

Technical Safety Requirements for the WIPP Mobile Characterization Units

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INTRODUCTION

This document contains the Technical Safety Requirements (TSRs) for the Waste Isolation Pilot Plant (WIPP) Central Characterization Project (CCP) Mobile Waste Characterization Units (MCUs) to process Department of Energy (DOE) transuranic (TRU) waste located at DOE-owned or related sites. This includes the Real Time Radiography (RTR) unit, Non-Destructive Assay (NDA) unit, Headspace Gas Sampling (HSGS) unit, Mobile Visual Examination and Repackaging (MOVER) unit, and the Mobile TRUPACT Loading Unit. The TSRs constitute requirements regarding the safe operation of the MCUs.

These TSRs are derived from the Basis for Interim Operation (BIO) for the MCUs (Ref. 1). The analysis presented in the BIO determined that the MCUs are low-chemical hazard, Hazard Category 2 non-reactor nuclear facilities. The TSRs consist primarily of inventory limits, as well as controls to preserve the underlying assumptions in the Process Hazard Analysis (PrHA) in the MCU BIO. Further, appropriate commitments to safety programs are presented in the Administrative Controls sections of this TSR document.

Chapter 5 of the MCU BIO documents the derivation of the TSRs and develops the operational limits that protect the safety envelope defined for the MCU operations. This TSR document is applicable to the handling, characterization, and TRUPACT-II loading of TRU waste drums. Section 5, Administrative Controls, contains those Administrative Controls necessary to ensure safe operation of the MCUs. A basis explanation follows each of the requirements described in Section 5.5, Specific Administrative Controls. This basis explanation does not constitute an additional requirement, but is intended as an expansion of the logic and reasoning behind the development of the requirement. Programmatic Administrative Controls are in Section 5.6.

This introduction to the MCU TSRs is not part of the TSR limits or conditions and contains no requirements related to the safety analyses in the MCU BIO (Ref. 1).

Section 1
Use and Application

SECTION 1 USE AND APPLICATION

1.1 DEFINITIONS

NOTE: Defined terms in this list appear in uppercase type throughout this TSR document.

Term	Definition
APPROVED TRU WASTE DRUM	DOT 17C, 17H or UN1A2, 55-gallon steel drums with filter vents or without filter vents. [Note: These drums may or may not be stamped “Type A” per 49 CFR 178.350 (b).]
MAY	Denotes an acceptable, but not required, way to maintain the requirements, assumptions, or conditions of the MCU BIO.
PLUTONIUM-239 EQUIVALENT CURIES (PE-Ci)	A normalized isotope value in Ci based upon the dose conversion factors of the isotope relative to the dose conversion factor of plutonium-239. Such that the isotope in Ci multiplied by the applicable dose conversion factor (DCF) (from the WIPP Waste Acceptance Criteria [WAC]), divided by the DCF for Pu-239 equals the Pu-239 equivalent in Ci. This equals the amount of the isotope that would deliver a dose in rems equivalent to the calculated Pu-239 equivalent, in Ci. There is no relationship to the mass equivalence described and used specifically for criticality purposes.
SHALL	Denotes a mandatory requirement that must be complied with.
SHOULD	Denotes the responsibility of following the TSR either as specified or in a manner that meets the intent of the TSR. The use of “should” recognizes that there may be site- or project-specific attributes that warrant special treatment and that literal compliance with the TSR may not be required to maintain the requirements, assumptions, or conditions of the MCU BIO.
TRANSURANIC (TRU) WASTE	Waste containing 100 nCi/g or more of alpha-emitting radionuclides above uranium in the periodic table (i.e., atomic number greater than 92) and with half-lives greater than 20 years.

1.2 OPERATIONAL MODES

Facility modes are not required since there are no Limiting Conditions for Operation (LCOs). The facilities will be performing their mission throughout the operational life of the facility. This section is not applicable to the MCUs.

1.3 FREQUENCY NOTATION

No surveillance requirements (SRs) have been identified as necessary to support the safety analysis for the MCUs; therefore, no frequency notations have been included in this TSR document.

1.4 ABBREVIATIONS AND ACRONYMS

The following abbreviations and acronyms are used in this document.

AC	Administrative Control
ALARA	as low as reasonably achievable
BIO	Basis for Interim Operation
CFR	Code of Federal Regulations
CCP	Central Characterization Project
Ci	Curie
DCF	dose conversion factor
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DVS	Drum Venting System
ES&H	Environment, Safety and Health
FPOC	Facility Point of Contact
HENC	High Efficiency Passive Neutron Counter
HEPA	high efficiency particulate air
HSGS	Headspace Gas Sampling
ISMS	Integrated Safety Management System
LCO	Limiting Condition for Operation
MAR	Material at Risk
MCU	Mobile Characterization Unit
MOVER	Mobile Visual Examination and Repackaging
NFPA	National Fire Protection Association
PAO	polyalphaolephin
PE-Ci	plutonium-239 equivalents, in curies
PrHA	Process Hazard Analysis
QA	quality assurance
RTR	real time radiography
SL	safety limit

1.4 ABBREVIATIONS AND ACRONYMS (cont'd)

SR	surveillance requirement
SSCs	Structures, Systems, and Components
TRU	transuranic
TSR	Technical Safety Requirement
USQ	Unreviewed Safety Question
WAC	Waste Acceptance Criteria
WIPP	Waste Isolation Pilot Plant

1.5 SAFETY LIMITS

No Safety Limits (SLs) have been identified as necessary to support the safety analysis for the MCUs.

1.6 LIMITING CONTROL SETTING

Since operation of the MCUs include no SLs; Limiting Control Settings are not applicable.

1.7 LIMITING CONDITIONS FOR OPERATION

No Limiting Conditions for Operation (LCOs) have been identified as necessary to support the safety analysis for the MCUs.

1.8 SURVEILLANCE REQUIREMENTS

No Surveillance Requirements (SRs) have been identified as necessary to support the safety analysis for the MCUs.

Section 2

Safety Limits

SECTION 2 SAFETY LIMITS

There are no Safety Limits.

Section 3/4

**Limiting Conditions for Operation and
Surveillance Requirements**

**SECTION 3/4 LIMITING CONDITIONS FOR OPERATION AND
SURVEILLANCE REQUIREMENTS**

There are no Limiting Conditions for Operation (LCOs) or related Surveillance Requirements (SRs).

Section 5
Administrative Controls

SECTION 5 ADMINISTRATIVE CONTROLS

5.1 CONTRACTOR RESPONSIBILITY

The Facility Manager SHALL be responsible for overall facility operation and SHALL delegate in writing the succession to this responsibility to a qualified individual during each absence.

5.2 CONTRACTOR ORGANIZATION

5.2.1 Site Organization

Lines of authority, responsibility, and communications SHALL be established and defined for the highest through the intermediate management levels, including all safety and operating organization positions. The roles, responsibilities and reporting relationships are described in the Interface Document and Statement of Work that support the MCU BIO (Ref. 1).

5.2.2 Facility Organizations

The Facility Point of Contact (FPOC) for the MCUs is responsible for facility safety in the MCUs. Some of the FPOC responsibilities include concurring that work can be safely performed in the facility, and working with the responsible individual to identify job-specific hazards associated with the work location. The FPOC MAY also participate in pre-start reviews of work, evaluate proposed operational or activity changes against the facility's existing Environment, Safety and Health (ES&H) documentation (e.g., the safety basis), and concurring that work MAY proceed in the MCUs, prior to the onset of work.

5.3 PROCEDURES

The Central Characterization Project (CCP) maintains a number of operational procedures that provide additional instruction to help ensure safe operation of the MCUs. The CCP procedures that affect safety in the MCUs SHALL be reviewed by host site management.

5.4 TECHNICAL SAFETY REQUIREMENTS

5.4.1 General

The TSR document SHALL be prepared, reviewed independently, and approved in accordance with 10 CFR 830 Subpart B.

5.4.2 Compliance

The TSRs SHALL be complied with, except for reasonable action taken in an emergency (see Section 5.4.6 below). Site management is responsible for ensuring that the requirements of these TSRs are met. Compliance SHALL be demonstrated by establishing, implementing, and maintaining the required Administrative Controls (ACs) and AC Programs.

5.4.3 Violation of TSR

Violation of a TSR occurs as a result of failure to comply with an AC statement.

5.4.4 Violation of an Administrative Control

Failure to comply with the specific ACs in Section 5.5 constitutes a TSR violation. For the programmatic ACs listed in Section 5.6, violation occurs when the failure is of sufficient magnitude that the intent of the referenced program is not fulfilled.

5.4.5 Response to an AC Violation

For all TSR and AC Program failures:

- Place the affected MCU in a safe condition.
- Notify DOE and as necessary, prepare an Occurrence Report in accordance with DOE Order 232.1A, *Occurrence Reporting and Processing of Operations Information*.
- Prepare a recovery plan describing the steps leading to compliance with the AC Program. For failures that are corrected within 72 hours, no plan is prepared.
- Within as short a time as can be safely accomplished after discovery, return the MCU to compliance.

5.4.6 Emergency Actions

Emergency actions MAY be taken that depart from a requirement in the TSR provided that:

- an emergency situation exists;
- these actions are needed immediately to protect the public health and safety;
- no action consistent with the TSR can provide adequate or equivalent protection.

Such emergency actions SHALL be authorized by **Facility Manager**, designee or incident commander and performed by personnel trained and qualified for the equipment or systems needed to perform the actions. If an emergency action is taken, both verbal notification and a written report SHALL be made within 24 hours to the DOE Site Office Manager or designee.

5.5 SPECIFIC ADMINISTRATIVE CONTROLS

This section establishes non-programmatic ACs that preserve critical assumptions in the MCU safety analyses.

5.5.1 Inventory Control

The following limits are specified as individual controls:

- a. **AC Statement:** For each MCU, the radioactive material inventory SHALL be no greater than 100 PE-Ci. Material inventory SHALL be verified by the Host Site before receipt of new material into the MCU. Material sealed in a certified Type-B shipping cask is not included in this inventory.

Basis:

The purpose of this requirement is to ensure that the radionuclide inventory in each MCU remains below quantities and consequences analyzed in the BIO (Ref. 1). Inventory controls were identified as an initial assumption for the activities in the PrHA. The radionuclide inventory is maintained in accordance with DOE/WIPP-069, Appendix B.

- b. **AC Statement:** For TRU WASTE DRUM, the radioactive material inventory SHALL be no greater than 100 PE-Ci and the fissile material inventory SHALL be no greater than 200 Pu-239 fissile gram equivalent (FGE). If a drum is determined to exceed its initial estimated activity level after being assayed, then the Nonconforming Drum Disposition Program SHALL be followed.

Basis:

Inventory controls were identified as an initial assumption for the activities in the PrHA.

- c. **AC Statement:** Each MCU or segment that contains 100 PE-Ci SHALL be separated from other nuclear facilities using an exclusion or “Keep Clear” zone of 20 feet. The area SHALL be inspected each working day to ensure that no material has been introduced.

Basis:

Inventory controls were identified as an initial assumption for the activities in the PrHA. The exclusion zone ensures that there is no interaction between segments, so the Material at Risk (MAR) assumed in the analysis remains bounding.

5.5.2 Combustible Material and Ignition Source Controls

- a. **AC Statement:** A combustible material and ignition source control program SHALL be implemented in MCUs. Attributes for the combustible material and ignition source program include:

- A Fire Protection Engineering approved combustible control plan SHALL be implemented.
- Flammable/combustible liquids SHALL not be stored outside National Fire Protection Association (NFPA) approved cabinets
- Hot work SHALL be controlled by a permitting process.

Basis:

Limiting combustible material and ignition source controls reduces the likelihood of a fire within the MCU or within the exclusion zone.

- b. **AC Statement:** Non-sparking, spark-resistant or spark-proof tools SHALL be used within the Mobile Visual Examination and Repackaging (MOVER) glovebox. Tools shall be confirmed to be non-sparking, spark-resistant, or spark-proof prior to introduction into the glovebox.

Basis:

Use of non-sparking tools within the MOVER glovebox reduces the likelihood of a fire within the glovebox that could lead to a radiological material release. Approved tools include non-sparking, spark-resistant or sparkproof tools made of metals such as brass, bronze, Monel metal (copper-nickel alloy), copper aluminum alloys (aluminum-bronze), copper-beryllium (beryllium-bronze), and titanium.

5.5.3 Staging and Handling

- a. **AC Statement:** Traffic controls SHALL be established and maintained that physically prohibit vehicles while TRU waste drums are staged in MCUs.

Basis:

Protection from vehicular traffic is judged to provide significant benefit in reducing the frequency of events impacting staged drums in the MCUs. Physical barriers, such as fences, gates, and jersey barriers, SHALL be used to preclude interaction between vehicles and material containers and SHALL be capable of serving this function.

- b. **AC Statement:** The crane lift for TRUPACT-II loading SHALL be a critical lift and the crane SHALL be positioned such that it cannot impact MAR in other nuclear segments. The critical lift plan SHALL include crane position. The plan SHALL be verified as a pre-requisite to lifting activities.

Basis:

Critical lift designation and crane positioning were identified as a control in the PrHA to ensure failure of the crane would not result in a release of material at risk in the TRU Waste Characterization Unit or involve other nuclear segments.

- c. **AC Statement:** Diesel-fueled forklifts SHALL NOT be used.

Basis:

A prohibition on the use of diesel-fueled forklifts significantly reduces the likelihood of a significant drum breach and pool fire resulting from a forklift accident. Eliminating diesel-fueled forklifts prevents pooling of fuel in the event the forklift fuel tank is breached.

5.6 PROGRAMMATIC ADMINISTRATIVE CONTROLS

This section establishes programmatic ACs committed to in the MCU BIO (Ref. 1).

5.6.1 Criticality Safety Program

A Criticality Safety Program SHALL be established, implemented, and maintained to ensure that the frequency of a criticality is beyond extremely unlikely. The principal controls in this program are a limit of 200 Pu-239 FGE per drum, and 325 Pu-239 FGE per TRUPACT-II cask.

The criticality safety program is further described in Section 6.1 of the MCU BIO.

5.6.2 Radiation Protection Program

A radiation protection program SHALL be established, implemented, and maintained to ensure that workers are provided adequate protection from radiological hazards, including training and monitoring in accordance with requirements of 10 CFR 835. The Radiation Protection Program encompasses continuous air monitoring and differential pressure monitoring when operating the MOVER glovebox.

The Radiation Protection Program is discussed in Section 6.2 of the MCU BIO.

5.6.3 Emergency Preparedness Program

An emergency preparedness program SHALL be established, implemented, and maintained to ensure that workers are aware of the proper response actions in the event of an emergency. Personnel are expected to leave the area in the event of an accidental release. Operators and others working in the segments SHALL be trained on personnel evacuation routes.

The Emergency Preparedness Program is discussed in Section 6.10 of the MCU BIO.

5.6.4 Fire Protection Program

A Fire Protection Program SHALL be established, implemented, and maintained to ensure that the facility has provisions in place for combustible loading control and adequate fire detection capabilities. This program also maintains the assumptions of the hazard analyses by including the following elements:

- Combustibles brought into the characterization units are limited to incidental material necessary to conduct operations. The MCUs SHALL be inspected weekly in accordance with the Fire Protection Program.
- Only incidental quantities of flammable or combustible liquids are allowed in the segments (other than any required for operations). Required materials SHALL be stored in NFPA approved flammable material cabinets.
- Fire detection systems and fire extinguishers SHALL be maintained operational in accordance with the Fire Protection Program.
- Manually operated fire suppression in the MOVER glovebox SHALL be designed, installed and tested in accordance with NFPA 2001, *Standard on Clean Agent Fire Extinguishing Systems*.

The Fire Protection Program is described in Section 6.6 of the MCU BIO.

5.6.5 Initial Testing, In-Service Inspection & Test, Configuration Management, and Maintenance Program

An Initial Testing, In-Service Inspection & Test, Configuration Management, and Maintenance program SHALL be established, implemented, and maintained to ensure the integrity of the Safety Significant Structures, Systems, and Components (SSCs). The In-Service Inspection & Test Configuration Management, and Maintenance program SHALL ensure the integrity of the Design Features. Inspections, tests, and maintenance SHALL be performed by qualified personnel using documented procedures. The Container Inspection Program provides visual surveillance and inspection of drums to identify signs of pressurization or degradation that could challenge drum integrity. The MOVER unit high efficiency particulate air (HEPA) filters SHALL be polyalphaolephin (PAO) (or equivalent) tested prior to use.

The Initial Testing, In-Service Inspection & Test, Configuration Management, and Maintenance Program is described in Section 6.5 of the MCU BIO.

5.6.6 Additional Safety Management Programs

The following Safety Management Programs discussed in Chapter 4 of the MCU BIO provide additional protective measures for worker safety and SHALL be established, implemented, and maintained in accordance with the site ES&H program:

- Radioactive and Hazardous Waste Management

- Operational Safety
- Procedures
- Quality Assurance, including the Nonconforming Drum Disposition Program

5.7 MINIMUM STAFFING REQUIREMENTS

The MCUs normally operate on a single work shift. The normal work shift MAY be extended to complete a given operation. At a minimum, two persons are required for movement of waste and for characterizing waste in the units. A single person MAY perform inspections and maintenance. No APPROVED TRU WASTE DRUMS are stored in the MCUs at the end of the normal work shift. An exception is an APPROVED TRU WASTE DRUM in the MOVER that contains an item or items that are judged to pose safety concerns; in which case the process SHALL be halted pending further evaluation to mitigate any potential hazards.

5.8 OPERATING SUPPORT

The site provides technical support for radiation safety, fire protection, industrial hygiene, industrial safety, and environmental analysis. An ES&H Team Health & Safety Technician SHALL be on site when work is being performed and SHALL be on call at all other times when radioactive material is present in the MCUs. In the event of an emergency, additional support can be provided as part of the Emergency Preparedness Program described in Section 6.10 of the MCU BIO (Ref. 1).

5.9 PROJECT STAFF QUALIFICATIONS AND TRAINING

A Training Program SHALL be established, implemented, and maintained to ensure that operators are qualified to perform their specified duties and thereby minimize exposure to hazardous conditions. Radiation protection training is included in the Training Program to help ensure that radiation doses are kept ALARA in both MCU segments. Workers are trained in emergency response, which includes instructions to immediately evacuate in case of fire. Training is provided for truck and forklift operators, critical lift/hoisting and rigging for crane operators, and characterization unit operators to ensure operators are capable of operating their equipment in a safe manner. CCP personnel SHALL be trained and qualified to operate and maintain equipment in accordance with the CCP training and qualification plan.

The Training Program is described in Section 6.7.2 of the MCU BIO (Ref. 1).

5.10 OPERABILITY DEFINITION AND IMPLEMENTATION PRINCIPLES

This section is not applicable.

5.11 REVIEWS AND AUDITS

Reviews SHALL be performed by project staff to ensure that day-to-day activities are conducted in a safe manner. Individual reviewers do not review their own work for which they have direct responsibility. Technical review, audit, and self-assessment of project activities and programs that affect safety are performed independent of the project staff.

Written records of project reviews, technical reviews, audits, and assessments SHALL be maintained in accordance with the Quality Assurance Program. In conjunction with the Quality Assurance Program and the Integrated Safety Management System (ISMS), the Unreviewed Safety Question (USQ) process ensures that the site achieves its safety goal. These programs provide a systematic process for assuring

the status of MCU BIO (Ref. 1) requirements, and maintaining the appropriate descriptive documentation.

5.12 REPORTING REQUIREMENTS

Events and conditions that violate TSR Administrative Control Programs, as defined in Sections 5.4.3 and 5.4.4 above, are considered Occurrences. Occurrences SHALL consistently be reported to ensure that both DOE and site contractor line management, including the Office of the Secretary, are kept fully and currently informed of all events that could (1) affect the health and safety of the public; (2) seriously impact the intended purpose of DOE facilities; (3) have a noticeable adverse effect on the environment; or (4) endanger the health and safety of workers. A system SHALL be established for determining appropriate corrective action and for ensuring that such actions are effectively taken.

Section 6

Design Features

SECTION 6 DESIGN FEATURES

APPROVED TRU WASTE DRUMS, the MOVER Glovebox Operation Room structure, the MOVER glovebox (including the first testable HEPA filter), and the Drum Venting System (DVS) are identified as Design Features. These are passive Safety Significant SSCs.

6.1 APPROVED TRU WASTE DRUMS

The TRU metal waste drums are passive design features. A TRU waste container maintenance program is established, implemented, and maintained to preserve container integrity and minimize the likelihood of hydrogen gas buildup, as described in Chapter 3 of the MCU BIO (Ref. 1). Container integrity means 1) no significant rusting, 2) sound structural integrity, and 3) no leaks. Significant rust is a readily observable loss of metal due to oxidation (evidenced by flaking, bubbling or pitting) that causes degradation of the container's structural integrity. Sound structural integrity means free of denting, deformation or breaches, damage to that results in creasing, cracking, or gouging that exposes the internal container or adversely affects closure. The waste container management program ensures that containers are inspected periodically for integrity and the presence of a filter.

6.2 MOVER Glovebox

The MOVER glovebox and the exhaust HEPA filter are passive design features. The exhaust HEPA filter has been installed and tested in accordance with ASME Code AG-1 *Code on Nuclear Air and Gas Treatment*. Prior to each use, a visual inspection of the glovebox, including gloves in the pumped out condition, SHALL be performed. Drums SHALL be installed and pigtailed to the glovebox prior to use. The differential pressure across the HEPA filter SHALL be verified prior to each use to assure filtration of the exhaust flow. The HEPA filter SHALL be PAO (or equivalent) tested prior to installation.

6.3 MOVER Unit Glovebox Operation Room Structure

The MOVER Unit Glovebox Operation Room structure is a passive Design Feature, and is certified as a DOT Type 7A container. Operating Personnel are trained to close doors to the Glovebox Operation Room upon entry and exit from the room, in accordance with the CCP Training and Qualification Plan (Ref. 2).

6.4 Drum Venting System

The DVS HEPA filter train, inlet filter and drum cabinet are passive Design Features. The HEPA filter train SHALL be PAO (or equivalent) tested before installation. Doors on the drum cabinet SHALL be closed prior to venting drums.

Section 7
References

SECTION 7 REFERENCES

1. *Basis for Interim Operation (BIO) for the WIPP Mobile Characterization Units*, WSMS TRU Solutions, Carlsbad, NM, 2003.
2. CCP-QP-002, *WIPP Training and Qualification Plan*, U.S. Department of Energy Carlsbad Area Office, Carlsbad, NM.

Appendix A

SL AND LCO Bases

APPENDIX A
SL AND LCO BASES

No Safety Limits (SLs) or Limiting Conditions for Operation (LCOs) have been identified as necessary to support the safety analysis; therefore, no bases explaining the reasons for these requirements have been included in this TSR document.