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**Oak Ridge National Laboratory
Transuranic Waste
Certification Program**

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ENVIRONMENTAL AND HEALTH PROTECTION DIVISION

OAK RIDGE NATIONAL LABORATORY TRANSURANIC WASTE
CERTIFICATION PROGRAM

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Date Published - June 1987
Date Revised - August 1988

Prepared by the
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MARTIN MARIETTA ENERGY SYSTEMS, INC.
for the
U.S. DEPARTMENT OF ENERGY
under contract No. DE-AC05-84OR21400

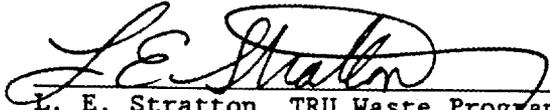


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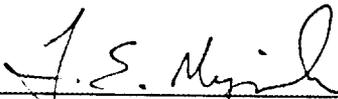
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OAK RIDGE NATIONAL LABORATORY TRANSURANIC WASTE CERTIFICATION PROGRAM

J. H. Smith, L. D. Bates, W. D. Box, W. S. Aaron, and J. A. Setaro

ABSTRACT

The U.S. Department of Energy (DOE) has requested that all DOE facilities handling defense transuranic (TRU) waste develop and implement a program whereby all TRU waste will be contained, stored, and shipped to the Waste Isolation Pilot Plant (WIPP) in accordance with the requirements set forth in the DOE certification documents WIPP-DOE-069, 114, 120, 137, 157, and 158.

The program described in this report describes (1) how Oak Ridge National Laboratory (ORNL) intends to comply with these requirements and (2) the techniques and procedures used to ensure that ORNL TRU wastes are certifiable for shipment to WIPP.

This document describes the program for certification of newly generated (NG) contact-handled transuranic (CH-TRU) waste. Provisions have been made for addenda, which will extend the coverage of this document to include certification of stored CH-TRU and NG and stored remote-handled transuranic (RH-TRU) waste, as necessary.

This document (upon approval) supersedes all previous ORNL Certification Documents including the previously approved ORNL-5985/R2, Certification Document for Newly Generated Contact-Handled Transuranic Waste, December 1984, and the unpublished draft ORNL-6267/V1-5, Oak Ridge National Laboratory Transuranic Waste Certification Program, April 1986.

1. INTRODUCTION

The primary objectives of the Oak Ridge National Laboratory (ORNL) Certification Program are to ensure that all transuranic (TRU) wastes will meet the criteria set forth in WIPP-DOE-069¹ and are packaged so that transportation to the Waste Isolation Pilot Plant (WIPP) and subsequent operations may be performed safely and adequately. The program will also implement and comply with the additional requirements of WIPP-DOE-114², -120³, -137⁴, -157⁵, and -158⁶. The diverse activities of the various ORNL divisions necessitate the use of general Laboratory-wide policies and procedures, which are then supplemented at the division level by those that specifically address the particular field of research and/or development unique to individual facilities.

An example of a Laboratory-wide policy is procedure 5.1, "Segregation and Management of Solid Radioactive Waste Materials," of the ORNL Health Physics Procedures Manual⁷. An example of an individual facility procedure is the Radioactive Solid Waste Operations Manual⁸.

This certification plan describes the methods, training, and procedures used by ORNL to meet the criteria set forth in WIPP-DOE-069 and associated documents and incorporates the requirements contained in pertinent ORNL policies as well as the quality assurance (QA) requirements in WIPP-DOE-120.

The procedures developed specifically for the packaging of TRU waste have been augmented by an intensive training program. All personnel responsible for the preparation of TRU waste have attended classes and taken proficiency tests to verify their understanding of the material.

These classes discuss background information on WIPP, the importance of meeting the criteria, the checks and balances instituted at ORNL for verifying the waste, and the consequences of failing to meet the criteria. An ORNL training document⁹ has been published that provides guidance to specific facilities on the content of an acceptable training program for TRU waste generation personnel. Only personnel that have been certified by completion of the training course and successful passing of the examination are allowed to package TRU wastes for storage and disposal.

This plan also presents the organization structure of ORNL as it applies to TRU waste certification, an overview of the waste generation and treatment operations, and details on data management. Sections 1, 2, 4, and 5 of this document, which cover these basic elements, encompass all four TRU waste types generated at ORNL. This includes newly generated (NG) and stored contact-handled transuranic (CH-TRU) wastes as well as NG and stored remote-handled transuranic (RH-TRU) wastes. The remainder of this document (Sects. 3, 6, 7, and 8), exclusive of future addenda, is specific to the program for certification of NG CH-TRU that is currently implemented at ORNL. As more specific plans are developed for certification programs for the remaining three waste types, supplements to this document will be written that will describe the unique requirements and/or deviations from the basic program for certification of NG CH-TRU. It is important to emphasize that additional material will be provided for exceptions only, as much of the program for NG CH-TRU described herein is equally applicable to other waste types.

2. PURPOSE AND FEATURES

2.1 REQUIREMENTS FOR CERTIFICATION

The purpose of this document is to provide the required information to support the premise that TRU waste generated at ORNL meets the criteria set forth in the WIPP Department of Energy (DOE) certification requirements documents¹⁻⁶. This information pertains to the required personnel training; the operating and QA procedures to be used in generating, containerizing, and storing the waste; and pertinent data concerning all aspects of the specific TRU waste package.

These procedures and requirements address four main areas as defined in the WIPP-DOE certification requirements: (1) general requirements, (2) waste container requirements, (3) waste form requirements, and (4) waste package requirements. The term "waste package" refers to the combination of the waste container and waste form. The general requirements deal with the organizational structure of the program, wasteflow diagrams, and general methods for waste stream control. Those requirements that pertain primarily to the purchase of the waste containers (with respect to construction material, size, features incorporated for handling, and quality documentation) are considered waste container requirements. The waste form requirements, deal with the specific physical and chemical properties of the waste that is to be emplaced in the containers for shipment to WIPP. Finally, the waste package requirements address the total package criteria for factors such as weight, criticality, dose rate, surface contamination, thermal power, gas generation, plutonium-equivalents documentation, and labeling. It is important to recognize, however, that the net weight of the waste form is used in evaluations related to

transuranic concentrations (for determining compliance with the TRU waste definition) and for assay calculations.

2.2 OVERVIEW OF WASTE-GENERATING OPERATIONS

Transuranic wastes are defined by DOE Order 5820.2A¹⁰ as those radioactive wastes (without regard to source or form) that are contaminated with alpha-emitting transuranium radionuclides having half-lives > 20 years and concentrations > 100 nCi/g at the time of the assay. In addition, ORNL handles ²³³U and ²²⁶Ra as TRU wastes because DOE Oak Ridge Operations (DOE-ORO) has determined that these materials generated at ORNL represent an equivalent hazard.

Most CH-TRU waste at ORNL is generated during isotope production, analytical support, or research activities, and usually only small quantities (fraction of a gram to several grams) of the TRU isotopes are contained in large quantities (kilograms) of discarded material. All CH-TRU waste has such low levels of penetrating radiation (<200 mrem/h at the container surface) that the container can be handled without extensive shielding and generates very little heat (a few hundredths of a watt per container).

The RH-TRU waste at ORNL is generated primarily in hot cell activities in the recovery of transplutonium elements from irradiated targets. Most ORNL RH-TRU waste has alpha, beta, and gamma radiation levels below 100 R/h. The neutron levels of many packages will be over the WIPP acceptable limit when the waste is first placed in the storage container,

a consequence of the ^{252}Cf contained in the waste. Storage for a period of five to ten years will allow this waste to decay to acceptable limits. In a few packages, the thermal output of this waste may be a few hundred watts per container. The total thermal power for RH-TRU waste must be less than 300 watts per waste package per WIPP-DOE-158. This heat output may be calculated from the quantities of alpha material present.

Because of the similarity of the production activities, the bulk of ORNL CH-TRU and RH-TRU are, for all practical concerns, identical except for radiation levels. Obvious exceptions include unique waste forms such as the ORNL RH-TRU sludges.

2.3 SCOPE AND ORGANIZATION OF THE CERTIFICATION PLAN

The following sections describe, with appropriate reference to documented controls and supporting data, various site-specific activities relating to the TRU Waste Certification Program. Specifically, the Certification Plan (1) details the Quality Assurance/Quality Control (QA/QC) requirements for safe packaging and transportation of TRU waste, as well as the procedures used to implement this plan; (2) outlines and illustrates by organization charts the structures, management responsibilities and authorities, and interfaces of the waste-generating, processing, and supporting organizations that participate in the Certification Program; (3) describes the data collecting and archiving methods and records control; (4) references the procedures used in the procurement and handling of waste containers and related control methods; and (5) describes the waste-generating and processing operations.

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3. IMPLEMENTATION OF CERTIFICATION QUALITY ASSURANCE REQUIREMENTS

3.1 PURPOSE AND SCOPE

As defined in WIPP-DOE-120, QA comprises all those planned and systematic actions necessary to provide adequate confidence that a facility, structure, system, component, or process will perform satisfactorily in service. Quality assurance includes QC, which comprises all those actions necessary to control and verify the features and characteristics of a material, process, product, or service to specified requirements. If the QA activities are effective, the documentation related to waste certification will be valid and adequate for performing the waste package certification activities.

DOE Order 5700.6B requires all DOE programs to have QA. In addition to the general requirement for QA in all DOE programs, any TRU waste that is packaged for shipment to WIPP is required to have QA and the concomitant documentation. The DOE issued certification QA requirements are adapted from the basic requirements of NQA-1 and are the bases for the certification-related QA activities of the certification program. The following principles adapted from the ORNL Quality Assurance Manual¹¹ are applicable:

- o Primary emphasis shall be on achieving a high degree of operational success, recognizing that safety, environmental protection, reliability, and performance are integrally related through the compliance requirements.
- o QA activities shall be identified to the extent to which the certification QA requirements shall be applied.

- o Organizational responsibility and authority for activities affecting waste processing and certification shall provide for the effective implementation of the certification program and command effective management support.
- o The certification plan must be amenable to both internal and external audits and surveillance.

3.2 CERTIFICATION QA PLAN

This section describes the content of the certification QA plan for TRU waste. The use of the term "QA Plan" in this section provides consistency with the terminology used in the certification QA requirements.³ In developing this plan, appropriate advantage has been taken of existing QA personnel, policies, and practices. If existing site documents on QA, operating, and administrative procedures were used, they have been referenced. The QA program in operation at ORNL is best described in the program description (Sect. 1) of the ORNL Quality Assurance Manual.

Attachment 1 illustrates by cross-referencing to specific sections of this document, as well as other supporting documents, how the ORNL QA Program complies with the 18 QA Program elements identified in NQA-1 and WIPP-DOE-120. Section 3.3 further describes the specific techniques and procedures (identified in Attachment 1) that constitute the certification program. The column of Attachment 1 entitled "Specific references for implementation" is by no means all inclusive, particularly with respect to existing generic ORNL procedures that support the program. References are provided, however, for the major procedures and references that

specifically (by incorporation, revision, or creation) support TRU waste certification and that represent the major implementing documentation that would support a certification program audit. The numerical references in this column of Attachment 1 are identified in Attachment 2, which lists the implementing documents for NG CH-TRU certification. The absence of specific references in this column does not indicate the absence of procedures or controls but simply indicates that no additional references are necessary beyond either the referenced ORNL QA procedure identified in the second column of Attachment 2 or the discussion within this document as referenced by the third column of Attachment 1.

3.3 QA PROGRAM ELEMENTS

This section defines all those planned and systematic activities which will ensure that ORNL's TRU Waste Certification Program will perform satisfactorily. The waste is not the product, and QA/QC is not applied to the waste as a product but to the certification activities for shipment of waste to WIPP.

3.3.1 Organization

The ORNL is operated for DOE-ORO by Martin Marietta Energy Systems, Inc., which provides the Laboratory as well as other DOE facilities operated by the Energy Systems with a centralized Office of Quality Assurance. This office establishes and interprets the overall Energy Systems QA Program and coordinates its implementation with the quality organizations of the specific installations such as ORNL. The QA Office also serves as a focal point for Energy Systems' communication with various quality personnel of the DOE-ORO.

Quality assurance activities at ORNL are coordinated by the Quality Department head. The Quality Department (see Fig. 1) consists of five groups: Quality Engineering and Inspection, Quality Auditing and Training, Quality Administration and Services, Performance Improvement Coordination, and Quality Assurance. The position of the Quality Department with respect to the overall ORNL organization is shown in Figs. 2 and 3. The Quality Department head reports to the ORNL executive director. The major operating divisions or programs which the Quality Department monitors report either to the ORNL executive director or one of the associate directors.

It is the responsibility of the individual divisions of ORNL to ensure compliance with all applicable ORNL QA requirements and plans. Toward this end, each division has appointed a Quality Assurance specialist (QAS) to ensure implementation of their divisional QA responsibilities. The QAS reports functionally to the division director and interfaces with and reports administratively with the ORNL Quality Department. The Division Director is responsible for assuring implementation of the division and project/program QA programs. The QAS performs and coordinates QA activities within the division. Similarly, at the next lower organizational level, quality assurance representatives (QARs) are designated by section heads to handle QA activities for the sections. QARs work in coordination with QASs but report to the section heads.

The QAS in each division (or program) interfaces directly with the various operating components of the division and with the Quality Department. It is the duty of the QAS to (1) review proposed additions or deletions to the QA plans, (2) schedule periodic formal review of existing

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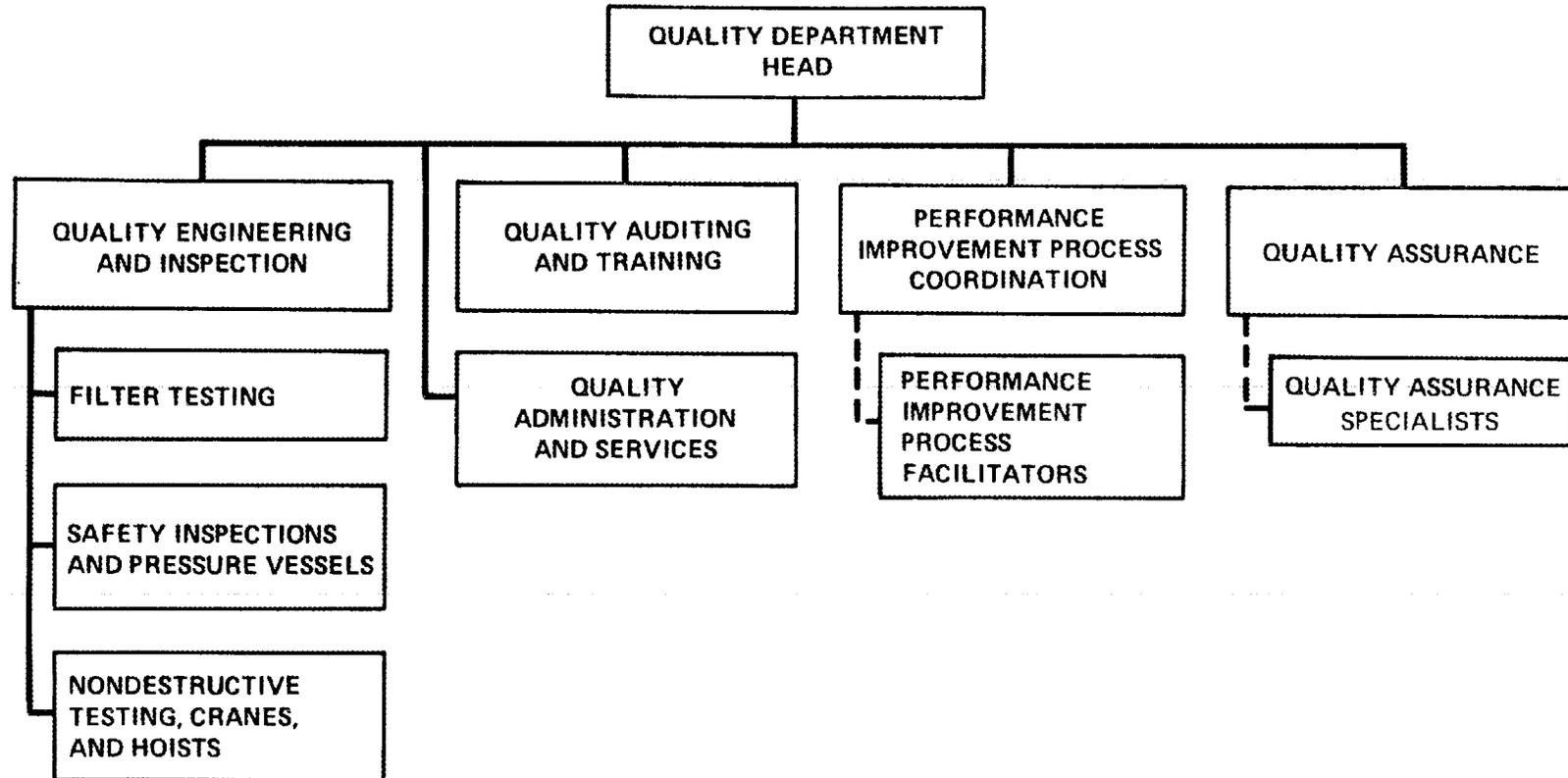


Fig. 1. Organization chart of quality assurance activities at Oak Ridge National Laboratory

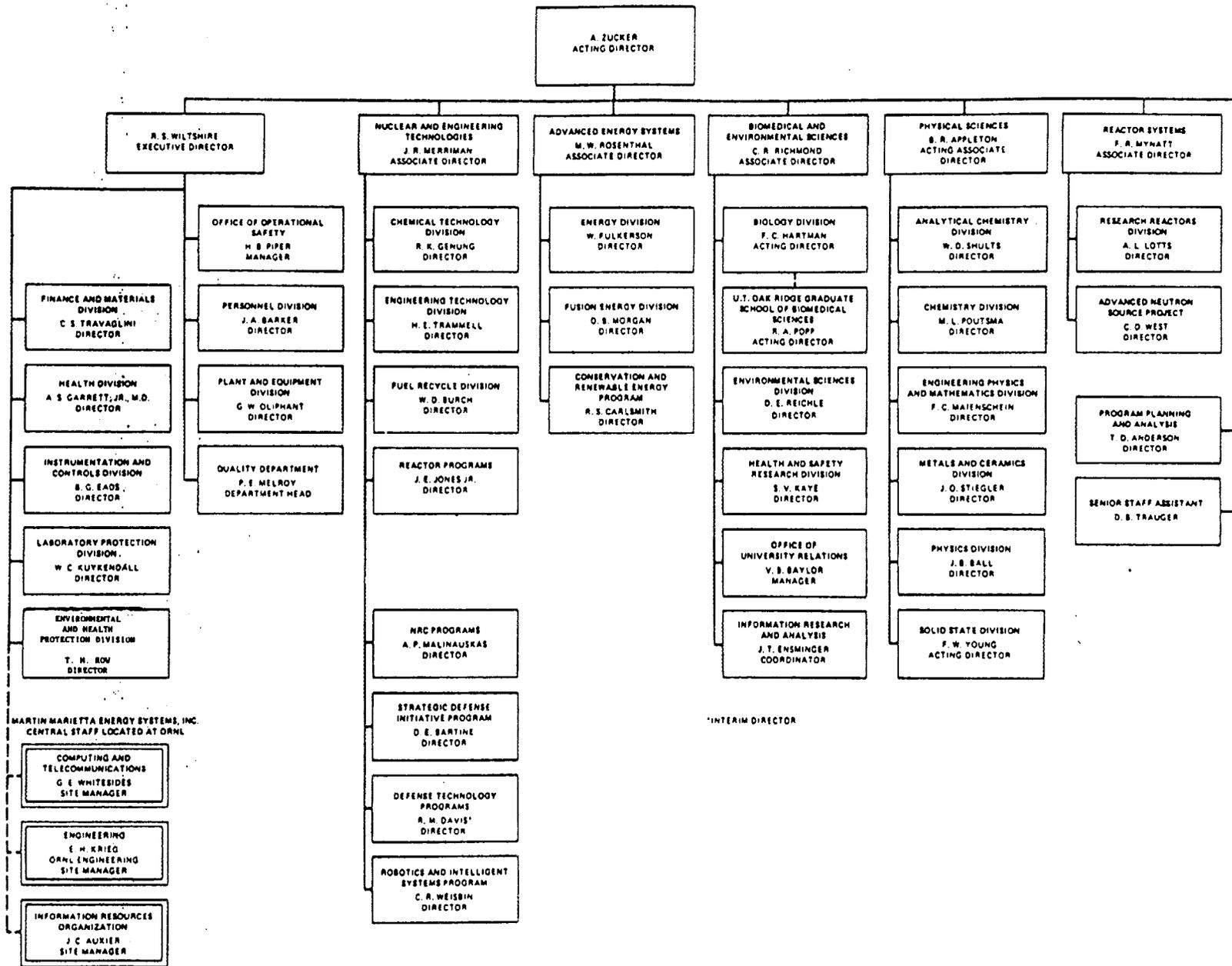


Fig. 2. Basic organizational structure of ORNL

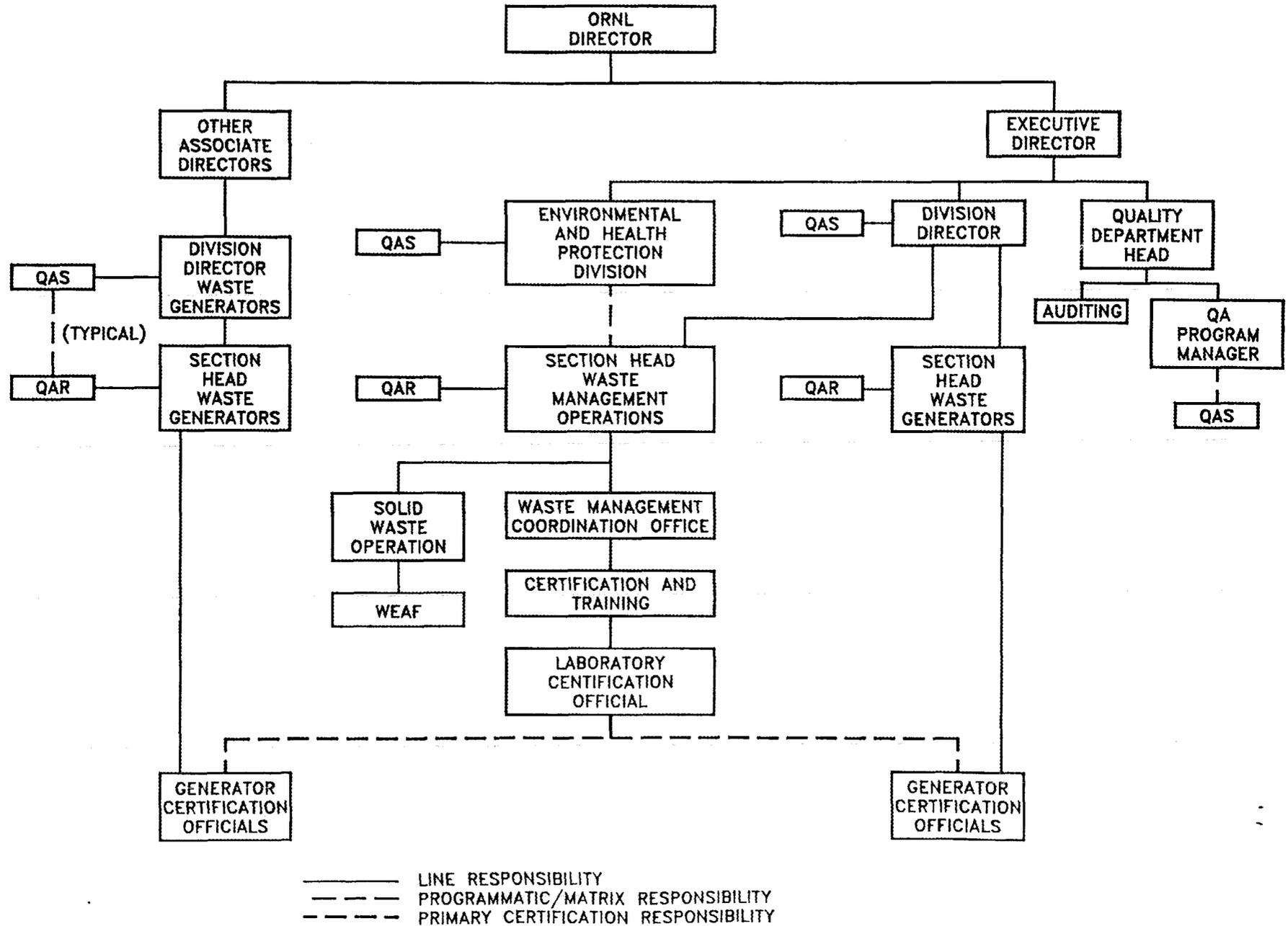


Fig. 3. Transuranic Waste Certification organization structure

QA plans, (3) conduct periodic audits of the certification program for his division and investigate any nonconformance items, and (4) review and approve divisional QA requirements on engineering documents. His reports are sent to the division director, operating components involved, and the ORNL Quality Department.

The QAR coordinates programs within the section, adhering to current Laboratory and division QA practices. His function is to represent quality responsibilities and concerns of his specific section. This representative has daily firsthand knowledge of waste-related activities at the generator site and is most likely to be aware of specific problems dealing with the QA procedures in the preparation of TRU waste. It is the duty of the QAR to know current QA policies, ensure that the certification programs are conforming to good QA practices, report to the section head on matters of certification, and interface with the QAS for internal audits of the certification program.

In addition to the normal QAS and QAR structure established by the Quality Department, the positions of laboratory certification official (LCO) and generator certification official (GCO) have been established to directly support the TRU waste certification effort. The LCO, representing the Waste Management Operations program manager, is responsible for the certification of each waste package prior to shipment to WIPP. This certification requires a review of all documents pertaining to each waste package and a knowledge of the operations involved in generating the waste package to ensure that every package that is certified at ORNL will be accepted at WIPP. Each operating site that generates TRU waste must maintain a GCO to assist the LCO in monitoring the generation and packaging of TRU waste for certifiability. The GCO is

also responsible for maintaining an awareness of the various training programs within the division to ensure that they include all appropriate employees and that the training programs meet the specific needs of the TRU waste certification effort. The GCO monitors waste documentation such as nonconformance reports and signs waste log-in sheets as an indication to the LCO that the subject waste meets the certification requirements. The general responsibilities of the LCO and GCOs are defined in the QA procedure QA-L-20-100¹². Responsibilities for periodic monitoring of the assay/examination of TRU waste are also addressed in the Waste Examination Assay Facility (WEAF) Quality Assurance Assessment/Plan, OP-RI-QAA-30¹³.

3.3.2 Quality Assurance Program Plan

The general requirements for this plan are discussed in Sect. 3.2. Compliance with the QA Program plan is accomplished through the use of the existing QA organization, existing administrative and operating procedures, and procedures that have been prepared specifically for TRU waste generation and packaging. Existing administrative and operating procedures are referenced where appropriate and are included in the references in Sect. 9. For ease of review and audit, the procedures prepared specifically to support the TRU Waste Certification Program, referred to as the implementing documents, have been listed in Attachment 2. Many of these documents are duplicated in the references, where necessary. The implementing documents are listed in two categories: program/ORNL documents, which define requirements of the overall program, and facility/operation specific documents, which define procedures and requirements specific to a given generating facility or operational unit.

Proper execution of these procedures (program and specific) will yield a waste package that is certifiable on the basis of the data package that is generated for each waste package. Included in this data package are:

1. generators' log-in sheet (reviewed and signed by the GCO);
2. form 2822, as updated;
3. neutron and gamma-ray assay results;
4. real-time radiography (RTR) results;
5. certification data in the format required by WIPP-DOE-157; and
6. LCO's review and signature.

At any point when a nonconformance of the waste package is discovered, the package is tagged and returned to the waste generator for repackaging. The nonconformance report (NRC) is tracked by the Quality Assurance Specialist (QAS) on the Energy Systems Quality Information System (ESQIS) until corrective action is taken by the generator. The waste drum is then identified and resubmittal through the nondestructive assay (NDA) and nondestructive examinations (NDE).

3.3.3 Design Control

The QA procedure (QA-L-3-100) established by the Laboratory, and the individual procedures developed by divisions provide an effective system for handling design control and design changes. Specific design control examples related to TRU waste certification include the WEAFF NDE/NDA equipment. The control of original

designs and any changes in a radioactive facility at ORNL is also accomplished through Safety Analysis Reports and Safety Assessments, which are prepared by the facility operators and reviewed through the ORNL Office of Operational Safety (OOS).

3.3.4 Procurement Document Control

The individual division ordering materials at ORNL is responsible for ensuring that documents necessary for procurement (e.g., plans, specifications, engineering drawings, instructions, procedures, codes, standards, requisitions, and purchase orders) are prepared and are included in the contracts. Quality-related subjects that are discussed in such documents are: source selection and evaluation, supplier's QA program, material inspections, NDE, fabrication, processing, documented supplier reports and due dates, supplier data packages, supplier certifications, supplier nonconformances, supplier deviations, QA audits, source surveillance and inspection, shipping, operating manuals, equipment acceptance tests, and quality records (see ORNL QA Procedure QA-L-4-100¹⁵).

In the specific case of TRU waste containers, the Solid Waste Management group and the Quality Department work with the Energy Systems Purchasing Division to ensure that all containers comply with applicable Department of Transportation (DOT) requirements as defined in 49 CFR 178.350 and 178.118 for Specification 17H, Type A steel drums. Compliance is ensured through a combination of purchase requisition requirements, vendor inspection, receipt inspection, and controlled distribution of accepted containers. Figure 4 illustrates the overall process for ORNL Type A drum procurement at ORNL.

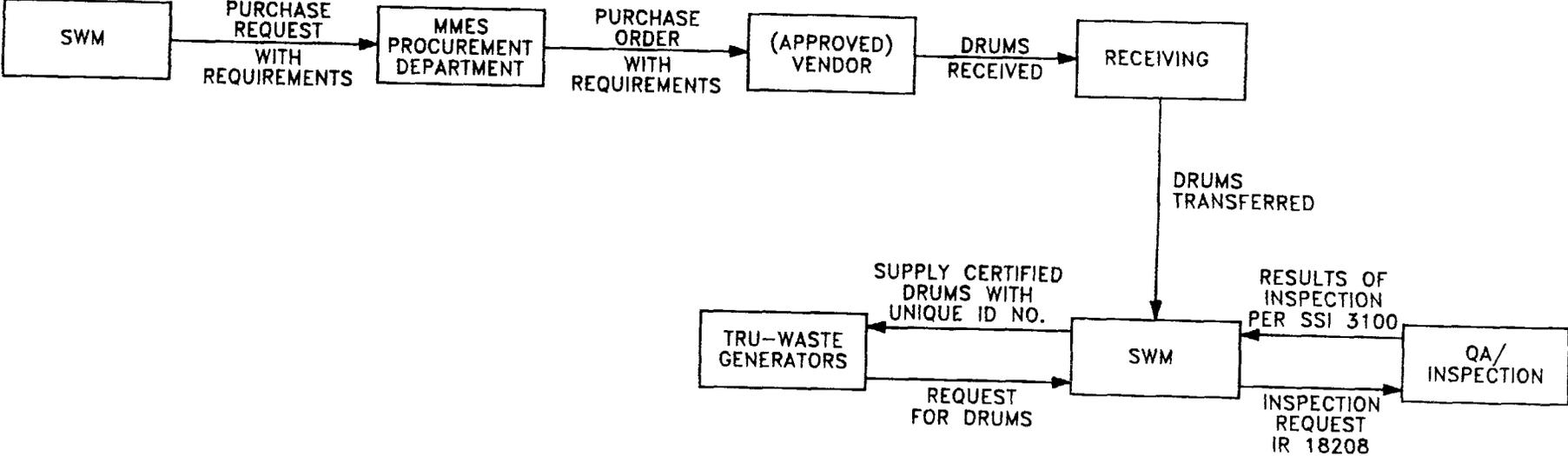


Fig. 4. Contact-handled transuranic waste drum procurement

The Solid Waste Management group procures new drums when the inventory reaches a defined minimum level. Based on the generator usage, a purchase requisition is submitted to a qualified vendor, for drum procurement. 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 49 CFR 173.465 for a Type A package including drop test reports, hydrostatic test reports, compression test reports, leakage test reports, mill analysis of the stainless steel, and welding qualifications. When the drums are received, a receiving inspection is performed by the ORNL Quality Department to ensure that the fabrication/inspection standards have been met. Checklists for the vendor site inspection and the receiving inspection are defined in ORNL Quality Department document SSI-3100. The vendor data package, received with the drum procurement, is transferred to Solid Waste Management personnel for filing with other TRU certification records. Bar-code labels bearing the unique drum ATN (accountability transfer number) are affixed to the drums, and they are delivered, on request, to the TRU generators for waste packaging. Only drums obtained from Solid Waste Management that have been properly certified are accepted for storage of TRU waste. Procedures outlining the above requirements are included in QA-L-20-100.

3.3.5 Instructions, Procedures, and Drawings

Activities affecting quality are controlled by procedures contained in the ORNL QA Manual or in division or program procedures manuals that are approved by division or program directors. The ORNL Standard Practice Procedures Manual¹⁶ contains instructions and procedures that are also applicable to QA programs.

Operating procedures and/or work instructions are prepared by the line organization for predetermined conditions of start-up, normal, shutdown, and emergency operations. Procedures that apply to the certification of TRU waste are listed in Attachment 2. Operating logs and checklists are used to record actual operations events. Operational reviews are conducted periodically to evaluate the methods and procedures used in the project.

3.3.6 Document Control

Documents (such as plans, drawings, specifications, procedures, and instructions) that establish the item description and quality requirements or that prescribe inspections and tests to determine compliance of the completed item with technical requirements are defined as "quality-related documents." The ORNL QA Manual (procedure QA-L-6-100) requires that any changes in these documents must be reviewed and approved by the same organization that performed the original review and approval. Quality-related documents are approved by a designated individual (normally the QAS) in each affected division. These approvals verify that particular control requirements applicable to the document have been satisfied and that the document is acceptable for its intended use. Both understanding and acceptance are indicated by the signatures on the data document.

The initial release and distribution of documents, and changes thereto, are the responsibility of a designated releasing authority. This authority is also responsible for instructing the user in the proper method for disposing of obsolete quality-related documents and for obtaining any necessary verification that such action has been taken, whenever required by the complexity of the project.

These requirements focus primarily on divisional control of documents. Program-related activities such as the TRU Certification Program are not adequately covered under existing ORNL procedures. Therefore, a QA assessment specific to TRU certification document control, OP-WM-QAA-17¹⁷, was completed. This assessment required a periodic review of document changes that may affect the certification effort and ensures that specific divisional changes will not affect the overall effectiveness of the certification program.

Training-related documents, which include a record of each employee who has completed training on TRU waste packaging, are maintained by division supervision or training coordinators within the division for review and auditing.

3.3.7 Control of Purchased Materials, Equipment, and Services

When requested by project management, source surveillance of suppliers and manufacturers is performed by designated ORNL personnel during the course of a procurement. In such events, inspection personnel may be sent to a supplier's plant upon specific request by project management or on some periodic frequency. Reports prepared by the inspection personnel must include recommendations for all required corrective actions¹⁵. Any proposed changes to design documents, standards, specifications,

manufacturing procedures, inspection and test procedures, QA programs, or other documents forming a part of procurement contracts must meet the requirements of WIPP-DOE-114, WIPP-DOE-120, WIPP-DOE-137, and WIPP-DOE-158.

After being reviewed for compliance with technical and quality-related requirements, data packages on completed items are submitted to the user division. The Materials Department in the receiving plant performs routine receiving inspection and ensures that the agency designated to perform special inspections, as indicated on the purchase requisition, is notified. Receiving inspection results and all quality verification documentation submitted by the supplier are transmitted to the ordering division. Nonconformances are transmitted to the contract administrator of the Energy Systems Purchasing Division, so that contracts will not be closed out until corrective measures are taken, and the item is fit for intended use.

Procurement of TRU waste containers at ORNL is a joint responsibility of the Solid Waste Management staff and the Energy Systems Purchasing Division and is completed as described in Sect. 3.3.4 above. Acceptable containers are stored and distributed to waste generators, as needed, by the Solid Waste Management staff.

3.3.8 Identification and Control of Items

ORNL Quality Assurance Procedure QA-L-8-100, "Identification and Control of Items," requires that the necessary requirements be put in place to ensure that only correct and accepted items are used or installed. The task leader responsible for the activity shall determine the extent and scope of controls necessary.

Supplier-provided items are identified and documented by the supplier in a manner consistent with applicable codes or in the manner specified in the procurement documents. Upon the user division's receipt of materials, parts, and components, inspections are made according to preplanned procedures and test specifications. If the items have been incorrectly identified or incorrectly documented, they will not be accepted until the condition is resolved. In the case of TRU waste containers received by the SWSA staff, each container is uniquely identified by a bar-code applied to the container prior to its distribution to waste generators. This code identifies each container, from procurement through loading and ultimate certification and shipment of the waste package. All documents pertaining to a particular waste package carry that unique identification number.

Incorrect or defective material, parts, and components are identified by being labeled with "hold tags" and are handled in accordance with the ORNL Quality Assurance Manual.

3.3.9 Control of Processes

Control of processes is accomplished through the use of written procedures, training, and careful documentation.

All personnel involved in loading, handling, and examining TRU waste packages are required to complete training in TRU waste packaging prior to being authorized to perform their duties. Each training program in the various operating groups includes the entire TRU waste packaging program, along with in-depth coverage of that particular group's responsibilities.

Written procedures apply to all aspects of the TRU Waste Program, from procurement of the waste container through loading, examination, and storage for eventual shipment to WIPP. This has been accomplished through the use of existing procedures, modification of existing procedures, and the development of new procedures specifically for handling TRU waste.

Records are maintained relating to the qualification of equipment and personnel involved in the various phases of waste package preparation that supplement the documents and data generated for each waste package. Each group supervisor is responsible for his phase of the waste package handling, while the GCOs and the LCO have overall responsibility to ensure that TRU waste packages generated at ORNL are certifiable for shipment to WIPP.

3.3.10 Inspection

Inspections are performed at appropriate points throughout the entire TRU waste packaging process to ensure conformance to certification criteria. Both internal inspections (by the various groups who perform specific portions of the overall packaging process) and independent inspections (by qualified personnel outside the different groups that verify conformance to certification requirements) are required. Finally, the Quality Department at ORNL is available on request to perform source surveillance, special inspections of materials received, monitoring of inspection activities at suppliers' facilities, and a wide variety of other inspection and testing functions.

Standard waste containers are procured using requirements established by the certification program and the Quality Department. Certification test results are required from the vendor as part of the purchase order.

The containers, are routinely inspected by Quality Department personnel for damage, quality, and conformance with orders. In addition, CH-TRU drums are inspected by Quality Department personnel according to an established inspection checklist (SSI 3100). The Solid Waste Management staff members cognizant of TRU waste certification requirements reinspect the containers to ensure that they meet these requirements.

Several inspections are needed during the loading phase of the TRU waste packaging process. The primary inspection is performed on a continuing basis by the waste generator's supervisory staff. Each waste packet is documented on a log-in sheet (Fig. 5a) as it is placed in the drum. (Instructions for completing the log-in sheet are given in Fig. 5b.) Periodically, this process is verified by signature of the facility QAR, radiation control officer (RCO), GCO, or assigned health physicist. In areas where frequent inspections of the contents of the waste drums would result in excessive exposure to radiation, the area health physicist routinely performs the verification. Training and testing equivalent to that received by the operating personnel and supervision is given to any health physicist asked to verify log-in sheet usage.

The log-in sheet requires an indication of the presence or absence of hazardous materials (column 9, Fig. 5a). To obtain the required characterization of hazardous components necessary for completion of the WIPP data package, the generator is also required to complete form UCN-13689, "Request for Disposal of Hazardous Waste Material." This form is shown in Fig. 6.

DRUM ATN NO. _____

Log-In Data Sheet - Transuranic (TRU) Waste Generation

Page ____ of ____

Building No. _____

WASTE CATEGORY: _____
(TRU or TRU Mixed)

(Entry/ies must be made in every applicable column for each packet or item placed in this container before waste can be certified and removed for storage or disposal.)

Room No. _____

1 Waste Pack No.	2 Date	3 Physical form	4 Source of Waste	5 Est. Combin- tible Content (Vol. %)	6 Est. Wt. (kg) Opt.	7 Radiation Data (mrem/h)		8 Radionuclide Content				9 Hazardous Material Content (Yes or No) Atch. UCM: 13698 if yes	10 Technician's Signature Certifying Waste Data	11 Date Inspection	
						7a B/g	7b n	8a Nuclide	8b Chemical form	8c Est. Act. (Ci/Kg) Opt.	8d Est. Total Act. (Ci)			11a Date	11b Signature

NOTES:

1. Drum Weight _____
2. Drum Closure: Gasket has been put in place and closure ring bolt tightened to 45 ft-lb. Signature _____
3. This certifies that the named TRU waste materials are properly described and are in accordance with the WIPP-WAC and DRML TRU Waste Certification requirements and procedures. GCO Signature _____ Date _____
(First Page Only)
4. Additional facility specific instructions: _____

Fig. 5a. Transuranic Waste Log-In Sheet.

GENERATOR INSTRUCTIONS FOR COMPLETING THE "LOG-IN DATA SHEET - TRANSURANIC (TRU) WASTE GENERATION"

Waste Category - Indicate if drum contains radioactive TRU only or mixed hazardous and TRU.

Drum ATM No. - Enter the bar-coded number affixed to the drum.

Building No./Room No. - Enter building number and room number (if applicable) from which waste was generated.

COLUMN

1. Waste Pack No. - All waste material placed in the container must be bagged or sealed to contain contaminants. The first package placed in each container should be labeled number one and each subsequent package labeled and numbered sequentially thereafter.
2. Date - Enter the date that waste material or package is placed in the container.
3. Waste Form Categories - Acceptable entries for physical form categories include (Est. Combustible Contents - excluding containment materials - are given in parenthesis): plastic (100%), paper (100%), glass (0%), metal parts (0%), soil (0%), wood (100%), rubber parts (100%), cloth (100%), electrical equipment (25%), tools (0%), filters (75%), and machinery (0%).
4. Source of Waste - Enter the room number or other information (i.e., glove box) which identifies the location from which the waste originated.
5. Est. Combustible Content (Vol %) - enter an estimate for the combustible content of the waste (i.e., 0%, 25%, 50%, 75%, or 100%). See estimates for various waste form categories in No. 3 above.
6. Est. Wt. (Kg) - Enter a rough estimate of waste weight (1 lb = 0.45 Kg). Use of this column is optional.
7. Radiation Data (mrem/h)
 - a. B/g - Monitor all material for beta-gamma radiation using a "Cutie Pie", Victoreen 440, or other comparable instrument in contact with the waste package. Record the result.
 - b. n - For waste containing neutron-emitting radionuclides, monitor the waste for neutron emissions using a BF₃ counter or other comparable instrument in contact with the waste package. Record the result.
8. Radionuclide Content
 - a. Nuclide - enter dominant nuclides, use as many lines as needed.
 - b. Chemical Form - may be given as: Elemental, Chloride, Oxide, Inorganic salt, Nitrate, or some other general chemical description.
 - c. Est. Activity (Ci/Kg) - Enter best estimate of concentration if known, use column 6 to determine total activity. Use of this column is optional.
 - d. Est. total activity (Ci) - Enter best estimate of total curie content.
9. Hazardous Material Content - A complete listing of such material can be found in 40 CFR 261. See Table 3 of the Health Physics Procedure Manual for a partial listing and Section 5.1 Procedure 8.0 of the Environmental Protection Manual for a more complete listing. Indicate if hazardous materials are present by entering yes or no. DO NOT LEAVE BLANK. If hazardous materials are present, complete form UCN-13698 and attach to this log-in sheet.
10. Signature - The person placing each sealed or bagged article in a container will be required to put his/her signature (initials are not acceptable) in column 9. This person must have taken and passed the training course on TRU waste certification and the RCRA/LLW Inspector course or the waste package will not be approved for disposal or storage.
11. Data Verification - Verification that the data is being entered properly must be made on a routine basis by either the QAR, RCO, GCO, or HP assigned to that building. The data and signature (initials are not acceptable) of the person making the verification should be entered in the appropriate columns. This person must have taken and passed the training course on TRU waste certification or the waste package will not be approved for disposal or storage.

NOTES

1. The closed drum should be weighed and the weight recorded here. (DO NOT complete the weight on form UCN-2822. This will be entered by WEAF personnel.)
2. The lid, gasket, and bolt ring must be placed on the drum and the ring bolt tightened to 45 ft-lb. The signature of the person closing the drum is required.
3. When the drum is ready for SMSA pickup, the GCO must sign the required certification.
4. Additional facility specific instructions can be indicated to customize the log-in sheet.

Fig. 5b. Instructions for completing "Log-In Data Sheet - Transuranic (TRU) Waste Generation."

No.

REQUEST FOR DISPOSAL OF HAZARDOUS WASTE MATERIAL

Date		Page	1 of
Waste Generator		Bldg.	Room No.
Plant	Employee No.	Phone No.	Charge/Work Order No.
Location of Material		Room or Area	

ITEM NO.	DESCRIPTION OF MATERIAL *	QUANTITY	RADIOACTIVE/ NONRADIOACTIVE	HAZARD INFORMATION	EPA WASTE NO./ CONTAINER NO. **
1	Benzene	1 Gallon	Nonradioactive	Suspected Carcinogen	
2	Mixture of Organic Solvents	Acetone 1 Gallon Methanol 1 Gallon Xylene 1 Gallon	Nonradioactive	Flammable	

* IF THE WASTE IS A CHEMICAL MIXTURE OR AN ITEM SUCH AS CONTAMINATED CLOTHING, LIST EACH CHEMICAL AND APPROXIMATE AMOUNTS OF EACH. ALL FORMS NOT PROPERLY FILLED OUT WILL BE RETURNED!

TO BE COMPLETED BY THE DEPARTMENT OF ENVIRONMENTAL MANAGEMENT.

STORAGE LOCATION		TOTAL WEIGHT/VOLUME
DATE TO STORAGE	RECYCLE/DISPOSAL DATE	RECYCLE/DISPOSAL SITE

WHITE - DEM
CANARY - CONTAINER
BLUE - WASTE GENERATOR

** INFORMATION TO BE COMPLETED BY DEM

Fig. 6. Request for Disposal of Hazardous Waste Material.

The inventorying and auditing of special nuclear materials by the Laboratory Protection Division serves as an inspection function with regard to the quantity of fissile material in the waste containers. The list showing the location of all fissile materials is updated daily, formally inventoried monthly, and audited frequently on both a scheduled and "surprise" basis by personnel from the Laboratory Protection Division and/or DOE.

When a container has been filled, the lid is placed on the drum, and the closure ring is installed. Drums are sealed by this ring when the accompanying bolt is tightened to 45 ft-lb (with tapping). Boxes are sealed with bolts after a gasket is placed between the lid and the body. The container is then carefully monitored by health physics personnel for radiation levels and for maximum transferable (smear) surface contamination alpha levels of ≤ 50 pCi/100 cm² and beta-gamma levels of ≤ 450 pCi/100 cm². A radiation tag giving the results of this survey is attached to the container. This information, along with other appropriate waste data, is entered by the generator (and/or health physicist) on the "Request for Storage or Disposal of Radioactive Solid Waste or Special Materials" (form UCN-2822 shown in Fig. 7). When the waste includes accountable nuclear materials, a "Request for Authorization to Dispose of Nuclear Materials" (form UCN-6073) must be submitted to the Special Nuclear Materials Group of the Laboratory Protection Division and approved prior to transfer to the Solid Waste Management staff.

REQUEST FOR STORAGE OR DISPOSAL OF RADIOACTIVE SOLID WASTE OR SPECIAL MATERIALS

REQUESTER: EXECUTES THIS SECTION BEFORE ARRANGING MATERIAL TRANSFER

DATE	OFFICE OF WASTE BLDG. IF DRNL	REQUESTER'S SIGNATURE	EMPLOYEE NO.	PHONE NO.	OFFICE AND BLDG. NO.	CHARGE NO.
TOTAL VOLUME (CU. FT.)	COMBUSTIBLE VOL. (CU. FT.)	WEIGHT (LBS)	ACCOUNTABILITY (MM NUMBER)	TOTAL CURIES IN WASTE (BEST ESTIMATE)		

<p>WASTE CLASSIFICATION (CHECK ONE)</p> <p>0. <input type="checkbox"/> TEMPORARY STORAGE</p> <p>1. <input type="checkbox"/> TRU OR 233U (> 100 µCi/Kg) - Retrievable Storage</p> <p>2. <input type="checkbox"/> URANIUM/THORIUM</p> <p>3. <input type="checkbox"/> FISSION PRODUCT</p> <p>4. <input type="checkbox"/> INDUCED ACTIVITY</p> <p>5. <input type="checkbox"/> TRITIUM</p> <p>6. <input type="checkbox"/> BETA-GAMMA TRU OR 233U (> 100 µCi/Kg) - Retrievable Storage</p> <p>7. <input type="checkbox"/> ALPHA TRU OR 233U (< 100 µCi/Kg) BETA-GAMMA TRU OR 233U (< 100 µCi/Kg)</p> <p>8. <input type="checkbox"/> OTHER _____</p> <p>9. <input type="checkbox"/> LANDFILL</p>	<p>TYPE OF WASTE (CHECK ONE)</p> <p>1. <input type="checkbox"/> BIOLOGICAL (BW)</p> <p>2. <input type="checkbox"/> CONTAMINATED EQUIPT. (CE)</p> <p>3. <input type="checkbox"/> DECONTAMINATION DEBRIS (DD)</p> <p>4. <input type="checkbox"/> DRY SOLIDS (DS)</p> <p>5. <input type="checkbox"/> SOLIDIFIED SLUDGE (SS)</p> <p>6. <input type="checkbox"/> NOT CLASSIFIED (NC)</p> <p>BRIEF DESCRIPTION: _____</p> <p>_____</p> <p>_____</p> <p>CHARGE NO. _____</p> <p><input type="checkbox"/> CONSTRUCTION</p> <p><input type="checkbox"/> RENOVATION</p> <p><input type="checkbox"/> DECONTAMINATION & DECOMMISSIONING (D&D)</p>	<p>CONTAINER(S) IDENTIFICATION (INDICATE NUMBER OF EACH)</p> <p>1. <input type="checkbox"/> 55 GAL SS DRUM</p> <p>2. <input type="checkbox"/> 30 GAL SS DRUM</p> <p>3. <input type="checkbox"/> 4 1/2" WALL CONCRETE CASK</p> <p>4. <input type="checkbox"/> 6 IN. WALL CONCRETE CASK</p> <p>5. <input type="checkbox"/> 12 IN. WALL CONCRETE CASK</p> <p>6. <input type="checkbox"/> 55 GAL BI DRUM</p> <p>7. <input type="checkbox"/> 30 GAL BI DRUM</p> <p>8. <input type="checkbox"/> WOOD 11. <input type="checkbox"/> PLASTIC</p> <p>9. <input type="checkbox"/> OTHER 12. <input type="checkbox"/> DUMPSTER</p> <p>10. <input type="checkbox"/> GI CAN 13. <input type="checkbox"/> NONE</p> <p>14. <input type="checkbox"/> CASK NO. _____ WALL THICKNESS _____ IN. SHIELDING MATERIAL _____</p> <p>METAL BOX</p> <p>15. <input type="checkbox"/> 74.5" L x 50.5" W x 38.5" H</p> <p>16. <input type="checkbox"/> 68" L x 54" W x 38.5" H</p> <p>17. <input type="checkbox"/> 88" L x 54" W x 54" H</p> <p>18. <input type="checkbox"/> 112" L x 68" W x 77" H</p>
--	--	---

PRINCIPAL ISOTOPE(S): BEST ESTIMATE:		<input type="checkbox"/> GRAM(S)	
1. QUANTITY _____	<input type="checkbox"/> CURIE(S): IDENTITY _____	2. QUANTITY _____	<input type="checkbox"/> CURIE(S): IDENTITY _____
3. QUANTITY _____	<input type="checkbox"/> GRAM(S)	4. QUANTITY _____	<input type="checkbox"/> GRAM(S)
	<input type="checkbox"/> CURIE(S): IDENTITY _____		<input type="checkbox"/> CURIE(S): IDENTITY _____

REQUESTER'S COMMENTS FOR THOSE HANDLING WASTE IN FIELD _____

QUANTITY _____ WATTS/M TOTAL _____

HEALTH PHYSICIST: EXECUTES THIS SECTION BEFORE MATERIAL TRANSFER

RADIATION DATA

BETA-GAMMA: FOR PACKAGE _____ mrem/hr @ _____ IN. OR FOR SHIELDED CASK _____ mrem/hr @ _____ IN.

SURFACE CONT. _____ dpm (3-γ); _____ dpm (α); NEUTRON READING _____ mrem/hr.

HP SURVEYOR'S COMMENTS FOR THOSE HANDLING WASTE IN FIELD _____

	HP'S SIGNATURE	PHONE NO.
--	----------------	-----------

STORAGE AREA FOREMAN: COMPLETES AND SENDS COPY TO ORIGINATOR AFTER HANDLING WASTE

ACTION TAKEN (CHECK ONE)	LOCATION	DATE
WASTE WAS <input type="checkbox"/> STORED, <input type="checkbox"/> BURIED, <input type="checkbox"/> COMPACTED, <input type="checkbox"/> OTHER _____	SWSA NO.	
FACILITY <input type="checkbox"/> BUILDING <input type="checkbox"/> WELL <input type="checkbox"/> RAVINE	WASTE DESCRIPTION:	FACILITY NUMBER
(Check One: <input type="checkbox"/> TRENCH <input type="checkbox"/> ON GROUND <input type="checkbox"/> OTHER _____)		SWSA ATN

LOCATION WITHIN FACILITY	LAYER	FILE	RANK
FFO FFT COMP. NO.			

FISSION WASTE DATA	CRITICALITY COMMITTEE	SCALE NO.
WELL FULL <input type="checkbox"/> YES <input type="checkbox"/> NO	APPROVAL FOR _____ GRAMS	

COMMENTS FROM SWSA FOREMAN REGARDING WASTE AND/OR OPERATION: _____

FOREMAN'S SIGNATURE _____

Fig. 7. Request for Storage or Disposal of Radioactive Solid Waste or Special Materials.

The container and copies of form UCN-2822, form 6073 (if applicable), radiation tag, and the log-in sheets (all completed by the generator) are received and transferred by Solid Waste Management personnel. Drums are taken to the WEAFF, located in the SWSA area; boxes are stored for future processing. When a drum is picked up, Solid Waste Management personnel verify the closure ring torque to be 45 ft-lb and review all documents accompanying the drum per a checklist included in the Radioactive Solid Waste Operating Procedures (RSWOP). At WEAFF, the drum is weighed, segmented gamma scans and active/passive neutron assays are made to verify radioisotope type and quantity, and RTR is performed to identify drum contents and ensure that no nonconforming items are present in the drums. At this point, accepted drums are documented and placed in interim storage for certification and shipment to WIPP. Any drum that fails to meet the definition of TRU waste will be disposed of according to the appropriate ORNL procedure for the type waste contained. Nonconforming drums will be returned to the waste generator for repackaging, renumbering, and resubmission to the entire TRU waste handling process. A Nonconformance Report (NCR) is completed on nonconforming drums per the procedure defined in QA-L-20-100. This procedure is illustrated graphically in Fig. 8. A new ATN (bar-code) number is applied by Solid Waste Management staff to drums that have been repackaged, and the drums are resubmitted.

FLOW OF NONCONFORMANCE REPORTS FOR REJECTED CH-TRU WASTE DRUMS

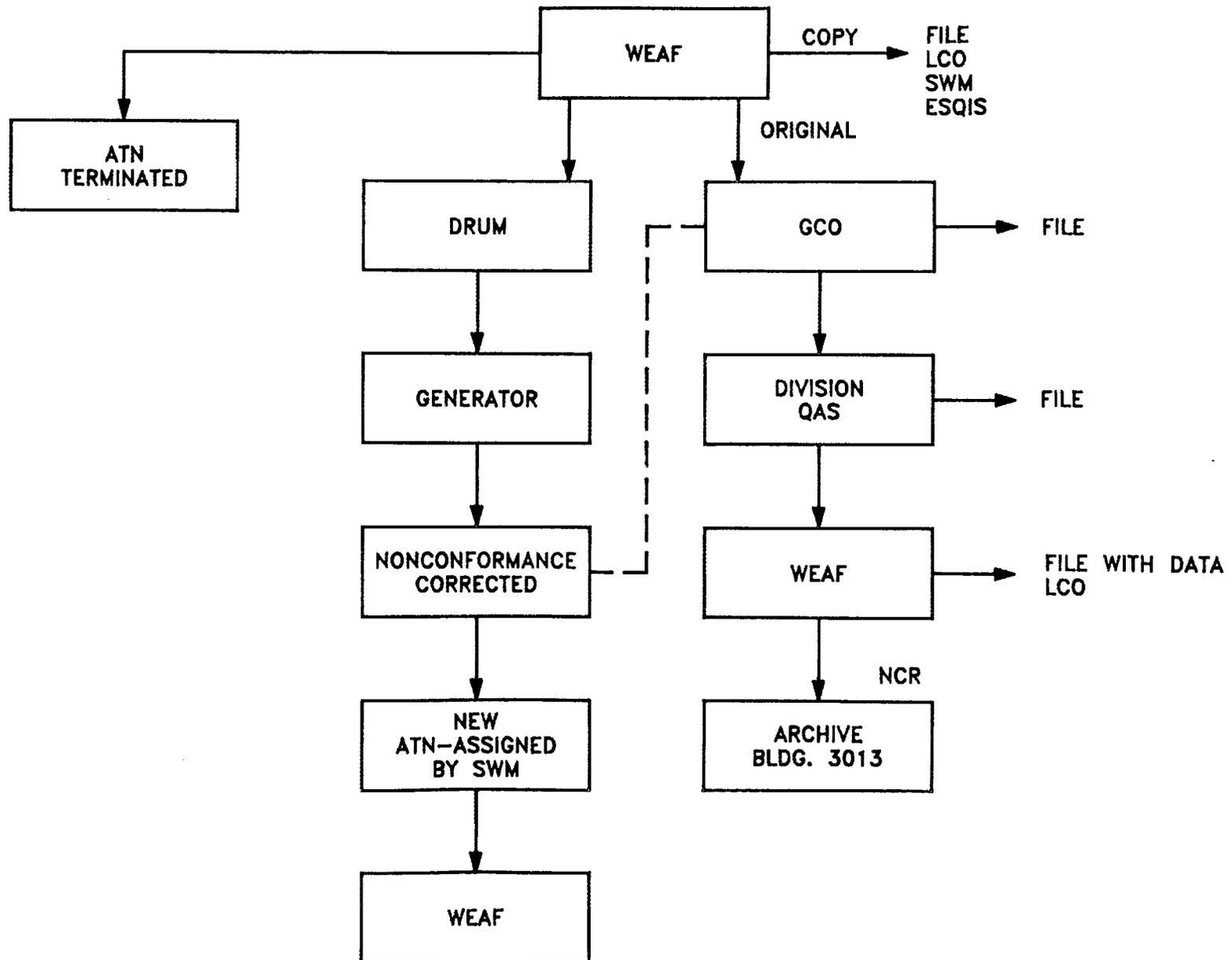


Fig. 8. Newly-generated contact-handled transuranic waste Nonconformance Report procedure

3.3.11 Test Control

Test control consists of NDA/NDE of the waste package prior to certification. The segmented gamma scanning, active/passive neutron assaying, and radiation level monitoring ensure compliance with radioactivity criteria. The X-ray examination of the packages by RTR ensures compliance with waste form criteria. The records generated in these tests will be identified with the unique numbers (ATN) assigned to the individual waste packages and will be retained on-site for 25 years after waste shipment to WIPP.

3.3.12 Control of Measuring and Test Equipment

To achieve a systematic approach to calibration, all measuring and testing equipment (M&TE) at ORNL is categorized according to one of the following applications categories (see ORNL QA Procedure QA-L-12-100)¹⁸: (1) "casual" devices and systems that are not to be calibrated in service, (2) "routine" devices and systems that are to be included in calibration recall program on a regular cycle, and (3) "experimental" devices and systems that are to be calibrated by, or at the direction of, the user.

Calibration control is achieved by following procedures that describe calibration techniques and requirements for the frequency of calibration of the operating instruments. This control ensures that all instruments, gauges, and other M&TE are calibrated to the required accuracies. The operations supervisor is responsible for enforcement of the calibration controls. The requirements for the control and calibration of M&TE are found in QA-L-12-100.

The calibration procedures for radiation survey instruments are contained in ORNL/TM-8405¹⁹.

3.3.13 Handling, Storage, and Shipping

Written procedures have been formulated to ensure compliance with certification criteria. Subjects of these procedures include container procurement and labeling, loading, sealing, NDA/NDE of the waste package, and interim storage. Procedures for shipping radioactive and hazardous materials are already in force²⁰, and procedures specific to the shipment of TRU waste packages to WIPP have been developed²¹. Requirements are determined by qualified project and QA personnel, based on the appropriate internal and external documents and policy.

3.3.14 Inspection, Testing, and Operating Status

Each package is subjected to inspection and testing by a variety of NDA/NDE methods. Radiation and external contamination levels are verified using standard health physics instruments and procedures. Segmented gamma scans and active/passive neutron assays are used to determine the types and quantities of radioisotopes in drums, and RTR will permit examination of the waste forms within the drums. All movements of the waste packages within the WEAFF facility will be monitored, and all data entries (into the computer data base and log books) will be made only by, or under the direction of, the WEAFF staff. Color coding is used as an additional means of internal control at WEAFF. Any package that fails to meet the requirements of WIPP-DOE-114, -137, and -158 will be returned to the waste generator for repackaging. Hold tags will be placed on any questionable packages until the nonconformance has been resolved and the package is

accepted. Approved packages will be identified for future segregation and shipment.

Data for each package will be stored electronically, using an IBM-PC system, and will be keyed to the bar-code number attached to the waste container. Hard copies of these data packages can be printed as necessary.

3.3.15 Control of Packages

Written procedures govern the action that should be taken upon discovery of nonconforming items and stipulate the measures for their control, identification, reporting, and disposition. The control actions specified in these procedures are applied through tests and inspections throughout the waste management process. These procedures are defined in a variety of Laboratory, division, and facility quality and operational procedures (see Attachments 1 and 2).

When inspection, testing, analyses, or other QA actions indicate that an item is nonconforming a "hold" tag or "reject" tag (Fig. 9) is attached to the item, and the questionable package is physically segregated to the extent possible. The TRU waste certification compliance requirements contained in WIPP-DOE-114 specifically define the acceptable limits for controlled properties of the waste package, including the actual certification. Any deviation from these limits is to be considered a nonconformance. A package that is found to contain less than the TRU lower limit (100 nCi/g) will be classified as LLW and will be segregated for on-site storage or disposal. All nonconforming packages will be returned to the waste generator for corrective action. If repackaging is

HOLD
ITEM NOT TO BE FURTHER PROCESSED

DATE _____

NOTIFIED (NAME): _____

SIGNATURE & CAPACITY _____

WER NO. _____

MATERIAL IDENTIFICATION

DRAWING NO. _____

PART NO. _____

ITEM _____

DISPOSITION _____

DISPOSITION APPROVED BY

SIGNATURE & CAPACITY	DATE

UCN-10858
15 8-59

HOLD TAG (UCN-10858)
COLOR-YELLOW

REJECT

DATE _____

WER NO. _____

PROJECT _____

ITEM _____

DRAWING NO. _____

PART NO. _____

DISPOSITION _____

DISPOSITION _____

DISPOSITION _____

DIRECTED BY

SIGNATURE & CAPACITY	DATE

UCN-10859
15 8-59

REJECT TAG (UCN-10859)
COLOR-RED

Fig. 9. "Hold" and "reject" tags prescribed by quality assurance procedure QA-L-15-100.

required, the new package must be renumbered and resubmitted to the entire testing and analysis procedure, rather than accepted as corrected.

3.3.16 Corrective Action

Unusual or unplanned events that have an adverse effect on quality (such as malfunctions, unapproved deviations, and other quality problems) are noted in NCRs, Unusual Occurrence Reports (UOR), Quality Investigation Reports (QIR), and Quality Event Reports (QER). If conditions indicate that the quality system requires improvement or modification, actions will be taken to identify the particular problem and to determine the appropriate measures to correct the condition and preclude a recurrence²². The laboratory and appropriate generator certification officials (GCO) are responsible for seeing that corrective actions have taken place. In general, the group responsible for the unusual or unplanned event will carry out the corrective actions and resubmit the waste package through the entire process. Appropriate supervisory and QA personnel will be notified of unusual and unplanned events and subsequent corrective actions. The NCR process for nonconforming waste drums is illustrated in Fig. 8. The QER process is used in the certification program predominately to reflect trends in quality-related problems that are not of sufficient magnitude to warrant an NCR or are immediately corrected during generation.

3.3.17 Certification Records

All records pertinent to the certification process will be stored at ORNL permanently by Solid Waste Management/WEAF personnel. During the current working- document period, the following regulations specify the type of records to be retained by originators in metal cabinets in areas protected by sprinklers or in fire-proof cabinets:

1. Records pertaining to the purchase, fabrication, and approval of waste containers to be used for shipment of waste to WIPP shall be maintained by the Energy Systems Purchasing Division in accordance with that division's requirements. Purchased container records shall be retained permanently by the Solid Waste Management;
2. Records pertaining to the loading of the waste into containers for shipment shall be maintained by the waste generator;
3. Records pertaining to the testing, approval, storage, and shipment of packages to WIPP shall be maintained by Solid Waste Management or WEAF management;
4. Detailed training records shall be maintained by each generator site training officer; and
5. Records of nonconformances, corrective actions, audits, and instrument calibration shall be maintained by Solid Waste Management or WEAF management.

All records related to TRU certification are stored in a designated area of Building 3013 at ORNL.

3.3.18 Audits

A series of internal audits and reviews is performed by the ORNL QA lead auditor, the QASs, and the QARs to verify compliance with all aspects of the ORNL QA Program. The ORNL TRU Waste Program is audited at least on an annual basis. These audits are conducted in accordance with ORNL QA Procedure QA-L-18-100²³ and QA-L-20-100. The LCO and involved GCOs participate in these audits. DOE-ORO performs annual appraisals of the ORNL QA Program.

Quality assurance and QC audits of suppliers are conducted by the Quality Department, as specified on purchase requisitions, and/or by qualified personnel from the ORNL user divisions and/or by other experts selected by these divisions. These audits are scheduled by the user divisions on the basis of quality requirements.

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4. WASTE GENERATION AND MANAGEMENT: ORGANIZATIONAL STRUCTURES AND INTERFACES

ORNL uses the matrix management system illustrated in Fig. 3. The LCO reports administratively to the Certification and Training Coordinator, who reports to the Waste Management Coordination Office (WMCO). The head of the WMCO reports to the Waste Management Operations (WMO) section head. The Waste Examination and Assay Facility reports to the Solid Waste Operations group who in turn reports to the WMO section head. The WMO section head reports to the associate director of the Environmental and Health Protection Division. Some of the TRU waste generators, as well as QA personnel, report to the same executive director.

The individual waste generators are responsible for ensuring that the waste will be acceptable to the WIPP. To this end, each generating facility (or functional area) has a GCO who reports programmatically to the LCO. The TRU Waste LCO will give the final signature for shipment to WIPP.

The overall TRU Waste Certification Program has been coordinated under the guidance of the Environmental and Health Protection Division director in conjunction and cooperation with the individual divisions at ORNL.

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5. DATA COLLECTION AND ARCHIVING

Data concerning the certification and storage of TRU waste are summarized on a "Request for Storage or Disposal of Radioactive Solid Waste or Special Materials" (form UCN-2822) and transmitted to the Solid Waste Management Group along with the waste. This information is entered in computer storage for retrieval as needed. Additionally, a copy of the log-in sheets completed during loading are forwarded with the waste to assist the NDA/NDE staff with their tasks. The individual waste-generating divisions are responsible for maintaining back-up records for the TRU waste packages in the form of log-in sheets, log books, data sheets, and transfer forms. Each package is surveyed by a health physics representative who certifies the radiation and contamination levels on the Waste Storage Data Sheet and completes a radiation tag, which is affixed to the package along with the log-in sheet and form 2822 before pick up by SWSA. The LCO and GCOs are responsible for ensuring that all data requirements of WIPP-DOE-157 have been met.

The following WEAFF records are duplicated and stored in Building 3013: RTR tapes, neutron and gamma assay diskettes, hard copies of assay results, and data log books.

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6. CONTAINER PROCUREMENT AND HANDLING

6.1 CONTAINERS

6.1.1 Description of Acceptable Containers

Waste containers for emplacement at the WIPP shall be noncombustible and meet all the applicable requirements of 49 CFR 178.350 and 49 CFR 173.412 for Type-A packaging. Waste containers of various sizes shown to meet DOT Type 7A requirements by the methods detailed in MLM 3245 are acceptable to WIPP. The containers shall have a design life of at least 20 years from the date of certification. Documented evidence must be maintained at the generator sites showing that the shipping containers have met all of the specified DOT and WIPP criteria.

The certified container for shipping CH-TRU waste to WIPP is the TRUPACT II carrier. All CH-TRU waste containers shipped to WIPP must fit compactly inside the TRUPACT II carrier. Because of the carriers' design, and materials shipped to the TRUPACT II carrier will be packaged in either DOT Type A 55-gal drums or one of the Standard Waste Boxes (SWB) which has been specifically designed to fit the TRUPACT II carrier.

The standard container used for storage and shipment of CH-TRU waste at ORNL is the Type 17H stainless steel 55-gal drum that meets DOT 7A Type A packaging requirements. These drums are procured and distributed to the user/generators (on request) by the Solid Waste Management operating staff. The cost of the container is borne by the user. Compliance with DOT and WIPP requirements is ensured by a combination of

purchase specifications, vendor certification and inspection, receiving inspection, and controlled distribution. Additional details regarding drum procurement can be found in Sect. 3.3.4 with particular reference to Fig. 4. The drum procurement process is described in procedure QA-L-20-100.

Other containers are sometimes required to store CH-TRU waste that is too bulky to be placed in 55-gal drums. In lieu of drums, metal boxes are acceptable containers for CH-TRU waste, provided the metal boxes (1) meet all requirements for Type A packaging and (2) have a design life of 20 years after certification. In the past, DOT approved 4x4x7 ft. boxes have been used to store bulky items at ORNL. At the present time there is no means to ship these boxes to WIPP. In the future, bulky items can be stored in the SWB whenever possible. Bulky waste items that are too large for the SWB's, can still be stored at ORNL (in 4x4x7 ft. boxes), but the size of these items will have to be reduced (to fit the SWB) before they can be shipped to WIPP for storage.

DOT approved waste boxes are used infrequently at ORNL and are procured on an individual, special-case basis at the user's expense. Solid Waste Management personnel work with the specific generators to ensure compliance with specified requirements for container procurement. All CH-TRU containers must be procured through Martin Marietta Energy Systems, Inc., purchasing procedures. Solid Waste Management personnel provide assistance in defining the procurement requirements and specifications for the container and receive a copy of the data package for the container. No container will be accepted for storage without an accompanying data package sufficient to meet the WIPP certification requirements.

6.1.2 Combustibility of Containers

All TRU waste material must be packaged in noncombustible containers. DOT Type A stainless steel drums and metal boxes meet this requirement.

6.1.3 Waste Container Size

A wider range of container sizes can be stored at the WIPP than can be shipped to WIPP. The maximum size waste container that can be stored at WIPP has overall L x W x H dimensions of 12 x 8 x 8.5 ft. or 3.7 x 2.4 x 2.6 m. The size is restricted by the limitations of the waste hoist and the waste hoist cage at WIPP. A minimum size container also exists for handling efficiency, etc. For this reason, all new drums for CH-TRU waste are limited to the 55-gal size. Smaller drums and components will need to be placed inside a 55-gal drum. The largest item that can be shipped to WIPP must fit into the SWB which is certified DOT Type A container designed specifically to fit into the TRUPACT II carrier. The shape of the SWB is circular with arc segments removed on two opposite sides. The inside diameter of the SWB is nominally 5.5 ft. (1.7 m.).

6.1.4 Waste Container Handling

The waste drums are fitted with vented, fully removable drum heads, which are closed by means of a gasket and bolted ring. The drums may be handled by drum slings or lifters. Because it will be necessary for several drums to be packaged in drum assemblies prior to shipment to WIPP, no welded lifting lugs or rings are allowed on the drums themselves. Lifting rings and other auxiliary lifting devices for other packages must be recessed, offset, or hinged such that stacking of the packages is not inhibited.

All packages, other than drums, must be provided with cleats, offsets, chimes, or skids or handling by means of fork trucks, cranes, or similar devices. Any lifting rings or other auxiliary lifting devices must be recessed, offset, or hinged such that stacking is not inhibited.

6.1.5 Procurement Procedures

As mentioned in Sect. 6.1.1, the containers used for the storage and shipment of TRU waste must be procured through the Energy Systems Purchasing Division and must comply with the required specifications. Because the containers must meet a DOT specification (Type A), they are considered "special items." The term "special items" is defined as:

"Those items procured according to special descriptions and requirements provided by Martin Marietta Energy Systems, Inc. They are normally based on performance specifications or detail design drawings and/or specifications provided by the Company."

This definition is taken from the procedure QA-L-7-100, "Control of Purchased Items and Services." The requirements for purchase requisition, bidding, receiving, and inspecting of the containers are also found in QA-L-20-100.

6.2 OTHER CONTAINERS

6.2.1 Introduction

Because some CH-TRU waste is too bulky to fit the 55-gal drum containers and because the problems related to contamination control, radiation exposure, and standardization of operations are the same as those encountered with drum-loadable waste, it is necessary that other reasonably standard containers be considered. This section describes the sizes, types, and limitations of containers other than drums.

6.2.2 Description of Acceptable TRU Waste Containers

In lieu of drums, metal boxes are acceptable containers for CH-TRU waste. These metal boxes must (1) meet all applicable requirements for Type A packaging and (2) have a design life of 20 years after certification. Testing of containers to meet Type A criteria must be performed and documented prior to use.

Standardized containers (WIPP-acceptable DOT Type A) for use in cases in which CH-TRU waste is too bulky to be placed in drums must be obtained at the user's expense in cooperation with the SWM operating staff. While other size of containers are acceptable for storage of CH-TRU waste at WIPP, only 55 gal drums and the standard waste box designed for the TRUPACT-II carrier can be used to ship CH-TRU waste to WIPP. All CH-TRU containers must be procured through Energy Systems purchasing and must meet the required specifications. SWM personnel work with specific generators to ensure compliance with the necessary requirements when other containers are procured. SWM personnel provide assistance in defining the procurement requirements and specifications for the container and receive

a copy of the data package for the container. No container will be accepted for storage without an accompanying data package sufficient to meet the WIPP certification requirements.

6.2.3 Combustibility of Containers

All containers must be non combustible.

6.2.4 Waste Package Size

All TRU Waste must fit into either a standard 55-gal drum or the standard waste box designed for the TRUPACT II carrier.

6.2.5 Waste Package Handling

All packages other than drums must be provided with cleats, offsets, chimes, or skids for handling by means of fork trucks, cranes, or similar devices. Any lifting rings or other auxiliary lifting devices must be recessed, offset, or hinged such that stacking is not inhibited.

6.2.6 Procurement Procedures

As mentioned in Sect. 6.2.2, containers used for the storage and shipment of TRU waste must be procured through Energy Systems purchasing procedures and must comply with the required specifications. These metal boxes must meet the standard DOT Type A specification and are procured as

"special items." The term "special items" has the following meaning at ORNL:

Those items procured according to special descriptions and requirements provided by Martin Marietta Energy Systems, Inc.

They are normally based on performance specifications or detail design drawings and/or specifications provided by the Company.

This definition is taken from procedure QA-L-7-100, "Control of Purchase Items and Services." The requirements for purchase requisition, bidding, receiving, and inspection are included in this procedure and are also found in QA-L-20-100.

If in the future, the DOT issues standard specifications concerning these containers, all procurement actions will include these specifications.

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7. WASTE GENERATION AND TREATMENT

7.1 INTRODUCTION

Several programs at ORNL generate TRU waste and the facilities are distributed throughout the ORNL complex. This diversity of generators explains the rationale for having individual divisions assume the responsibility for ensuring that their waste (destined for WIPP) meets the required acceptance criteria. The LCO and other segments of the waste management organization then coordinate with the GCOs and other divisional personnel to ensure that the divisions fulfill their obligations for waste certification.

The waste generator is responsible for obtaining approved, labeled, TRU waste containers from the SWM staff. After a container has been filled with waste and sealed, health physics personnel determine the surface contamination, and the surface DOE Rate of the container. Acceptable limits for CH-TRU waste packages are ≤ 50 pCi/100 cm² alpha contamination and ≤ 450 pCi/100 cm² beta-gamma transferable (smear) contamination, with a reading of ≤ 200 mrem/h external dose at the container surface. Specific information on the contamination levels and dose rate of each package is recorded on the radiation tag and form 2822 accompanying the shipment. This includes the specific beta-gamma dose rate of all packages and the specific neutron dose rate if greater than 20 mrem/h. The TRU waste container is then transferred to WEAFF for examination. NDA/NDE will be performed on the larger metal boxes when facilities become available in the future. Drums are either placed in a holding area or sent directly to the WEAFF, depending on the current work load of the facility. RTR is performed first, followed by segmented gamma

scans and neutron analyses. If found acceptable for certification, the drum is sent to interim storage; if rejected, the waste drum is tagged and sent back to the generator for repackaging. If the package contains less than certifiable quantities of TRU waste, it is handled as solid low-level waste (SLLW). The above described TRU waste certification process is illustrated graphically in the flow sheet of Fig. 10.

7.2 GENERAL WASTE STREAMS/CONTROL MATRIX

7.2.1 Standard Waste Containers

Most of the CH-TRU waste generated at ORNL results from hot-cell and glove-box operations in research and development experiments, isotopes production, or small pilot-scale operations and can be accommodated in 55-gal stainless steel drums. These wastes consist of ion-exchange resins, tools and machinery, glassware, plastic ware, rubber gloves, gaskets and other rubber parts, wipes (paper and cloth), ventilation filters, metal parts, electrical equipment, and general waste generated during the operation of the glove boxes and hot cells.

Methods of preparation for the CH-TRU waste, layers of containment, and waste forms generated from various facilities at ORNL are noted in Sect. 7.3.1 and summarized in Table 1.

Table 1. Divisional waste preparation methods

Waste form	Division/bldg. (or dept) ^{a, b}	Waste preparation method ^c	Remarks
Ion-exchange resins	CT/7920, 7930	1, 3, 5, 6, 7, 8	
	CT/3038-3028	1, 3, 5, 7	
	CH/5505	1, 3, 5, 6, 7, 8	
Tools, machinery, and structural	CT/7920, 7930	4, 5, 6, 7	
	CT/3019	3, 5, 7	
	CT/(Iso-Prod)	3, 4, 5, 7	
	CH/5505	3, 4, 5, 6, 7, 8	
	AC/2026	5, 6, 7	
Glassware	CT/7920, 7930	1, 3, (or 4), 5, 6, 7	
	CT/3019	1, 3, 5, 6, 7	
	CT/(Iso-Prod)	1, 3, 5, 7	Bagged in heavy plastic prior to bag-out from glove box
	CH/5505 AC/2026	1, 3, 4, 6, 7, 8 1, 3, 5, 6, 7	
Plastic ware	CT/7920, 7930	1, 5, 7	
	CT/3019	1, 5, 7	Bagged in 6-mil plastic prior to bag-out from glove box
	CT/(Iso-Prod)	1, 5, 7	Some materials canned
	CT/5505	1, 5, 6, 7, 8	
	AC/2026	1, 5, 6, 7	
Rubber gloves, gaskets, and other rubber	CT/7920, 7930	5, 7	
	CT/3019	5, 7	Bagged in 6-mil plastic prior to bag-out from glove box
	CT/(Iso-Prod)	3, 5, 7	
	CH/5505	5, 6, 7, 8	
	AC/2026	5, 6, 7	
Wipes (paper, cloth)	CT/7920, 7930	2, 5, 7	
	CT/3019	2, 5, 7	Dry overnight
	CT/(Iso-Prod)	2, 3, 5, 7	
	CH/5505	2, 5, 6, 7, 8	
	AC/2026	2, 5, 6, 7	Dry overnight

Table 1: Divisional waste preparation methods
(continued)

Waste form	Division/bldg (or dept) ^{a, b}	Waste preparation method ^c	Remarks
Ventilation filters	CH/7920, 7930 CT/3019	4, 5, 7, 10 5, 7, 10	Bagged in 6-mil plastic. Placed in drums or plywood boxes after removal from system
Ventilation filters	CT/(Iso-Prod) CH/5505 AC/2026	3 (or 4), 5, 7, 10 3, 6, 7, 10 3, 6, 7, 10	
Metal parts	CT/7920, 7930 CT/3019	3 (or 4), 5, 6, 7 5, 7	(3) or (4) if sharp edges present Bagged in 6-mil plastic prior to bag-out from glove box. (3) if sharp edges present
Electrical equipment	CT/(Iso-Prod) CH/5505 AC/2026 CT/7920, 7930 CT/3019	3 (or 4), 5, 7 3 (or 4), 5, 6, 7, 8 3 (or 4), 5, 6, 7 3 (or 4), 5, 7 5, 7	Bagged in 6-mil plastic prior to bag-out from glove box. (3) if sharp edges present
	CT/(Iso-Prod) CH/5505 AC/2026	3 (or 4), 5, 7 3 (or 4), 5, 7, 8 3 (or 4), 5, 6, 7	(3) if sharp edges present

Table 1. Divisional waste preparation methods
(continued)

Waste form	Division/bldg (or dept) ^{a, b}	Waste preparation method ^c	Remarks
Glove boxes	CT/(Iso-Prod)	9	
	CH/5505	9	
	CT/3019	9	
	CT/7920, 7930	9	
	AC/2026	9	

^aDivision abbreviations: CT - Chemical Technology, AC - Analytical Chemistry, a CH - Chemistry.

^bDepartment abbreviations: Iso-Prod - Isotope Production.

^cMethod of preparation for shipment:

1. Drain dry;
2. Squeeze dry;
3. Place in secondary container (plastic paper container, bucket, metal can, etc.);
4. Wrap and tape sharp edges;
5. Bag out of glove box (heat seal or tape and cut);
6. Overbag (heat seal or tape and cut);
7. Transfer to a stainless steel drum;
8. Stainless steel drum is lined with a polyethylene bag but, upon closure, is not necessarily sealed;
9. Decontaminate to as low as practicable, tape all utility lines wrap with plastic or seal in wood box, and place in metal DOT box; and
10. Hold pending additional developmental work for certification.

7.2.2 Other Containers

Occasionally the need arises to dispose of a contaminated glove box. When disposal becomes necessary, as much of the equipment as possible is removed and the inside is cleaned to remove as much loose contamination as is practicable. The building services are then severed, and the glove box is contained for contamination control (plastic wrap or wood box) and placed into a metal box (see Sect. 6.2). The top of the container is secured in place by bolts and a gasket. A pressure-relief fitting will be incorporated in the waste container. Current assay techniques are limited to estimates based on historical data for TRU isotopes present and to material balances for maximum quantities. A box RTR unit has been purchased and will be used for the examination of boxes containing both LLW and TRU waste . It will be used to verify the presence of nonconforming items and to characterize the physical contents of the boxes. ORNL has no plans to purchase box-assay equipment and will depend on mobile equipment, when it becomes available, to identify the isotopic contents of the boxes for WIPP-WAC compliance.

7.3 CERTIFIABLE AND NONCERTIFIABLE WASTE FORMS

7.3.1 Certifiable Waste

The CH-TRU waste generated at ORNL can be categorized according to the following waste forms:

1. ion-exchange resins;
2. tools, machinery, and structural materials;
3. glassware;
4. plastic ware;
5. elastomeric gloves or boots, gaskets, and other rubber parts;
6. wipes (paper and cloth);
7. ventilation filters;
8. small metal parts; and
9. electrical equipment.

These nine waste forms, their points of generation, and methods of preparation for shipment are shown in Table 1.

7.3.2 Noncertifiable Waste

Any waste that does not comply with the certification compliance requirements set forth in WIPP-DOE-114 will be repackaged and resubmitted by the waste generator to meet these standards for certification, given a new ATN, and sent through the WEAFF again for certification. Any wastes that cannot be certified via these procedures will be placed on hold until specific techniques or procedures can be developed and approved by the LCO. The shipment of noncertifiable waste will not be considered.

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8. SPECIFIC CERTIFICATION PROCEDURES

8.1 CERTIFICATION OF WASTE FORMS

Specific certification procedures that include step-by-step actions to ensure that a single waste form and package meet the WIPP requirements are a necessary part of this plan. The various divisions in ORNL produce more than one type of waste form, and the specific problems and processes vary from building to building. Therefore, it is necessary that each facility produce auditable documents that can be referenced that describe the steps taken to certify that their waste satisfies the requirements listed in WIPP-DOE-114. Procedures describing this documentation are referenced in Attachment 2 as entries 17 through 20.

8.2 CERTIFICATION METHODS

The methods and procedures used at ORNL to satisfy compliance with WIPP-DOE-114 are described in the following paragraphs and are summarized in Tables 2, 3, and 4. Supervisors of the generator sites have primary responsibility for ensuring that no nonconforming materials are placed in the TRU waste containers. They have been given the training required by the certification program and are cognizant at all times of the operations in the area where TRU waste is generated. The operators/technicians also have the responsibility to ensure that no noncertifiable materials enter the TRU waste containers. They have been trained in the proper preparation of TRU waste and are specifically instructed by the applicable site procedures to notify supervision if materials listed as nonconformance items need to be disposed of from the glove box or work area.

Table 2. ORNL procedures (in addition to this document) for meeting TRU waste container requirements

WIPP TRU waste criteria	WIPP specifications	ORNL procedures ^a	Compliance method
Container	49 CFR 178.350 and 173.412 DOT Type-A, noncombustible, >20-year design life	QA-L-20-100, ref. 12 Sect. 3, ref. 8	Administrative control, vendor qualification, receiving inspection, controlled distribution
Package size	Maximum allowable CH-TRU size (L x W x H): 3.7 x 2.4 x 2.6 m (see Sect. 6.1.3)	Procedure 5.1, ref. 7; Sect. 3, ref. 8; QA-L-20-100, ref. 12	Administrative control
Package handling	Use WIPP acceptable handling devices	Procedure 5.1, ref. 7; Sect. 3, ref. 8; Facility Operating Procs.	Administrative control, documented check sheets

^aReferences are listed in Sect. 9 of this report.

Table 3. ORNL procedures (in addition to this document)
for meeting TRU waste form requirements

WIPP TRU waste criteria	WIPP specifications	ORNL procedures	Compliance method
Immobilization	≤ 1 wt % of waste <10 m; ≤ 15 wt % of waste <200 m	Procedures 5.1 in ref. 7, facility operating procs., flow sheets	Administrative control, check list
Free Liquid	No free liquids	Procedure 5.1 in ref. 7, facility operating procs.	Administrative control, check list, real time radiology
Pyrophoric material	≤ 1 wt % is allowed to be radioactive pyrophoric 49 CFR 173, subparts D and E	Procedure 5.1 in ref. 7, facility operating procs., flow sheets	Check list, administrative control, visual inspection
Explosives and compressed gases	None allowed as defined in 49 CFR 173, subparts C and G	Procedure 5.1 in ref. 7, ORNL-SPP-61 in ref. 16, facility operating procs., flow sheets	Check list, real time radiography administrative control, visual inspection
Radioactive mixed waste	No RCRA unless contaminated with TRU waste, identified, quantified, and doesn't jeopardize container life	Procedure 5.1 in ref. 7, ESH-18 in ref. 16, facility operating procs., flow sheets	Check list, administrative control, visual inspection
Specific activity	>100 nCi/gm of waste matrix	Procedure 5.1 in ref. 7, facility procedure, flow sheets	Administrative control, NDA verification

^aReferences are listed in Sect. 9 of this report.

Table 4. ORNL procedures (in addition to this document)
for meeting TRU waste package requirements

WIPP TRU waste package criteria	WIPP specification	ORNL procedures ^a	Compliance method
Weight	21,000 lb (9,500 kg) for CH-TRU waste	Facility operating procedures	Administrative control, checksheet
Nuclear criticality	≤ 200 g fissile isotope/208 L drum, ≤ 100 g fissile isotope/114 L drum, ≤ 500 g fissile isotope/6M container, ≥ 5 g/ft ³ in other boxes up to 350 g maximum	ORNL-SPP-31, ref.16; Sect. 3, ref. 8; procedures 2.4, 4.1, 4.3, 5.1, ref. 7	Administrative control NDA verification and administration control
Pu-Equivalent activity (PE-Ci)	$\leq 1,000$ Ci (PE-Ci)	Sect. 3, ref.8; WEAFF operating procedures	Administrative control, NDA verification
Surface dose rate	≤ 200 mRem/h, >20 mrem/h. Report neutron contributions >20 mRem/h in data package	ORNL SPP-31, ref. 16; ESH-17, ref. 20; Sect. 3, ref. 8; procedures 2.4, 4.1, 4.3, 5.1, ref. 7; E&OSD IP No. 201 ref. 24	Administrative control, checks at WEAFF/SWSA ORNL/TM-8405, ref. 19
Surface contamination	≤ 50 pCi/100 cm ² , alpha; ≤ 450 pCi/100 cm ² , beta/gamma	ORNL SPP-31, ref. 16; ESH-17, ref. 20; Sect. 3, ref. 8; procedures 2.4, 4.1, 4.3, 5.1, ref. 7 E&OSD IP No. 201 ref. 24	Administrative control at WEAFF ORNL/TM-8405, ref. 19
Thermal power	If >3.5 w/m ³ (0.1 watt/ft ³); thermal power recorded in data package	49 CFR 173.442, isotopic contents listed on form UCN-2822. WEAFF operating procedures	Administrative control, checksheet (calculation based on NDA verification)

Table 4. ORNL procedures (in addition to this document)
for meeting TRU waste package requirement (continued)

WIPP TRU waste package criteria	WIPP specification	ORNL procedures ^a	Compliance method
Gas generation	Pressure relief provided, with positive venting	Combustible content listed on form UCN-2822	Administrative control, check list
Labeling	As specified in WIPP-DOE-114	Sect. 3, ref. 8	Administrative control, checksheet, checks at WEAF
Data package	As specified in WIPP-DOE-157	QA-L-20-100, ref.12, QA-0-19-1, QA-CT-20-3	Laboratory Certification Official

8.2.1 Waste Containers

The certification procedures for waste containers apply to the specification and procurement of standard and special items by ORNL divisions and programs¹². Solid Waste Management personnel procure the standard CH-TRU waste containers and control distribution to generating personnel (see Sect. 3.3.4). Special CH-TRU containers are procured by the generating divisions with the assistance of and agreement by Solid Waste Management personnel to ensure that the necessary requirements are enforced.

8.2.2 Waste Package Sizes

This document and the reference procedures^{7,8,12} delineate the sizes of containers acceptable for use at ORNL for TRU waste and address the QA program that deals with the purchase and testing of these containers.

8.2.3 Waste Package Handling

All containers used at ORNL for TRU waste must have WIPP-approved handling devices. The requirements for the safe transfer of materials from glove boxes, hot cells, and other radioactive processing areas to shipping containers are outlined in ORNL Health Physics Procedures Manual, Appendix A-9, "Guide for the Transfer of Materials Between Contaminated Enclosure Systems and Noncontaminated Areas." In addition, these requirements are supplemented by detailed procedures specific to the individual facilities at ORNL (see Attachment 2).

8.2.4 Immobilization

All waste generated at ORNL must meet the immobilization requirements by one of the methods described below.

Ion-exchange resins. All ion-exchange resins designated as CH-TRU waste must be placed in a suitable metal container resistant to corrosive attack and/or immobilized in grout before removal from the work environment. Control of ion-exchange resins is facility specific. The flow sheet process described in Sect. 8.2.6 is used to identify specific ion-exchange resin waste streams, or potential streams, and ensure that administrative controls or immobilization measures are implemented to meet the WIPP criteria. Most ORNL facilities generate very small quantities of resins none of which exceed the fines limit even under worst-case assumptions. Facilities that generate significant quantities use grout immobilization. Flow sheets and specific operating procedures provide the necessary controls.

Ventilation filters. The certification of high-efficiency particulate air (HEPA) filters at ORNL is a generator-specific issue because of the lack of consistency in the processes generating HEPA filters. The basic elements of HEPA filter certification include characterization of the process (see discussion of flow sheets in Sect. 8.2.6); assay, where possible, to determine if the filters are TRU waste; and immobilization. Filters that can be certified by characterization of the process will be accepted as certified waste upon submittal of the necessary justification by the generator and acceptance of the justification by the LCO. Filters that cannot be certified by process characterization will be placed on hold, pending development of assay and certification techniques.

Glove-box cleaning. Assay drum counting and accountability methods and other administrative controls must be used to ensure that quantities of fine powder from glove-box cleaning will not exceed specified requirements.

Most glove-box cleaning is a wet-wipe process, which does not generate significant fines within the waste package. As with resins and filters, the primary control is specific facility/process flow sheets and implementing procedures for administrative controls as necessary.

8.2.5 Free Liquid

Procedures provide that all containers of liquid must be emptied into the hot drain system, evaporated, or solidified using an appropriate solidifying material (such as grout) before being placed in the TRU waste container. All CH-TRU drums must be inspected by RTR to confirm that they contain no free liquids. Free liquid is defined in WIPP-DOE-069 as "Liquid that is not sorbed into a host material such that it could spill or drain from its container."

8.2.6 Pyrophoric Material

The facility supervisor and the operator/technician have the primary responsibility to ensure that pyrophoric materials in TRU waste are controlled. To ensure that this control is implemented, the certification program is developing facility or process flow sheets for each operation generating TRU waste. These flow sheets emphasize such items as HEPA filters, WIPP-WAC prohibited materials, and Resource Conservation and Recovery Act (RCRA) materials (mixed waste) in addition to pyrophoric materials.

Figure 11 illustrates the flow sheet process for control of pyrophoric materials. As mentioned above, the operators of each facility or process that generates TRU waste will prepare a flow sheet. This flow sheet will be reviewed against the 40 CFR 261 hazardous materials list as well as for other nonconformance problem areas. If hazardous or prohibited materials are utilized in the process, facility-specific procedures will be prepared to demonstrate either their exclusion from TRU waste or their identification and quantification within TRU waste, as appropriate. The LCO will review and maintain copies of the flow sheets, and the GCO will be responsible for updating the flow sheet as necessary to reflect facility or process changes. Maintenance of the flow sheets to reflect process changes will be reviewed during periodic QA audits.

8.2.7 Explosives and Compressed Gases

The flow sheet process described in Sect. 8.2.6 will also provide administrative control on explosives and compressed gases in the waste package. Explosives are further controlled at ORNL by an Explosives Request Authorization (form UCN-12970)¹⁶. The operator/ technician has the primary responsibility for seeing that no intact compressed gas cylinders are placed in the waste container, and their absence will be verified by RTR at the WEAFF.

8.2.8 Radioactive Mixed Waste

No hazardous wastes will be placed in TRU waste packages unless contaminated with TRU material. If the hazardous waste is cocontaminated with TRU, the package must be labeled appropriately, and the hazardous waste must be treated or packaged to ensure no degradation of the waste container over its design life.

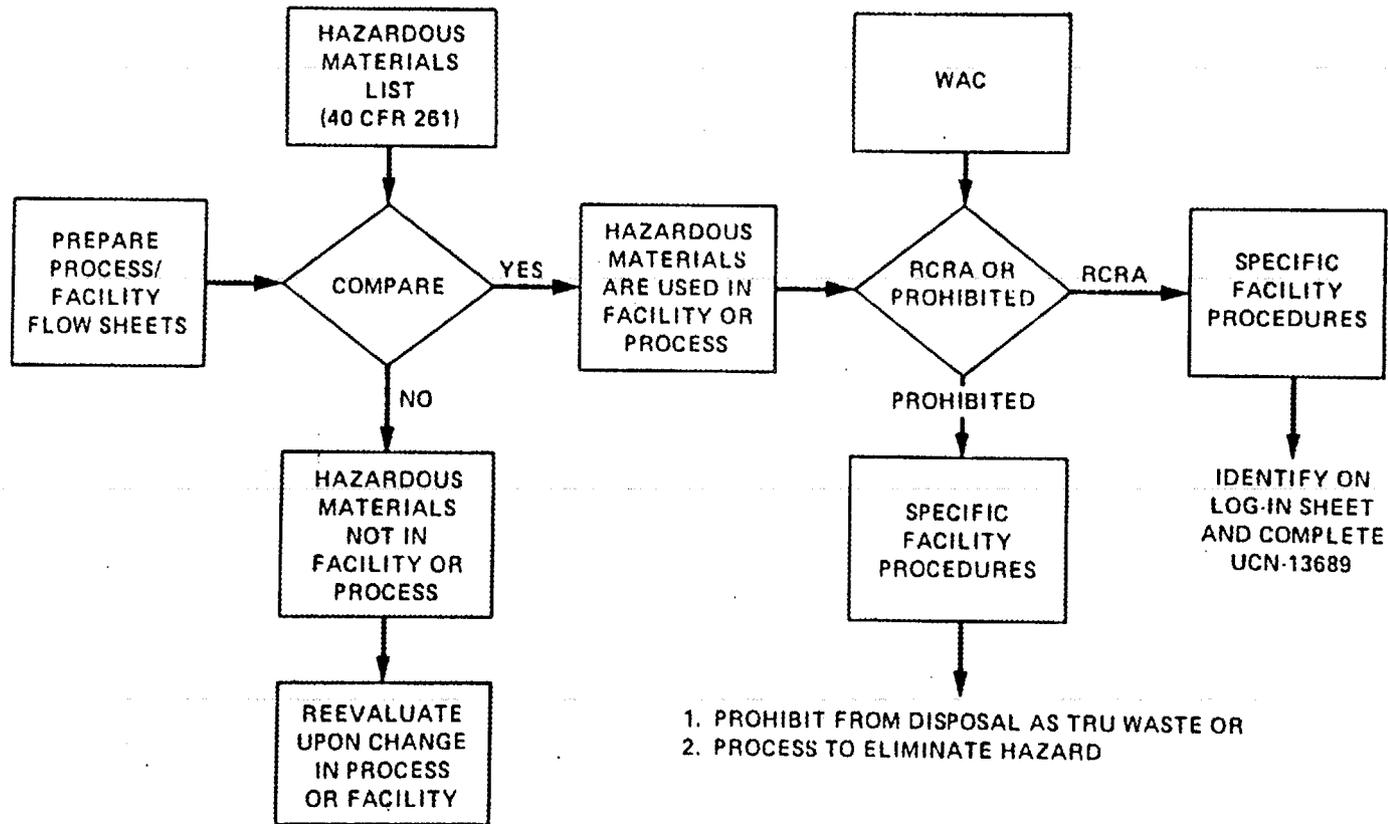


Fig. 11. Flow sheet for control of Resource Conservation and Recovery Act and prohibited materials.

In addition, the flow sheet process described in Sect. 8.2.6 will ensure the identification of any hazardous materials that could be present in TRU waste (see Fig. 11). A log-in sheet (see Fig. 5a) must be signed by the operators at the time that the packet of waste is removed from the generating area and is placed in the TRU drum. The operator/technician's signature or initialing of this sheet certifies that the waste being placed in the drum does not contain any nonconformance materials as listed on the generator site procedure and as identified in the facility/process flow sheet. The QA representative or other designated individual must make periodic inspection of proper use of the log-in sheets.

8.2.9 Waste Package Weight

The weight of the waste container is recorded on the log-in sheet (Fig. 5a) by the generator. In addition, the package weight is checked as part of the NDA/NDE examinations at WEAFF and recorded on form UCN-2822 (Fig. 7). The WEAFF scales are maintained and calibrated by the Plant Metrology Department on a quarterly basis.

8.2.10 Nuclear Criticality

The values listed on form UCN-2822 are used to determine an approximate fissile content of all waste packages. These values are verified by the Neutron Assay System (NAS) for certification. Until the boxes are assayed using the mobile system, the fissile content will be calculated from radiation readings, and/or accountability techniques.

8.2.11 Plutonium-Equivalent TRU Activity

The ^{239}Pu -equivalent activity for the drums of CH-TRU waste must be determined by NDA at WEAf. The assay unit has a computer and software to automatically calculate radioactivity results in ^{239}Pu -equivalents.

8.2.12 Surface Dose Rate

The surface dose rates of all waste containers must be recorded on form UCN-2822, Rev. 1, and the equipment used must be maintained in accordance with ORNL/TM-8405. In addition, a dose scanning system is being procured for WEAf and will be used to provide the dose rates, a record of which will accompany shipments to WIPP as part of the WIPP data package.

8.2.13 Surface Contamination

The surface contamination must be recorded on form UCN-2822, Rev. 1, and the equipment used must be maintained in accordance with ORNL/TM-8405.

Any package that has excess surface contamination must be cleaned before being sent to the SWSA for shipment. If a package is found to have excess contamination, it must be tagged for nonconformance and the source of contamination must be determined. If the contamination originated at the generator site, the package must be contained and returned to the waste generator for further processing. If the contamination occurred as a result of a leak during storage or assay/examination, the package will either be repackaged within waste management facilities or overpacked for future handling. If the package is returned to the generator, a new ATN must be assigned before the package is again transferred to the NDA/NDE Facility.

8.2.14 Thermal Power

Using the values determined at the WEAFF facility, the thermal power of predominant isotopes present in the waste package must be calculated, and these values will be recorded in the WEAFF computer data base, which will form the WIPP data package.

8.2.15 Gas Generation

To ensure proper venting and control of gas generation, ORNL will use waste packages having vendor-installed HEPA filter vents. In cases in which drums have already been procured without vents, vent clips may be used as a substitute. In all cases, either a HEPA-filtered vent or vent clip will be in place. In addition, the flow sheets described in Sect. 8.2.6 will ensure identification of gas generating materials that can be present in the TRU waste so they can be minimized as required to prevent gas generation problems.

8.2.16 Labeling

The waste package must be labeled in accordance with WIPP-DOE-114, in addition to meeting the labeling requirements of the DOT.

8.2.17 Data Package

The data package must be in accordance with the data package format, WIPP-DOE-157, for "Shipping Certified TRU Waste to the WIPP." All checklists and pertinent forms must be maintained on-site for 25 years.

8.3 PROCEDURES FOR WASTE CONTAINER REQUIREMENTS

Table 2 summarizes the procedures by which ORNL meets the waste container compliance requirements.

8.4 PROCEDURES FOR WASTE FORM REQUIREMENTS

The waste form compliance requirements are met at ORNL by the procedures summarized in Table 3.

8.5 PROCEDURES FOR WASTE PACKAGE REQUIREMENTS

Table 4 summarizes ORNL procedures by which the nine TRU waste package compliance requirements of WIPP are met.

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9. REFERENCES

1. TRU Waste Acceptance Criteria for the Waste Isolation Pilot Plant, WIPP-DOE-069, Rev. as updated, U.S. Department of Energy, Washington, D.C.
2. TRU Waste Certification Compliance Requirements for Newly-Generated Contact-Handled Wastes for Shipment to the WIPP, WIPP-DOE-114, Rev. as updated, U.S. Department of Energy, Washington, D.C.
3. Quality Assurance Requirements for Certification of TRU Waste for Shipment to the WIPP, WIPP-DOE-120, Rev. as updated, U.S. Department of Energy, Washington, D.C.
4. TRU Waste Certification Compliance Requirements for Contact-Handled Wastes Retrieved from Storage for Shipment to the WIPP, WIPP-DOE-137, Rev. as updated, U.S. Department of Energy, Washington, D.C.
5. Data Package Format for Certified Transuranic Waste for the Waste Isolation Pilot Plant (WIPP), WIPP-DOE-157, Rev. as updated, U.S. Department of Energy, Washington, D.C.
6. TRU Waste Certification Compliance Requirements for Remote-Handled Wastes for Shipment to the WIPP, WIPP-DOE-158, Rev. as updated, U. S. Department of Energy, Washington, D.C.
7. Health Physics Procedures Manual: Procedures and Practices for Radiation Protection, Rev. as updated, Oak Ridge National Laboratory, Oak Ridge, Tenn.
8. Radioactive Solid Waste Operations Manual, Rev. as updated, Oak Ridge National Laboratory, Oak Ridge, Tenn.
9. D. B. Owsley and B. W. Starnes, Oak Ridge National Laboratory Transuranic Waste Training Manual, ORNL/CF-86/90, Oak Ridge National Laboratory, Oak Ridge, Tenn., June 1986 or latest revision.
10. "Radioactive Waste Management," DOE Order 5820.2A Draft, U.S. Department of Energy, Washington, D.C., February 6, 1984 or latest revision.
11. ORNL Quality Assurance Manual, Rev. as updated, Oak Ridge National Laboratory, Oak Ridge, Tenn.
12. "QA Requirements for TRU Waste Certification Program," ORNL Quality Assurance Manual, procedure QA-L-20-100, Rev. as updated, Oak Ridge National Laboratory, Oak Ridge, Tenn.
13. "NDA-NDE CH-TRU Waste Containers," Operations Division Quality Assurance Assessment/Plan, OP-RI-QAA-30, May 1, 1986 or latest revision.

14. "Design Control," ORNL Quality Assurance Manual, procedure QA-L-3-100, Rev. as updated, Oak Ridge National Laboratory, Oak Ridge Tenn.
15. "Procurement Document Control," ORNL Quality Assurance Manual, procedure QA-L-4-100, Rev. as updated, Oak Ridge National Laboratory, Oak Ridge, Tenn.
16. ORNL Standard Practice Procedures Manual, Rev. as updated, Oak Ridge National Laboratory, Oak Ridge, Tenn.
17. "ORNL TRU Waste Program Document Control," Operations Division Quality Assurance Assessment/Plan, OP-WM-QAA-17, June 23, 1986 or latest revision, Oak Ridge National Laboratory, Oak Ridge, Tenn.
18. "Measuring and Test Equipment Control and Calibration," ORNL Quality Assurance Manual, procedure QA-L-12-100, Rev. as updated, Oak Ridge National Laboratory, Oak Ridge, Tenn.
19. C. D. Berger, et al., ORNL Calibrations Facility, ORNL/TM-8405, August 1982, Oak Ridge National Laboratory, Oak Ridge, Tenn.
20. "Receipt and Shipment of Hazardous Materials and Hazardous Wastes (Including Radioactive Materials)," Martin Marietta Energy Systems, Inc., Policy Procedures, procedure ESH-17, Rev. as updated, Martin Marietta Energy Systems, Inc., Oak Ridge, Tenn.
21. "Handling, Storage, and Shipping," Operations Division Quality Assurance Manual, procedure QA-0-13-1, Rev. as updated, Oak Ridge National Laboratory, Oak Ridge, Tenn.
22. "Identification and Control of Nonconforming Items," ORNL Quality Assurance Manual, procedure QA-L-15-100, Rev. as updated, Oak Ridge National Laboratory, Oak Ridge, Tenn.
23. "Quality Assurance Audits," ORNL Quality Assurance Manual, procedure QA-L-18-100, Rev. as updated, Oak Ridge National Laboratory, Oak Ridge, Tenn.
24. "Servicing of Portable Instruments," in Environmental and Occupational Safety Division Internal Procedures, IP Number 201, March 1, 1986 or latest revision, Oak Ridge National Laboratory, Oak Ridge, Tenn.

Cross references for QA standards

QA Element	ORNL QA procedure	Paragraph reference ORNL-TM/ 10322	WIPP-DOE- 120 criteria reference	Specific references for implementation (Attachment 2)
Organization and responsibilities	QA-L-1-100	3.3.1	V.1.0	(2)(13)
QA program	QA-L-2-100	3.3.2	V.2.0	All
Design control	QA-L-3-100	3.3.3	V.3.0	- - -
Procurement document control	QA-L-4-100	3.3.4	V.4.0	(2)(5)(6)(21)
Instructions, procedures, and drawings	QA-L-5-100	3.3.5	V.5.0	All
Document control	QA-L-6-100	3.3.6	V.6.0	(4)
Control of purchased material equipment, and services	QA-L-7-100	3.3.7	V.7.0	(2)(5)(6)(21)
Identification and control of items	QA-L-8-100	3.3.8	V.8.0	- - -
Control of processes	QA-L-9-100	3.3.9	V.9.0	(1)(3)(12)(17)(18) (19)(20)(21)(22)(23) (24)(25)(26)(27)(28)
Inspection	QA-L-10-100	3.3.10	V.10.0	(2)(5)(6)(17)(18)(19) (20)(21)(22)(23)(24) (25)(26)(27)(28)
Test Control	QA-L-11-100	3.3.11	V.11.0	(22)(23)(24)(25)(26) (27)(28)
Control of measuring and test equipment	QA-L-12-100	3.3.12	V.12.0	(7)(8)
Handling, storage, and shipping	QA-L-13-100	3.3.13	V.13.0	(9)(32)
Inspection, test, and operating status	QA-L-14-100	3.3.14	V.14.0	(22)(23)(24)(25)(26) (27)(28)
Control of Non conforming items	QA-L-15-100	3.3.15	V.15.0	(24)(25)(26)(27)(28)
Corrective action	QA-L-16-100	3.3.16	V.16.0	(2)(10)
Quality Assurance records	QA-L-17-100	3.3.17	V.17.0	- - -
QA audits	QA-L-18-100	3.3.18	V.18.0	(2)(11)

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IMPLEMENTING DOCUMENTS FOR NG CH-TRU CERTIFICATION

PROGRAM/ORNL DOCUMENTS

1. Oak Ridge National Laboratory Transuranic Waste Training Manual, ORNL/CF-86/90, November 1986.
2. QA Requirements for TRU Waste Certification Program, ORNL Quality Assurance Manual, Procedure QA-L-20-100, Rev. as updated.
3. "Segregation and Management of Solid Radioactive Waste Materials," Health Physics Procedure 5.1, Rev. as updated.
4. "ORNL TRU Waste Program Document Control," Environmental and Health Protection Division Quality Assurance Assessment/Plan, OP-WM-QAA-17, Rev. as updated.
5. ORNL Quality Department, DOT 17H; Steel Drum Single Trip Containers; Capacity: 5 gal; 30 gal; 55 gal, Inspection Check List, SSI-3100, Rev. as updated.
6. ORNL Quality Department, "Request for Inspection Engineering Services," IR 13208, Rev. as updated.
7. "Measuring and Test Equipment Control and Calibration," ORNL Quality Assurance Manual, Procedure QA-L-12-100, Rev. as updated.
8. ORNL Calibrations Facility, ORNL/TM-8405, August 1982.
9. "Receipt and Shipment of Hazardous Materials and Hazardous Wastes (Including Radioactive Materials)," Martin Marietta Energy Systems, Inc., Policy Procedures, Procedure ESH-17, Rev. as updated.
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FACILITY/OPERATION SPECIFIC DOCUMENTS

12. Draft, Waste Examination Assay Facility Operations Training Program Manual, ORNL/TM-10026.
13. "NDA-NDE CH-TRU Waste Containers," Environmental and Health Protection Division Quality Assurance Assessment/Plan, OP-RI-QAA-30, Rev. as updated.

14. "Quality Assurance Requirements for Packaging Contact-Handled Transuranic Waste," Environmental and Health Protection Division Quality Assurance Procedure Manual, Procedure QA-0-13-2, Rev. as updated.
15. "Quality Assurance Requirements for Certifying Transuranic Waste," Chemical Technology Division Quality Assurance Procedure Manual, Procedure QA-CT-20-103, Rev. as updated.
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17. "CH-TRU Waste," Environmental and Health Protection Division, Isotope Production Department, Operating Procedure, IP-001, Rev. as updated.
18. Procedure for Preparation of CH-TRU Waste, Chemical Technology Division, Radiochemical Pilot Plant, Rev. as updated.
19. "Procedure for the Disposition of Contact-Handled (CH) Transuranic Waste," Transuranium Processing Plant Operating Manual, Section 1373E, Rev. as updated.
20. "CH-TRU Waste," Analytical Chemistry Division, Hazardous Materials Analytical Laboratory, Operating Procedure, AC-001, Rev. as updated.
21. Radioactive Solid Waste Operations Manual, ORNL/CF-85/205, Sect. 3, Rev. as updated.
22. "Flow Sheet Procedure," Environmental and Health Protection Division, Isotope Production Department, Waste Examination Assay Facility Procedure, IP-300, Rev. as updated.
23. "Real-Time Radiography (RTR) System Operating Procedure," Environmental and Health Protection Division, Isotope Production Department, Waste Examination Assay Facility Procedure, IP-301, Rev. as updated.
24. "Total External Surface Radiation Dose Rate Measurement Procedure," Environmental and Health Protection Division, Isotope Production Department, Waste Examination Assay Facility Procedure, IP-302, Rev. as updated.
25. "Safety Interlock System Performance Verification Procedure," Environmental and Health Protection Division, Isotope Production Department, Waste Examination Assay Facility Procedure, IP-303, Rev. as updated.

26. "Contact-Handled (CH-TRU) Waste Drum Assay System Procedures," Environmental and Health Protection Division, Isotope Production Department, Waste Examination Assay Facility Procedure, IP-304, Rev. as updated.
27. "Passive Scan," Environmental and Health Protection Division, Isotope Production Department, Waste Examination Assay Facility Procedures, IP-305, Rev. as updated.
28. "Drum Screening Station Procedure," Environmental and Health Protection Division, Isotope Production Department, Waste Examination Assay Facility Procedure, IP-306, Rev. as updated.
29. "Transuranium Processing Plant (Bldg. 7920) Transuranic Waste Packaging for WIPP," Chemical Technology Division, Quality Assurance Assessment Checklist, CT-A-300, Rev. as updated.
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31. "Hazardous Materials Analytical Laboratory (Bldg. 2026) Transuranic Waste Packaging for WIPP," Analytical Chemistry Division, Quality Assurance Assessment Checklist, Rev. as updated.
32. "Handling, Storage, and Shipping," Environmental and Health Protection Division Quality Assurance Manual, Procedure QA-0-13-1, Rev. as updated.

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