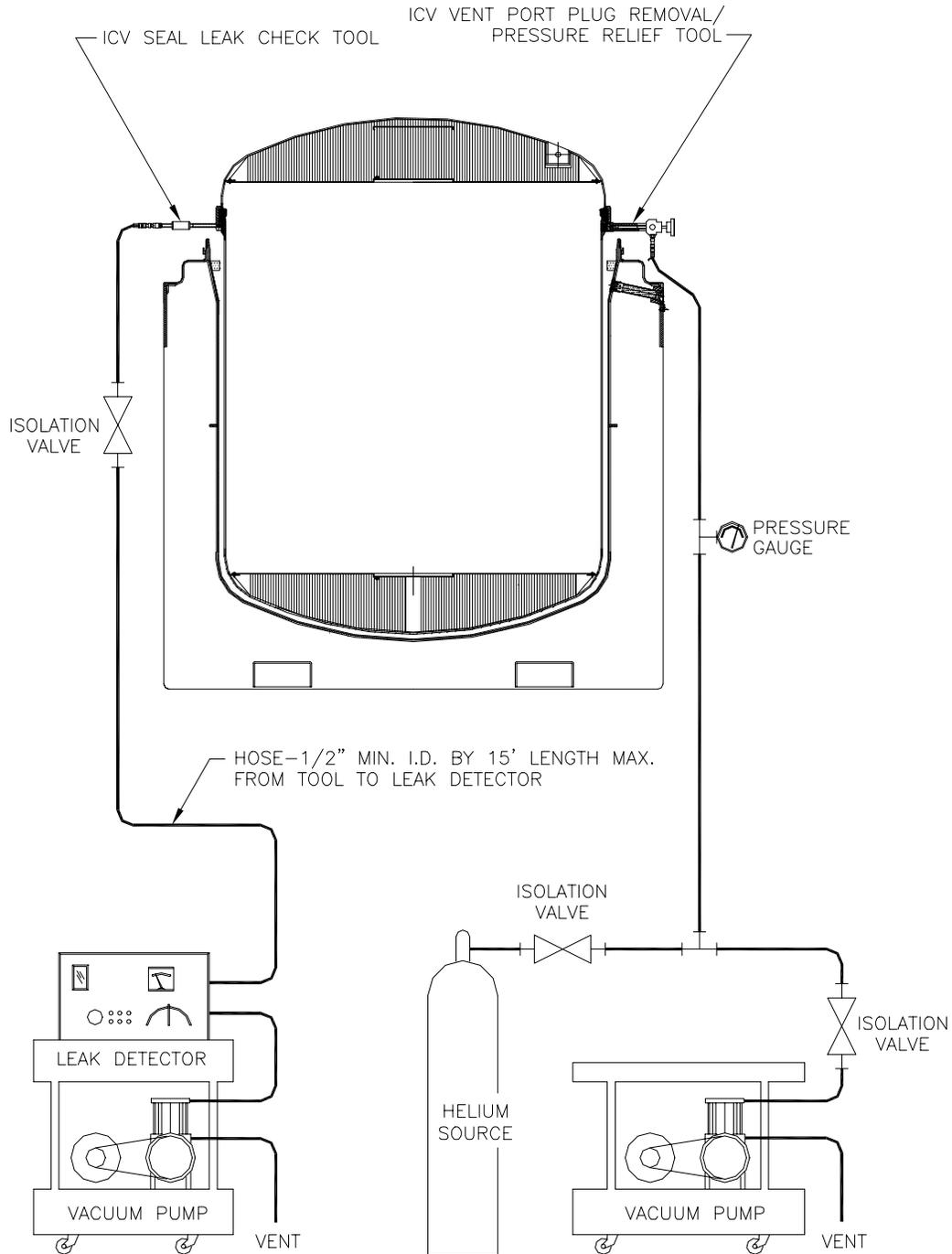
**SIGN-OFF**

- 4.5.27 Install OCV vent port thermal plug and access plug.
- 4.5.28 Torque OCV vent port access plug to 35 to 45 lb-ft and record on Attachment 8.

**SIGN-OFF**

- 4.5.29 **RETURN TO** step 2.18.17.

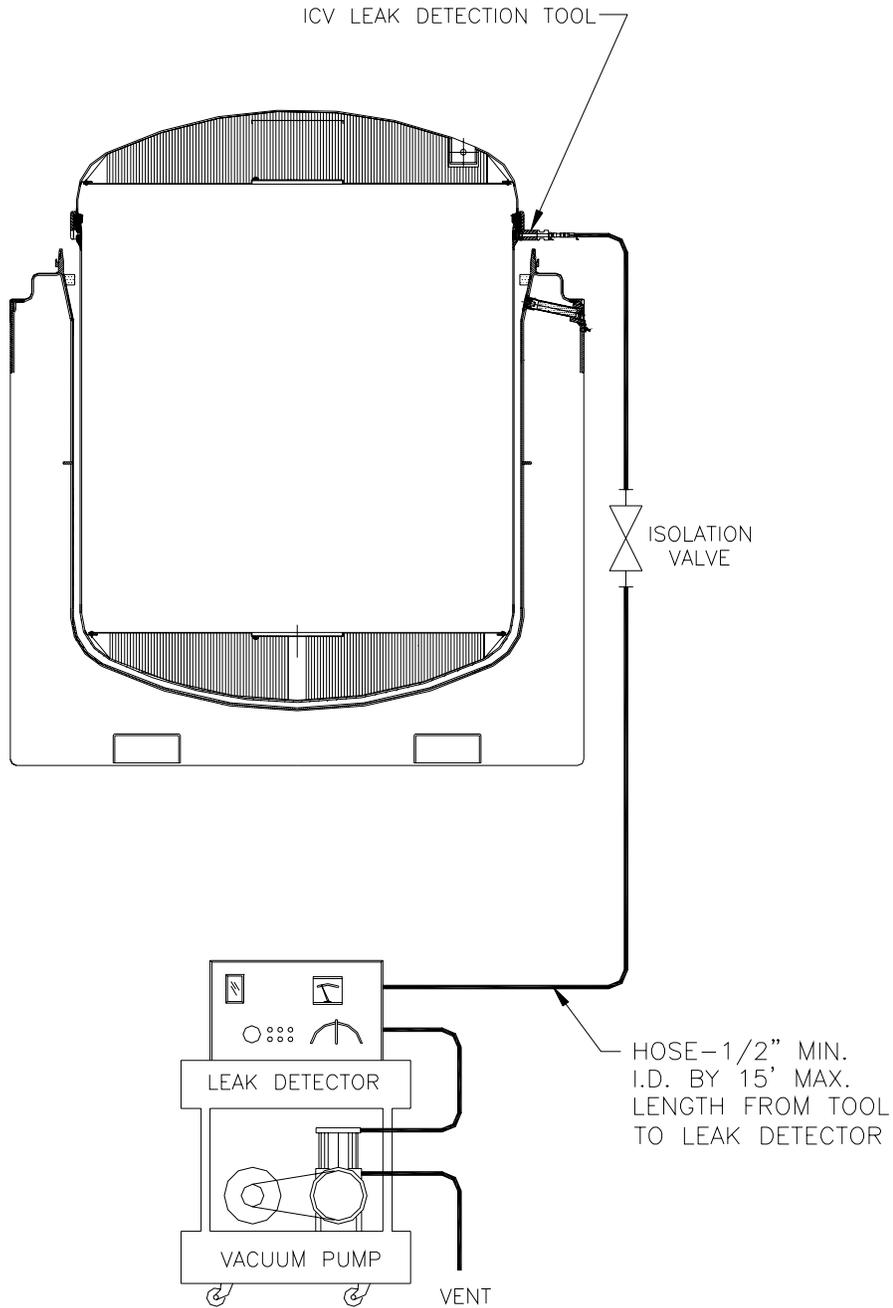
Figure 4.1 - ICV Main O-Ring Seal Test



NOT TO SCALE

NOTE: MINIMUM REQUIRED  
EQUIPMENT SHOWN

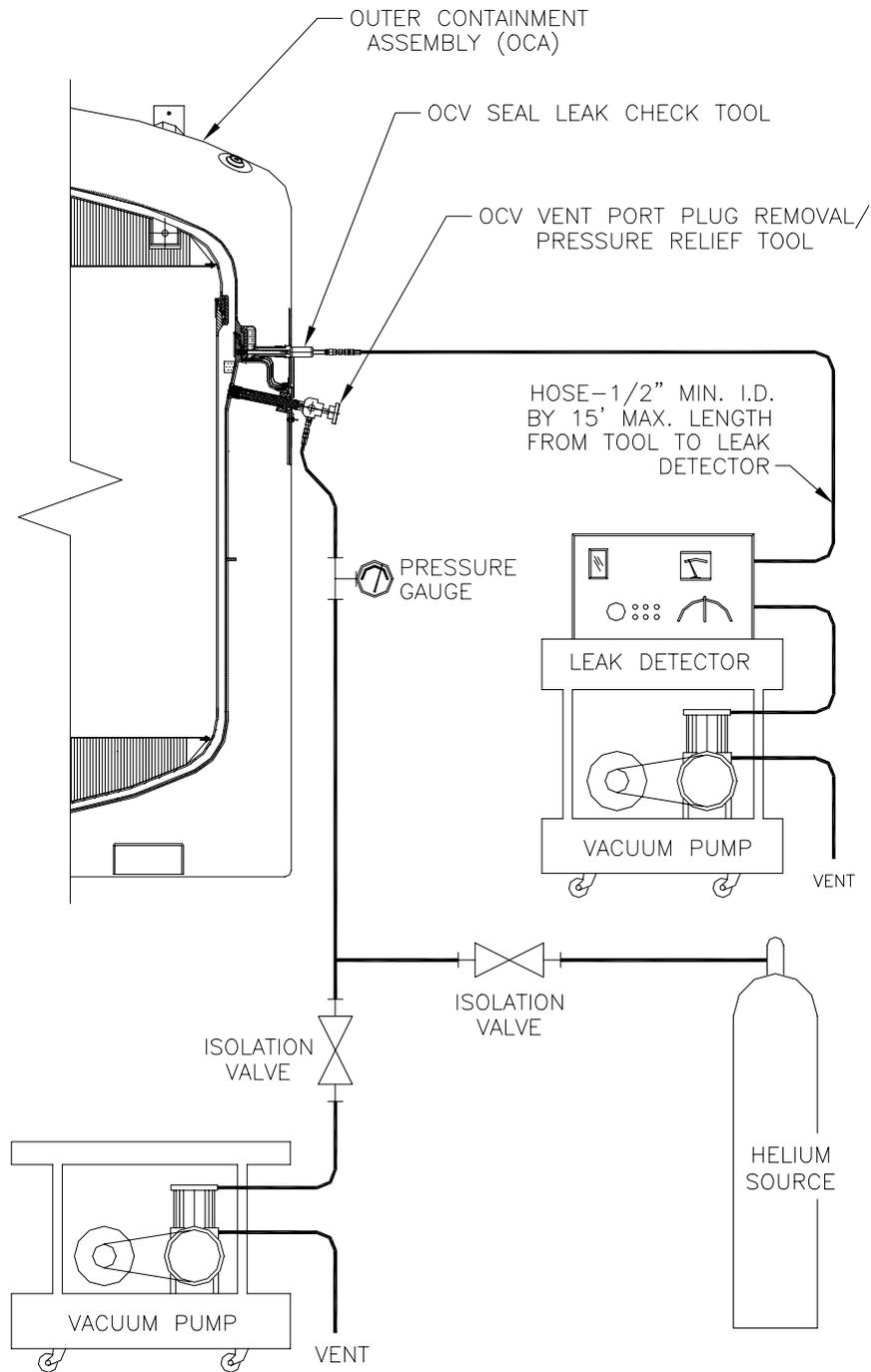
Figure 4.2 - ICV Outer Vent Port Plug O-Ring Seal Test



NOT TO SCALE

NOTE: MINIMUM REQUIRED EQUIPMENT SHOWN

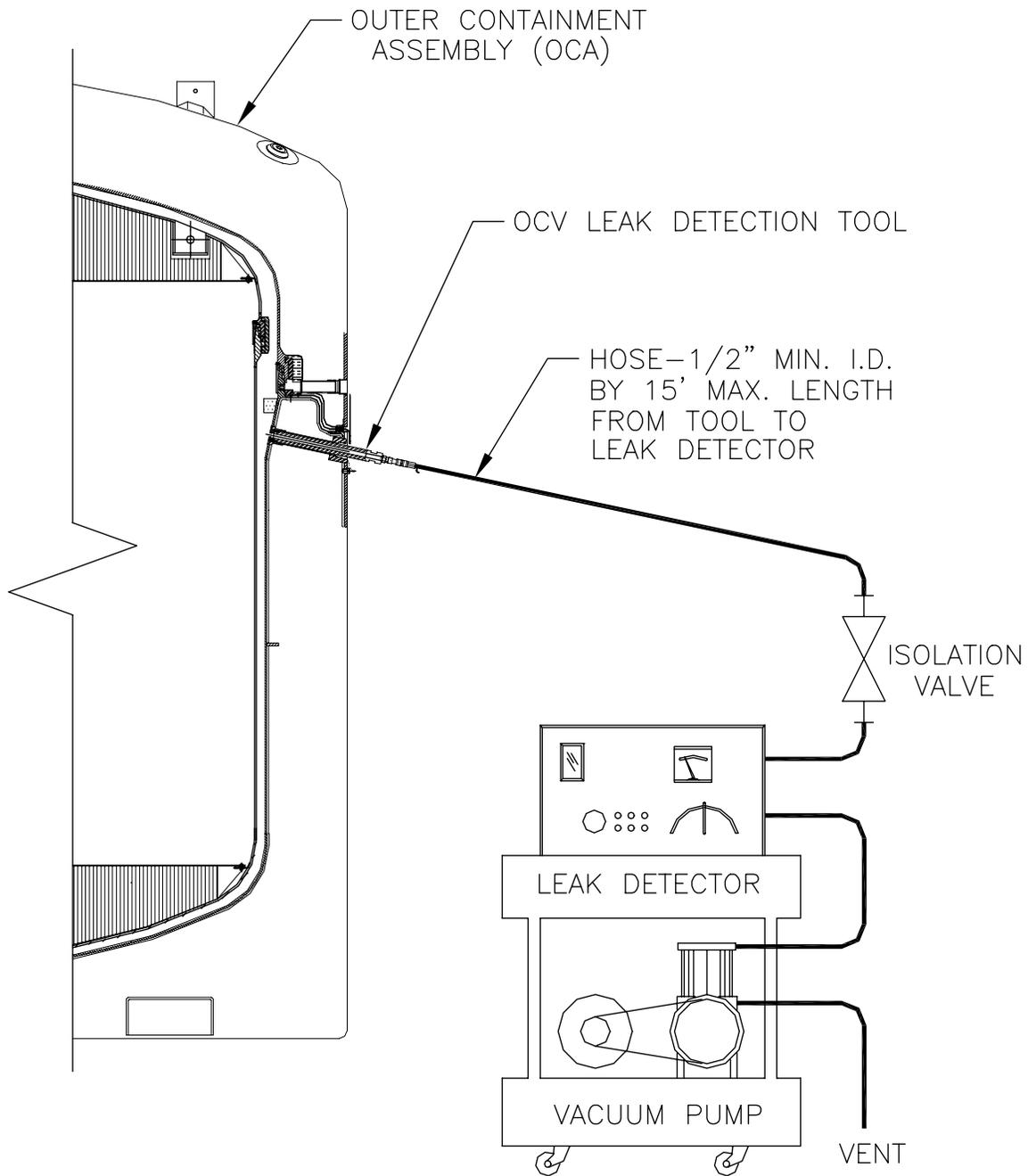
Figure 4.3 - OCV Main O-Ring Seal Test



NOT TO SCALE

NOTE: MINIMUM REQUIRED EQUIPMENT SHOWN

Figure 4.4 - OCV Vent Port Plug O-Ring Seal Test



NOT TO SCALE

NOTE: 1. MINIMUM REQUIRED EQUIPMENT SHOWN

Attachment 1 - CH Packaging Receipt and Inspection Data Sheet

CH Packaging Receipt and Inspection Data Sheet		
STEP(S)	DESCRIPTION	INITIALS
Facility: _____ Date: _____		
2.2.1	OCA serial No: _____	
PERFORMANCE		
2.2.2	Shipping documents validated, packaging undamaged and released, and nameplate checked	
2.2.3	Maintenance labels are present and maintenance is current	
2.7.1	Activity on smears is below DOT acceptable limits Survey No: _____ Survey Date: _____	
2.7.4	OCA lid components and hardware satisfactory	
2.8.1	Activity on smears is below DOT acceptable limits Survey No: _____ Survey Date: _____	
2.8.7	ICV lid components and hardware satisfactory	
2.9.1	Activity on smears is below DOT acceptable limits Survey No: _____ Survey Date: _____	
2.9.5	OCA body inspection satisfactory	
2.10.10	OCA components and hardware satisfactory	
2.11.4	ICV body inspection satisfactory	
2.12.9	ICV components and hardware satisfactory	
2.13.4	ICV free of water	
2.14	Pre-loading preparations and inspections complete	

Performers, enter printed name, signature, date and initials:

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Printed Name	Signature	Date	Initials

REMARKS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

REVIEW/VALIDATIONS: \_\_\_\_\_  
 Supervisor: (Print Name) Signature Date

Attachment 2 - CH Packaging Loading Data Sheet

CH Packaging Loading Data Sheet		
STEP(S)	DESCRIPTION	INITIALS
Facility: _____ Date: _____		
2.16.1	OCA S/N: _____	
PERFORMANCE		
2.16.2	Payload assembled in accordance with TRAMPAC	
2.16.8	Payload assembly weight: _____	
2.16.10	Empty packaging weight: _____	
2.16.11	Loaded package total weight: _____ <b>Not to exceed: (19,250-lb - TRUPACT-II or 18,100-lb - HalfPACT)</b>	
2.17.1	ICV serial number _____	
2.17.2	Torque wrench S/N: _____ Due: _____ Torque wrench S/N: _____ Due: _____	
2.17.15	ICV inner vent port plug at specified value	
2.17.17	ICV lock ring bolts at specified values	
2.17.18	ICV preshipment leakage rate test performed	
2.18.2	OCA S/N: _____	
2.18.15	OCA lock ring bolts at specified values	
2.18.16	OCV preshipment leakage rate test performed	
2.18.19	Tamper indicating security seals installed and numbers recorded Seal No: _____ Seal Date: _____ Seal No: _____ Seal Date: _____	

Performers, enter printed name, signature, date and initials:

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Printed Name	Signature	Date	Initials

REMARKS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

REVIEW/VALIDATIONS: \_\_\_\_\_

Supervisor: (Print Name) \_\_\_\_\_ Signature \_\_\_\_\_ Date \_\_\_\_\_

Attachment 3 - Loaded CH Package Trailer Data Sheet

Loaded CH Package Trailer Data Sheet		
STEP(S)	DESCRIPTION	Initials
Facility: _____ Date: _____		
PERFORMANCE		
2.19.1	Shipment No. _____	
	Trailer No. _____	
	Package Nos.: _____	
2.19.3	Trailer Inspection Date: _____	
2.19.6	Position # 1 package S/N: _____ Weight: _____ lb.	
	Position # 2 package S/N: _____ Weight: _____ lb.	
	Position # 3 package S/N: _____ Weight: _____ lb.	
2.19.7	Payload weight: _____	
2.19.8	Shipment complies with 49 CFR 172, Subparts D, E, and F	
2.19.10	Shipping papers are in accordance with 49 CFR 172, Subpart C	
2.19.11	Trailer loading complete	

Performers, enter printed name, signature, date and initials:

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Printed Name	Signature	Date	Initials

REMARKS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

REVIEW/VALIDATIONS: \_\_\_\_\_

Supervisor: (Print Name) \_\_\_\_\_ Signature \_\_\_\_\_ Date \_\_\_\_\_

Attachment 4 - Loaded Package Receipt and Processing Data Sheet

Loaded Package Receipt and Processing Data Sheet		
STEP(S)	DESCRIPTION	Initials
Facility: _____		Date: _____
PERFORMANCE		
2.20.1	OCA S/N: _____	
2.20.2	Shipping documents validated, package undamaged and released	
2.20.3	Package external survey complete and below DOT acceptable limits	
2.22.19	Activity on smears at or below acceptable limits	
2.23.13	Activity on smears at or below acceptable limits	
2.23.17	Activity on smears at or below acceptable limits	
2.24.8	Payload inspected for damage	
2.24.9	Activity on smears at or below acceptable limits	

Performers, enter printed name, signature, date and initials:

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Printed Name	Signature	Date	Initials

REMARKS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

REVIEW/VALIDATIONS: \_\_\_\_\_

Supervisor: (Print Name) \_\_\_\_\_ Signature \_\_\_\_\_ Date \_\_\_\_\_

## Attachment 5 - Empty Packaging Shipment Data Sheet

Empty Packaging Shipment Data Sheet		
STEP(S)	DESCRIPTION	Initials
Facility: _____ Date: _____		
PERFORMANCE		
2.25.1	OCA S/N: _____	
2.25.2	Torque wrench S/N: _____ Due: _____ Torque wrench S/N: _____ Due: _____	
2.25.3	Packaging maintenance is current	
2.26.1	OCA lid interior and exterior survey complete and below DOT acceptable limits: Survey No: _____ Survey Date: _____	
2.26.5	OCA lid components and hardware satisfactory	
2.27.1	ICV lid interior and exterior survey complete and below DOT acceptable limits: Survey No: _____ Survey Date: _____	
2.27.7	ICV lid components and hardware satisfactory	
2.28.1	OCA body exterior and ICV body interior surveys complete and below DOT acceptable limits. Survey No: _____ Survey Date: _____	
2.28.5	OCA body inspection satisfactory	
2.29.10	OCA components and hardware satisfactory	
2.30.4	ICV body inspection satisfactory	
2.31.9	ICV components and hardware satisfactory	
2.32.4	ICV free of water	
2.32.5	Preshipment inspections complete	
2.33.2	ICV serial number: _____	
2.33.16	ICV inner vent port plug at 55 to 65 lb-in.	
2.33.18	ICV outer vent port plug at 55 to 65 lb-in.	
2.33.20	ICV seal test port plug at 55 to 65 lb-in.	
2.33.22	ICV vent port cover at 55 to 65 lb-in.	
2.33.24	Each ICV locking ring bolt at 28 to 32 lb-ft	
2.34.2	OCA serial number: _____	
2.34.4	OCV seal test port plug at 55 to 65 lb-in.	
2.34.17	OCV vent port plug at 55 to 65 lb-in.	
2.34.19	OCV vent port cover at 55 to 65 lb-in.	
2.34.21	OCA seal test port access plug at 35 to 45 lb-ft	
2.34.23	OCA vent port access plug at 35 to 45 lb-ft	

Attachment 5 - Empty Packaging Shipment Data Sheet

2.34.25	OCA lock ring bolt at 28 to 32 lb-ft	
2.34.27	Preshipment preparations complete, unit ready for transport	

Performers, enter printed name, signature, date and initials:

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Printed Name	Signature	Date	Initials
--------------	-----------	------	----------

REMARKS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

REVIEW/VALIDATIONS:

_____	_____	_____
Supervisor: (Print Name)	Signature	Date



## Attachment 7 - ICV Preshipment Leakage-Rate Test Data Sheet

Basic Data:	
4.2.1	ICV body S/N: _____ ICV lid S/N: _____ Date: _____ MSLD model: _____ S/N: _____ Vacuum/pressure gauge S/N: _____ Due: _____ Thermometer S/N: _____ Due: _____ Torque wrench S/N: _____ Due: _____ Torque wrench S/N: _____ Due: _____ Calibrated leak S/N: _____ Due: _____ Barometer S/N: _____ Due: _____
4.2.4	ICV surface temperature: _____ °C
Concentration Correction Factor Data:	
4.2.10	Ambient atmospheric pressure _____ in. Hg (Patm)
4.2.12	Vacuum reading _____ in. Hg (V1)
4.2.14	Concentration Correction Factor (CCF) = $Patm/V1$ _____
Pretest Calibration for ICV Main O-Ring Seal Test:	
4.2.15	Leak rate of standard leak _____ scc/s Temperature at time of calibration _____ °C Temperature adjusted leak rate used to calibrate leak detector _____ scc/s Zero reading at time of calibration _____ scc/s Time of calibration _____
Test Data for ICV Main O-Ring Seal:	
4.2.20	He background (RB) _____ scc/s
4.2.23	Pressure reading at end of He backfill _____ psi
4.2.26	He reading after _____ 3 _____ minute dwell (RT) = _____ scc/s
Post-test Calibration for ICV Main O-Ring Seal Test:	
4.2.29	Temperature at time of recalibration _____ °C He reading with standard leak installed _____ scc/s Zero reading at time of calibration _____ scc/s Time of calibration _____

## Attachment 7 - ICV Preshipment Leakage-Rate Test Data Sheet

Leak Rate Calculation for Main O-Ring Test:	
4.2.30	<p>If there is <b>NO</b> difference in the post-test calibration from the pretest calibration, use the following equation:</p> $\text{Leak Rate} = (\text{RT} - \text{RB}) \times \text{CCF}$ <p>LR = ( _____ - _____ ) X _____ = _____ scc/s</p>
4.2.31	<p>If the post-test calibration is <b>LESS</b> than pretest calibration, add the calibration difference:</p> $\text{Leak Rate} = (\text{RT} + \text{Calibration Difference} - \text{RB}) \times \text{CCF}$ <p>LR = ( _____ + _____ - _____ ) X _____ = _____ scc/s</p>
4.2.32	<p>If the post-test calibration is <b>MORE</b> than pretest calibration, subtract the calibration difference:</p> $\text{Leak Rate} = (\text{RT} - \text{Calibration Difference} - \text{RB}) \times \text{CCF}$ <p>LR = ( _____ - _____ - _____ ) X _____ = _____ scc/s</p>
4.2.34[C]	NCR number recorded _____ Initials _____
4.2.37	ICV seal test port plug at 55 to 65 lb-in. Initials _____
4.3.4	ICV outer vent port plug at 55 to 65 lb-in. Initials _____
Pretest Calibration for Outer Vent Port Plug O-Ring Seal Test:	
4.3.8	<p>Leak rate of standard leak _____ scc/s</p> <p>Temperature at time of calibration _____ °C</p> <p>Temperature adjusted leak rate used to calibrate leak detector _____ scc/s</p> <p>Zero reading at time of calibration _____ scc/s</p> <p>Time of calibration _____</p>
Test Data for Outer Vent Port Plug O-Ring Seal Test:	
4.3.12	He reading after _____ 3 _____ minute dwell (RT) = _____ scc/s
Post-test Calibration for Outer Vent Port Plug O-Ring Seal Test:	
4.3.15	<p>Temperature at time of recalibration _____ °C</p> <p>He reading with standard leak installed _____ scc/s</p> <p>Zero reading at time of calibration _____ scc/s</p> <p>Time of calibration _____</p>
Leak Rate Calculation for Outer Vent Port Plug O-Ring Seal Test:	
4.3.17	<p>If there is <b>NO</b> difference in the post-test calibration from the pretest calibration, use the following equation:</p> $\text{Leak Rate} = \text{RT} \times \text{CCF}$ <p>LR = _____ X _____ = _____ scc/s</p>

## Attachment 7 - ICV Preshipment Leakage-Rate Test Data Sheet

4.3.18	<p>If the post-test calibration is <b>LESS</b> than pretest calibration, add the calibration difference:</p> <p style="text-align: center;">Leak Rate = ( RT + Calibration Difference) X CCF</p> <p>LR = ( _____ + _____ ) X _____ = _____ scc/s</p>
4.3.19	<p>If the post-test calibration is <b>MORE</b> than pretest calibration, subtract the calibration difference:</p> <p style="text-align: center;">Leak Rate = (RT - Calibration Difference) X CCF</p> <p>LR = ( _____ - _____ ) X _____ = _____ scc/s</p>
4.3.21[C]	<p>NCR number recorded _____ Initials _____</p>
4.3.24	<p>ICV vent port cover at 55 to 65 lb-in. Initials _____</p>
<b>Accountability Section</b>	
<p>_____</p>	
Tests performed by/Level	Date
<p>_____</p>	
Tests reviewed by/Level	Date

## Attachment 8 - OCV Preshipment Leakage Rate Test Data Sheet

Basic Data:	
4.4.1	OCV body S/N: _____ OCV lid S/N: _____ Date: _____ MSLD model: _____ S/N: _____ Pressure/vacuum gauge S/N: _____ Due: _____ Thermometer S/N: _____ Due: _____ Torque wrench S/N: _____ Due: _____ Torque wrench S/N: _____ Due: _____ Standard leak S/N: _____ Due: _____ Barometer S/N: _____ Due: _____
4.4.2	OCV surface temperature: _____ °C
Concentration Correction Factor Data:	
4.4.7	Ambient atmospheric _____ in. Hg (Patm) pressure
4.4.9	Vacuum reading _____ in. Hg (V1)
4.4.11	Concentration Correction Factor (CCF) = Patm/V1 _____
Pretest Calibration for OCV Main O-Ring Seal Test:	
4.4.13	Leak rate of standard leak _____ scc/s Temperature at time of calibration _____ °C Temperature adjusted leak rate used to calibrate leak detector _____ scc/s Zero reading at time of calibration _____ scc/s Time of calibration _____
Test Data for OCV Main O-Ring Seal:	
4.4.18	He background (RB) _____ scc/s
4.4.21	Backfill pressure reading at end of He backfill _____ psi
4.4.24	He reading after _____ 3 _____ minute dwell (RT) = _____ scc/s
Post-test Calibration for OCV Main O-Ring Seal Test:	
4.4.27	Temperature at time of recalibration _____ °C He reading with standard leak installed _____ scc/s Zero reading at time of calibration _____ scc/s Time of calibration _____

## Attachment 8 - OCV Preshipment Leakage Rate Test Data Sheet

Leak Rate Calculation for Main O-Ring Test:	
4.4.29	<p>If there is <b>NO</b> difference in the post-test calibration from the pretest calibration, use the following equation:</p> $\text{Leakage Rate} = (\text{RT} - \text{RB}) \times \text{CCF} =$ <p>LR = ( _____ - _____ ) X _____ = _____ scc/s</p>
4.4.30	<p>If the post-test calibration is <b>LESS</b> than pretest calibration, add the calibration difference:</p> $\text{Leak Rate} = (\text{RT} + \text{Calibration Difference} - \text{RB}) \times \text{CCF}$ <p>LR = ( _____ + _____ - _____ ) X _____ = _____ scc/s</p>
4.4.31	<p>If the post-test calibration is <b>MORE</b> than pretest calibration, subtract the calibration difference:</p> $\text{Leak Rate} = (\text{RT} - \text{Calibration Difference} - \text{RB}) \times \text{CCF}$ <p>LR = ( _____ - _____ - _____ ) X _____ = _____ scc/s</p>
4.4.33[C]	NCR number recorded _____ Initials _____
4.4.36	OCV seal test port plug at 55 to 65 lb-in. Initials _____
4.5.4	OCV vent port plug at 55 to 65 lb-in. Initials _____
Pretest Calibration for OCV Vent Port Plug O-Ring Seal Test:	
4.5.8	<p>Leak rate of standard leak _____ scc/s</p> <p>Temperature at time of calibration _____ °C</p> <p>Temperature adjusted leak rate used to calibrate leak detector _____ scc/s</p> <p>Zero reading at time of calibration _____ scc/s</p> <p>Time of calibration _____</p>
Test Data for OCV Vent Port Plug O-Ring Seal	
4.5.12	He leakage rate after _____ 3 _____ minute dwell (RT) = _____ scc/s
Post-test Calibration for OCV Vent Port Plug O-Ring Seal Test:	
4.5.15	<p>Temperature at time of recalibration _____ °C</p> <p>He reading with standard leak installed _____ scc/s</p> <p>Zero reading at time of calibration _____ scc/s</p> <p>Time of calibration _____</p>
Leak Rate Calculation for OCV Vent Port Plug O-Ring Seal Test:	
4.5.17	<p>If there is <b>NO</b> difference in the post-test calibration from the pretest calibration, use the following equation:</p> $\text{Leakage Rate} = (\text{RT}) \times \text{CCF}$ <p>LR = ( _____ ) X _____ = _____ scc/s</p>

## Attachment 8 - OCV Preshipment Leakage Rate Test Data Sheet

4.5.18	<p>If the post-test calibration is <b>LESS</b> than pretest calibration, add the calibration difference:</p> <p style="text-align: center;">Leakage Rate = ( RT + Calibration Difference ) X CCF</p> <p>LR = ( _____ + _____ ) X _____ = _____ scc/s</p>
4.5.19	<p>If the post-test calibration is <b>MORE</b> than pretest calibration, subtract the calibration difference:</p> <p style="text-align: center;">Leakage Rate = ( RT - Calibration Difference ) X CCF</p> <p>LR = ( _____ - _____ ) X _____ = _____ scc/s</p>
4.5.21[C]	NCR number recorded _____ Initials _____
4.5.24	OCV vent port cover at 55 to 65 lb-in. Initials _____
4.5.26	OCV seal test port access plug at 35 to 45 lb-ft Initials _____
4.5.28	OCV vent port access plug at 35 to 45 lb-ft Initials _____
<b>Accountability Section</b>	
_____	
Tests performed by/Level	Date
_____	
Tests reviewed by/Level	Date