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WIPP/DOE - 137

Revision 2

UC - 70

**TRU Waste Certification Compliance Requirements
For Acceptance of Contact-Handled Wastes
Retrieved from Storage to be Shipped to the
Waste Isolation Pilot Plant**

January 1989



WASTE ISOLATION PILOT PLANT

890102



Printed in the United States of America

**Available from
National Technical Information Service
U. S. Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
NTIS Price Codes: Printed Copy A04
Microfiche A01**

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WIPP-DOE-137
Revision 2
UC-70

TRU WASTE CERTIFICATION COMPLIANCE REQUIREMENTS FOR
ACCEPTANCE OF CONTACT-HANDLED WASTES RETRIEVED
FROM STORAGE TO BE SHIPPED TO THE
WASTE ISOLATION PILOT PLANT

JANUARY 1989

WESTINGHOUSE ELECTRIC CORPORATION
WASTE ISOLATION PILOT PLANT
MANAGEMENT AND OPERATING CONTRACTOR

TABLE OF CONTENTS

	<u>Page</u>
1.0 INTRODUCTION	1
2.0 GENERAL REQUIREMENTS	2
3.0 WASTE CONTAINER REQUIREMENTS	5
3.1 CRITERION: WASTE CONTAINERS	5
3.2 CRITERION: WASTE PACKAGE SIZE	7
3.3 CRITERION: WASTE PACKAGE HANDLING	9
4.0 WASTE FORM REQUIREMENTS	11
4.1 CRITERION: IMMOBILIZATION	11
4.2 CRITERION: LIQUID WASTES	12
4.3 CRITERION: PYROPHORIC MATERIALS	14
4.4 CRITERION: EXPLOSIVES AND COMPRESSED GASES	15
4.5 CRITERION: RADIOACTIVE MIXED WASTE	16
4.6 CRITERION: SPECIFIC ACTIVITY OF WASTE	18
5.0 WASTE PACKAGE REQUIREMENTS	20
5.1 CRITERION: WASTE PACKAGE WEIGHT	20
5.2 CRITERION: NUCLEAR CRITICALITY	21
5.3 CRITERION: PU-239 EQUIVALENT ACTIVITY	22
5.4 CRITERION: SURFACE DOSE RATE	24
5.5 CRITERION: SURFACE CONTAMINATION	25
5.6 CRITERION: THERMAL POWER	26
5.7 CRITERION: GAS GENERATION	27
5.8 CRITERION: LABELING	29
5.9 CRITERION: DATA PACKAGE/CERTIFICATION	30
6.0 REFERENCES	34

LIST OF FIGURES

<u>Figure No.</u>	<u>Title</u>	<u>Page</u>
1	BASIS FOR CERTIFICATION OF TRU WASTE FOR SHIPMENT TO WIPP	4

1.0 INTRODUCTION

Compliance requirements are presented for certifying that unclassified, contact-handled (CH) transuranic (TRU) solid defense wastes retrieved from storage at DOE sites meet the Waste Isolation Pilot Plant (WIPP) Waste Acceptance Criteria (WAC) (Reference 1). All applicable Department of Energy (DOE) orders must continue to be met. The compliance requirements for acceptance of newly generated CH waste to be shipped to the WIPP are addressed in another document (Reference 2).

The compliance requirements are divided into four sections, primarily determined by the general feature that the requirements address. These sections are General Requirements, Waste Container Requirements, Waste Form Requirements, and Waste Package Requirements. The waste package is the combination of waste container and waste.

2.0 GENERAL REQUIREMENTS

The compliance requirements are presented to assist those storing TRU waste to prepare their site-specific certification program (plans and detailed procedures) to be applied to waste packages retrieved from interim storage for shipment to the WIPP. The certification program includes the shipper's* plans for certification and quality assurance as illustrated in Figure 1.

The certification plan should include a general description of the procedures to be applied by the shipper to certify that waste packages meet the certification requirements. These include administrative controls, inspection techniques, and, where appropriate, package upgrading. The controls and methods should be those most suited to the needs and capabilities of the site and the types of waste in storage.

The shipper's Quality Assurance Plan is guided by the Certification Quality Assurance Requirements (Reference 3). Site certification and quality assurance plans and procedures will be subject to audit by the cognizant DOE Field/Area Office in addition to DOE overview.

The shipper's certification program includes the operating procedures which control the actual operations for certifying waste packages. These operating procedures, which employ the principles of the certification plan and quality assurance plan, contain the specific details of the inspection techniques and remedial actions applied to each waste package. The documented data from the operating procedures form the base of information to verify that waste sent to the WIPP is certified by the shipper as meeting the WIPP requirements.

* The term "shipper" is used in this document to refer to the authority responsible for certification of waste retrieved from storage, recognizing that in some cases the authority resides with the waste generation site or is transferred to the waste storage site.

Each shipper's certification and quality assurance plan must be submitted to and be approved by the WIPP Project Office (WPO) prior to certifying waste. Only waste certified to the WIPP-WAC or waste with special WPO approval will be accepted at the WIPP.

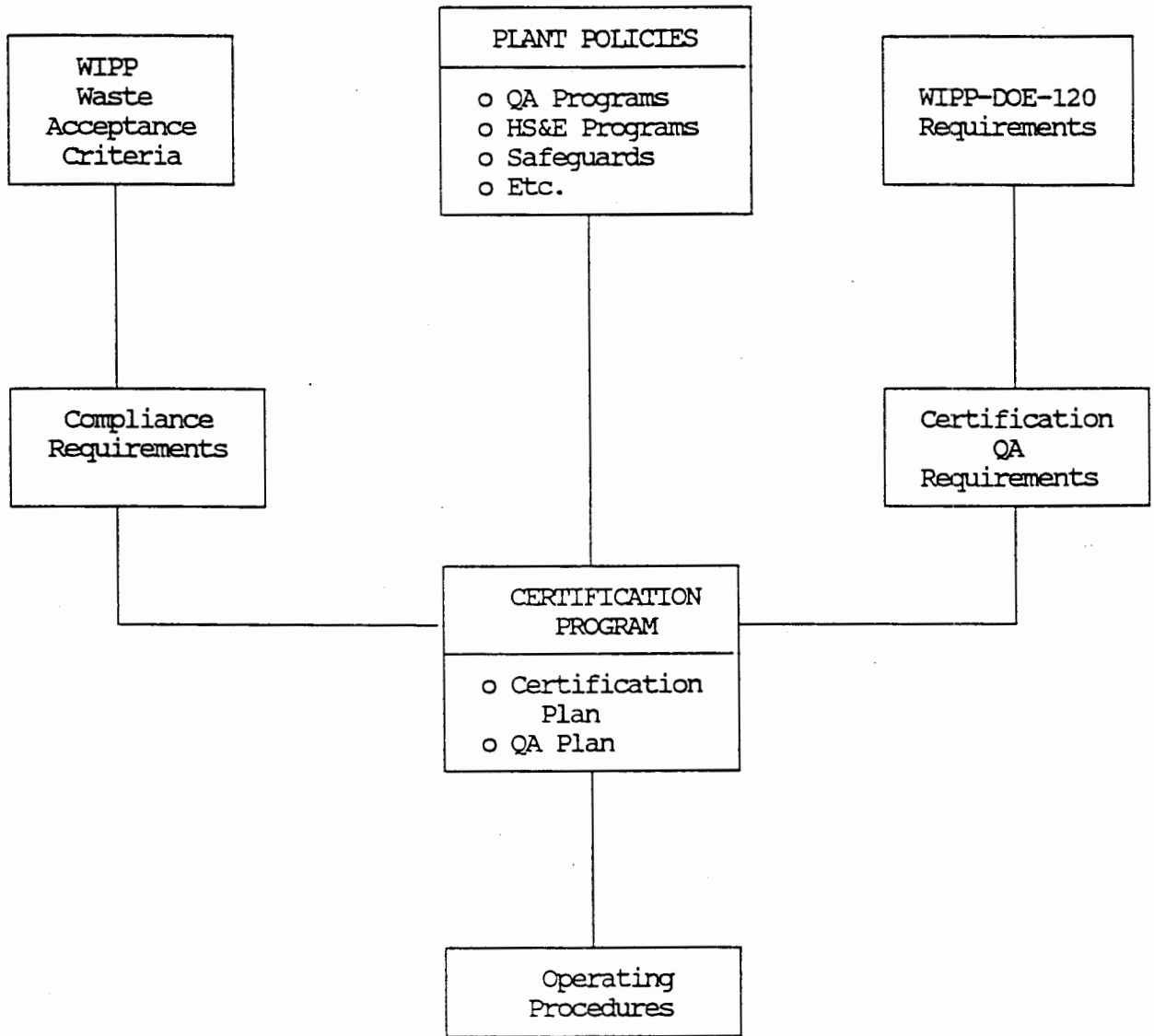


Figure 1 Basis for Certification of TRU Waste for Shipment to WIPP.

3.0 WASTE CONTAINER REQUIREMENTS

The requirements in this section apply to the container for the waste package. The container may be the original container, or it may be an overpack added to the waste package.

Generally, common inspection methods can be used to verify that the container meets the requirements. The CH waste container, or its external surface, is directly accessible, allowing some freedom in the selection of inspection methods most suitable for the shipper. The shipper's operating procedures must describe the methods to be used for each requirement and show that they will result in the necessary data.

3.1 CRITERION: WASTE CONTAINERS

Waste containers for emplacement at the WIPP shall be noncombustible and meet all the applicable requirements of 49 CFR 173.412 for Type A packaging. Waste containers of various sizes shown to meet DOT Type A requirements by the methods detailed in MLM 3245 (Reference 4) are acceptable to WIPP. In addition, they shall have a design life of at least 20 years from the date of certification.

Any waste containers that appear to be bulged or otherwise damaged shall be repackaged or overpacked in a container meeting the above requirements.

INTENT

The purpose for this criterion is to provide protection to personnel from the potential failure of waste containers and the release of contamination during shipping and handling, including retrieval if required.

CONTROLLED PROPERTIES

- o Container design and fabrication

- o Physical condition of container
- o Design life of container

COMPLIANCE REQUIREMENTS

TRU waste containers will comply with this criterion if the following conditions are met:

- 3.1.1 Documentation shall exist to show that the container is made of metal or other noncombustible material.
- 3.1.2 Documentation shall exist to show that, as a minimum, the container complies with the DOT requirements for Type A packaging and can be reasonably expected to have a lifetime of 20 years following certification.
- 3.1.3 Documented inspection data shall exist to show that the container does not present a hazard because of pressurization or other deterioration.

DISCUSSION

All waste containers retrieved from storage must be examined and, where deficiencies are found, corrective actions must be taken to certify the packages as meeting Criterion 3.1. Examples of acceptable methods of inspection and corrective action are described below.

For Criterion 3.1.1, a visual inspection may be appropriate for most waste packages to verify that the container is metallic. A test for magnetism with a permanent magnet may be used for identifying carbon steel containers. The ultrasonic or eddy current tests used for inspection for other requirements may also verify metallic materials. Any container which cannot be shown to be noncombustible is unacceptable. A package may be upgraded by overpacking in a container meeting all requirements for Criterion 3.1.

For Criterion 3.1.2, procurement and fabrication documents showing compliance with DOT requirements cited in 49 CFR 173.412 and 173.415 will verify that the container is Type A packaging. Original markings on the container as per 49 CFR 173.24(c)(1), which identify the container as Type A, will verify meeting this requirement. For drums or bins without proper documentation or markings, demonstrate that material type and thickness, physical size, and other physical attributes (closure, stiffeners, penetrations, etc.) meet applicable Type A requirements and that the lifetime can reasonably be projected for 20 years after package certification. The 20-years design life is for the combination of the waste container and the protective coating (e.g., paint). It should not be interpreted that the paint itself must have a 20-year lifetime without defect. A type of container can also be verified as Type A by subjecting a model of it to tests as specified in 49 CFR 173.461. Waste containers of various sizes shown to meet DOT Type A requirements by the methods detailed in MLM 3245 are acceptable to WIPP. Waste packages which cannot be shown to meet applicable Type A requirements must be repackaged or overpacked in a container meeting all requirements for Criterion 3.1.

For Criterion 3.1.3, waste packages that present a hazard can be corrected by an overpack meeting all the requirements for Criterion 3.1.

3.2 CRITERION: WASTE PACKAGE SIZE

CH TRU waste packages or package assemblies shall not exceed 12 x 8 x 8.5 feet (3.7 x 2.4 x 2.6 m) in overall L x W x H dimensions.

INTENT

The purpose for this criterion is to prevent exceeding the size limitations of handling equipment, facilities, and transportation hardware.

CONTROLLED PROPERTY

- o Waste package size

COMPLIANCE REQUIREMENTS

TRU waste packages shipped to the WIPP will comply with this criterion if the following conditions are met:

- 3.2.1 Packages or package assemblies shall not exceed 12 x 8 x 8.5 feet (3.7 x 2.4 x 2.6 m) (L x W x H).
- 3.2.2 No package shall be smaller than a 30-gallon drum or equivalent container.

DISCUSSION

The size of the hoist cage at the WIPP limits the dimensions of waste packages or an assembly of packages received at the WIPP. Other size limitations for the height and width of packages important to the shipper depend on the sizes of the TRUPACTs and other transporters which may be developed for CH TRU waste package shipments.

If alternate transportation methods for shipment to WIPP become available, packages or package assemblies meeting the requirements for these transportation methods must not exceed the dimensions listed in the above criterion.

To optimize WIPP stacking efficiencies, however, it is recommended that TRU waste be packaged in the DOT Specification 17C 55-gallon steel drum or rectangular steel boxes with nominal outside dimension of:

- Standard 55-gal. (208-L) metal drum (DOT Spec. 17C and 17H)
- Standard 55-gal. (208-L) metal drum (DOT Spec. 6M)
- Rectangular metal box (74.4 X 50.5 X 38.5 in. LWH)
- Rectangular metal box (68 X 54 X 38.5 in. LWH)
- Rectangular metal box (88 X 54 X 54 in. LWH)
- Rectangular metal box (71 X 57 X 52.5 in. LWH)
- Rectangular metal box (50.4 X 58.4 X 72.4 in. LWH)

- Rectangular metal box (4 x 4 x 7 ft LWH)
- Standard Waste Box (37 in. high x 71 in. long OD/54.25 in. short OD x 45.06 in. side)

These are not intended to be exclusive sizes.

3.3 CRITERION: WASTE PACKAGE HANDLING

All waste packages shall be provided with cleats, offsets, chimes, or skids for handling by means of fork trucks, cranes, or similar handling devices. Lifting rings and other auxiliary lifting devices on the packages, if provided, shall be recessed, offset, or hinged in a manner which does not inhibit stacking the packages.

INTENT

The purpose for this criterion is to permit the use of standard methods for waste package handling.

CONTROLLED PROPERTY

- o Container configuration and design features

COMPLIANCE REQUIREMENTS

TRU waste packages will comply with this criterion if one of the following conditions is met:

- 3.3.1 Inspection shall show that existing containers have acceptable handling features.
- 3.3.2 New containers shall be fabricated to documented design specifications (a) incorporating standard or WIPP-approved handling features and favorable stacking features and (b) having a 5:1 safety factor based on the ultimate strength of the material used for permanent lifting attachments (Reference 5).

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DISCUSSION

Inspection methods must be applied to verify that a package has standard or WIPP-acceptable handling features and that permanent lifting attachments have not significantly deteriorated during interim storage. Successful retrieval of a package from interim storage is evidence that it can be handled safely. A package which does not meet Criterion 3.3.1 may be corrected by adding acceptable handling features or by overpacking in a container meeting Criterion 3.3.2. It is recommended that new overpacks or multiple drum assemblies be provided with lifting-loop attachments as described in report SAND-81-0141 (Reference 6).

4.0 WASTE FORM REQUIREMENTS

Compliance with certification requirements for the waste form in waste packages retrieved from interim storage will require characterizing the contents of each waste container. Such characterizations can be accomplished by waste source evaluation, nondestructive examination, representative sampling, or combinations thereof.

Reliable identification and characterization of the waste form by documents, results from records evaluation, and nondestructive examination can be sufficient evidence of meeting many requirements. For example, a waste form identified as large metallic components should contain sufficiently low particulate content to preclude immobilization treatment.

Consideration should be given to developing methods for upgrading waste forms which do not meet requirements. Examples of methods which may be considered include: the addition of an agent to immobilize particulates and the addition of an agent to inhibit corrosion. Each method would require evaluation and verification. Processes could include incineration, concreting, etc.

4.1 CRITERION: IMMOBILIZATION

Powders, ashes, and similar particulate waste materials shall be immobilized if more than 1 weight percent of the waste matrix in each package is in the form of particles below 10 microns in diameter, or if more than 15 weight percent is in the form of particles below 200 microns in diameter.

INTENT

The purpose for this criterion is to reduce: (a) the quantity of potentially respirable fines and (b) the dispersibility of radioactive material, in the event of container failure.

CONTROLLED PROPERTIES

- o Quantity, size, and density of particles in waste
- o Durability of waste particle
- o Stability of immobilized waste

COMPLIANCE REQUIREMENT

TRU waste will comply with this criterion if the following condition is met:

- 4.1.1 Documented evidence shall exist to show that the waste package contains no more than 1 weight percent of less than 10 microns in diameter, or 15 weight percent of less than 200 microns in diameter particles with radioactive contamination.

DISCUSSION

A waste form shown by representative sampling, waste source evaluation, nondestructive examination, or combinations thereof, to contain an acceptable quantity of particulates meets Criterion 4.1.

Particulate desiccants, such as Portland cement, originally added externally to the inner packaging to immobilize minor quantities of free liquid, are not considered particulate waste material.

4.2 CRITERION: LIQUID WASTES

TRU waste shall not be in free-liquid form. Minor liquid residues remaining in well-drained bottles, cans, and other containers are acceptable.

INTENT

The purpose for this criterion is to reduce the dispersibility of radionuclide materials in the event of waste container failure.

CONTROLLED PROPERTIES

- o Quantity of free liquids present in waste
- o Stability of solidified liquids

COMPLIANCE REQUIREMENTS

TRU waste will comply with this criterion if the following conditions are met:

- 4.2.1 Documented procedures are utilized to ensure the absence of free liquid waste forms, other than minor residues.
- 4.2.2 There exist documented evidence or analyses showing the stability of solidified liquids through the WIPP retrievability period.

DISCUSSION

The type and form of the waste in each waste package should be identified by records and verified by nondestructive examination. The package should not contain encapsulated (bottled) liquids. Minor liquid residues within bottles, cans, or containers that have obviously been well-drained are acceptable. Waste forms may meet the requirement by documented inspection data showing the absence of free liquid. Waste packages with free liquid must be treated to remove or absorb the excess liquid. Use of absorbents outside a sealed bag which contains trapped liquid does not meet the intent of this criterion.

4.3 CRITERION: PYROPHORIC MATERIALS

Pyrophoric materials, other than radionuclides, shall be rendered safe by mixing with chemically stable materials (e.g., concrete, glass, etc.) or processed to remove their hazardous properties. No more than 1 percent by weight of the waste in each package may be pyrophoric forms of radionuclides, and these shall be generally dispersed in the waste.

INTENT

The purpose for this criterion is to reduce the possibility of fire originating from spontaneous combustion.

CONTROLLED PROPERTIES

- o Quantity of potentially pyrophoric material present in waste
- o Degree of dispersion of potentially pyrophoric materials in waste
- o Potentially pyrophoric combination of material and waste matrix

COMPLIANCE REQUIREMENT

TRU waste will comply with this criterion if the following condition is met:

- 4.3.1 Documented evidence shall exist to show that the waste package contains no significant quantities of pyrophorics, or nonpyrophoric waste that could form pyrophoric compounds because of mixing.

DISCUSSION

A significant quantity of pyrophoric material is that quantity which could produce fires under normal handling, transportation, interim storage, and WIPP

emplacement conditions, and, when ignited, burns so vigorously and persistently as to cause breaching of the waste package. This includes water-reactive materials and other materials described in 49 CFR 173, Subparts D and E.

Waste containing elemental alkaline metals that have been subjected to a controlled reaction to convert these metals to oxides or salts is considered nonpyrophoric. The absence of any spontaneous combustion during retrievable storage is evidence to support other information from records and nondestructive testing to meet this requirement.

4.4 CRITERION: EXPLOSIVES AND COMPRESSED GASES

CH TRU waste shall contain no explosives or compressed gases as defined by 49 CFR 173, Subparts C and G.

INTENT

The purpose for this criterion is to reduce the risk to personnel from possible explosions and the potential release of contamination in the event of waste container failure.

CONTROLLED PROPERTIES

- o Presence of explosive items or materials, including selected chemical compounds, in the waste
- o Presence of pressurized vessel(s) in waste

COMPLIANCE REQUIREMENTS

TRU waste will comply with this criterion if the following conditions are met:

- 4.4.1 Documented procedures are utilized to ensure that individual waste packages contain no pressurized vessels.

4.4.2 Documented procedures are utilized to (a) exclude explosive items, explosive compounds, or combinations of materials capable of forming explosive compounds within a waste container; or (b) ensure that explosive compounds are treated or diluted such that detonation is not possible.

DISCUSSION

A vessel or waste container pressurized to greater than 7 psig is considered to be a pressurized vessel for the purposes of this criterion.

Vessels should be permanently vented if repressurization above 7 psig could occur. When permanent venting is not performed, the pressure inside the vessel should be reduced to ambient pressure at room temperature at the time of packaging.

This criterion is not intended to apply to trace amounts of chemical compounds that are used in explosive materials. It is intended to apply to items or compounds which can actually detonate, including compounds which might form in the waste during storage if they are capable of detonating.

Nondestructive examinations may be used to verify compliance with Criterion 4.4.

4.5 CRITERION: RADIOACTIVE MIXED WASTE

TRU waste shall contain no hazardous wastes unless they exist as co-contaminants with transuranics. Waste packages containing hazardous materials shall be identified with the appropriate DOT label. TRU-contaminated corrosive materials shall be neutralized, rendered noncorrosive, or packaged in a manner to ensure container adequacy through the design lifetime. Hazardous materials to be reported are listed in 40 CFR 261, Subparts C and D.

INTENT

The purposes for this criterion are: (a) to ensure that operating personnel are aware of potential hazards in the event of a waste container

failure; and (b) to preclude the possibility of container failure through the potential retrieval period because of attack by corrosive materials.

CONTROLLED PROPERTIES

- o Identification of hazardous and corrosive materials
- o Form and packaging of hazardous and corrosive materials
- o Waste package design

COMPLIANCE REQUIREMENTS

TRU waste will comply with this criterion if the following conditions are met:

- 4.5.1 Documented procedures are utilized to ensure hazardous materials (a) are not included in waste packages or (b) are chemically identified, quantified, and documented, and waste packages are identified with the appropriate DOT label.
- 4.5.2 There exist documented evidence or analyses showing, and documented procedures are utilized to ensure, that radioactive mixed TRU wastes are neutralized or packaged as follows:
 - (a) The corrosive material is treated to remove its corrosive character, or
 - (b) The corrosive material is packaged to ensure package integrity through the retrieval period, as specified under the Waste Containers' Criterion.
- 4.5.3 The types and quantities of hazardous waste characteristics are listed in the data package.

DISCUSSION

The WIPP is not intended to be a chemical disposal facility, and there are no plans to ship highly toxic substances as such to WIPP. The WIPP will not dispose of hazardous materials except when they exist as co-contaminants in TRU waste. Control was not required of toxic materials entering TRU waste packages in past waste management activities, and small quantities are believed to be in some stored TRU wastes. Because these toxic materials are contaminated with TRU nuclides, it will be necessary to dispose of this material in the WIPP. Where it is known or reasonably suspected that a waste package contains reportable concentrations of hazardous materials, the information must be documented in the data package.

The records should show that the waste is noncorrosive or has been rendered noncorrosive by packaging so the design life of the container will not be jeopardized. Meeting Criterion 3.1.3 is evidence to support other data that the waste is noncorrosive.

4.6 CRITERION: SPECIFIC ACTIVITY OF WASTE

For purposes of TRU waste certification, the 100 nCi/g TRU waste limit shall be interpreted as 100 nCi per gram of waste matrix. The weight of added external shielding and the containers (including any rigid liners) should be subtracted prior to performing the nCi/g calculation.

INTENT

The purpose of this criterion is to ensure that the waste disposed of in WIPP meets the TRU waste definition.

CONTROLLED PROPERTIES

- o Radioactivity contained in waste package
- o Mass of waste matrix

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COMPLIANCE REQUIREMENTS

4.6.1 Documented evidence shall exist to show that the specific activity of any TRU waste package is 100 nCi per gram of waste matrix or greater.

DISCUSSION

DOE Order 5820.2A, Chapter II.3.a.(2) (Reference 7), states:

"The lower concentration limit for transuranic waste (>100 nCi/g of waste) shall apply to the contents of any single waste package at the time of assay. The mass of the waste container including shielding shall not be used in calculating specific activity of the waste."

DOE Order 5820.2A also defines a waste container as:

"A receptacle for waste, including any liner or shielding material that is intended to accompany the waste in disposal."

5.0 WASTE PACKAGE REQUIREMENTS

The criteria in this section apply to the waste package, that is, the combination of the container and its TRU waste contents. Several of these require documented inspection results to show compliance. Generally the inspection may be conducted by common methods. Four criteria involve the presentation of information either on the external surface of the waste package or in the data package.

5.1 CRITERION: WASTE PACKAGE WEIGHT

CH TRU waste packages or package assemblies shall weigh no more than 21,000 pounds (9,550 kg).

INTENT

The purpose for this criterion is to prevent overloading of waste package handling equipment.

CONTROLLED PROPERTY

- o Waste package weight

COMPLIANCE REQUIREMENTS

TRU waste packages will comply with this criterion if the following conditions are met:

- 5.1.1 Each waste package or package assembly shall be weighed to ensure that the total weight does not exceed 21,000 pounds (9,550 kg). The actual weight shall be documented.
- 5.1.2 The weight of each package shall not exceed the weight for which the container has been successfully certified in accordance with 49 CFR 173.463 Standards for Type A packaging.

DISCUSSION

The measured weight of each package must be documented in the data package, Criterion 5.9.

Waste packages which exceed this weight limit must be repackaged.

5.2 CRITERION: NUCLEAR CRITICALITY

The fissile or fissionable radionuclide content for CH TRU waste containers shall be no greater than the following values, in Pu-239 fissile gram equivalents:

200 g per 55-gallon (0.21 m³) drum

100 g per 30-gallon (0.11 m³) drum

500 g per DOT 6M container

5 g per ft³ (0.028 m³) in boxes, up to 350 g maximum

For materials other than Pu-239, U-235, and U-233 which shall be treated as equivalent, fissile equivalents shall be obtained using ANSI/ANS-8.15-1981.

INTENT

The purpose for this criterion is to prevent the occurrence of a criticality incident within a waste package or package array.

CONTROLLED PROPERTY

- o Pu-239 fissile gram equivalent material content of the waste package

COMPLIANCE REQUIREMENTS

TRU waste packages will comply with this criterion if one of the following conditions is met:

- 5.2.1 Assay data shall be presented to show that the fissile content complies with the limits for a waste package with any container specified in the criterion.
- 5.2.2 Assay data shall be presented to show the fissile content is less than 5 g per ft³, on a volumetric average of the waste, not to exceed 350 g for containers whose sizes are not specified in the criterion.
- 5.2.3 For containers not listed in this criterion with a fissile radionuclide content exceeding 5 g/ft³, there exists documented analysis showing criticality safety for waste packages and arrays thereof.

DISCUSSION

For Criteria 5.2.1 and 5.2.2, the shipper's assay data for each package must show that the specific limits for fissile content are not exceeded. The contents must be stated in terms of Pu-239 fissile gram equivalent values.

Criterion 5.2.3 provides a means to show criticality safety for special cases. The analytical methods applied and the determination of acceptable criticality safety must be done in agreement with the WIPP operator (Reference 1). Waste packages which do not comply with one of these specifications must be repackaged.

The assay data are to be documented in the data package, Criterion 5.9.

The shipper must comply with DOT regulations.

5.3 CRITERION: PU-239 EQUIVALENT ACTIVITY

Waste packages shall not exceed 1,000 Ci of Pu-239 equivalent activity (PE-Ci).

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INTENT

The purpose of this criterion is to limit the impact of any potential release of radioactivity in the WIPP facility should an accident occur which involves breach of containers.

CONTROLLED PROPERTY

- o Pu-239 equivalent activity content in any waste package

COMPLIANCE REQUIREMENT

TRU waste packages will comply with this criterion if the following condition is met:

- 5.3.1 There exist documented analyses showing each package meets the above limit.

DISCUSSION

Analyses may be based on the data output from the assay measurements. The Pu-239 equivalent weighting factor is based on the ratio of the 50-year effective whole body dose commitment due to inhalation of Pu-239, and the 50-year effective whole body dose commitment due to inhalation of the radionuclide of interest. These values may be obtained from WIPP-DOE-176 (Reference 8).

The waste generator can determine the PE-Ci quantity by any of the following techniques:

- o Knowledge of the isotopic distribution and calculating the PE-Ci quantity using the equation and factors given in WIPP-DOE-069.
- o Knowledge of the isotopic distribution of the waste stream and assaying the waste package to determine the total radionuclide content and calculation of the PE-Ci value.

5.4 CRITERION: SURFACE DOSE RATE

Waste packages shall have a maximum surface dose rate at any point no greater than 200 mRem/hr. Neutron contributions of greater than 20 mRem/hr to the total package dose rate shall be reported separately in the data package.

INTENT

The purpose for this criterion is to control the radiological exposure to operating personnel.

CONTROLLED PROPERTY

- o Surface radiation levels

COMPLIANCE REQUIREMENT

TRU waste packages will meet this criterion if the following condition is met:

- 5.4.1 Documented procedures are utilized for the measurement of surface dose rates for each type of container. The results of these measurements showing compliance with the above criterion will be documented for each waste package. Total surface dose rate and neutron contribution of greater than 20 mRem/hr to the total package dose rate shall be reported in the data package.

DISCUSSION

The maximum surface dose rate must be documented in the data package, Criterion 5.9. A neutron contribution greater than 20 mRem/hr must be reported in the data package.

Waste packages which exceed 200 mrem/hr at any point on the surface may be corrected by overpacking with additional shielding to reduce the surface dose

below the limit or by repacking (or by certifying to RH TRU waste requirements).

Waste placed in certified storage may have significant changes in radiation levels prior to the actual shipment to the WIPP. Interim storage sites will need to check radiation levels prior to shipment to WIPP as part of a certification verification. Changes in dose rates will require correction of the data package.

5.5 CRITERION: SURFACE CONTAMINATION

CH TRU waste packages or package assemblies shall have a removable surface contamination no greater than 50 picocuries per 100 cm² for alpha-emitting radionuclides and 450 picocuries per 100 cm² for beta-gamma-emitting radionuclides.

INTENT

The purpose for this criterion is to limit radiological exposure to operating personnel and to reduce the potential for the contamination of the WIPP.

CONTROLLED PROPERTY

- o Surface contamination levels

COMPLIANCE REQUIREMENT

TRU waste packages will comply with this criterion if the following condition is met:

- 5.5.1 Documented procedures are utilized for the measurement of surface contamination, and the results of these measurements showing compliance with the above criterion are documented.

DISCUSSION

The shipper must measure the degree of removable surface contamination for each waste package prior to shipment. The sampling methods are described in 49 CFR 173.443. The surface of each waste package should be free of any substance that would interfere with the measurement. Fixation of surface contamination shall not be allowed.

Possible contamination during certified storage will require the shipper to verify surface contamination levels prior to shipment to the WIPP.

5.6 CRITERION: THERMAL POWER

Individual CH TRU waste packages in which the average thermal power density exceeds 0.1 watt/ft^3 (3.5 W/m^3) shall have the thermal power recorded in the data package.

INTENT

The purpose for this criterion is to control the thermal loading at the WIPP.

CONTROLLED PROPERTY

- o Identification of waste package thermal power

COMPLIANCE REQUIREMENT

TRU waste packages will comply with this criterion if the following condition is met:

- 5.6.1 Thermal power data from measurements or assay-based calculations shall be presented for each waste package which exceeds 0.1 watt/ft^3 (3.5 W/m^3) and recorded in the data package.

DISCUSSION

The shipper must identify each waste package which potentially has an average thermal power in excess of 0.1 watt/ft³. The average thermal power of that package may be determined by measurement or assay-based calculations and shall be documented in the data package, Criterion 5.9, if in excess of 0.1 watt/ft³. Each waste package must meet the requirements of 49 CFR 173.442 for heat generation and temperature.

5.7 CRITERION: GAS GENERATION

Waste packages containing waste forms known or suspected of gas generation, such that a combination of overpressure and explosive mixtures might damage the container in the long term, shall be provided with an appropriate method for pressure relief. Any liner other than plastic bagging shall be provided with positive gas communication to the outer container.

Each TRU waste shipper shall provide the following data for each waste package:

- o Total activity (alpha-Ci)
- o Waste form description (from Certification Plan)
- o Mass and volume percent of organic content

For the purposes of transportation and emplacement (short term), there will be no mixture of gases or vapors in any package which could through any credible spontaneous increase of heat or pressure, or through an explosion, significantly reduce the effectiveness of the packaging.

INTENT

The purpose of this criterion is to prevent fires or explosions resulting from the accumulation of gases and/or pressurization of waste containers. The objective of identifying gas generation parameters is to allow WIPP to

calculate the gas generation to ensure that gas generation rates are less than 10 moles per cubic meter of storage room volume per year.

CONTROLLED PROPERTIES

- o Pressure relief of waste packages

- o Container design

COMPLIANCE REQUIREMENTS

TRU waste packages will comply with this criterion if the following conditions are met:

- 5.7.1 The contents of the packages are included in the data package as to the waste matrix, alpha-curie content, and mass and volume percent of organic content.

- 5.7.2 The TRU waste packages comply with pressure relief and positive gas communication from the liner (other than plastic bags) requirements as specified.

DISCUSSION

- o The shipper must determine and report the alpha-curie content, waste matrix, volume, and mass and volume percent of organic content in each waste package. This may be done by assay, records, measurements, calculations, or other acceptable means. The data submitted by the shipper must be sufficient to allow verification of gas generation rates by others to ensure that the 10 moles per cubic meter of storage room volume per year is not exceeded.

- o Positive venting of containers is required to prevent pressure buildup of gas while still precluding release of radioactive particles from the package. Filtered vents with or without hydrogen

getters or recombination catalysts are the only acceptable method for meeting the transportation requirements for shipment in TRUPACT II.

- o Additionally, vents shall be installed in such a manner as not to degrade the waste package's ability to meet all applicable DOT shipping requirements.

5.8 CRITERION: LABELING

In addition to DOT labeling requirements, each waste package shall be uniquely identified by means of a label permanently attached in a conspicuous location. The package identification number (to be standardized) shall be in medium to low density Code 39 barcode symbology per MIL-STD-1189 in characters at least 1 inch high, and alphanumeric characters at least 1/2 inch high.

The label must be reasonably expected to remain legible and affixed to the container for a period of 10 years under anticipated conditions of interim storage before shipment to the WIPP and emplacement underground.

INTENT

The purpose for this criterion is to provide container identification to operating personnel.

CONTROLLED PROPERTIES

- o Durable labeling methods
- o Label properties
- o Unique identification number

COMPLIANCE REQUIREMENTS

TRU waste packages will comply with this criterion if the following conditions are met:

5.8.1 Each waste package shall be labeled with a unique package identification number consisting of both a barcode and a series of letters, which identify the generating site, and numerals, which are the package serial number. The barcode symbol will be 1 inch high and the letters and numerals will be 1/2 inch high. The barcode will comply with all requirements shown in MIL-STD-1189 (Reference 9). Labels will be placed at 3 side locations approximately 120 degrees apart within 5 inches above the bottom and on the top surface of cylindrical containers and on all four sides and the tops of rectangular containers.

5.8.2 The waste package label can reasonably be expected to remain legible and affixed to the package for a period of 10 years under anticipated conditions of interim storage.

DISCUSSION

- o The military standard for barcode symbology is applied because it gives specific criteria for the label properties (i.e., spacing, reflectivity, contrast, etc.), and this requirement defines a uniform symbology for all TRU waste participants.

5.9 CRITERION: DATA PACKAGE/CERTIFICATION

There shall be transmitted to the WIPP operator in advance of shipment, a Data Package/Certification attesting to the fact that the waste package meets the requirements of these criteria. This Data Package/Certification shall be based upon a quality assurance program subject to audit and verification and shall provide information on the items specified below:

- o Package identification number
- o Package Assembly identification number (if applicable)
- o Date of waste package certification

- o WAC exception number (if applicable)
- o Waste generation site
- o Date of packaging (closure date)
- o Maximum surface dose rate in mRem/hr and neutron dose rate if greater than 20 mRem/hr
- o Weight (in kg)
- o Container type
- o Physical description of waste form (content code)
- o Assay information, including PE-Ci, alpha-Ci, and Pu-239 fissile gram equivalent content
- o Radionuclide information including radionuclide symbol, quantity, and measure (in grams or Curies)
- o Radioactive mixed waste (identity and quantity of hazardous waste characteristic[s])
- o Weight and volume percent of organic materials content
- o Measured or calculated thermal power (if over 0.1 watt/ft³)
- o Shipment number
- o Date of shipment
- o Vehicle type
- o TRUPACT number(s)
- o Other information considered significant by the shipper
- o Name of certifying official who certified the waste package
- o Name of person who certifies that the shipment meets the TRUPACT Authorized Payload Compliance Plan

A hard copy of the signed and dated Certification Statement, certifying that the waste content and packaging are in accord with the WIPP-WAC and that the waste is unclassified, shall be maintained on file at each site for WACCC audits.

INTENT

The purpose of this criterion is to provide documentation on waste shipped to the WIPP.

CONTROLLED PROPERTY

- o Transmittal of required information prior to each shipment

COMPLIANCE REQUIREMENTS

TRU waste packages will comply with this criterion if the following conditions are met:

- 5.9.1 The shipper shall have operating procedures for determining data required in Criterion 5.9.
- 5.9.2 The data package, in a format defined by WIPP-DOE-157 (Reference 10), shall be transmitted to the WIPP prior to the shipment of the waste.
- 5.9.3 A designated individual representing the waste certifying facility shall review the appropriate records for each waste package in the shipment to ensure that the compliance requirements in this document have been followed. A dated, signed Certificate of Compliance to this effect shall be maintained by the shipper's organization.

DISCUSSION

The certification statement indicates that the waste package is in full compliance with the WIPP-WAC as defined in the site's approved certification plan.

The date of shipment refers to the actual date of shipment.

A standard system will be used for the physical description of waste form. Content codes developed by the shipper and approved by the WAC

Certification Committee shall be used in lieu of physical descriptions. Other physical information, including neutron contributions (greater than 20 mRem/hr) to the surface dose rate, shall be included in the data package.

Assay information will allow the calculation of PE-Ci alpha-Ci and Pu-239 fissile gram equivalent.

Any changes to radiation levels, type of container, or package weight that occur as a result of certified storage will require updating the data package.

If hazardous materials (as defined by 40 CFR 261) are present, information on such materials shall be included in the data package under Hazardous Material sections.

Other hazards requiring special consideration of the WIPP should be listed under other information.

6.0 REFERENCES

1. WIPP-DOE-069, Current Revision, "TRU Waste Acceptance Criteria for the Waste Isolation Pilot Plant."
2. WIPP-DOE-114, Current Revision, "TRU Waste Certification Compliance Requirements for Acceptance of Newly Generated Contact-Handled Wastes to be Shipped to the Waste Isolation Pilot Plant."
3. WIPP-DOE-120, Current Revision, "Quality Assurance Requirements for Certification of TRU Waste for Shipment to the Waste Isolation Pilot Plant."
4. DOE/DP/0058-H1; MLM 3245, "DOE Evaluation Document for DOT 7A Type A Packaging," March 1987.
5. ANSI N14.6-1978, "American National Standard for Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4500 kg) or More for Nuclear Materials," February 15, 1978.
6. SAND 81-0141, "Development Report for Contact-Handled Waste Container and Handling System," Sandia National Laboratory, May 1981.
7. DOE Order 5820.2A, "Radioactive Waste Management," September 1988.
8. WIPP-DOE-176, Current Revision, "Estimates of Internal Dose Equivalent From Inhalation and Ingestion of Selected Radionuclides."
9. MIL-STD-1189, "Military Standard - Standard Department of Defense Barcode Symbolology," as updated.
10. WIPP-DOE-157, Current Version, "Data Package Format for Certified Transuranic Waste for the Waste Isolation Pilot Plant."