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CCP-CM-023

Revision 0

CCP CH Packaging Mobile Loading Unit (MLU)

(Equipment #MLU-01)

(Equipment #MLU-02)

(Equipment #MLU-03)

Equipment Description

EFFECTIVE DATE: 04/26/2007

Mark Pearcy

PRINTED NAME

APPROVED FOR USE

RECORD OF REVISION

Revision Number	Date Approved	Description of Revision
0	04/26/2007	Initial issue.

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ACGLF	Adjustable Center of Gravity Lift Fixture
AK	Acceptable Knowledge
ALARA	As Low As Reasonably Achievable
CCP	Central Characterization Project
CFR	Code of Federal Regulations
CH	Contact-Handled
cm^2	square centimeters
DOE	Department of Energy
DOT	Department of Transportation
dpm	Disintegrations per minute
FGE	Fissile Gram Equivalent
HalfPACT	Half Package Transporter
ICV	Inner Containment Vessel
MAR	Material at Risk
MCU	Mobile Characterization Unit
MLU	Mobile Loading Unit
mrem/hr	millirem per hour
NFPA	National Fire Protection Association
OCA	Outer Containment Assembly
OCV	Outer Containment Vessel
PE-ci	Plutonium-Equivalent curies
SAR	Safety Analysis Report
SIH	Standard Industrial Hazard
SSCs	Structures, Systems, and Components
STD	Standard
SWB	Standard Waste Box
TDOP	Ten Drum Overpack
TRU	Transuranic
VAC	Volt Alternating Current
VE	Visual Examination
WIPP WAC	Waste Isolation Pilot Plant Waste Acceptance Criteria
WTS	Washington TRU Solutions

SUMMARY

The Contact-Handled (CH) Packaging Mobile Loading Unit (MLU) (Equipment No. MLU-01, MLU-02, & MLU-03) is designed to transport Contact-Handled Transuranic (TRU) and other authorized payloads such as tritium-contaminated materials. The *Contact-Handled Transuranic Waste Authorized Methods for Payload Control (CH-TRAMPAC)* (Ref. 1) is the governing document for shipments of solid or solidified CH TRU and tritium-contaminated wastes in the CH packaging. All users of the CH packaging will comply with all payload requirements outlined in the CH-TRAMPAC (Ref. 1), using one or more of the methods described in that document. The CH packaging MLU will provide an assay functionality that is designed to meet the requirements of the Waste Isolation Pilot Plant (WIPP) Waste Acceptance Criteria (WAC) (Department of Energy [DOE]/WIPP WIPP-02-3122) (Ref. 2). CH packaging includes Transuranic Package Transporter-II (TRUPACT-II)/HalfPACT.

This Equipment Description is a central coordinating link among the engineering design documents, the facility authorization basis, and implementing procedures. This Equipment Description does not originate requirements or basis information, but rather collects that information into a convenient usable form. The Equipment Description consolidates information about the MLU into one document.

1.0 SYSTEM DESCRIPTION

The MLU is an assembly of equipment, housed and transported on a trailer, and specifically designed for performing the loading and unloading operations associated with the CH Packaging. CH Packaging includes Transuranic Package Transporter-II (TRUPACT-II) and Half Package Transporter (HalfPACT).

The MLU is used to load or unload TRU waste containers from the CH Packaging. The CH Packaging is a Department of Transportation (DOT) Type B shipping cask on a tractor-pulled trailer. Up to three casks can be placed on a single trailer for transportation. DOT Type B casks are designed to meet stringent performance standards under a variety of accident scenarios. The CH Packaging casks are specifically designed for the safe transport of TRU waste from generator sites to permanent disposal and the WIPP site (Ref. 3).

Structures, Systems, and Components (SSCs) for the CH Packaging MLU should be, at a minimum, classified as Balance-of-Plant to assure that proper design, operations, and maintenance requirements are assigned to provide for the health and safety of the worker and the environment and to ensure compliance with the other Host site requirements. Moreover, the CH Packaging MLU system classification is Mission-Critical (Section 2.2, DOE Standard [STD] 3024-98 [Ref. 4]).

1.1 Facility, Major Components, and Subsystems

1.1.1 Facility

The MLU is used to load or unload TRU waste containers into, or from, the CH Packaging. The CH Packaging is a DOT Type B shipping cask on a tractor-pulled trailer (Ref. 3). Each container is an assembly of steel and polyurethane foam. The foam, approximately 10 inches thick, is sandwiched between steel inner and outer shells and is not exposed to the environment. The foam cavity of the containers is provided with fusible plugs to provide for venting during severe fire exposure. CH Packaging containers are typically brought to, and from, the facility on a flatbed trailer or delivered by forklift, which is driven into the loading facility. A level surface area is used to load waste containers into CH Packaging containers.

CH Packaging loading does not involve a traditional facility. The MLU is an assembly of equipment, housed and transported on a trailer, and specifically designed for performing the loading and unloading operations associated with the CH Packaging. This equipment can be used indoors or outdoors depending on the loading area selected by the Host site. The MLU, shown in photos located in the Appendix section of this document, is operated in conjunction with a minimum of a 5-ton mobile or fixed crane that is supplied by the site or commercial vendor. Drums are staged and the occasional vehicle (typically a forklift) is used to move the drums, fixtures for bundling and lifting the payload, a crane is used to lift the payload into the CH Packaging, and the CH

Packaging casks on their trailer. In addition, a lift and/or ladders are used to access the CH Packaging casks, leak checking equipment, hand or power tools as needed, survey meters, and the stretch wrap system are utilized in the process.

In order to load drums of waste into the CH Packaging casks, the drums are bundled together into a single payload and lifted by a crane into the casks. A payload of fourteen 55–gallon drums are shown in Appendix A.

Once this is done, one payload assembly will be placed in each container and the container prepared for shipping. When all three containers are loaded and sealed, they are transported to WIPP. If the equipment is to be utilized outside a structure to protect the drums, containers and related operations from the weather must be considered by the Host site. Normally, CH Packaging casks are not loaded during bad weather. Up to three casks can be placed on a single trailer for transportation. DOT Type B casks are designed to meet stringent performance standards under a variety of accident scenarios. The CH Packaging casks are specifically designed for the safe transport of TRU waste from generator sites to the WIPP or other designated sites.

1.1.1.1 Safety Features

There are no unique safety features involved in loading the CH Packaging casks. The design and loading of the CH Packaging is covered by documents prepared by Washington TRU Solutions (WTS), Central Characterization Project (CCP), the WIPP management and operating contractor for the DOE.

1.1.2 Major Components

- Plastic stretch wrap machine
- Manual stretch wrap
- Adjustable Center of Gravity Lifting Fixture (ACGLF) console
- ACGLF
- SWB Adapter
- TDOP Adapter
- 4-Pack Adapter
- Elevating Work Platforms

A plastic stretch wrap machine is used to shrink-wrap the drums together in to a payload assembly. The Polyethylene Stretch Wrap is to provide greater stability to the drums once they are loaded on the pallet. As many as 18 layers of the two mil (0.002 inch) thick, clear-to-translucent stretch wrap may be applied around the outside of each set of seven drums. The stretch wrap may also overlap the top of the outer drums by a few inches. The machine has a flashing strobe light that activates during the wrapping cycle and sensor photo eye that stops the evolution if the beam is broken. The payload is typically further confined (i.e., manually) within multiple layers of plastic for radiological health purposes. This configuration ensures that the payload material has an insignificant level of contact with the CH Packaging materials of construction. However, the evaluation of compatibility is based on complete interaction of payload materials with the packaging.

An ACGLF is used to balance the payload assemblies so they can be safely lifted into the CH Packaging container. The ACGLF is an electrically powered device that positions adjustable balance weights on the fixture such that when a payload assembly (or CH Packaging lid) is lifted it is essentially level. A load cell (dynamometer) attached between the crane and the ACGLF provides a remote digital readout of the payload weight.

The ACGLF is used with a crane to lift the Outer Containment Vessel (OCV) and Inner Containment Vessel (ICV) lids, an empty ICV, or the payload waste containers into, or out of, the CH Packaging. The ACGLF has a lift capacity of 10,000 pounds and weighs approximately 2,500 pounds (Figure 1). The ACGLF is designed as follows:

- The lower strongback assembly, a carbon steel lifting beam structure, has three revolving joints, 120 degrees apart, to which the lift legs are attached.
- Three linear actuators mounted on the underside of the lower strongback, provide the linear motion for each of the lift leg revolving mechanisms, which connect the lift legs to the load.
- Two rotating balance weights are mounted on a circular upper plate assembly. The rotating balanced weights are attached to two counter-rotating ring gears, which are independently driven.
- Two 1/4 horsepower, 115 Volt Alternating Current (VAC), single-phase gear motors drive the counter-rotating ring gears that position the rotating balance weights around the circumference of the upper plate assembly.
- Three short lift legs lift the OCV and ICV lids, empty ICV, or Standard Waste Boxes (SWBs) when lifted with an SWB lift fixture adapter, Ten-Drum Overpack (TDOP) lift fixture adapter, or 85-gallon lift fixture adapter and three long lift legs lift a 14-drum payload pallet. The bottom of the lift legs are designed to engage a horizontal lifting bar in the lifting pockets of the OCV and ICV lids, SWB lift fixture adapter, TDOP lift fixture adapter, 85-gallon lift fixture adapter, and drum shipping pallet when the lift leg is rotated into position. The ACGLF also includes three electrical actuator

motors and arms to rotate the lift legs into their locking lift positions. The control system has limit switches with lights to indicate that each lift leg has rotated to attach to the lifting pins.

- Two tilt sensors provide X and Y-axis tilt indication of the ACGLF.
- Two balance weight position sensors continuously provide the position of each of the two rotating balance weights.
- A single point lifting shackle is mounted in the center of the ACGLF for attachment to the crane. One portable control console provides operator controls and indicators to monitor the balance condition of the load, and to compensate, if necessary, for load imbalance by repositioning the two counterweights.

1.1.3 Subsystems

1.1.3.1 Civil and Structural

The payload is raised 2 inches to 6 inches above the ground and balanced, using the ACGLF console, to within $\pm$0.5 degrees. The payload is raised and centered over the ICV cavity. The payload is placed into the ICV. The ACGLF/adapter is removed from the payload and, using the crane, attached to the lifting pockets on the matched ICV lid and locked. The lid is placed on the ICV and the ICV is prepared for evacuation. The vacuum must be a minimum of 3 inches Hg but not more than 15 inches Hg. A leak rate test is also performed.

The ACGLF/adapter is removed from the ICV lid and, using the crane, attached to the lifting pockets on the matched OCV lid and locked. The lid is placed on the OCV, and the OCV is prepared for evacuation. The vacuum must be a minimum of 3 inches Hg. The lock ringbolts are installed and a torque of 28-32 foot-pounds is applied. A leak test is also performed, lift pocket covers installed, and tamper-indicating seals installed.

The CH Package casks remain secured on the trailer at all times. The DOE Safety Analysis Report for the CH Shipping Package (Ref. 3) is the controlling Documented Safety Analysis at this point. This document limits the grams of Pu-239 or Fissile Gram Equivalent (FGE) to 325 grams per CH Packaging cask.

1.1.3.2 Mechanical and Material

A 54-inch drum metal payload pallet is positioned on a level surface adjacent to the stretch wrap machine. A slip-sheet is placed on the pallet with the guide-tube holes of the pallet and the slip-sheet aligned. The drums are inspected to ensure that at least one filter is installed in each loaded drum and properly labeled. Seven drums are placed on the slip-sheet in a weight-distributed pattern. Labels on all drums, except the center drum, must be visible. Locking bolts must be between drum gaps and not interfere with the guide tubes. In addition, the heaviest seven-pack must be on the

bottom of the payload assembly. Nine wraps of stretch wrap are used on the upper portion of the drums, extending down the side of the drums a maximum of 22 inches, with no overlap on top of the drums. A reinforcing plate is placed on top of the drums with all guide tube holes aligned with the bottom slip-sheet and pallet. An additional nine wraps of stretch wrap are added to the drums, with overlap on top of the drums.

A slip-sheet is placed on the top of the bottom layer of drums and aligned with the bottom slip-sheet using the white stripes on the sheets and guide tube holes for alignment. Another seven-drum layer is placed on the slip-sheet in a weight-distributed pattern. As before, labels on all drums must be visible, except for the center drum, and all locking bolts positioned between drum gaps so that they do not interfere with the guide tube holes. The upper parts of the drums are stretch wrapped with nine wraps to extend down a maximum of 22 inches, with no overlap on top of the drums. Another reinforcing plate is placed on top of the drums, ensuring the guide tube holes are aligned. An additional nine wraps of stretch wrap are added so that there is overlap on top of the drums. Guide tubes are installed, and they are bolted together to lock the whole payload together. This completes the payload preparation.

The CH Packaging casks are prepared for payload loading. If this is performed outdoors, these operations cannot be performed in rain, snow, other wet conditions, or dusty conditions. Water must not be allowed into the ICV of the CH Packaging. As part of the lift planning process, the crane position will be evaluated such that in case the crane falls, it cannot strike buildings or other structures holding TRU waste, or TRU waste staged in the TRU Waste Characterization Segment.

1.1.3.2.1 Outer Containment Assembly

The Outer Containment Assembly (OCA) lid is prepared for removal by removing the test port plugs, the vent port cover and plug, the lock ringbolts, and the lift pocket covers. The ACGLF is attached to the crane. The ACGLF legs are lowered into the OCA lid lift pockets and locked. A vacuum line is attached to the vent port and evacuated to 3 inches Hg minimum. The OCV lock ring is rotated to the unlocked position, and the vacuum pump is stopped and disconnected from the OCV. The OCV is vented to the atmosphere. The lid is removed, placed on a storage stand, and inspected.

1.1.3.2.2 Inner Containment Assembly

The ICV lid is removed following the same procedure as the OCA lid and placed on a storage stand, inspected, and cleaned. Any payload pallets, guide tubes, slip-sheets, reinforcing sheets, and dunnage containers, are removed from the ICV.

The OCA, the ICV, and their components are inspected, cleaned, and lubricated. If water is found in the ICV absorbent material, and a vacuum is required to remove it. Any water or absorbent material will be collected, sampled, and disposed as job control

waste in accordance with site procedures. This completes the CH Packaging cask preparation for receiving a payload.
The appropriate legs/adapter are attached to the ACGLF, and using a crane, the ACGLF long legs are lowered into the drum payload assembly guide tubes until the red stripes on the legs are no longer visible. The legs are locked.

1.1.3.3 Chemical and Process

CH Pacakging loading operations were determined to be Hazard Category 2 for the radionuclide inventory in accordance with DOE-STD-1027-92 *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports* (Ref. 6). Based on the chemical inventory (chemicals are limited to small quantities used in maintenance or contamination in mixed TRU waste), it is not anticipated that threshold quantities of the Occupational Safety and Health Administration Process Safety Management Standard (Title 29, Code of Federal Regulations [CFR] Part 1910.119) (Ref. 7) would be exceeded. It was demonstrated that the TRU waste characterization operations and CH Packaging loading operations do not adversely impact the health and safety of the workers or the public (Ref. 3).

1.1.3.4 Electrical Power

Electrical supply for the MLU operations requires four 120 VAC/20-amp circuits.

1.1.3.5 Instrumentation and Control

The following contain a summary of some of the methods of compliance used for CH Packaging payload control:

- Visual Examination (VE)

  VE may be used at the time of waste generation to qualify newly generated waste for transport (e.g., 100 Series waste). The operator(s) of a waste generating area shall use VE to verify the physical form of the waste, according to site/equipment-specific procedures and remove all prohibited waste forms prior to its placement in the payload container. Observation of the waste generation process by an independent operator may be used as an independent verification of the compliance prior to closure of the payload container. CCP operators will also use VE to verify the absence of prohibited items for 200 Series waste in accordance with approved VE procedures (Ref. 1).

- Visual Inspection

  Visual inspection may be used to evaluate compliance with specific restrictions for newly-generated or retrievably-stored waste (e.g., visual inspection of payload container type, marking, and number of filters). Visual inspection by a second operator may be considered an independent verification. CCP performs visual

inspection in accordance with CCP-TP-033, *CCP Shipping of Contact-Handled TRU Waste* (Ref. 8), to verify that the payload containers meet the requirements (e.g., visual inspection of payload container type, marking, and container integrity).

- Administrative and procurement controls

  Site-specific administrative and procurement controls are used to show that the payload container contents are monitored and controlled, and to demonstrate the absence of prohibited items (Ref. 1).

The CCP will use administrative and procurement controls for the following:

1. Show that the payload container or contents are monitored and controlled. This is performed using the applicable site container management procedures. CCP will also review the applicable Acceptable Knowledge (AK) information to provide evidence of proper container monitoring control during packaging.
2. Demonstrate the purchase of required materials (e.g., drums or filters) per CCP-QP-015, *CCP Procurement* (Ref. 9).

2.0 DESIGN REQUIREMENTS

2.1 Specific Requirements

While quantitative design requirements have not been identified for the CH Packaging, the system must be capable of assuring that fissionable material in its inspected drums does not exceed that permitted by the WIPP WAC (Ref. 2). The facility at which the CH Packaging MLU operates must also establish that the system, in its site-specific implementation, meets 10 CFR 830, *Nuclear Safety Management* (Ref. 10), 10 CFR 835, *Occupational Radiation Protection* (Ref. 11), and other requirements applicable to that site.

2.2 Codes and Standards

While codes and standards have not been identified as design requirements, a number of codes and standards have been used in the “as-built” system and are identified, where applicable.
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3.0 OPERATIONAL INFORMATION

3.1 System Control Features

3.1.1 Fire Protection

No suppression systems are required per National Fire Protection Association (NFPA) 101 (Ref. 12).

Portable Class A-B-C fire extinguishers are the only means of fire suppression.

3.1.2 Radiation and Other Hazards

Hazardous events that are unique to CH Packaging loading segment involve various drop scenarios of drum payloads. As part of the critical lift process, a crane lifts payloads approximately 13 feet in order to put them into the CH Package cask. A high-speed swing of the drums into a large object (CH Packaging cask, building, or vehicle) could cause a breach of the drums. Operator error leading to a drop and release is *anticipated*. A vehicle accident where the crane or payload is impacted leading to a release is *unlikely*. If the vehicle impacts the crane, the load may swing, but the event requires that the CH Packaging lift fixture fails. In general, equipment failures are considered *unlikely*. The Material at Risk (MAR) involved in these events is a payload that consists of 14 drums, each loaded to the WIPP WAC of 80 plutonium-equivalent curies (PE-Ci), which results in a MAR of 1,120 PE-Ci. Although the payload is lifted to a height that could challenge the integrity of the drums if dropped, it is assumed that only 25 percent of the drums would have their contents ejected, or 3.8 drums that is conservatively rounded up to four drums (320 PE-Ci). This is primarily because of the packaging required by WIPP. Payloads are shrink-wrapped prior to loading into the CH Package and this provides substantial confinement. Based on these factors, the unmitigated public and worker consequences are considered *low* from these events. This results in a Risk Class III event. Qualified operators are used to operate the crane. The rigging procedure (payload assembly and lift) is performed in accordance with a DOE approved CH Packaging Safety Analysis Report (SAR)(Ref. 3). The process of loading the CH Packaging is controlled by a dedicated WIPP trained team.

3.1.2.1 As Low As Reasonably Achievable (ALARA)

Radiological postings are used to alert personnel to the presence of radiation and radioactive materials and to aid in minimizing exposures and preventing the spread of contamination. Radiological postings are installed before work begins, and updated periodically when changes in radiological conditions occur or are expected.

3.1.3 Precautions and Limitations

- Removable surface contamination on CH TRU waste payload containers, container assemblies, or packagings SHALL NOT exceed the values in 10 CFR 835 Appendix D (less than 20 disintegrations per minute [dpm]/100 square centimeters [cm^2] Alpha, less than 200 dpm/100cm^2 Beta Gamma).
- Dose rates surveys on contact, 1 meter, and 2 meters including neutron contributions, are required for assembly payloads prior to shipment.
- The Transportation Certification Official SHALL be notified if any of the following items are exceeded:
  - Radiation dose rates exceed 200 millirem per hour (mrem/hr) at contact (beta plug gamma plus neutron).
  - Alpha contamination survey results exceed 20 dpm/100cm^2.
  - Beta-gamma contamination survey results exceed 200 dpm/100cm^2.
- Safety glasses, leather gloves, and toe protection are required when manually handling or moving drums.
- Back support belts are available and recommended.
- Each waste container SHALL be verified to meet Contact-Handled packaging requirements before shipment.
- As a general rule, no body part is allowed underneath a suspended load. The following exceptions have been made for this procedure: ACGLF adjustment/leg changes and guiding leg insertion. Use extreme caution, and DO NOT raise the load higher than necessary while performing this activity.

3.1.4 Nuclear Criticality Safety

The site contractor's criticality safety program shall be defined. The CH Packaging loading unit is an independent Hazard Category 2 nuclear facility segment that will stage and process TRU waste in 55-gallon drums. Based on the hazard analysis presented in Chapter 3 of the Basis for Interim Operation (Ref. 13), the unmitigated frequency of a criticality event related to the TRU characterization activities is considered *extremely unlikely*. With a criticality safety program in place, the mitigated frequency is considered *beyond extremely unlikely*. The double contingency principle has been used in the development of the criticality safety controls to preclude inadvertent criticality for all operations. Criticality safety in the CH Packaging loading unit is ensured by a combination of engineering and Administrative Controls on the following, as described in the criticality safety program:

- Drum sizes and types

- Quantities of fissionable materials
- Amounts of moderators and reflectors
- Interaction between drums in an array

The CH Packaging casks are certified by the Nuclear Regulatory Commission to meet 10 CFR 71 requirements for a Type B shipping container (Ref. 14). There are no unique safety features involved in loading the CH Packaging. The design and loading of the CH Packaging is covered by documents prepared by WTS, LLC CCP, the WIPP management and operating contractor for the DOE (Ref. 14, 5). The operation of the crane meets the definition of a Critical Lift as defined in DOE-STD-1090-2004 (Ref. 15).

3.1.5 Standard Industrial Hazards

The hazard identification table, Table A-2, is based on a predefined list of hazards (Ref. 3, 6). One column identifies if the hazard is present in the segment or not. The description column provides information on the nature of the hazard and the location. The last column is titled Standard Industrial Hazard (SIH) screening. A “Y” or yes in this column indicates that the hazard is an SIH and is screened out from further consideration.

There are no Safety Class of Safety Significant SSCs associated with the CH Packaging Loading process.

3.1.6 Operating Environmental and Natural Phenomena

3.1.6.1 External Events

The primary external hazard with potential impacts of concern is an aircraft crash. Based on the small footprint size for the Mobile Characterization Units (MCUs), including CH Packaging loading, an aircraft crash leading to the release of radioactive and/or hazardous material is considered *extremely unlikely* (once every 10,000 to 1,000,000 years). Unmitigated consequences of a coincident fire are expected to be in the moderate range for the public and moderate to high range for onsite workers. Facility worker impacts could be high if they are in the immediate vicinity of the crash. For an aircraft crash impacting the footprint of the MCUs, the dose is conservatively estimated based on the entire inventory (1120 PE-Ci).

3.2 Maintenance

Initial testing or inspections are performed on the safety SSCs as described in the WIPP WAC and Operations/Maintenance Manuals (Ref. 16, 2, 17). Maintenance of the CH Packaging casks is in accordance with DOE/WIPP 02-3183 (Ref 18).

3.3 Other Requirements

Requirement: The Crane Lift for CH Packaging loading is considered a lift planning process and positioning of the crane such that it cannot impact MAR in other nuclear segments.

Basis: Reduces the likelihood of payload drops and spills associated with CH Packaging loading operations

Requirement: A Criticality Safety Program shall be established, implemented, and maintained to ensure that the frequency of a criticality is *beyond extremely unlikely.*

Basis: The principal controls in this program are a limit of 200 FGE per drum, and 325 FGE per CH Packaging cask

4.0 REFERENCES

1. CCP-PO-003, *CCP Contact-Handled Transuranic Waste Authorized Methods for Payload Control*

2. DOE/WIPP-02-3122, *Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant*, U.S. Department of Energy, Carlsbad Field Office, Carlsbad, NM

3. *Safety Analysis Report for TRUPACT-II Shipping Package*, NRC Docket Number 71-9218, Carlsbad Field Office, U.S. Department of Energy, Carlsbad, NM, Current Revision

4. DOE-STD-3024-98, *Content of System Design Descriptions*.

5. CCP-TP-054, *CCP Adjustable Center of Gravity Lift Fixture Preoperational Checks and Shutdown*

6. DOE-STD-1027-92, Change Notice 1, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*, U.S. Department of Energy, Washington, DC,.

7. 29 CFR 1910, *Occupational Safety and Health Standards*, Subpart 1910.119, Process Safety Management of Highly Hazardous Chemicals, Code of Federal Regulations, U.S. Department of Labor, Washington, DC.

8. CCP-TP-033, *CCP Shipping of CH TRU Waste*

9. CCP-QP-015, *CCP Procurement*

10. 10 CFR 830, *Nuclear Safety Management*, Subpart B, Safety Basis Requirements, Code of Federal Regulations, U.S. Department of Energy, Washington, DC

11. 10 CFR 835, *Occupational Radiation Protection*, U.S. Department of Energy, Washington, DC,.

12. NFPA 101, *Life Safety Code*

13. CCP-QP-005, *CCP TRU Nonconforming Item Reporting and Control*, May 2006.

14. DOE-STD-1090-2004, *Hoisting and Rigging*, U.S. Department of Energy, Washington, DC,.

15. DOE/WIPP 02-3185, *CH Packaging Maintenance Manual*, Washington TRU Solutions, Carlsbad, NM.

16. DOE/WIPP 02-3184, *CH Packaging Operations Manual*, Washington TRU Solutions, Carlsbad, NM.

17. *CH TRU Payload Appendices*

18. DOE/WIPP 02-3183, *CH Packaging Program Guide*

Appendix A – Figures and Photos

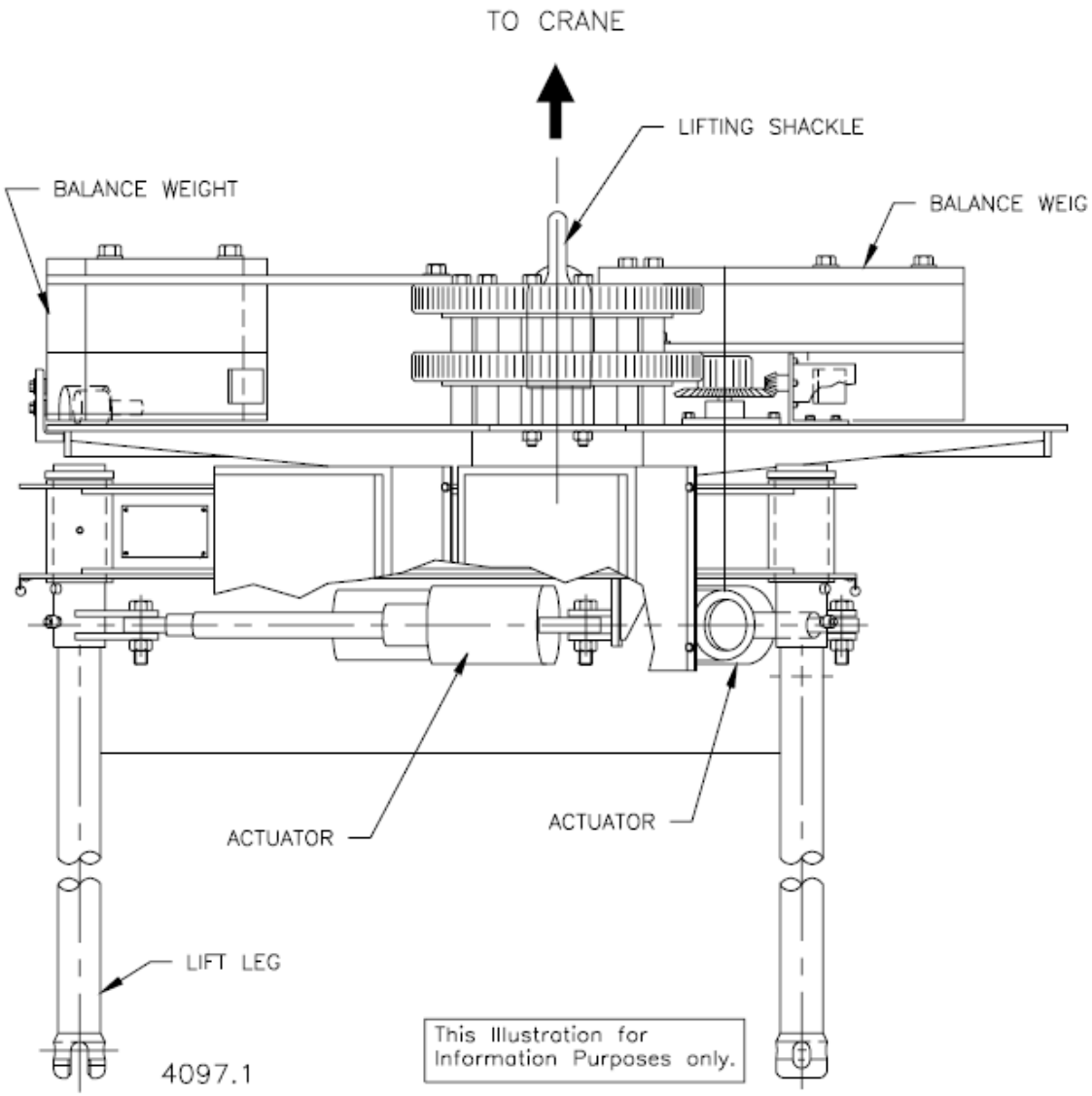

Figure 1. Adjustable Center of Gravity Lift Fixture

Appendix A – Figures and Photos (Continued)

Figure 2. CH Packaging Load Photo 1

Appendix A – Figures and Photos (Continued)

Figure 3. CH Packaging Load Photo 2

Appendix A – Figures and Photos (Continued)

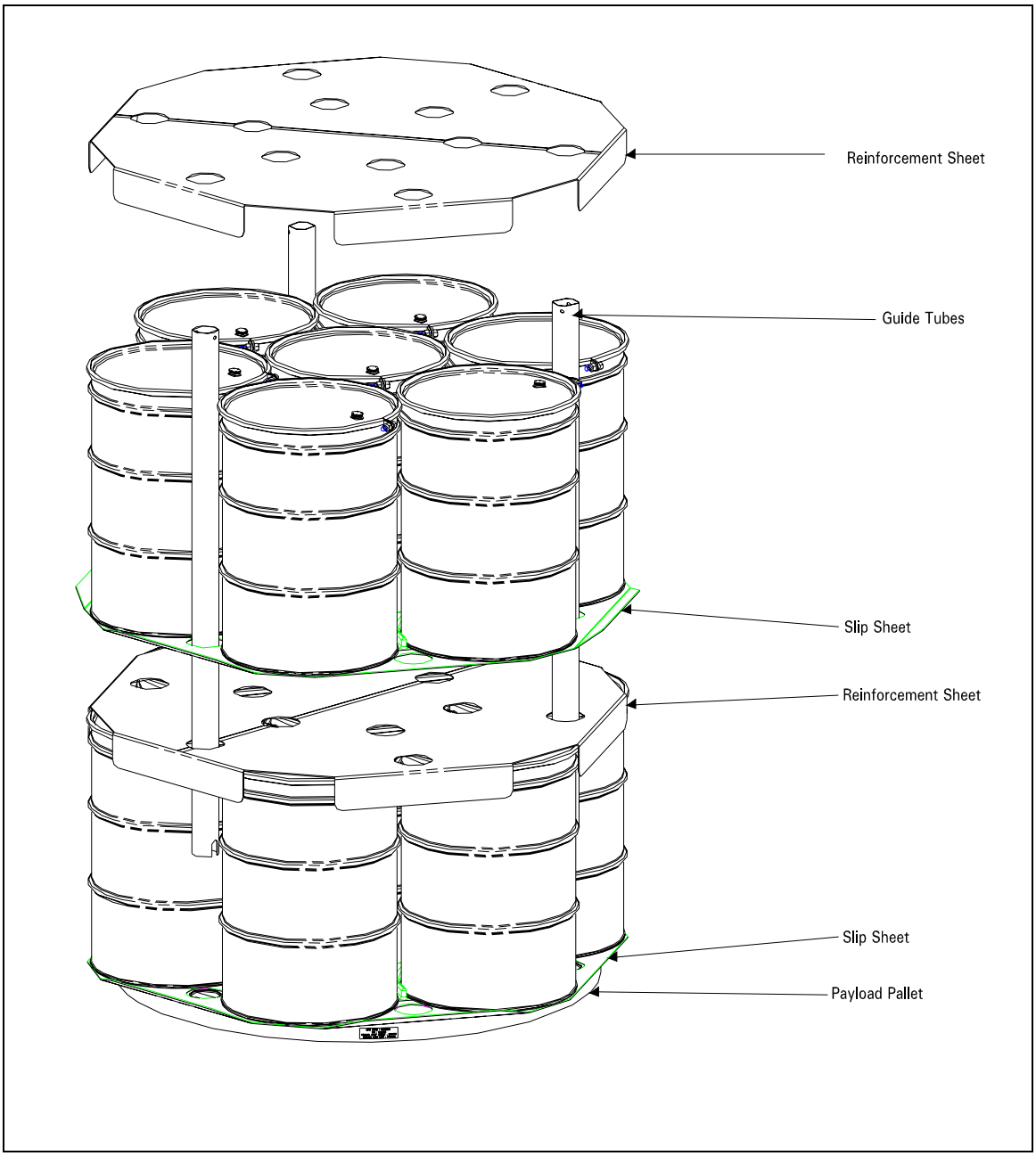

Figure 4. Payload of drums ready for CH Packaging Loading

Appendix A – Figures and Photos (Continued)

Figure 5. CH Packaging Load Photo 3

Appendix A – Figures and Photos (Continued)

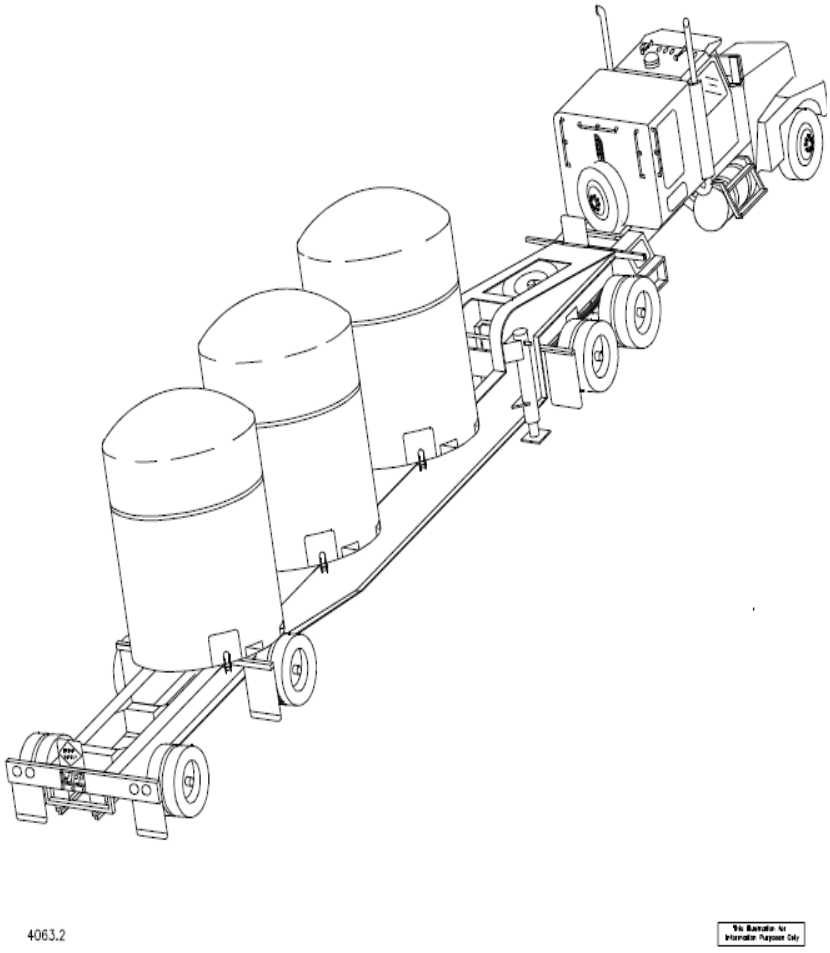

Figure 6. Truck, CH Packaging and Trailer

Appendix A – Figures and Photos (Continued)

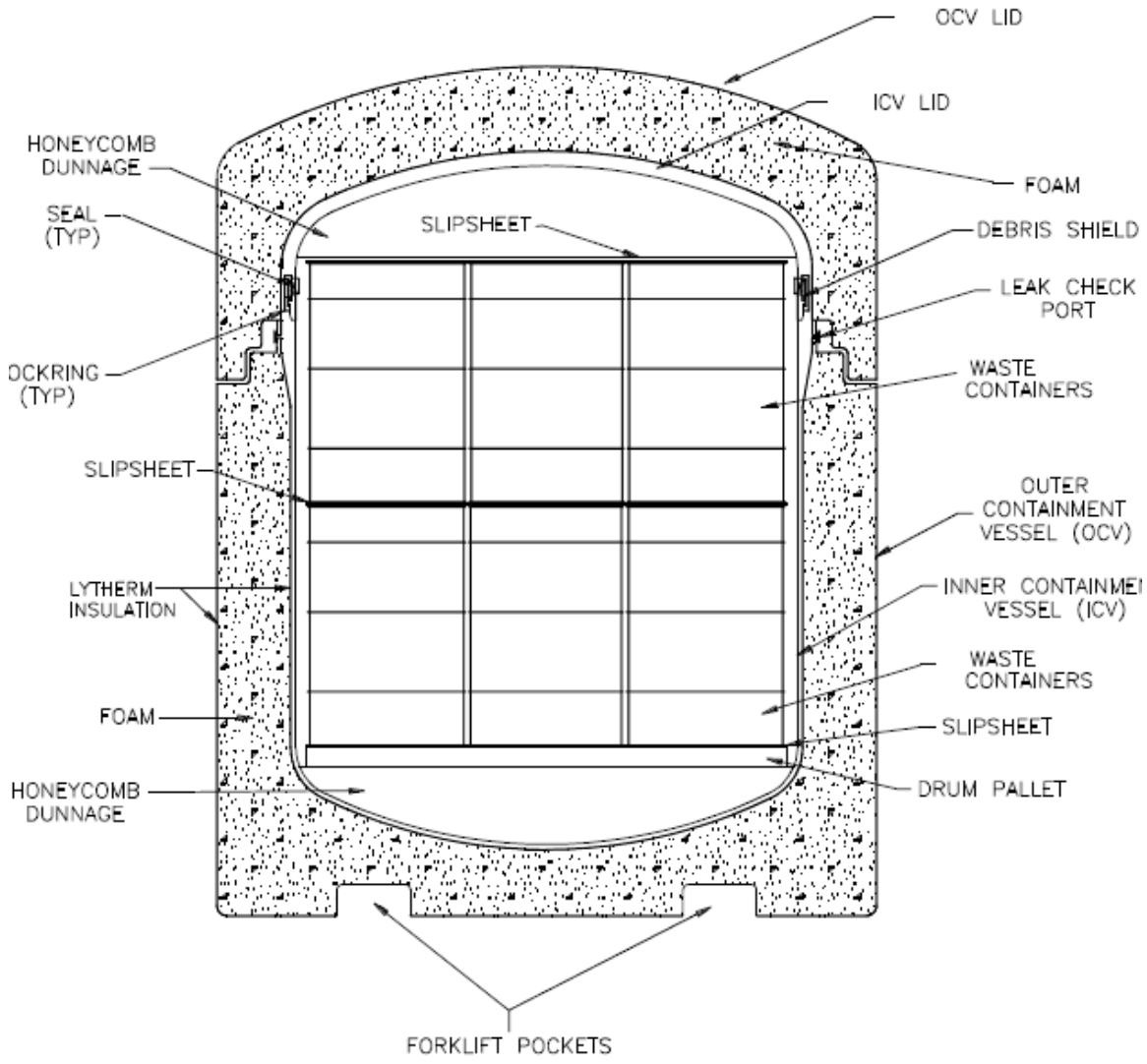

Figure 7. CH Packaging

Appendix B – CH Packaging Loading Segment Hazard Identification Table

The hazards that are not screened as Standard Industrial Hazards (SIH) in the following Hazard Identification Tables (Table A-2) are evaluated in the Hazard Evaluation Tables located in the CH Authorization Basis Supporting Document.

Table A-2 CH Packaging Loading Segment Hazard Identification Table

Item	Hazard Energy Source or Material	Exists (Y/N)	Description	SIH Screening
1.	**Electrical**			
1.1	Battery banks	N	Some forklifts are battery powered, but these are not battery banks.	
1.2	Cable runs	N	N/A	N/A
1.3	Diesel generators	Y	N/A	Y
1.4	Electrical equipment	Y	May be electrical equipment such as hand held tools, motors, extension cords, etc.	Y
1.5	Heaters	Y	Electric and Kerosene Heaters	Y
1.6	High voltage (> 600V)	N	N/A	N/A
1.7	Locomotive, electrical	N	N/A	N/A
1.8	Motors	Y	Some vehicles have electric motors (e.g., forklifts) (SIH). The vacuum pump used during the loading operations contains a motor. There are also other miscellaneous motors throughout the segment.	Y
1.9	Power tools	Y	Incidental use in segment.	Y
1.10	Pumps	Y	Vacuum pumps are used during the loading of the CH Packaging. There are also hydraulic pumps on the crane, forklifts, and other motor vehicles.	Y
1.11	Service outlets, fittings	Y	Incidental use for power tools, vacuum cleaner.	Y
1.12	Switchgear	N	Switchgear considered as an external event.	See 19.4
1.13	Transformers	N	Transformers considered as an external event.	See 19.4
1.14	Transmission lines	N	N/A	N/A

Appendix B – CH Packaging Loading Segment Hazard Identification Table (Continued)

1.15	Wiring / underground wiring	N	N/A	N/A
1.16	Other:	N	N/A	N/A
2.	**Thermal**			
2.1	Boilers	N	N/A	N/A
2.2	Bunsen burner / hot plates	N	N/A	N/A
2.3	Electrical equipment	Y	Powered hand tools	Y
2.4	Electrical wiring	Y	Extension cords for incidental power tool use.	Y
2.5	Engine exhaust	Y	The vehicles and forklifts in the area produce engine exhaust.	Y
2.6	Furnaces	N	N/A	N/A
2.7	Heaters	Y	Electric and Kerosene heaters	Y
2.8	Lasers	N	N/A	N/A
2.9	Steam lines	N	N/A	N/A
2.10	Welding surfaces	N	N/A	N/A
2.11	Welding torch	Y	Incidental use in segment. Potential initiator for a fire.	WH-7
2.12	Other	N	N/A	N/A
3.	**Pyrophoric Material**			
3.1	Pu and U metal fines	N	Plutonium or uranium oxides may be present in the waste; waste is predominately contaminated material, and material is not pyrophoric.	
3.2	Other: Pyrophoric solids	N	N/A	N/A
4.	**Open Flame**			
4.1	Bunsen burners	N	N/A	N/A
4.2	Welding / cutting torches	Y	Incidental use in segment. Potential initiator for a fire.	See 2.11
4.3	Other	Y	Electric and Kerosene heaters	Y
5.	**Flammables**			
5.1	Cleaning / decon solvents	Y	Incidental to routine decon and maintenance. Operator may be exposed to chemicals.	Y

Appendix B – CH Packaging Loading Segment Hazard Identification Table (Continued)

5.2	Flammable gases	Y	Some hazardous materials in the waste may offgas, but this is insignificant, given the nature of the waste.	WH-5
5.3	Flammable liquids	Y	Vehicles and forklifts have gasoline (or diesel fuel) and may use other flammable fluids.	WH-5
5.4	Gasoline	Y	Gasoline powered forklifts and vehicles. Gasoline powered vehicles can be an accident initiator.	WH-5
5.5	Natural Gas	Y	Considered an external event.	See 19.4
5.6	Nitric acid soaked rags (spontaneous combustion)	N	N/A	N/A
5.7	Nitric acid and organics	N	N/A	N/A
5.8	Paint / paint solvent	Y	Incidental use in segment.	Y
5.9	Propane	Y	Propane powered forklifts can be an accident initiator.	WH-5
5.10	Spray paint	Y	Incidental use in segment.	Y
5.11	Other	Y	Other Flammable Liquid. Alcohol for cleaning.	Y
6.	**Combustibles**			
6.1	Paper/wood products	Y	The requisition is on paper, which is in a plastic sleeve attached to the drum. The plastic sleeve may also contain other documents with information describing the drum or its contents. The rope used to secure drums to the truck may be combustible. Small amounts of miscellaneous paper may be in staging area.	WH-7
6.2	Petroleum based products	Y	Vehicles and forklifts have lubricating oils, fuels, etc.	Y
6.3	Plastics	Y	Negligible amount, such as info sleeve on the drum, plastic drum liner. Small amounts of miscellaneous paper may be in staging area. Stretch wrap used to wrap seven drums together. Slip sheets and reinforcement plates.	WH-7
6.4	Other	N	N/A	N/A

Appendix B – CH Packaging Loading Segment Hazard Identification Table (Continued)

7.	**Chemical Reactions**			
7.1	Concentration	N	N/A	N/A
7.2	Disassociation	N	N/A	N/A
7.3	Exothermic	N	N/A	N/A
7.4	Incompatible chemical mixing	N	N/A	N/A
7.5	Uncontrolled chemical reactions	N	N/A	N/A
8.	**Explosive Material**			
8.1	Caps	N	N/A	N/A
8.2	Dusts	N	N/A	N/A
8.3	Dynamite	N	N/A	N/A
8.4	Electric squibs	N	N/A	N/A
8.5	Explosive chemicals	N	N/A	N/A
8.6	Flammable gases	N	N/A	N/A
8.7	Hydrogen	Y	Hydrogen in the waste drum from radiolysis. Potential for deflagration.	WH-8
8.8	Hydrogen (batteries)	Y	Lead acid batteries are used in vehicles and forklifts.	Y
8.9	Nitrates	N	N/A	N/A
8.10	Peroxides	N	N/A	N/A
8.11	Primer cord	N	N/A	N/A
8.12	Propane	Y	Propane powered forklifts can be an accident initiator.	WH-6 L-1
8.13	Other	N		
9.	**Kinetic (Linear and Rotational)**			
9.1	Acceleration / deceleration	Y	Forklift or other vehicles could impact staged drums.	WH-1 WH-2 WH-3 WH-4 WH-5 WH-7 L-1 L-2

Appendix B – CH Packaging Loading Segment Hazard Identification Table (Continued)

9.2	Bearings	Y	Bearings are used throughout the Loading Segment. Bearings are used in the crane, motors, vehicles, etc.	Y
9.3	Belts	N		
9.4	Carts / dollies	Y	Incidental use for moving drums.	Y
9.5	Centrifuges	N		
9.6	Crane loads (in motion)	Y	Crane used to lift waste approximately 11 feet into the CH Packaging.	L-2
9.7	Drills	Y	Incidental use in segment.	Y
9.8	Fans	N	N/A	N/A
9.9	Firearm discharge	N	N/A	N/A
9.10	Forklifts	Y	While loading, forklift has potential of crushing or pinching extremities (SIH). Used for loading/ unloading.	See 9.1
9.11	Gears	N	N/A	N/A
9.12	Grinders	Y	Incidental use in segment	Y
9.13	Motors	Y	Motors in the crane, forklifts, and vacuum pump	Y
9.14	Power tools	Y	Incidental use in segment	Y
9.15	Presses / shears	Y	Stretch wrap system	Y
9.16	Rail cars	N		
9.17	Saws	Y	Incidental use in segment	Y
9.18	Vehicles	Y	Vehicles could impact staged drums	See 9.1
9.19	Vibration	N	N/A	N/A
9.20	Other:	N	N/A	N/A
10.	**Potential (Pressure)**			
10.1	Autoclaves	N	N/A	N/A
10.2	Boilers	N	N/A	N/A
10.3	Coiled springs	Y	Vehicles	Y
10.4	Furnaces	N		
10.5	Gas bottles	Y	Used with CH Packaging leak testing	Y
10.6	Gas receivers	N	N/A	N/A
10.7	Pressure vessels	N	N/A	N/A
10.8	Pressurized container or system (e.g., air)	Y		Y

Appendix B – CH Packaging Loading Segment Hazard Identification Table (Continued)

10.9	Steam headers and lines	N		
10.10	Stressed members	N		
10.11	Other – vacuum applied to TRUPACT-II	Y	A minimum of 3 inches Hg and a maximum of 15 inches Hg vacuum applied to the CH Packaging cask could rupture poorly vented cask.	Y
11.	**Potential (Height / Mass)**			
11.1	Cranes / hoists	Y	Lifts of payload of TRU waste	L-1 L-2 L-3 L-4
11.2	Elevated doors	N		
11.3	Elevated work surfaces	Y	Top of double stacked drums, top of CH Packaging	Y
11.4	Elevators	N	N/A	N/A
11.5	Lifts	Y	Might use lift to access top of CH Packaging	Y
11.6	Loading docks	Y	Vehicles can only use the loading dock when the CH Packaging Loading Segment is not being used in support of the TWLP.	Y
11.7	Mezzanines	N	N/A	N/A
11.8	Floor pits	N	N/A	N/A
11.9	Scaffolds and ladders	Y	Might use ladders to access top of stacked drums, top of CH Packaging	Y
11.10	Stacked material	Y	Double stacked drums as part of the payload for CH Packaging.	L-1 L-2 L-3
11.11	Stairs	Y	Rolling stairs to access the elevating work platforms and for lid inspections and crane connections.	N/A
11.12	Other:	N	N/A	N/A
12.	**Internal Flooding Sources**			
12.1	Domestic water	N	N/A	N/A

Appendix B – CH Packaging Loading Segment Hazard Identification Table (Continued)

12.2	Fire suppression piping	N	N/A	N/A
12.3	Process water	N	N/A	N/A
12.4	Other	N	N/A	N/A
13.	**Physical**			
13.1	Sharp edges or points	Y	Equipment	Y
13.2	Pinch points	Y	Mating of lifting equipment to payload	Y
13.3	Confined space	Y	TRUPACT-II cavity is considered space at all sties. Screw replacement in lower impact limiter connections.	
13.4	Tripping	Y	Leak test equipment, ACGLF cables, gas hoses, and extension cords.	Y
13.5	Other:	N	N/A	N/A
14.	**Radiological Material**			
14.1	Radiological material	Y	The waste contains radiological material.	L-1 L-2 L-3
15.	**Hazardous Material**			
15.1	Asphyxiants	N	N/A	N/A
15.2	Bacteria / viruses	N	N/A	N/A
15.3	Beryllium and compounds	Y	There may be beryllium-contaminated materials in some drums.	Y
15.4	Biologicals	N	N/A	N/A
15.5	Carcinogens	N	N/A	N/A
15.6	Chlorine and compounds	N	N/A	N/A
15.7	Corrosives	Y	Lead acid batteries in the forklifts and motor vehicles.	Y
15.8	Decontamination solutions	Y	Incidental to routine decon	Y
15.9	Dusts and particles	N	N/A	N/A
15.10	Fluorides	N	N/A	N/A
15.11	Hydrides	N	N/A	N/A
15.12	Lead	Y	Lead acid batteries in the forklifts and motor vehicles.	Y
15.13	Oxidizers	N	N/A	N/A

Appendix B – CH Packaging Loading Segment Hazard Identification Table (Continued)

15.14	Poisons (herbicides, insecticides)	N	N/A	N/A
15.15	Other	N	N/A	N/A
16.	**Ionizing Radiation Sources**			
16.1	Contamination	Y	The waste is made up of contaminated materials. There could be contamination inside the CH Packaging.	L-1 L-2 L-3
16.2	Electron beams	N	N/A	N/A
16.3	Radioactive material	Y	The waste contains radioactive materials and a release is assumed for most scenarios.	L-1 L-2 L-3
16.4	Radioactive sources	Y	Sealed sources are used to calibrate instruments	Y
16.5	Radiography equipment	N	N/A	N/A
16.6	X-ray machines	N	N/A	N/A
16.7	Other	N	N/A	N/A
17.	**Non-Ionizing Radiation**			
17.1	Lasers	N	N/A	N/A
17.2	Other	N	N/A	N/A
18.	**Criticality**			
18.1	Fissile material	Y	Waste contains fissile material. Although fissile material is present in waste and would be released in most scenarios, criticality accidents are considered in waste handling.	WH-10
19.	**Non-facility Events**		**See External Events in PrHA**	
19.1	Explosion	N	N/A	N/A
19.2	Fire	Y	Limited to crane hazards	
19.3	Power outage	Y	Can happen, but does not lead to a release or worker consequence.	Y
20.	**Vehicles in Motion**			
20.1	Airplane	Y	Small aircraft nearby. See external events in PrHA.	EE-2 EE-3

Appendix B – CH Packaging Loading Segment Hazard Identification Table (Continued)

20.2	Crane/hoist	Y	Crane used to lift waste into CH Packaging	L-1 L-2 L-3 L-4
20.3	Forklifts	Y	While loading drums, tines pierce drum or forklift impacts drum.	WH-1 WH-2 WH-3 WH-4 WH-5
20.4	Heavy construction equipment	N	N/A	N/A
20.5	Helicopter	Y		See 20.1
20.6	Train	N		
20.7	Truck/car	Y	Vehicle impacts staged drums or crane.	WH-1 WH-2 WH-4 WH-5 WH-6
21.	**Natural Phenomena**		**See Natural Phenomenon Events in PrHA**	
21.1	Earthquake	Y	Double stacked drums being prepared for loading in the CH Packaging, crane while lifting.	NPH-1 NPH-2 NPH-3 NPH-4
21.2	Flood	Y	CH Packaging cannot be loaded in rain.	NPH-5
21.3	Lightning	Y	TRU waste stored outside, CH Packaging, crane.	NPH-6
21.4	Rain/hail	Y	CH Packaging cannot be loaded in rain.	Y
21.5	Snow/freezing weather	Y	Unlikely during daytime.	Y
21.6	Straight wind	Y	Could blow projectiles into staged waste, cause the crane to sway and the payload to hit the CH Packaging.	NPH-7 NPH-8
21.7	Tornado	Y		See 21.6

Appendix C – Precautions and Limitations

C.1 Precautions and Limitations

- Filter vents, as specified in Section 2.5 of CCP-PO-003 (Ref. 1), must be installed in payload containers.
- For high wattage shipments, four approved filters are required in each SWB in accordance with Section 6.12 of the *CH TRU Payload Appendices* (Ref. 18).
- For high wattage shipments, a minimum of nine approved filters are required in each TDOP and the remaining port plugged (if not filtered) in accordance with Section 6.12 of the *CH TRU Payload Appendice*s (Ref. 18).
- Failure to rotate the counterweights on the ACGLF to the balance position may cause the ACGLF to swing uncontrollably.

C.2 Dunnage Containers

- Dunnage containers used for payload assembly shall have open vent ports (not filtered or plugged).
- Dunnage containers used for payload assembly shall be labeled either Dunnage or Empty.
- Dunnage shall have a unique serial number. If dunnage constitutes a seven pack, the unique serial number is NOT required.
- Dunnage containers shall meet the requirements of Section 2.2 of CCP-PO-003 (Ref. 1).

C. 3 Radiation Dose Rates and Removable Surface Contamination

- The external radiation dose rates of individual payload containers and a loaded Contact-Handled package to be shipped shall be less than, or equal to, 200 mrem/hr at the surface, and less than, or equal to, 10 mrem/hr at 2-meters for beta/gamma, and neutron.
- Removable surface contamination of individual payload containers and a loaded Contact-Handled package to be shipped to the WIPP shall **NOT** be greater than 20 disintegrations per minute (dpm)/100 cm^2 for alpha emitting radionuclides and 200 dpm/100 cm^2 for beta/gamma emitting radionuclides.

C.4 Controlled Shipments

- For high wattage waste shipments, attachments from DOE/WIPP 02-3220, *CH Packaging Operations for High Wattage Waste* will be used to control and document loading and shipping times.

Appendix C – Precautions and Limitations (Continued)

- For all other CCP controlled shipments, CCP-TP-033, *CCP Shipping of CH TRU Waste,* Attachment 1, *CCP Control Checklist for Controlled Shipments* and Attachment 2, *CCP Control Checklist for Receipt of Controlled Shipments*, will be used to control and document loading and shipping times.

Attachment 1 – Equipment Setup Requirements

Central Characterization Project (CCP)

Mobile Characterization Unit (MCU) Installation Specifications

Equipment: Mobile CH Packaging Loader Unit (MLU-01, MLU-02, & MLU-03)

Summary: Table A contains information regarding general site installation and preparation information for the Mobile CH Packaging Loader Unit MCU.

Table A Installation Specifications	
Weight	The maximum gross weight of a CH package, including a maximum payload weight of 7,265 pounds, is 19,250 pounds (Ref. 3). For CH Packaging payloads, the total weight of payload container(s) in the top layer of the payload assembly shall be less than, or equal to, the total weight of payload container(s) in the bottom layer of the payload assembly. In the case of drums overpacked in a TDOP, the total weight of the top layer of drums shall be less than, or equal to, the total weight of the bottom layer of drums. The total weight of tractor, trailer, and payload cannot exceed 80,000 pounds. If the total weight of the tractor, trailer, and payload is greater than, or equal to, 77,500 pounds, the shipment should be scaled to ensure that the 20,000 pound trailer axle weight limitation and 80,000 pound gross weight limitation are not exceeded (Ref. 17).
Primary Electrical Requirements (including overcurrent protection and grounding)	Electrical supply for the MLU operations requires four 120 VAC/20-amp circuits. Leak detectors, vacuum pump, battery chargers for elevating work platforms.
Fire Suppression	There are no automated fire suppression systems per NFPA 101 (Ref. 12). Portable Class A-B-C fire extinguishers are the only means of fire suppression.
Communication	N/A
Footprint	See Tables A, B, and C below

Attachment 1 – Equipment Setup Requirements (Continued)

Environmental Limits (temperature, water, dust, etc.)	The package loading/unloading operation shall only be performed in a dry environment. CH Packaging casks are not normally loaded during bad weather. 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 freestanding water shall be removed before shipment and liquid handled according to the site's waste management procedures.
Leveling	See SAR (ref. 3)
Anchoring Points	The CH Packaging is secured to its dedicated semi-trailer at four points, two on each trailer main beam. The attachment is made using trailer tie-down devices that pass over the tie-down lugs located at the bottom of the OCA body. The semi-trailer is also fitted with kick plates at the four tie-down points to provide horizontal restraint (blocking). The tie-down scheme utilized for the CH Packaging is shown in Figure 2.5-1 and Figure 2.5-2 of the Safety Analysis Report (Ref. 3).

Each payload container shall comply with the maximum gross weight limits summarized in Table B below, Payload Container Maximum Gross Weight Limits.

Table B Payload Container Maximum Gross Weight Limits

Payload Container	**Maximum Gross Weight (pounds)**
55-Gallon Drum	1,000
Standard Pipe Overpack (6-inch diameter)	328
Standard Pipe Overpack (12-inch diameter)	547
S100 Pipe Overpack	550
S200 Pipe Overpack	547
S300 Pipe Overpack	547
85-Gallon Drum*	1,000
100-Gallon Drum	1,000
SWB	4,000
TDOP	6,700

*The term “85-gallon drum” in this document includes 75- to 88-gallon drums.

Each loaded TRUPACT-II and associated payload assembly shall comply with the maximum gross weight limits provided in Table C below, TRUPACT-II and Payload Assembly Maximum Gross Weight Limits.

Attachment 1 – Equipment Setup Requirements (Continued)

Table C TRUPACT-II and Payload Assembly Maximum Gross Weight Limits

Assembly	**Maximum Gross Weight (pounds)**
Payload (Contents)	7,265
Loaded TRUPACT-II (Package)	19,250

Each loaded HalfPACT and associated payload assembly shall comply with the maximum gross weight limits provided in Table D below, HalfPACT and Payload Assembly Maximum Gross Weight Limits.

Table D HalfPACT and Payload Assembly Maximum Gross Weight Limits

Payload	**Maximum Gross Weight (pounds)**
Payload (Contents)	7,600
Loaded HalfPACT (Package)	18,100

Maximum gross weight limits for payload assemblies of either the TRUPACT-II or HalfPACT include the weight of the loaded payload container(s) and any additional payload assembly items (e.g., pallets, spacers, guide tubes, slip sheets, reinforcing plates, banding material, or slings) as specified in Section 2.9 of the Contact-Handled TRAMPAC (Ref. 1). Actual payload assembly weights are limited by “as-built” TRUPACT-II and HalfPACT weights and DOT requirements for a loaded transport vehicle. Payload containers and TRUPACT-II or HalfPACT payloads shall be acceptable for transport only if the weight plus the measurement error (i.e., one standard deviation) is less than, or equal to, the maximum gross weights specified in Table B, C, or D.

NOTE: When loading packages on trailer, or loading payload into packaging that is already on trailer, the following applies:

- Packages having a gross weight difference (heaviest to lightest) of 1,000 pounds or less can be considered equal and do not require a specific sequence for positioning on the trailer.

- Packages having a gross weight difference (heaviest to lightest), greater than 1,000 pounds shall be positioned on the trailer as follows:

Trailer Front	Heaviest	Medium	Lightest	Trailer Rear
	Heaviest	Lightest	None	
	Heaviest	None	None	

Additional Figures and Tables illustrating the footprint of the TRUPACT-II MLU are shown in the Contact-Handled TRAMPAC (Ref. 1).