

U.S. Department of Energy
Washington, D.C.

 **ENTERED**

ORDER

DOE 5820.1

9-30-82

SUBJECT: MANAGEMENT OF TRANSURANIC CONTAMINATED MATERIAL

1. **PURPOSE.** To establish guidelines for the generation, treatment, packaging, storage, transportation, and disposal of transuranic (TRU) contaminated material. Guidance related to other radioactive contaminated materials is also included.
2. **SCOPE.** The provisions of this Order apply to all elements of the Department of Energy (DOE) and, as provided by contract, to all contractors and sub-contractors performing work for the Department which involves radioactively contaminated material.
3. **REFERENCES.**
 - a. DOE 5480.1A, ENVIRONMENTAL PROTECTION, SAFETY, AND HEALTH PROTECTION PROGRAM FOR DOE OPERATIONS, of 8-13-81, which establishes an overall framework of program requirements for safety, and environmental and health protection.
 - b. WIPP-DOE-069, "TRU Waste Acceptance Criteria for the Waste Isolation Pilot Plant," of 9-81, and as updated, which specifies basic requirements for disposal of contact-handled and remote-handled transuranic waste at the WIPP. Copies of this and other WIPP-DOE reports can be obtained from the Albuquerque Operations Office.
 - c. WIPP-DOE-114, "TRU Waste Certification Compliance Requirements for Newly-Generated Contact-Handled Waste for Shipment to the WIPP," of 10-15-81, which details the procedures required to demonstrate compliance with WIPP-DOE-069.
 - d. WIPP-DOE-120, "Quality Assurance Measures for Certification of TRU Waste for Shipment to the WIPP," of 4-82, which details requirements for a quality assurance plan and for quality related documentation required for demonstrating compliance with WIPP-DOE-069.
 - e. DOE-NE-0017, "Integrated Data Base for Radioactive Waste Management," of 9-81, which annually updates the basic reference of inventories and projections for generation of all radioactive DOE wastes.

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DISTRIBUTION:

All Departmental Elements
Federal Energy Regulatory Commission (info)

INITIATED BY:

Office of Defense Waste
and Byproducts Management

- f. "Solid Waste Information Management System (SWIMS)," of 5-81, which annually reports actual and projected generation of solid radioactive wastes at various DOE sites.

4. DEFINITIONS.

- a. Byproducts. Materials which can be economically recovered from the nuclear fuel cycle and made available for beneficial use.
- b. Contact-Handled. Material contained in such a way as to not require additional shielding for handling (e.g., a surface dose rate not greater than 200 mrem/hr).
- c. Disposal. Isolation of waste from the biosphere with no intent of retrieval in a manner that does not permit easy access to the waste after its emplacement and that does not require perpetual maintenance and monitoring.
- d. High-Level Waste. The highly radioactive materials that result from the reprocessing of spent nuclear fuel, including, but not limited to, liquid waste produced directly in reprocessing and any solid waste derived from the liquid that contains fission products and transuranic waste as to require permanent isolation.
- e. Remote-Handled. Material contained in such a way as to require shielding for handling (e.g., a surface dose rate greater than 200 mrem/hr).
- f. Standard Container. Containers meeting all applicable requirements for Type A packaging (Attachment 1) that are readily transportable in the TRUPACT and meet all specific site requirements for handling and disposal.
- g. Storage. Isolation of waste from the biosphere in a manner that permits access to the waste after emplacement, and in which surveillance and human control are provided.
- h. Transuranic (TRU) Contaminated Material. Without regard to source or form, materials that at the end of institutional control periods are contaminated with alpha-emitting radionuclides of atomic number greater than 92 and half-lives greater than 20 years in concentrations greater than 100 nCi/g.
- i. TRU Waste. TRU contaminated material which has been declared as having no significant economic value or use.
- j. TRUPACT. A transuranic package transporter designed for the efficient and safe transport of standard containers of DOE TRU contaminated material.

- k. Waste Container. The disposable containment vessel for waste materials, including any integral liner or shielding materials that are intended for disposal. In the case of contaminated, damaged, leaking, or breached containers, any overpack shall be considered the waste container, and the original container shall be considered part of the waste.
- l. Waste Package. The TRU waste and container that are intended for disposal.
- m. Waste Isolation Pilot Plant (WIPP). A defense program facility near Carlsbad, New Mexico, for conducting research and development to demonstrate the safe disposal of radioactive wastes resulting from the defense activities and programs of the United States exempted from regulation by the Nuclear Regulatory Commission.

5. OBJECTIVES.

- a. To provide guidance to DOE organizations to conduct waste management operations in a safe, economic, and efficient manner to assure that the present and future radiation exposure of individuals, population groups, and the environment will be as low as reasonably achievable;
- b. To implement improved practices for management of TRU contaminated materials, consistent with health and safety and long term DOE objectives; and
- c. To clarify the controls, responsibilities, and authorities in the generation, treatment, packaging, storage, transportation, and disposal of TRU contaminated material.

6. BACKGROUND.

- a. Comprehensive guidance for various aspects of nuclear waste management is under consideration. This Order addresses the transition phases from generation and storage of TRU contaminated materials to the disposal phase. Guidance related to other radioactive contaminated materials is also included.
- b. This Order changes some traditional practices. For example, waste may be stored or disposed of according to the kinds and quantities or radioactivity, rather than origin. This concept provides more site flexibility in waste management practices and allows decisions to be made based on hazards assessment and economics rather than the activity that produces the waste.
- c. The "Integrated Data Base for Radioactive Waste Management" and the "Solid Waste Information Management System" are being coordinated and integrated to provide a single and reliable data base for DOE waste management activities.

7. RESPONSIBILITIES AND AUTHORITIES.

- a. The Assistant Secretary for Defense Programs (DP-1) has the primary authority for establishing policy for the management of all DOE TRU contaminated material.
- b. The Director of Defense Waste and Byproducts Management (DP-12) has lead responsibility for interpreting policy and the requirements set forth in this Order. For operations and facilities, such as for the handling, treatment, packaging, and/or transportation of waste for storage and/or disposal, the fiscal responsibility resides with the appropriate Headquarters program organization. For policy issues that significantly affect other programs, DP-12 will consult with Nuclear Safety, Nuclear Energy, and/or other offices as appropriate.
- c. The Heads of Field Organizations have been delegated authority and responsibility for implementation and compliance with this Order, including authority for appropriate redelegation. Approval authority for storage or disposal belongs to the Head of the Field Organization responsible for the specific storage or disposal site. For example, approval authority for certification programs, standard containers, transportation, and all other aspects related to TRU emplacement at the Waste Isolation Pilot Plant (WIPP) has been delegated to the Manager, Albuquerque Operations Office. Field organizations in consultation with Headquarters (DP-12), may establish new or alternate TRU waste management practices at specific sites, based on appropriate documented analyses which include safety, dose assessment, exposure pathway analysis, health protection, and economic feasibility, that are in compliance with DOE 5480.1A, ENVIRONMENTAL PROTECTION, SAFETY, AND HEALTH PROTECTION PROGRAM FOR DOE OPERATIONS, and the general requirements of this Order.

8. REQUIREMENTS.

a. General.

(1) Technical Controls.

- (a) Materials to be managed as TRU contaminated materials are ^{226}Ra isotopic sources and those other materials that, without regard to source or form, are contaminated with transuranic elements with half-lives greater than 20 years, and are above either of the following control values:

- 1 TRU alpha contamination greater than 100 nCi/g; or
- 2 Smearable TRU alpha contamination greater than 4,000 dpm/cm² averaged over the accessible surface.

- (b) The ingrowth of TRU daughter products shall be considered in determining whether materials are above or below the control values. For emitters with alpha half-lives less than 20 years and for beta emitters, the concentration of the first alpha-emitting daughter at the time of maximum activity must correspond by calculation to the control values of alpha activity. For example, ^{241}Pu is a beta emitter which decays with a 14.37 year half-life into ^{241}Am , an alpha emitter with alpha half-life of 438 years. The peak buildup of ^{241}Am (or subsequent alpha emitters) is 2.6 % of the initial ^{241}Pu activity in the waste. By dividing the 100 nCi/g maximum alpha activity by 0.026, a control value of 3850 nCi/g (beta) is obtained for waste contaminated only with ^{241}Pu .

(2) Administrative Controls.

- (a) Material suspected of containing a quantity of TRU or byproducts sufficient to make economic recovery feasible shall neither be declared as TRU waste nor disposed of without an appropriate evaluation, which would include an analysis of the cost of waste management. Material with economic recovery value shall be segregated and sorted to permit priority storage and/or processing. Where adequate facilities for the storage of TRU contaminated material above the discard levels are not available, it may be stored for the interim with TRU waste subject to appropriate segregation and documentation.
- (b) TRU waste shall be stored in a manner that is not likely to alter the certification (see 8b(1)) for disposal, and that provides reasonable assurance for retrieval of contamination-free containers after a 20-year storage period. Disposal of TRU waste shall not be delayed once the disposal method has been established. Acceptance criteria for storage shall neither be more stringent than, nor conflict with, the criteria for acceptance at the appropriate disposal site, unless related specifically to on-site health and safety during the storage and retrieval period.
- (c) The control values for disposal of TRU waste apply to any single waste package or bulk material impractical for packaging. The control values may be corrected to account for radioactive decay while in storage or while monitored for periods of institutional control (i.e., ≥ 100 yr.).

- (d) Regardless of source, radioactive waste with concentrations less than the control values for TRU waste shall be considered as low-level waste and disposed of accordingly.
- (e) TRU waste and TRU contaminated material that have been classified for security reasons shall be processed to remove or destroy the characteristic(s) requiring classification. Administrative or operational procedures, such as blending and immobilization, are acceptable to permit the placement of the materials in an unclassified storage or disposal facility.

b. SPECIFIC REQUIREMENTS.

- (1) Each site that generates TRU waste shall prepare and implement a certification program to demonstrate that the waste meets acceptance criteria for disposal. Certification programs shall be documented by the generator and approved by the appropriate authority. The certification programs shall be operational within one year of the effective date of this Order.
- (2) Technical and administrative controls shall be directed towards reducing or completely eliminating the generation of TRU waste that can not be certified under this Order. In unusual circumstances small amounts of TRU waste may be impractical to certify, and disposal of this material shall be approved (see 7c) on a case-by-case basis by a tightly controlled review and approval process.
- (3) Technical and administrative controls shall be directed towards reducing the gross volume of TRU waste generated and the amount of radioactivity in such waste. Reduction shall be based on the implementation of practical methods; such as, process optimization, materials substitution, and new technology development. Compaction, incineration, and decontamination processes shall be implemented wherever cost effective and practicable.
- (4) Material suspected of being TRU waste shall be assayed and sorted as soon as practicable in the generating process to avoid commingling TRU waste with other waste streams.
- (5) TRU waste for off-site disposal shall be placed in approved standard containers that meet off-site disposal acceptance criteria. The initial family of standard containers for efficient transportation of contact-handled waste in the TRUPACT and approved for emplacement at WIPP are specified in Attachment 2.

- (6) TRU waste that has been stored prior to implementation of this Order shall be certified for disposal to the maximum extent practicable by nondestructive tests, examination of historical records, and/or statistically significant sampling. Stored TRU waste not certifiable for disposal by non-destructive methods shall be processed as required to meet applicable disposal acceptance criteria. TRU waste disposed of prior to implementation of this Order shall be monitored and remedial actions performed where appropriate.



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Assistant Secretary
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APPLICABLE REQUIREMENTS FOR TYPE 'A' PACKAGING ^{1/}

1. Design and Construction. Type 'A' packaging must be so designed and constructed that, if it were subject to the environmental and test conditions set forth in this paragraph:
 - a. There would be no release of radioactive material from the package;
 - b. The effectiveness of the packaging would not be substantially reduced; and
 - c. There would be no mixture of gases or vapors in the package which could, through any credible increase of pressure or an explosion, significantly reduce the effectiveness of the package.

2. Environmental Conditions.
 - a. Heat. Direct sunlight at an ambient temperature of 130° F. in still air.
 - b. Cold. An ambient temperature of -40° F. in still air and shade.
 - c. Reduced Pressure. Ambient atmospheric pressure of 0.5 atmosphere (absolute) (7.3 psi absolute).
 - d. Vibration. Vibration normally incident to transportation.

3. Test Conditions. The packaging shall be subject to all of the following tests unless specifically exempted therefrom, and also to the consecutive application of at least two of the following tests from which it is not specifically exempted:
 - a. Water Spray. A water spray heavy enough to keep the entire exposed surface of the package except the bottom continuously wet during a period of 30 minutes. Packages for which the outer layer consists entirely of metal, wood, ceramic, or plastic, or combinations thereof, are exempt from the water spray test.
 - b. Free Drop. Between 1-1/2 to 2-1/2 hours after the conclusion of the water spray test, a free drop through a distance of 4 feet onto a flat essentially unyielding horizontal surface, striking the surface in a position for which maximum damage is expected.

^{1/} Excerpt from 49 CFR 173 (b)

- c. Corner Drop. A free drop onto each corner of the package in succession, or in the case of a cylindrical package onto each quarter of each rim, from a height of 1 foot onto a flat essentially unyielding horizontal surface. This test applies only to packages which are constructed primarily of wood or fiberboard, and do not exceed 110 pounds gross weight, and to all fissile Class II packagings.
- d. Penetration. Impact of the hemispherical end of a vertical steel cylinder 1-1/4 inches in diameter and weighing 13 pounds, dropped from a height of 40 inches onto the exposed surface of the package which is expected to be most vulnerable to puncture. The long axis of the cylinder shall be perpendicular to the package surface.
- e. Compression. For packages not more than 10,000 pounds in weight, a compressive load equal to either five times the weight of the package or 2 pounds per square inch multiplied by the maximum horizontal cross section of the package, whichever is greater. The load shall be applied during a period of 24 hours, uniformly against the top and bottom of the package in the position in which the package would normally be transported.

APPROVED CONTAINERS FOR TRANSPORTATION AND EMPLACEMENT

AT THE WASTE ISOLATION PILOT PLANT

The Albuquerque Operations Office maintains updated specifications for approved containers for transportation in the TRUPACT and/or for emplacement at the WIPP. The initial family of approved containers includes the standard 55 gal. (208 liter) metal drum (DOT Spec. 17C), and rectangular metal boxes of the following outside dimensions:

1. 74.5" L X 50.5" W X 38.5" H;
2. 68" L X 54" W X 38.5" H;
3. 88" L X 54" W X 54" H; and
4. 112" L X 68" W X 77" H.