

DOCUMENT APPROVAL

NAME AND TITLE

J. H. Smith

J. H. Smith

TRU Waste Laboratory Certification Official

DATE

9-10-90

T. F. Scanlan

T. F. Scanlan

Waste Management Operations Section Head

7/14/90

R. C. Mason

R. C. Mason

TRU Program Manager

9/13/90

ENVIRONMENTAL AND HEALTH PROTECTION DIVISION
WASTE MANAGEMENT OPERATIONS
WASTE MANAGEMENT COORDINATION OFFICE

OAK RIDGE NATIONAL LABORATORY
CONTACT-HANDED TRANSURANIC WASTE
CERTIFICATION PROGRAM PLAN

J. H. Smith
M. A. Smith

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TABLE OF CONTENTS

	Page
TABLE OF CONTENTS	iii
LIST OF FIGURES	ix
LIST OF ACRONYMS	xi
DEFINITIONS	xiii
1.0 INTRODUCTION	1
2.0 ORGANIZATION	2
3.0 FUNCTIONAL RESPONSIBILITIES	2
4.0 ORNL TRU WASTE CERTIFICATION PROCESS	4
5.0 WASTE CHARACTERIZATION	6
5.1 GENERAL	6
5.2 WASTE CONTAINER REQUIREMENTS	6
5.2.1 WIPP WAC Criterion	6
5.2.2 ORNL Policy	6
5.2.3 Discussion	6
5.3 WASTE PACKAGE SIZE	7
5.3.1 WIPP WAC Criterion	7
5.3.2 ORNL Policy	7
5.3.3 Discussion	7
5.4 WASTE PACKAGING HANDLING	9
5.4.1 WIPP WAC Criterion	9
5.4.2 ORNL Policy	9
5.4.3 Discussion	9
5.5 IMMOBILIZATION	9
5.5.1 WIPP WAC Criterion	9
5.5.2 ORNL Policy	9
5.5.3 Discussion	9
5.6 LIQUID WASTES	10
5.6.1 WIPP WAC Criterion	10
5.6.2 ORNL Policy	10
5.6.3 Discussion	10

TABLE OF CONTENTS (Contd.)

	Page
5.7 PYROPHORIC MATERIALS	10
5.7.1 WIPP WAC Criterion	10
5.7.2 ORNL Policy	10
5.7.3 Discussion	11
5.8 EXPLOSIVES AND COMPRESSED GASES	11
5.8.1 WIPP WAC Criterion	11
5.8.2 ORNL Policy	11
5.8.3 Discussion	11
5.9 RADIOACTIVE MIXED WASTES	11
5.9.1 WIPP WAC Criterion	11
5.9.2 ORNL Policy	12
5.9.3 Discussion	12
5.10 SPECIFIC ACTIVITY OF WASTE	12
5.10.1 WIPP WAC Criterion	12
5.10.2 ORNL Policy	12
5.10.3 Discussion	12
5.11 COMBUSTIBILITY	13
5.11.1 WIPP WAC Criterion	13
5.11.2 ORNL Policy	13
5.11.3 Discussion	13
5.12 WASTE PACKAGE WEIGHT	13
5.12.1 WIPP WAC Criterion	13
5.12.2 ORNL Policy	13
5.12.3 Discussion	13
5.13 NUCLEAR CRITICALITY	13
5.13.1 WIPP WAC Criterion	13
5.13.2 ORNL Policy	14
5.13.3 Discussion	14
5.14 PU²³⁹ EQUIVALENT ACTIVITY	14
5.14.1 WIPP WAC Criterion	14
5.14.2 ORNL Policy	14
5.14.3 Discussion	14
5.15 SURFACE DOSE RATE	14

TABLE OF CONTENTS (Contd.)

	Page
5.15.1 WIPP WAC Criterion	14
5.15.2 ORNL Policy	15
5.15.3 Discussion	15
5.16 SURFACE CONTAMINATION	15
5.16.1 WIPP WAC Criterion	15
5.16.2 ORNL Policy	15
5.16.3 Discussion	16
5.17 THERMAL POWER	16
5.17.1 WIPP WAC Criterion	16
5.17.2 ORNL Policy	16
5.17.3 Discussion	16
5.18 GAS GENERATION	16
5.18.1 WIPP WAC Criterion	16
5.18.2 ORNL Policy	17
5.18.3 Discussion	17
5.19 LABELING	17
5.19.1 WIPP WAC Criterion	17
5.19.2 ORNL Policy	17
5.19.3 Discussion	18
5.20 DATA PACKAGE/CERTIFICATION	18
5.20.1 WIPP WAC Criterion	18
5.20.2 ORNL Policy	19
5.20.3 Discussion	19
6.0 DATA COLLECTION AND ARCHIVING	19
7.0 REFERENCES	20

LIST OF FIGURES

	Page
1. ORNL TRU waste management structure	3
2. ORNL NG CH-TRU waste flow sheet	5
3. CH-TRU waste drum procurement	8

LIST OF ACRONYMS

ALARA	As Low As Reasonably Achievable
ATN	Accountability Tracking Number
CFR	Code Of Federal Register
CH	contact-handled
DOE	Department of Energy
DOT	Department of Transportation
EPA	Environmental Protection Agency
GCO	Generator Certification Official
HEPA	high efficiency particulate air (filter)
LCO	Laboratory Certification Official
LLW	low-level waste
NCR	Nonconformance Report
NDA	nondestructive assay
NDE	nondestructive examination
NG	newly generated
NRC	Nuclear Regulatory Commission
ORNL	Oak Ridge National Laboratory
ORO	Oak Ridge Operations
PAN	Passive Active Neutron
QA	quality assurance
QAR	Quality Assurance Representative
QAS	Quality Assurance Specialist
RH	remote-handled
RTR	real-time radiography
RSWO	Radioactive Solid Waste Operations Group
SAR	Safety Analysis Report
SGS	Segemented Gamma Scanner
SLLW	solid low-level waste
SWB	standard waste box
SWIMS	Solid Waste Information Management System
TRU	transuranic
TRUPACT	Transuranic Package Transporter
WAC	waste acceptance criteria
WACCC	Waste Acceptance Criteria Certification Committee
WEAF	Waste Examination and Assay Facility
WIPP	Waste Isolation Pilot Plant
WMCO	Waste Management Coordination Office

DEFINITIONS

contact-handled transuranic waste	Packaged transuranic waste whose external surface dose does not exceed 200 millirem per hour.
decontamination	The removal of radioactive contamination from facilities, equipment, or soils by washing, heating, chemical or electrochemical action, mechanical cleaning, or other techniques.
disposal	Emplacement of waste in a manner that assures isolation from the biosphere for the foreseeable future with no intent of retrievable and that requires deliberate action to regain access to the waste.
disposal facility	The land, structures, and equipment used for the disposal of waste.
free liquids	Liquids which readily separate from the solid portion of a waste under ambient temperature and pressure.
hazardous wastes	Those wastes that are designated hazardous by Environmental Protection Agency regulations (40 CFR 261).
mixed waste	Waste containing both radioactive and hazardous components as defined by the Atomic Energy Act and the Resource Conservation and Recovery Act, respectively.
pyrophoric material	A material which under normal conditions is liable to cause fires through friction, retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create serious transportation, handling or disposal hazard.
quality assurance	All those planned and systematic actions necessary to provide adequate confidence that a facility, structure, system, or component will perform satisfactorily and safely in service. Quality assurance includes quality control, which comprises all those actions necessary to control and verify the features and characteristics of a material, process, product, or service to specified requirements.
radioactive waste	Solid, liquid, or gaseous material that contains radionuclides regulated under the Atomic Energy Act of 1954, as amended and of negligible economic value considering costs of recovery.
remote-handled transuranic waste	Packaged transuranic waste whose external surface dose rate exceeds 200 millirem per hour. Test specimens of fissionable material irradiated for research and development purposes only and not for the production of power or plutonium may be classified as remote-handled transuranic waste.
repository	A facility for the permanent deep geologic disposal of high-level or transuranic waste.
storage	Retrievable retention of waste pending disposal.

DEFINITIONS (contd.)

storage facility	Land area, structures, and equipment used for the storage of waste.
transuranium radionuclide	Any radionuclide having an atomic number greater than 92.
transuranic waste	Without regard to source or form, waste that is contaminated with alpha-emitting transuranium radionuclides with half-lives greater than 20 years and concentrations greater than 100 nCi/g at the time of assay. Heads of Field Elements can determine that other alpha-contaminated wastes, peculiar to a specific site, must be managed as transuranic waste.
waste treatment	Any method, technique, or process designed to change the physical or chemical character of waste to render it less hazardous, safer to transport, store or disposal of, or reduced in volume.
waste package	The waste, waste container, and any absorbent that are intended for disposal as a unit. In the case of surface contaminated, damaged, leaking, or breached waste packages, any overpack shall be considered the waste container, and the original container shall be considered part of the waste.

1.0 INTRODUCTION

The ORNL is required by DOE Order 5820.2A¹ to package its TRU waste to comply with the WAC for the WIPP. TRU wastes are defined in DOE Order 5820.2A as those radioactive wastes (without regard to source or form) that are contaminated with alpha-emitting transuranium radionuclides having half-lives greater than 20 years and concentrations greater than 100 nCi/g at the time of the assay. In addition, ORNL handles U²³³, Cm²⁴⁴, and Cf²⁵² as TRU waste radionuclides.

The WIPP WAC for CH-TRU waste are defined in document WIPP/DOE-069² and associated documents³⁻⁶. These documents divide the waste certification criteria into four main categories: (1) general requirements, (2) waste container requirements, (3) waste form requirements, and (4) waste package requirements. General requirements deal with the organizational structure of the certification program, waste generation and processing operations, and general methods for waste stream control. Waste container requirements describe waste containers with respect to construction material, type and size of container, features incorporated for handling, and quality documentation. Waste form requirements describe the specific physical and chemical properties of the waste that can be placed in the containers for shipment to WIPP. Waste package requirements address the total package criteria for factors such as weight, criticality, dose rate, surface contamination, thermal power, gas generation, isotopic plutonium-equivalent documentation, and package labeling. Additional packaging and shipping criteria are defined in the SAR for the TRUPACT II carrier. The shipping criteria, defined in the TRUPACT SAR, are not covered in this certification plan.

The ORNL Transuranic Waste Certification Program was established to ensure that all TRU waste at ORNL is packaged to meet the required transportation and storage criteria for shipping to and storage at the WIPP. The ORNL management strategy for TRU waste is described in Reference 7.

The objective of this document is to describe the methods that will be used at ORNL to package CH-TRU waste to meet the criteria set forth in the WIPP certification requirements documents²⁻⁶. This document addresses NG CH-TRU waste. Stored CH-TRU will be repackaged. An addendum to this document will be issued later that describes the requirements and deviations from the basic program for the packaging and certification of retrievably-stored CH-TRU waste. RH-TRU waste will be covered in a separate document.

This document is organized to provide a brief overview of waste generation operations at ORNL, along with details on data management for CH-TRU waste. The methods used to implement this plan are discussed briefly along with the responsibilities and authorities of applicable organizations. Techniques used for waste data collection, records control, and data archiving are defined. Procedures for the procurement and handling of waste containers are also described along with related quality control methods.

The ORNL Quality Assurance Plan for Transuranic Waste Certification and Operations⁸, establishes the requirements and procedures to be implemented for the control of quality activities for the certification, acceptance, and storage of NG TRU waste. A similar QA plan will be prepared for retrievably-stored TRU waste.

2.0 ORGANIZATION

The organizational structure for the certification of TRU waste at ORNL is illustrated in Figure 1. The overall TRU Waste Certification Program has been coordinated under the guidance of the Laboratory Director in cooperation with the individual divisions that generate and manage TRU waste at ORNL. Individual waste generators are responsible for ensuring that TRU waste packaged in their area meets the required criteria for shipping to and storage at the WIPP. To facilitate meeting these requirements, a GCO shall be designated at each TRU waste generating facility to coordinate the waste packaging activities and to verify that wastes meet the applicable criteria at that facility. The GCO reports administratively to a facility supervisor and programmatically to the ORNL TRU waste LCO. The TRU waste LCO reports administratively to the Certification Coordinator in the WMCO and programmatically to the TRU Program Manager. The LCO and GCOs work with QA personnel to coordinate certification activities in the TRU waste program. A QAS is assigned to each division at ORNL. The QAS reports administratively to the ORNL Quality Department and programmatically to the respective division. Some divisions also have a QAR who reports to the manager of the area to which he is assigned. Every division at ORNL is required to have a QAS, but the QAR position is optional.

3.0 FUNCTIONAL RESPONSIBILITIES

THE TRU PROGRAM MANAGER is the administrator for TRU waste programs at ORNL and establishes internal coordination and direction. He is the primary contact and interface between ORNL and other agencies, such as WIPP and DOE, on issues related to TRU waste management.

WASTE GENERATORS are responsible for minimizing TRU waste production to the extent practical. Waste generators shall develop written procedures describing the methods used to package waste at their facilities and must document all TRU waste produced.

THE GENERATOR CERTIFICATION OFFICIAL is responsible for coordinating TRU waste packaging and certification activities within the GCO's specific area of responsibility. The GCO will have the final generator approval for the movement of TRU waste from waste generating facilities. The GCO will provide an avenue for information exchange and for the identification and resolution of problems relating to CH-TRU waste certification. The GCO will ensure that approved operating procedures exist for packaging TRU waste at the facilities under the GCO's jurisdiction, and that TRU waste is packaged in accordance with those procedures. The GCO assures that proper documentation has been completed and provides the final signature for movement of TRU waste from the waste generating facility.

THE LABORATORY CERTIFICATION OFFICIAL is responsible for coordinating TRU waste certification activities for all of ORNL. The LCO will interact with other organizations such as the ORNL Quality Department, WIPP WACCC, and DOE to exchange information relating to TRU waste certification. The LCO works with the GCOs to ensure the consistent implementation of the TRU waste certification program, and to provide an avenue of communication for the identification and resolution of problems. The LCO will provide the final signature for shipment of TRU waste to the WIPP.

THE RADIOACTIVE SOLID WASTE OPERATIONS GROUP is responsible for the transportation and storage of all radioactive waste at ORNL. All movements of TRU waste between facilities at ORNL is handled through the RSWO Group. The RSWO Group purchases TRU waste containers, maintains certification documents for containers, and supplies certified containers to the waste generators.

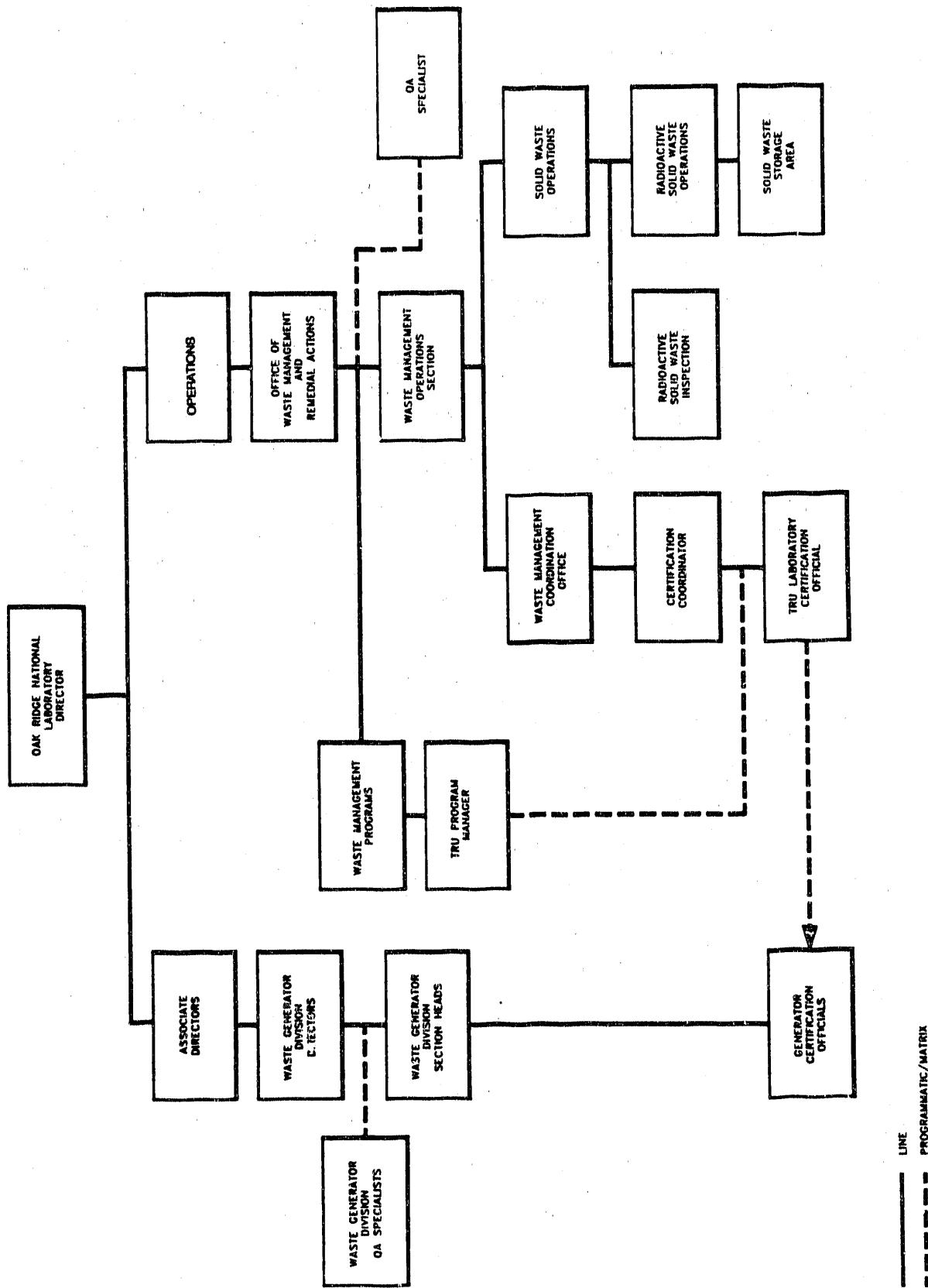


Fig. 1. ORNL TRU waste management structure.

The **WASTE EXAMINATION AND ASSAY FACILITY** is responsible for examining all CH-TRU waste packages generated at ORNL using NDE and NDA techniques. Some of the characterization data contained in the final data package are obtained at the WEAF. The NDE techniques include visual inspections of the waste containers and RTR. Drum assay techniques utilize a SGS and a PAN system.

The **QUALITY ASSURANCE SPECIALIST** is responsible for coordinating and managing QA activities for the assigned organization. The QAS has the authority to stop work through line management where quality requirements are not being met.

The **QUALITY ASSURANCE REPRESENTATIVE** is assigned to particular groups to assist with QA activities.

4.0 ORNL TRU WASTE CERTIFICATION PROCESS

Most CH-TRU waste is generated at ORNL by activities related to isotope research and production, including analytical support. The waste results primarily from hot cell and glove box operations, and most of it can be accommodated in 55-gal drums. CH-TRU waste is removed from contaminated work areas (hot cells, glove boxes, etc.) and transferred to the waste containers using the methods defined in the "Guide for the Transfer of Materials Between Contaminated Enclosure Systems and Non-Contaminated Areas," Appendix A9, of the ORNL Health Physics Manual⁹. Each generator facility is required to provide local procedures for these transfers.

CH-TRU waste at ORNL consists of general laboratory wastes such as various glassware, plastic ware, empty reagent bottles, vials, and other containers, cloth and paper wipes, rubber and cotton gloves, contaminated clothing, gaskets and other rubber parts, metal parts, tools and machinery, electrical equipment, ion-exchange resins, ventilation filters, and other general waste generated during the operation of glove boxes and hot cells. A given container of waste may contain several different TRU radionuclides.

TRU waste Content Codes are descriptive identification codes that are placed on waste packages to provide a description of the waste in terms of processes and packaging, and the generation location. TRU waste Content Codes are described in the TRUPACT II SAR. CH-TRU waste generated by the various facilities at ORNL is similar enough to be classified with only two Content Codes. Routine waste is classified as OR 125A, and waste that results from hot cell and glove box renovation, which contains more metal, is classified as OR 125B. Since OR 125B waste is sometimes too large to fit in a drum or a SWB, and since ORNL has no size reducing equipment for this type of waste, these large items are decontaminated to the extent possible and stored in DOT approved metal boxes until an appropriate repackaging facility becomes available.

Figure 2 outlines the flow of CH-TRU waste packages at ORNL. The RSWO Manual¹⁰ contains additional procedures and requirements that must be met. Waste generators obtain certified containers from the RSWO Group and package CH-TRU waste to meet waste form specifications required by ORNL and WIPP WAC. Generators are required to identify and quantify the waste items placed in TRU waste containers by completing the TRU waste log sheets.

After a waste container is filled and closed, the associated documentation is checked for accuracy and completeness. The waste package is checked to determine the surface contamination level and the surface radiation dose rate. The specific radiation and contamination values are recorded on the radiation hazard tag (UCN-2785) and on the "Request for Storage or Disposal of Radioactive Solid Waste Material" (UCN-2822). These forms accompany the waste packages as they are moved within ORNL. Waste packages are moved from the generator facility to the WEAF. Depending on the work load and waste storage space available, the waste packages may be moved to Building 7823 for temporary storage until they can be transferred to the WEAF.

ORNL NG CH-TRU FLOW SHEET

ORNL-DWG 67-9437

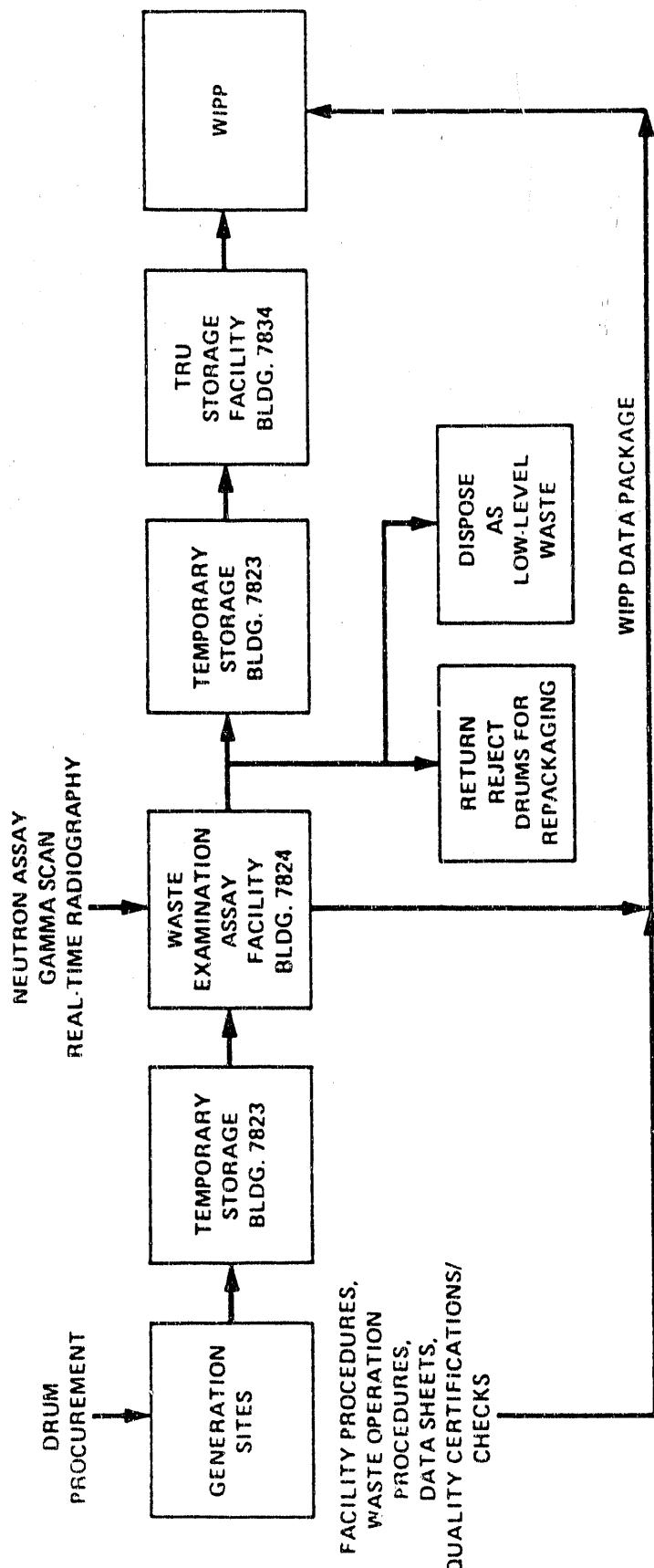


Fig. 2. ORNL NG CH-TRU waste flow sheet.

Waste packages are inspected at the WEAF to verify that the waste form requirements for free liquids and compressed gas cylinders have been met. Assay examinations are performed at the WEAF to certify that the waste packages meet those waste package requirements that relate to radioisotopic content. Waste packages that pass all inspections at the WEAF will be placed in interim storage to await shipment to the WIPP. Depending on the work load the waste packages may be moved to Building 7823 for temporary storage until they can be transferred to the interim TRU waste storage facility. If the waste package is rejected because it contains nonconforming items such as free liquids or compressed gas cylinders, a Nonconformance Report will be issued and the waste package will be returned to the generator for repackaging. In accordance with DOE Order 5820.2A, waste packages with quantities of TRU radionuclides in concentrations of <100 nCi/g of waste will be considered to be LLW and will be managed as such.

5.0 WASTE CHARACTERIZATION

5.1 GENERAL

This section discusses the criteria that have been established for the acceptance of unclassified CH-TRU waste at the WIPP and how ORNL meets those criteria. The criteria shown in Sects. 5.2-5.4 deal with the WIPP waste container requirements, the criteria in Sects. 5.5-5.11 address the waste form requirements, and the criteria listed in Sects. 5.12-5.20 relate to the waste package requirements.

5.2 WASTE CONTAINER REQUIREMENTS

5.2.1 WIPP WAC Criterion

Waste containers for emplacement at the WIPP shall be noncombustible and meet all the applicable requirements of 49 CFR 153.412 for Type A packaging. Waste containers of various sizes shown to meet DOT Type A requirements by the methods detailed in MLM 3245 are acceptable to WIPP. In addition, they shall have a design life of at least 20 years from the date of certification. Documented evidence must be maintained at ORNL showing that all shipping containers have met the specified DOT and WIPP criteria.

5.2.2 ORNL Policy

Administrative controls are used to ensure ORNL waste generators use certified containers to package CH-TRU waste. Compliance with DOT and WIPP requirements is ensured by a combination of purchase specifications, vendor certification and inspection, receiving inspection, and controlled distribution.

5.2.3 Discussion

GENERAL - Most of ORNL's CH-TRU waste is contained in Type 17H stainless steel 55-gal drums. The drums meet specified DOT 7A, Type A packaging requirements. Certification documentation for the drums is maintained by the RSWO Group. SWB will be procured and distributed by the RSWO Group on an "as needed" basis. Other containers have been used to package CH-TRU waste at ORNL. For example, several older 55-gal drums have been overpacked in 59-gal drums, and some waste (mostly from glove box renovations) has been packaged in DOT approved 4 ft x 4 ft x 5 ft boxes. This waste will have to be size reduced and repackaged before it can be shipped to the WIPP because the containers can not be transported in the TRUPACT II carrier. Only those containers obtained from the RSWO Group are acceptable for packaging TRU waste at ORNL. If waste is produced that will not fit inside a SWB, the LCO and RSWO personnel will work with the generators to select appropriate containers.

WASTE DRUM PROCUREMENT - All containers for CH-TRU waste are obtained by the RSWO Group. The containers are purchased through the Martin Marietta Energy Systems, Inc., Purchasing Division. Because these containers must meet DOT Type A specifications, they are procured as "special items," as defined in the ORNL Quality Assurance Manual¹¹, procedure QA-L-7-100, "Control of Purchased Items and Services." The process for waste drum procurement at ORNL is illustrated in Figure 3. The RSWO Group, with assistance from the TRU LCO, defines the procurement requirements and specifications for the containers. A purchase requisition is submitted through the Energy Systems procurement department to a qualified vendor. Contract award is contingent on the vendor either successfully passing a site inspection or having successfully passed a site inspection in the last two years. Vendor documentation for drum fabrication is required for compliance with specifications for DOT Type A containers. Required data include drop test reports, hydrostatic test reports, compression test reports, leakage test reports, mill analysis of the stainless steel, and welding qualifications. When new drums are received, an inspection is performed by the ORNL Quality Inspection group. Checklists for the vendor site inspection and the receiving inspection are defined in ORNL Quality Department document SSI-3100. The vendor data, receiving inspection data, and other drum certification records are maintained by the RSWO Group.

WASTE DRUM DISTRIBUTION - The RSWO Group stores new waste drums for distribution to the waste generators on request. The drums are labeled with a vendor certification sticker that identifies the purchase order and date of purchase of the container. A bar-code label is also affixed to each drum that identifies it with an ATN. The ATN identity is used to track the drum through the ORNL waste management process. A log book is maintained by the RSWO Group to record the drums distributed, the ATNs assigned, and the generators who received the drums.

VENTING - CH-TRU waste containers must be vented prior to shipment to the WIPP. Venting is required by both the WIPP WAC and the TRUPACT II SAR. The RSWO Group is responsible for installing vent filters in all TRU waste containers to be shipped to the WIPP.

5.3 WASTE PACKAGE SIZE

5.3.1 WIPP WAC Criterion

CH-TRU packages or package assemblies shall not exceed 12 ft x 8 ft x 8.5 ft (3.5 m x 2.4 m x 2.6 m) in overall L x W x H dimensions.

5.3.2 ORNL Policy

CH-TRU waste will be packaged in certified 55-gal drums or in containers such as the SWB that have been designed to fit the TRUPACT II carrier. If waste is generated that is too large for an acceptable shipping container, it will be packaged in an appropriate DOT Type A container and will be stored on-site until the items can be reduced in size or a larger shipping container becomes available.

5.3.3 Discussion

The dimensions given in the WIPP WAC criterion above apply to WIPP only, and they describe the largest containers that can be handled at that site. The primary restriction on package size is defined in the TRUPACT II shipping criteria. Only 55-gal drums and SWBs can be shipped in the TRUPACT II carrier. Waste may be packaged directly into a SWB or it may be placed in other smaller containers that are placed inside the SWB. Waste containers placed in the SWB do not have to be certified but the waste must meet all required criteria. Other containers, such as DOT 4 ft x 4 ft x 5 ft boxes, may be used to store waste at ORNL, but the use of these containers should be minimized as the waste will have to be repackaged before it can be shipped off-site in the TRUPACT II carrier.

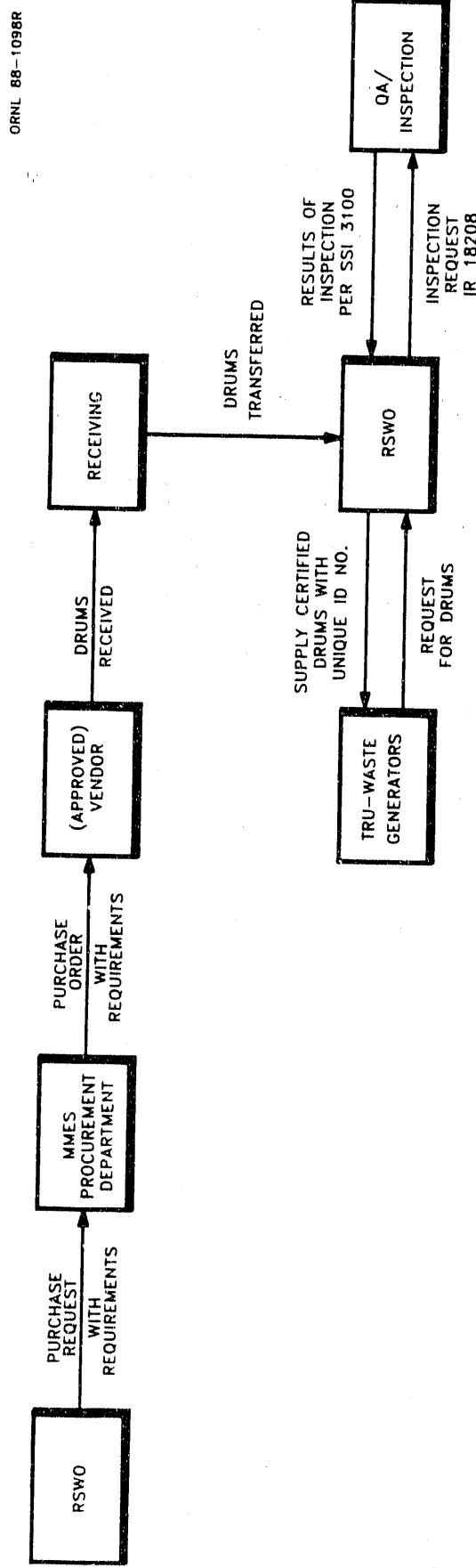


Fig. 3. CH-TRU waste drum procurement.

5.4 WASTE PACKAGING HANDLING

5.4.1 WIPP WAC Criterion

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.

5.4.2 ORNL Policy

All waste packages will be handled with approved handling devices that present no potential damage to the container or the handler. No permanent lifting devices, such as welded lugs or rings, will be placed on the waste packages that will inhibit stacking or shipping the packages.

5.4.3 Discussion

Drums may be handled by detachable slings or lifters, or with fork lifts and drum handling devices. SWBs may be handled with fork lifts, cranes, or other approved devices. The methods for handling all TRU waste containers at ORNL will be consistent with WIPP procedures and with ORNL Safety and Health Physics procedures. If problems arise, the RSWO Group will determine the proper handling methods for CH-TRU waste containers.

5.5 IMMOBILIZATION

5.5.1 WIPP WAC Criterion

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.

5.5.2 ORNL Policy

Administrative controls such as training, operating procedures, and process flow charts are used to assure that wherever possible waste generated at ORNL meets the WIPP WAC immobilization requirements.

5.5.3 Discussion

ORNL does not generate large amounts of TRU contaminated particulate waste of respirable or dispersible size. Ion exchange resins and ventilation filters constitute most of the particulate waste, and small amounts result from glove box cleaning. CH-TRU waste in the form of ion-exchange resins will either be placed in containers that are resistant to corrosive attack or immobilized before removal from the work environment. Control of ion-exchange resins is facility specific.

No method exists at this time to satisfactorily immobilize respirable or dispersible particles embedded in HEPA filters at ORNL. TRU contaminated HEPA filters at ORNL are secured in plastic bags and placed in a standard TRU waste container. The presence of HEPA filters in the waste container is recorded on the TRU waste data log sheet and verified by RTR inspection. CH-TRU waste packages that contain HEPA filters are classified with a "HOLD" disposition. A "HOLD" tag is attached to the container and the disposition of the waste package is recorded in the WEAF inspection log and on the associated data forms. The "HOLD" disposition designates that the waste package is "UNCERTIFIABLE" at the present time and it cannot be shipped to the WIPP until an appropriate immobilization technique is developed.

5.6 LIQUID WASTES

5.6.1 WIPP WAC Criterion

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

5.6.2 ORNL Policy

Administrative controls, operating procedures, and training are used to exclude free liquids from waste generated at ORNL. RTR examinations are used to confirm the exclusion of free liquids from waste packages.

5.6.3 Discussion

Free liquids are not acceptable in CH-TRU waste, but allowances are made for thin films that may remain on container walls. A liquid heel in a small container (bottle, beaker, vial, etc.) is acceptable as long as the container meets the definition of being "well drained" and the heel does not constitute a flagrant disregard for the no-free-liquid-content rule. All CH-TRU waste packages are inspected using RTR techniques to confirm the presence or absence of free liquids. Waste packages containing free liquids or excessive heels, indicating a disregard for the "well-drained" bottle rule, are rejected, a Nonconformance Report is written, and the waste package is returned to the generator to remove the free liquid and repackage the waste.

5.7 PYROPHORIC MATERIALS

5.7.1 WIPP WAC Criterion

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.

5.7.2 ORNL Policy

Administrative controls, operating procedures, process flow sheets, and training are used to prohibit pyrophoric materials, other than radionuclides, from ORNL TRU waste packages. Pyrophoric forms of radionuclides will be rendered safe by treatment and will not exceed 1 percent of the waste by weight.

5.7.3 Discussion

Pyrophoric materials, other than radionuclides, are not presently used in the processes that generate CH-TRU waste at ORNL. Process controls are exercised over the operations that generate waste to assure that, if pyrophoric materials are used, they are not placed in TRU waste containers. Standard operating procedures, process flow charts, and materials lists provide additional checks to detect the use of pyrophoric materials. Training assures that all personnel who place waste in a CH-TRU container are aware of the exclusion criterion for pyrophoric materials. If a generator process changes to include pyrophoric materials, facility specific procedures will be prepared (or modified) to demonstrate that either the materials are excluded from TRU waste or the materials are identified and rendered safe as appropriate. The GCO is responsible for updating the flow sheet as necessary to reflect facility or process changes. The LCO will review and maintain copies of the flow sheets.

Devices that are designed to create sparks, such as weld strikers, are also excluded from TRU waste drums unless the devices are rendered inoperable.

5.8 EXPLOSIVES AND COMPRESSED GASES

5.8.1 WIPP WAC Criterion

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

5.8.2 ORNL Policy

Administrative controls, including operating procedures, process flow sheets, materials lists, and training are used to assure that explosives and compressed gases are prohibited from ORNL waste packages. RTR techniques are used to verify the exclusion of compressed gas containers.

5.8.3 Discussion

Training assures that all personnel who place waste in a CH-TRU container are aware of the exclusion for explosives and compressed gases. Standard operating procedures, flow charts, and materials lists provided by TRU waste generators provide a means to identify the use of explosives and compressed gases in the processes that produce the waste. The presence or absence of compressed gas cylinders from CH-TRU waste packages is verified by RTR inspection. Waste packages containing compressed gas cylinders are rejected, a Nonconformance Report is written, and the waste package is returned to the generator to remove the gas cylinder and repackage the waste.

5.9 RADIOACTIVE MIXED WASTES

5.9.1 WIPP WAC Criterion

TRU wastes 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.

5.9.2 ORNL Policy

Waste generators at ORNL are responsible to assure that no hazardous wastes are placed in TRU waste packages unless they are co-contaminated with TRU material. The exclusion, or identification and quantification of hazardous waste in TRU waste containers is ensured by administrative control and personnel training.

5.9.3 Discussion

Standard operating procedures, flow charts, and materials lists produced by TRU waste generators provide a means to identify hazardous materials used in the processes that produce TRU waste. Hazardous waste is not excluded from CH-TRU waste containers, but the hazardous waste must be identified and quantified. Sometimes special packaging is required, e.g. hazardous waste that is corrosive must be treated or packaged to ensure that no degradation of the waste container occurs over its design life.

Data log sheets are used to identify and quantify hazardous materials that are placed in the waste containers. An entry is required on the TRU waste data log sheet that identifies whether or not hazardous materials are placed in the container. If the waste packet contains hazardous materials, a supplemental log sheet must be completed to identify and quantify the hazardous materials present. All entries on the data log sheets are checked by a second person (either the QA representative, HP representative, or the GCO for that area), and both persons sign the data log sheet. A third check is made of all data entries on the log sheets by the GCO when the container is full.

5.10 SPECIFIC ACTIVITY OF WASTE

5.10.1 WIPP WAC Criterion

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.

5.10.2 ORNL Policy

The specific activity of TRU waste packages will be determined using approved NDA techniques. The weight of the containers and any added external shielding will be excluded from the calculations.

5.10.3 Discussion

The specific activity of CH-TRU waste drums will be determined at the WEAF. The activity of each waste package is determined using NDA measurements. The waste packages are weighed on calibrated scales. Only the weight of the waste matrix will be used to calculate the specific activity, the weight of the container and any external shielding will be excluded. External shielding has not been used in NG CH-TRU waste at ORNL. Since only drums can be assayed at ORNL, TRU waste packaged in boxes and bins will have to be assayed using the mobile assay system provided by WIPP.

5.11 COMBUSTIBILITY

5.11.1 WIPP WAC Criterion

There is no need to limit the combustibles present in the waste provided that the waste containers are noncombustible. Consequently, there is no criterion for combustibility in CH-TRU waste.

5.11.2 ORNL Policy

Only metal containers will be used to package TRU waste at ORNL.

5.11.3 Discussion

None.

5.12 WASTE PACKAGE WEIGHT

5.12.1 WIPP WAC Criterion

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

5.12.2 ORNL Policy

CH-TRU waste packages will be selected so the waste package assemblies meet the weight requirements of the WIPP WAC.

5.12.3 Discussion

At ORNL, the weight of a typical waste package is around 200 lbs. A few heavier drums exist at ORNL and it will be necessary to select lighter drums to form a seven pack assembly that meets the WIPP WAC weight requirements.

The waste package weight is determined at the WEAF. The weight is recorded in a log book and on form UCN-2822. The package weight will also be recorded on the waste data package that is transmitted to the WIPP prior to shipping the waste.

5.13 NUCLEAR CRITICALITY

5.13.1 WIPP WAC Criterion

The fissile or fissionable radionuclide content for CH-TRU waste containers shall be no greater than the following values, in Pu²³⁹ fissile gram equivalents.

200 g per 55-gal (0.21 m³) drum
100 g per 30-gal (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 Pu²³⁹, U²³⁵, and U²³³ which shall be treated as equivalent, fissile equivalents shall be obtained using ANSI/ANS-8.15-1981.

5.13.2 ORNL Policy

NDA techniques are used to determine the fissionable radioisotopic content of CH-TRU waste packages at ORNL. Any CH-TRU waste packages that do not meet the WIPP WAC will be repackaged to meet the waste acceptance requirements.

5.13.3 Discussion

Since large quantities of fissile materials are not maintained at ORNL generator sites, ORNL CH-TRU waste packages do not contain significant amounts of fissile materials. Most of the fissionable radionuclides in the waste packages are TRU and only small quantities are present. Approximations of the fissionable radionuclide content are provided by the waste generators on the UCN-5352 and UCN-2822 data forms. The final determination of fissionable radionuclide content is made at the WEAF using NDA techniques. Each CH-TRU waste drum is examined using both SGS and PAN assay techniques. The fissile content of each waste package is calculated from the assay examination data. Approximately 40 boxes of CH-TRU waste exist at ORNL that will have to be assayed using the mobile assay system, or size reduced and repackaged into drums.

5.14 PU²³⁹ EQUIVALENT ACTIVITY

5.14.1 WIPP WAC Criterion

Waste packages shall not exceed 1,000 Ci of Pu²³⁹ equivalent activity (PE-CI).

5.14.2 ORNL Policy

NDA techniques are used to determine the Pu²³⁹ equivalent activity of CH-TRU waste packages at ORNL. Any waste packages that exceed 1,000 Ci of Pu²³⁹ equivalent activity will be repackaged to meet the WIPP WAC requirements.

5.14.3 Discussion

SGS and PAN assay techniques are used to determine Pu²³⁹ equivalent activity.

5.15 SURFACE DOSE RATE

5.15.1 WIPP WAC Criterion

Waste packages shall have a maximum surface dose rate at any point no greater than 200 millirem/hr.

Neutron contributions of greater than 20 millirem/hr to the total package dose rate shall be reported separately in the data package.

5.15.2 ORNL Policy

No CH-TRU waste package at ORNL will have a surface dose rate that is greater than 200 millirem/hr. TRU waste packages with surface dose rates that exceed 200 millirem/hr are classified as RH waste and are handled accordingly.

Neutron contributions to the total package dose rate will be reported as required.

5.15.3 Discussion

TRU waste generators at ORNL are responsible to monitor the CH-TRU waste containers during packaging to assure that the surface dose rate does not exceed the 200 millirem/hr limit. If the limit is exceeded, the waste is classified as RH and is treated accordingly. In addition, the surface dose rate for each waste package is determined by Health Physics personnel at the generator site before the container is moved from that site. Surface dose rate readings are recorded on a radiation tag, form UCN-2785 and on the request to move and store the waste container, form UCN-2822. These forms must be completed and must accompany the waste packages when they are moved within ORNL. RSWO personnel check both forms to verify that the surface dose rate does not exceed 200 millirem/hr before moving the waste container. The surface dose rate of each waste package will be checked again by Health Physics personnel just prior to shipping the waste to the WIPP and the values will be recorded in the waste data package.

The neutron component of the surface dose rate is monitored for each waste drum by Health Physics personnel. These readings are recorded on the UCN-2785 form.

5.16 SURFACE CONTAMINATION

5.16.1 WIPP WAC Criterion

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.

5.16.2 ORNL Policy

The surface contamination for CH-TRU waste packages at ORNL will not exceed 50 picocuries per 100 cm² for alpha-emitting radionuclides, and will not exceed 450 picocuries per 100 cm² for beta-gamma-emitting radionuclides.

5.16.3 Discussion

TRU waste generators at ORNL are responsible to maintain the integrity of CH-TRU waste containers during packaging so the containers will meet ORNL surface contamination requirements, which are more stringent than those for the WIPP WAC. The ORNL limits for exterior transferable surface contamination, defined in Procedure 4.1 of the ORNL Health Physics manual, are 20 dpm/100 cm² for alpha emitters and 200 dpm/100 cm² for beta-gamma emitters. A container surface contamination check is required anytime radioactive materials are moved from one area to another at ORNL. The surface contamination readings are recorded on the Radiation Tag (form UCN-2785) and on the request to move the container (form UCN-2822). These forms accompany the waste packages when they are moved within ORNL. Waste packages that exceed the contamination limits must be decontaminated before they can be moved from a facility. If surface contamination occurs because of a failure of the container, the waste will be repackaged or the container will be overpacked for future handling. The surface contamination for each CH-TRU waste package will be checked by Health Physics personnel just prior to shipping the waste to the WIPP and those readings will be recorded in the waste data package.

5.17 THERMAL POWER

5.17.1 WIPP WAC Criterion

Individual CH-TRU waste packages in which the average thermal power density exceeds 0.1 watt/ft³ (3.5 W/m³) shall have the thermal power recorded in the data package.

5.17.2 ORNL Policy

The thermal power density will be determined for each CH-TRU waste package generated at ORNL. If the thermal power density for any waste package exceeds 0.1 watt/ft³ (3.5 W/m³), the thermal power for that waste package will be recorded in the associated data package.

5.17.3 Discussion

PAN and SGS assay examinations are performed at the WEAF that identify and quantify the radioisotopes present in each waste package. The thermal power density for each CH-TRU waste package generated at ORNL will be calculated from the assay data. The thermal power data for CH-TRU waste packages will be recorded at the WEAF. If the average thermal power density for a given waste package exceeds 0.1 watt/ft³ (3.5 W/m³), the thermal power will be recorded in the data package that is transmitted to the WIPP prior to shipping the waste.

5.18 GAS GENERATION

5.18.1 WIPP WAC Criterion

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.

5.18.2 ORNL Policy

WIPP approved pressure relief devices will be installed on all CH-TRU waste containers prior to shipment to the WIPP. Liners, other than plastic bagging, will be provided with holes, filters, or other positive gas communication links to the outer container.

5.18.3 Discussion

NG CH-TRU waste at ORNL is characterized by process knowledge, operating procedures, flow charts, log sheets, data forms, and nondestructive examinations. The CH-TRU waste generated at ORNL is not suspected of generating quantities of gas that could cause overpressure or explosive mixtures. Historically, no overpressure or explosive gas generation problems have occurred in CH-TRU waste at ORNL. As a precautionary measure, all CH-TRU waste packages will be provided with HEPA type filter vents prior to shipment to the WIPP.

Most of the existing CH-TRU waste at ORNL will be repackaged prior to shipment of the WIPP. Plastic bags of repackaged waste will be sealed using the twist, tape, and cut method or a WIPP approved venting method, such as filtered bags.

Drum liners, other than thin (0.006-0.010 in) plastic bagging, are not used at ORNL.

5.19 LABELING

5.19.1 WIPP WAC Criterion

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 bar code symbol per MIL-STD-1189 in characters at least 1 in high, and alphanumeric characters at least 1/2 in 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.

5.19.2 ORNL Policy

Prior to shipping to the WIPP, each CH-TRU waste package generated at ORNL will be uniquely identified by means of a label as defined in the WIPP WAC. Other labels such as those required by DOT and EPA will also be placed on the waste packages prior to shipment off-site.

5.19.3 Discussion

Several different labels are placed on CH-TRU waste packages at ORNL to identify and track the waste package, identify hazardous contents if present, and to provide certification information about the container. A bar-code label is affixed to each CH-TRU waste container, before the container is distributed, that identifies the container with a unique ATN. ATNs are used to track waste containers and waste packages through the ORNL waste management system. Each container is also identified with a vendor certification label identifying the purchase order and date of purchase of the container. This information provides traceability for each container to the certification records maintained by the RSWO Group. TRU waste containers, that also include hazardous waste, will be labeled with an appropriate EPA label when the waste packages are moved from the generator's site. Prior to shipment to the WIPP, each waste package shall be uniquely identified by labeling in accordance with specifications defined in WIPP-DOE-069. Prior to shipping off-site, each waste package will also be properly labeled to meet DOT labeling requirements. The ORNL RSWO Group is responsible for affixing all labels to the CH-TRU waste containers.

5.20 DATA PACKAGE/CERTIFICATION

5.20.1 WIPP WAC Criterion

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. The data package/certification shall be based upon a QA program subject to audit and verification and shall provide information on the items specified below:

- o Package Identification
- o Package Assembly Identification
- 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 millirem/hr and specific neutron dose rate if greater than 20 millirem/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 per 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.

5.20.2 ORNL Policy

A data package/certification attesting to the fact that the waste package meets the requirements of the WIPP WAC shall be transmitted to the WIPP in advance of any waste shipment. The data package will contain the required information arranged in accordance with the data package format defined in WIPP-DOE-157.

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

5.20.3 Discussion

The information required on the data package will be obtained from different sources, (e.g., UCN 2822 form, data log sheets, WEAF data, etc.), and will be assembled in a single computer data base. The LCO will be responsible for assuring that the data base meets WIPP requirements. Copies of the data package shall be maintained on file at ORNL for WACCC audits.

6.0 DATA COLLECTION AND ARCHIVING

CH-TRU waste generated at ORNL shall be sufficiently characterized to identify the contents of the waste package to ascertain whether the waste meets specified WIPP WAC. Characterization data shall be documented and records will be maintained at the point of origin. Copies of the waste characterization data shall accompany the waste package through all phases of the ORNL waste management process, from generation through shipment off-site. These records will provide an auditable trail for each waste package.

Forms TX-5352, UCN-2785, and UCN-2822, are required and shall be completed for each CH-TRU waste package generated. A TRU waste package will not be moved unless the required forms are correctly completed, signed, and attached to the waste package. The TRU waste log sheet, Form TX-5352, is used to record waste characterization information. Form UCN-2785 is used to record health physics measurements such as dose rate and surface contamination. Form UCN-2822 is the request to move the waste package. Characterization information and health physics measurements are also recorded on this form. Form TX-5352A is used to record characterization information about hazardous waste. This form is required only if the TRU waste package contains hazardous waste. The required forms accompany each CH-TRU waste package as it is moved within ORNL. The above forms are described in more detail in Reference 10.

7.0 REFERENCES

1. Radioactive Waste Management, DOE Order 5820.2A, U.S. Department of Energy, Washington, D.C., September, 1988.
2. TRU Waste Acceptance Criteria for the Waste Isolation Pilot Plant, WIPP-DOE-069, Rev. 3, U.S. Department of Energy, Washington, D.C.
3. TRU Waste Certification Compliance Requirements for Newly-Generated Contact-Handled Wastes for Shipment to the WIPP, WIPP-DOE-114, Rev. 2, U.S. Department of Energy, Washington, D.C.
4. Quality Assurance Requirements for Certification of TRU Waste for Shipment to the WIPP, WIPP-DOE-120, Rev. 2, U.S. Department of Energy, Washington, D.C.
5. TRU Waste Certification Compliance Requirements for Contact-Handled Wastes Retrieved from Storage for Shipment to the WIPP, WIPP-DOE-137, Rev. 2, U.S. Department of Energy, Washington, D.C.
6. Data Package Format for Certified Transuranic Waste for the Waste Isolation Pilot Plant (WIPP), WIPP-DOE-157, Rev. 2, U.S. Department of Energy, Washington, D.C.
7. ORNL Transuranic Waste Management Strategy Document, ORNL/TM-11506, March 1990, Oak Ridge National Laboratory, Oak Ridge, Tenn.
8. Quality Assurance Plan for ORNL Transuranic Waste Certification and Operations, QAP-X-89-EHP/WM-030, September, 1989, Oak Ridge National Laboratory, Oak Ridge, Tenn.
9. Health Physics Procedures Manual: Procedures and Practices for Radiation Protection, May 25, 1990, Oak Ridge National Laboratory, Oak Ridge, Tenn.
10. Radioactive Solid Waste Operations Manual, WM-HRWO-501, September, 1989, Oak Ridge National Laboratory, Oak Ridge, Tenn.
11. ORNL Quality Assurance Manual, Oak Ridge National Laboratory, Oak Ridge, Tenn.

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