

WIPP/DOE - 114

Revision 2

UC - 70



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

January 1989



WASTE ISOLATION PILOT PLANT



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WIPP-DOE-114
Revision 2
UC-70

TRU WASTE CERTIFICATION COMPLIANCE REQUIREMENTS
FOR ACCEPTANCE OF NEWLY GENERATED
CONTACT-HANDLED WASTES TO BE
SHIPPED TO THE
WASTE ISOLATION PILOT PLANT

JANUARY 1989

WESTINGHOUSE ELECTRIC CORPORATION
WASTE ISOLATION PILOT PLANT
MANAGEMENT AND OPERATING CONTRACTOR

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1.0 INTRODUCTION

Compliance requirements are presented for certifying that unclassified, newly generated (NG), contact-handled (CH) transuranic (TRU) solid wastes from defense programs meet the Waste Isolation Pilot Plant (WIPP) Waste Acceptance Criteria (WAC) (Reference 1). Where appropriate, transportation and interim storage requirements are incorporated; however, interim storage sites may have additional requirements consistent with these requirements. All applicable Department of Energy (DOE) orders must continue to be met. The compliance requirements for stored (Reference 2) or buried waste are not addressed in this document.

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 structured to assist TRU waste generators in preparing site-specific certification plans and detailed procedures. Site certification plans and procedures may incorporate process and administrative controls, and/or tests on individual waste packages to accomplish certification. Site certification plans and procedures must incorporate quality assurance measures and will be subject to audit by the cognizant DOE Field Office in addition to DOE overview. The Certification Program includes the plans for certification and quality assurance as illustrated in Figure 1. Sites are required to obtain WIPP Project Office (WPO) approval on certification and quality assurance plans.

As a minimum, quality assurance measures shall include: (1) the identification of the organizational structure, functional responsibilities, levels of authority, and lines of communication for activities affecting waste processing and certification; (2) a records management and document control system for the maintenance of procurement documents, procedures, drawings, calibration and test results, and certification records; (3) measures to ensure that correct tests and procedures are used, personnel conducting the tests are adequately trained, suitable sampling and test frequencies are used, and that the tests and test equipment are standardized and calibrated; and (4) procedures for identifying and implementing corrective actions when unacceptable waste forms or packages are found. The specific details are available in WIPP-DOE-120, Current Revision, "Quality Assurance Requirements for Certification of TRU Waste for Shipment to the Waste Isolation Pilot Plant." (Reference 3)

The documentation referred to in the compliance requirements (i.e., documented procedures, etc.) will form the bases to establish the adequacy of certification procedures or specific waste certifications.

The compliance requirements account for the fact that waste generators may be unable to immediately certify to all WIPP-WAC. When complete certification is not possible, the specific areas of noncompliance must be identified in the

data package transmitted to the interim storage site. Certification would then be completed at an appropriate future date prior to shipment to the WIPP. Each waste shipper's Certification and Quality Assurance Plan must be submitted to be approved by the WPO prior to certifying waste. Waste generators should attempt as soon as possible to certify waste to all WIPP-WAC to minimize certification efforts at interim storage sites. Only wastes certified to the WIPP-WAC, or waste with special WPO approval, will be accepted at the WIPP.

Certified waste packages retrieved from certified storage for shipment to the WIPP will require that selected properties be verified by the shipper. These properties are surface radiation, contamination levels, and physical condition of container.

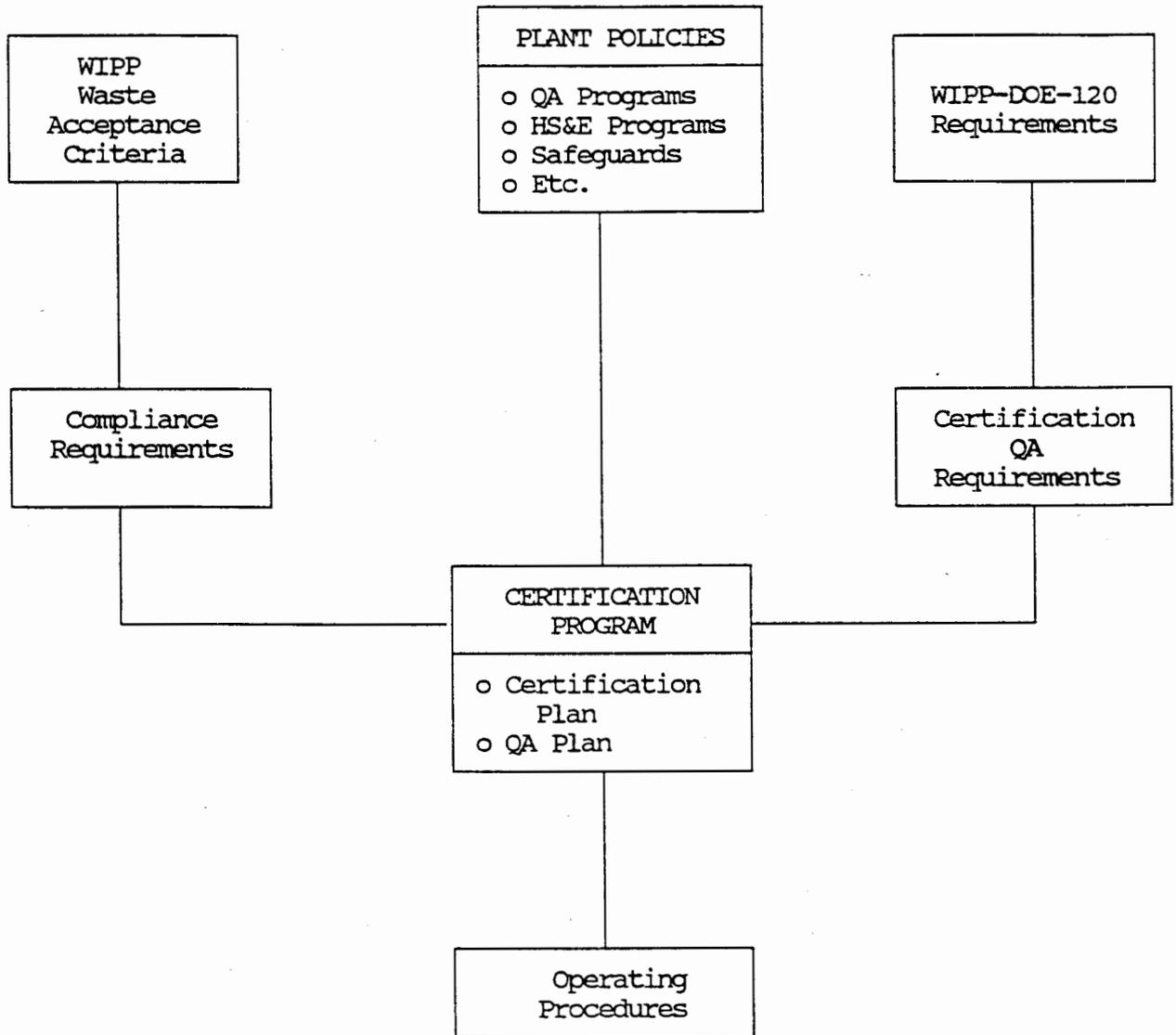


Figure 1. Basis for Certification of TRU Waste for Shipment to WIPP.

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 Department of Transportation (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 Documented procurement or fabrication specifications are utilized to ensure that waste containers are noncombustible and, as a minimum, comply with DOT requirements for Type A packaging in 49 CFR, or shown to meet Type A requirements by methods detailed in MLM 3245. The results of Type A packaging certification tests for each container type will be documented.
- 3.1.2 There exist documented evidence and/or analyses showing that containers will remain intact and contamination free during the 20-year life.
- 3.1.3 Documented inspection procedure is utilized to ensure that damaged waste containers are not shipped from a waste generation/storage site unless replaced or overpacked with an approved container. The results of the inspection will be documented.

DISCUSSION

- o Other criteria relating to the waste containers' criterion are combustibility, handling, and size. The "type of container" must be provided as part of the data package.
- o The 20-year design life for waste containers is specified to provide for retrieval of intact waste packages at the maximum expected time

after emplacement and to include interim storage after certification, before WIPP opens. The 20-year 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. The WIPP storage conditions include a dry salt environment at a nominal 82°F (28°C).

- o Acceptable containers are those certified as meeting applicable DOT requirements, storage site requirements, and other requirements outlined in this document.
- o For purposes of this criterion, bulged or otherwise damaged refers to any condition that compromises the integrity of the waste container.
- o The integrity of waste containers should not be compromised from waste form reactions such as gas generation or corrosion. Waste forms that might produce such effects should be packaged or processed to ensure container integrity.
- o Possible deterioration of waste containers during certified storage will require verification of container condition prior to shipment to the WIPP. Deteriorated containers must be replaced or overpacked. Repackaging of a waste package will require relabeling and updating of the Data Package.
- o Containers shall not be loaded beyond the weight used for the DOT tests described by 49 CFR 173.463, Standards for Type A Packaging.
- o Bulky or heavy waste items shall be blocked inside the waste package to prevent shifting during handling.

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

- o The size limitation for the waste package is based on the WIPP waste hoist cage. Other limitations for the height and width important to the shipper depend upon the sizes of the TRUPACTs and other transporters which may be developed for CH TRU waste package shipments.
- o Containers which must be repackaged prior to certification must meet the above size limitations prior to shipment to the WIPP.
- o 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 this criterion.

- o 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

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COMPLIANCE REQUIREMENTS

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

- 3.3.1 There exist container design specifications: (a) incorporating standard or WIPP-acceptable handling devices and favorable stacking features and (b) utilized for procurement or fabrication.
- 3.3.2 Lifting attachments shall be designed with a 5:1 safety factor based on the ultimate strength of the material (Reference 5).

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DISCUSSION

- o To standardize waste package handling methods, it is recommended that waste boxes or drum package 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 will require characterizing the contents of each waste container. Such characterizations can be accomplished by waste source evaluation, chemical analysis, nondestructive examination, representative sampling, or combinations thereof.

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 REQUIREMENTS

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

- 4.1.1 Documented procedures and results utilized to ensure that wastes have: (a) no greater than 1 weight percent of the particulate of less than 10 microns in diameter and (b) no greater than

15 weight percent particulate of less than 200 microns in diameter. Wastes not meeting these requirements must be immobilized.

- 4.1.2 There exists documented evidence or analyses showing the stability and durability of wastes. This applies to wastes capable of forming particulates, as described above, between packaging and emplacement.

DISCUSSION

- o Durability, in this case, is defined as the resistance of waste particles to abrade into smaller particles during handling and transportation. Stability, in this case, is defined as the resistance of waste to degrade into smaller particles as a function of time.
- o The 200-micron limit was selected because particles smaller than 200 microns are easily dispersed. Particles smaller than 10 microns are considered respirable particles and could result in a radiation dose if inhaled.
- o Administrative controls should be used as much as possible to identify and segregate waste containing or capable of generating fine material. This criterion is not intended to apply to incidental dust associated with nonparticulate waste, nor to Portland cement or other desiccants added for liquid absorbance.

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

- o Stability, in this case, is defined as the resistance to the formation of free liquids within containers during the time period specified.
- o Containerization of free liquids is not permitted. Minor liquid residues remaining in well-drained bottles, cans, or containers are acceptable.
- o Solidified corrosive liquids must meet the compliance requirements for radioactive mixed waste.

- o Use of absorbents outside a sealed bag which contains trapped liquid does not meet the intent of this criterion.
- o All liquid waste forms must be solidified in a manner that the solid waste formed contains no free liquid.

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 material in waste
- o Potentially pyrophoric combination of material and waste matrix

COMPLIANCE REQUIREMENTS

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

- 4.3.1 Documented procedures or policies controlling the introduction into waste or waste packages of (a) significant quantities of

pyrophorics and (b) nonpyrophoric waste that could form pyrophoric compounds because of mixing.

- 4.3.2 Documented procedures describing the method(s) of converting pyrophorics into safe forms through dispersion, dilution with a noncombustible material, or oxidation prior to packaging.

DISCUSSION

- o A significant quantity of pyrophoric material is that quantity that could produce fires under normal handling, transportation, interim storage, and WIPP emplacement conditions, or, if ignited, burns so vigorously and persistently as to cause breaching of the waste package. Included are water-reactive materials and other pyrophoric materials described in 49 CFR 173, Subparts D and E.
- o Waste containing elemental alkaline metals that have been subjected to a controlled reaction to convert these metals to oxides or salts is considered nonpyrophoric.

4.4 CRITERION: EXPLOSIVES AND COMPRESSED GASES

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 personnel risk 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 or policies 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

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

4.5 CRITERION: RADIOACTIVE MIXED WASTE

TRU wastes all 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 that 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 all 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

- o Experience has shown that wastes with a pH of less than 4.0 may compromise package integrity. Such wastes shall be treated or packaged to ensure package integrity through the package design life.
- o Corrosive materials "otherwise rendered noncorrosive" must be identified by code, found in 40 CFR 261, Subparts C and D, or otherwise identified, and entered into the data package (see 5.9).
- o Chemically incompatible substances should not be packaged in the same container.
- o Administrative controls shall be established to minimize the amount of hazardous material contaminated with TRU radionuclides.
- o According to individual site conditions, it may be desirable to enhance corrosion protection (e.g., galvanize). The use of corrosion-resistant liners is recommended.

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

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 is weighed to ensure that the waste package weight does not exceed 21,000 pounds. 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 certified in accordance with 49 CFR 173.463 standards for Type A packaging.

DISCUSSION

- o Waste packages which must be repackaged or overpacked must meet the weight limitation.
- o 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 the following conditions are met:

- 5.2.1 There exist documented analyses showing criticality safety for waste packages and arrays thereof, using containers not listed in the criterion and with a fissile radionuclide content exceeding 5 g/ft³.
- 5.2.2 Documented procedures are utilized (a) for the assay of waste packages, and the results of these assays showing compliance with the criterion are documented for each waste package or (b) for controlling loading of contents into the waste package.

DISCUSSION

- o Assay may consist of direct measurement on waste packages, sampling and analyses of package contents.
- o Assay information is to be included as part of the data package and stated in terms of Pu-239 fissile gram equivalent values.
- o Control of loading contents into the waste package is administrative.
- o Additional criticality analyses showing equivalent safety to the WIPP (Reference 1) shall be submitted to WIPP for approval to ship packages which do not clearly meet this criterion.
- o 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).

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

- o Analyses may be based on the data output from the assay measurements.
- o The Pu-239 equivalent weighting factor is based on the ratio of the 50-year effective whole body dose commitment due to the inhalation of Pu-239 and the 50-year whole body dose commitment due to the inhalation of the radionuclide of interest. These values may be obtained from WIPP-DOE-176 (Reference 8).
- o The waste generator can determine the PE-Ci quantity by any of the following techniques:
 - a. Knowledge of the isotopic distribution and calculating the PE-Ci quantity using the equation and factors given in WIPP-DOE-069.
 - b. 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 comply with 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 contributions of greater than 20 mRem/hr to the total package dose rate shall be reported in the data package.

DISCUSSION

- o The reported dose rate will be the maximum dose rate measured for the package.
- o The total surface dose rate and neutron contribution greater than 20 mRem/hr are also to be recorded as part of the data packages.
- o 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

- o The measurement of removable surface contamination will require the appropriate sampling of the external surface of a waste package such as described by 49 CFR 173.443.

- o Waste package outer surfaces should be free of any substances that would interfere with normal surface contamination measurement methods. Fixation of surface contamination shall not be allowed.
- o 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 There exist documented thermal power measurements or assay-based calculations of thermal power for each waste package exceeding 0.1 watt/ft^3 (3.5 W/m^3).

DISCUSSION

- o The thermal output must be listed in the data package if it exceeds 0.1 watt/ft^3 .

- o 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 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 gas generation to ensure 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 descriptions of contents of the packages are included in the data package as to the waste matrix, curie content, and mass and volume percent of organic content.
- 5.7.2 The TRU waste packages comply with the 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, and volume percent and mass 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 Documented procedures are utilized for identifying and correctly labeling individual waste packages.

- 5.8.2 Waste package labels can reasonably be expected to be legible and remain affixed to the package for at least 10 years from date of certification under anticipated interim storage conditions.
- 5.8.3 The waste package is uniquely identified by an identification number. The first part of this identification number will consist of a series of letters which identify the generating site, and the remaining part is made up of the package serial number.
- 5.8.4 The unique identification number is in medium to low density Code 39 barcode symbology per MIL-STD-1189 (Reference 9), in characters at least 1 inch high and in letters at least 1/2 inch high and placed at 3 side locations approximately 120 degrees apart within 5 inches above the bottom and on the top of cylindrical containers or on all four sides and the top of rectangular containers.

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

- Package assembly identification number (if applicable)
- Date of waste package certification
- WAC exception number (if applicable)
- Waste generation site
- Date of packaging (closure date)
- Maximum surface dose rate in mRem/hr and specific neutron dose rate if greater than 20 mRem/hr
- Weight (in kg)
- Container type
- Physical description of waste form (content code)
- Assay information, including PE-Ci, alpha-Ci, and Pu-239 fissile gram equivalent content
- Radionuclide information including radionuclide symbol, quantity, and measure (in grams or Curies)
- Radioactive mixed waste (identity and quantity of hazardous waste characteristic(s))
- Weight and volume percent of organic materials content
- Measured or calculated thermal power (if over 0.1 watt/ft³)
- Shipment number
- 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 for 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 Documented procedures are utilized to ensure that the required information is obtained and transmitted for each waste package prior to shipment to WIPP.
- 5.9.2 The format for the data package meets WIPP-DOE-157 (Reference 10).

5.9.3 A designated individual representing the waste-generating facility will 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 Certification of Compliance to this effect shall be maintained by the shipper's organization.

DISCUSSION

- o 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. For cases of delayed certification at interim storage sites, corrected areas of original noncompliance will be identified.
- o The date of shipment refers to the actual date of shipment.
- o A standard waste classification scheme is anticipated and will be used to describe 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.
- o Assay information will allow the calculation of PE-Ci, alpha-Ci, and Pu-239 fissile gram equivalent.
- o Any changes to radiation levels, type of container, or package weight that occur as a result of certified storage will require updating of the data package.

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

- o 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-137, Current Revision, "TRU Waste Certification Compliance Requirements for Acceptance of Contact-Handled Wastes Retrieved from Storage 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/00058-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, Revision 1, "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."