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PACKAGING AND TRANSPORTATION MANUAL

Chapter on the
Packaging and Transportation of
Hazardous and Radioactive Waste

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OVERVIEW

The purpose of this chapter is to outline the requirements that Los Alamos National Laboratory employees and contractors must follow when they package and ship hazardous and radioactive waste. This chapter applies to on-site, intra-Laboratory, and off-site transportation of hazardous and radioactive waste.

DEFINITIONS

This section will define specific terms used in this Chapter that either have a specific meaning with regards to waste packaging and transportation or their meaning is not generally known to the user of the Chapter. Definitions that appear in the Preface Information Chapter's Definition Section will not be repeated.

Definitions of common LANL terms are contained within the LANL Dictionary.

49 CFR—Title 49, Code of Federal Regulations

- Parts 100–180, Transportation of Hazardous Materials
- Parts 350–399, Federal Motor Carrier Safety Rules

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Approved Container—

- Approved means approval issued or recognized by the U. S. Department of Transportation unless otherwise specifically indicated in 49 CFR. A Department of Transportation (DOT) specification or exemption container; or
- a Certificate of Compliance container approved by the Department of Energy (DOE) or the Nuclear Regulatory Commission (NRC); or
- Off-Site Transportation Certificate (OTC) packaging approved by DOE/AL; or
- for transportation within the Rocky Flats plant sam, a container shown in this manual or approved by the On-Sam Transportation Committee.

As Low as Reasonably Achievable (ALARA)—a philosophy of protection that controls and maintains radiation, radioactive contamination and hazardous material exposures to individuals and to the work force and general public as low as technically and economically feasible below the regulatory limits.

Bulk Packaging (LANL) — this consists of placing the hazardous waste directly in to 55-gallon drums. NOTE: This does not meet the definition under DOT.

Bulk Packaging (DOT) — from 49 CFR 171.8, a container with a:

- Maximum capacity greater than 450 L (119 gallons) as a receptacle for a liquid;
- Maximum net mass greater than 400 Kg (882 lbs.) and a maximum capacity greater than 450 L (119 gallons) as a receptacle for a solid; or
- Maximum water capacity greater than 454 L (1,000 lbs.) as a receptacle for gas

NOTE: LANL's Bulk Packaging would be considered nonbulk packaging by DOT standards.

Certificate of Compliance (C of C)—a DOE or NRC document that provides certification that a specific packaging for specified quantities and types of radioactive materials meets the applicable regulatory requirements.

Combination Packaging—means a combination of packaging, for transport purposes, consisting of one or more inner packaging secured in a non-bulk outer packaging. It does not include a composite packaging.

Commercial Carrier—a for hire carrier, common or contract, interstate or intrastate. (Air, rail, motor, or water)

Compatibility Group Letter—means a designated alphabetical letter used to characterize different types of explosives, substances and articles for purposes of storage and segregation.

Contamination—as used in this manual, when not specifically preceded by a descriptive word, i.e., plutonium, beryllium, etc., implies contamination with one or more of the radioactive or hazardous materials present at the Laboratory.

Contractor—any DOE prime contractor or subcontractor subject to the contractual provisions of 48 CFR 970.5204.2 or other specific negotiated provisions indicating DOE's decision to enforce environmental protection, safety, and health protection requirements.

Controlled Area—a specifically defined security area or space into which access is controlled but where there are no personnel clearance requirements.

Crate—means an outer packaging with incomplete surfaces.

Division—means a subdivision of a hazard class.

Drum—means a flat-ended or convex-ended cylindrical packaging made of metal, fiberboard, plastic, plywood, or other suitable materials. This definition also includes packaging of other shapes made of metal or plastic (e.g., round taper-neck packaging or pail-shaped packaging) but does not include cylinders, jerricans, wooden barrels or bulk packaging.

DOE—the U.S. Department of Energy.

DOT—the U.S. Department of Transportation.

DOT Exemption—a document providing approval by the DOT of relief from one or more provisions of the DOT regulations (49 CFR).

DOT Label—a diamond-shaped label for hazardous material containers as required in 49 CFR Parts 172.101 and 172.400.

DOT Placard—a diamond-shaped symbol used on a vehicle that represents the hazard associated with the material being transported.

Empty Radioactive Material Packaging—a packaging that previously contained radioactive material, has been emptied of contents as far as practicable, and meets the criteria of Part 173.427 of 49 CFR.

Environmental Media—material resulting from environmental monitoring and restoration activities which has not been characterized.

EPA—the U.S. Environmental Protection Agency.

Fissile Material—(for transportation purposes) means any material consisting of or containing one or more fissile radionuclides. Fissile radionuclides are plutonium-238, plutonium-239, plutonium-241, uranium-233 and uranium-235. Fissile materials are classified according to the controls needed to provide nuclear criticality safety during transportation.

H&S—Health & Safety.

Hazard Class—the category of hazard assigned to a hazardous material under the definitional criteria of 49 CFR 173 and the provisions of 172.102 Table. A material may meet the defining criteria for more than one hazard class but is assigned to only one hazard class.

Hazardous Material—a substance or material, including a hazardous substance, which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety and property when transported and which has been so designated in 49 CFR, Section 172.101, or the appendix to 172.101, or subject to the Hazardous Waste Manifest Requirements of the U.S. EPA specified in 40 CFR Part 262. This is an all-inclusive

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term which covers radioactive and other hazardous materials, hazardous substances, and hazardous waste that is subject to EPA requirements, 40 CFR Part 261.

Hazardous materials are divided into a number of classes according to the nature of the potential danger. The definition and determination for each class is listed in 49 CFR Part 173. For purposes of transportation, these are the only applicable definitions. A synopsis of the hazard class definitions and their 49 CFR references is shown in Section 3.1.

HazMat Employee—a person who in the course of employment directly affects transportation safety. This includes specifically the following: A person who:

- Loads, unloads or handles hazardous material packages. Handling consists of movement of prepared packages to a loading dock or movement from a dock to an end user.
- Inspects, marks or qualifies shipping containers for use as hazardous material packages.
- Prepares hazardous materials for transportation. This includes selection of packages and containers, application of packaging requirements, labeling and marking.
- Is responsible for safely transporting hazardous materials. This includes determination of hazard classes, preparation of shipping documents, training or supervision of hazmat employees, planning, administration, and management of transportation safety programs, plans, programs and procedures.
- Operates, inspects or placards a vehicle used to transport hazardous materials.

HSP—Health & Safety Practice.

Infectious Substance—a viable microorganism, or its toxin, which causes or may cause disease in humans or animals, and includes those agents listed in 42 CFR 72.3 of the regulations of the Department of Health and Human Services or any agent that has the potential to cause severe, disabling or fatal disease. The terms 'infectious substance' and 'etiologic agent' are synonymous.

Inner Packaging—a packaging for which an outer packaging is required for transport. It does not include the inner receptacle of a composite packaging.

Inner Receptacle—a receptacle which requires an outer packaging in order to perform its containment function. The inner receptacle may be an inner packaging or the inner receptacle of a composite packaging.

Jerrican—a metal or plastic packaging of rectangular or polygonal cross-section.

Limited quantity—when specified as such in 49 CFR applicable to a particular material, means the maximum amount of a hazardous material for which there is a specific labeling or packaging exception.

Low Specific Activity Material (LSA)—material of low radioactivity level such as ores and chemical concentrations of those ores and objects of non-radioactive material externally contaminated with radioactive material as defined in 49 CFR 173.403.

Marking—means applying the descriptive name, identification number, instructions, cautions, weight, specification, or UN marks, or combinations thereof, required by 49 CFR on outer packagings of hazardous materials.

MSDS—a Material Safety Data Sheet.

NDA&MC—Nondestructive Assay & Material Control.

NMH&P—Nuclear Material Handling & Packaging.

Non-Radioactive Material—(For the purposes of transportation) Normally, those materials containing a specific activity less than or equal to 0.002 microcuries/gram. Non-radioactive material may be designated at a lower specific activity by procedure for on-site transfer.

Office of Primary Responsibility — BUS-6 is the office of primary responsibility for oversight of the implementation of these requirements at LANL. This includes responsibility for providing oversight, developing guidance, and maintaining required records.

Off-Site Shipment—transfer of material over public highways to a destination outside the LANL boundaries.

Off-Site Transportation Certificate—A DOE document authorizing one-time or continuing multiple transportation activities of packaging. Certificates normally are issued for five years.

On-Site—any area that is fenced or otherwise access-controlled DOE property (suitable access control includes physical barricades, manned gate houses, or manned temporary positions).

OSA—Operational Safety Analysis, a written safety review which outlines the safety hazards involved in an operation, the controls of those hazards, and the responsible personnel.

Outer Packaging—the outermost enclosure of a composite or combination packaging together with any absorbent materials, cushioning and any other components necessary to contain and protect inner receptacles or inner packaging.

Package—means a packaging plus its contents.

Packaging—means a receptacle, which may require an outer packaging, and any other components or materials necessary for the receptacle to perform its containment function and to ensure compliance with the minimum packaging requirements of 49 CFR.

For radioactive material, it may consist of one or more receptacles, absorbent materials, spacing structures, thermal insulation, radiation shielding, and devices for cooling or absorbing mechanical shocks. The conveyance, tie-down systems and auxiliary equipment may sometimes be designated as part of the packaging.

Packing Group—a grouping according to the degree of danger presented by hazardous materials. Packing Group I indicates great danger; Packing Group II, medium danger; Packing Group III, minor danger.

Primary Hazard—the hazard class of a material as assigned in the 49 CFR 172.101 Table.

PC—Production Control.

Product—for the purpose of this manual, product is defined as material manufactured at LANL, not meeting the definitions of waste, scrap or residue.

Property Protection Area (PPA)—a type of security area having boundaries identified with barriers and access controls for the protection of DOE property.

Protected Area (PA)—an area encompassed by physical barriers (e.g., walls or fences), subject to access controls, surrounding a Material Access Area, and meeting the standards of DOE Order 5632.2A. The area of the Rocky Flats Plant which is located within several physical security boundaries and in which most of the Special Nuclear Material is used, processed, and stored.

Quality Assurance—a system of administrative and technical checks and balances by means of which the specified requirements for an operation are met. The term includes other related terms such as "quality control" and "compliance inspection."

Radioactive Material—(for the purposes of transportation) means any material having a specific activity greater than 0.002 microcuries per gram ($\mu\text{Ci/g}$).

Radiologically Controlled Area (RCA)—Any area to which access is controlled in order to protect individuals from exposure to radiation and/or radioactive materials. The RCA is normally a transition area between the Radiological Area (RA) and an Uncontrolled Area.

Resource Conservation and Recovery Act (RCRA) Regulated—Waste materials which contain hazardous constituents regulated by the EPA's 40 CFR Part 261.

Regulated Medical Waste—includes cultures and stocks of infectious agents, pathological wastes such as human tissues and organs, human blood and blood products, sharps (e.g., discarded hypodermic needles, suture needles, scalpel blades, and blood vials), animal waste such as contaminated carcasses, and biological or contaminated materials from humans and animals. Regulated medical waste includes infectious waste as identified in the

Residues—A variety of solid industrial materials used in process and fabrication operations at LANL that become contaminated with nuclear materials and require a drum count or other type measurement to determine if recoverable ($>$ than Economic Discard Limit [EDL]) or nonrecoverable ($<$ than EDL).

RMMA—Radioactive Materials Management Area.

ROI—Radiological Operating Instruction.

Safety Analysis Report for Packaging (SARP)—a document that provides a comprehensive technical evaluation and review of the design, testing, and operational and maintenance procedures of a particular package.

Shipment—any on-site or off-site transportation of materials.

Shipper—The initiating organization or person that classifies, prepares, and signs shipping documents to ship materials or offer them for shipment. Both the initiating organization and BUS-6 may be responsible as shippers for a particular shipment. LANL training requirements must be met before a person can be authorized as a qualified shipper at LANL.

Shipping Paper—means a shipping order, bill of lading, manifest or other shipping document serving a similar purpose and, for hazardous materials, containing the information required by 49 CFR 172.202, 172.203 and 172.204.

Single Packaging—a non-bulk packaging other than a combination packaging.

Site—an area of land that contains a DOE facility or facilities or is either owned or leased by DOE or the Federal government. A DOE site and facility may or may not have the same boundaries. The general public may or may not have access.

Specification Packaging—a packaging conforming to one of the specifications or standards for packaging in 49 CFR 178 or 179.

Subsidiary Hazard—a hazard of a material other than the primary hazard.

Transfer—movement of materials between buildings within the Laboratory. Between buildings refers to movement exterior to the building structure.

Transport Index (TI)—a dimensionless number placed on a radioactive material package to designate the degree of control to be taken by the carrier during transportation. The transport index is based on the higher of the TI values established by the two following options:

- the degree of external radiation (millirem/hour at 1 meter, including both gamma and neutron radiations), as determined by Radiological Operations; or
- fissile material criticality considerations, in which case the TI will be assigned by Criticality Engineering.

Transport Vehicle—any conveyance (motor vehicle, rail car, aircraft, boat, barge or seagoing vessel) used for the transportation of property. Each cargo-carrying body (trailer, van, boxcar, freight container, barge, or ship's hold) is a separate vehicle.

Transportation—the on-site or off-site activity of moving passengers or cargo from one point to another.

Toxic Substance Control Act (TSCA) Regulated—waste materials which contain hazardous constituents regulated by EPA pursuant to 40 CFR, Parts 702-799.

Type A Package—a Type A packaging together with its limited radioactive contents.

Type A Quantity—the maximum activity of radioactive material permitted in a Type A package, as shown in 49 CFR 173.435.

Type B Package—a Type B packaging together with its radioactive contents.

Type B Quantity—any activity of radioactive material greater than Type A.

GENERAL REQUIREMENTS

- 1) Requirements. Laboratory packaging and transportation workers will package waste, prepare shipments, and transport hazardous and radioactive wastes in accordance with the references listed below.
- 2) References:

LANL Packaging and Transportation Manual, Laboratory Manual Chapter 1: "Environment, Safety, and Health, Director's Policies, Policy 117, Packaging and Transportation"

DOE Orders 1540.1, 1540.2, 1540.3, 5400.3, 5480.2A, 5480.5, 5820.2A, 532.11

40 CFR 262; 49 CFR 170-178

RESPONSIBILITIES

This section will identify the specific responsibilities of the major LANL organizations as they relate to the packaging and transportation of hazardous and radioactive wastes. The responsibilities of the following organizations will be identified.

- Property and Transportation group
- Waste Management Facility
- Waste Generators
- Waste Management Coordinator

Property and Transportation Group

The Property and Transportation Group is responsible for oversight management of various divisions at LANL. These divisions are

- Traffic Services
- Packaging & Shipping
- Regulatory Services
- Packaging & Transportation Services
- SNM/SST
- P & T Technical Services
- P & T Packaging Engineering
- Property Accounting

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- Vehicles, Loans, GFP, and Excess
  - Property Management

Waste Management Facility

The waste management facility monitors all shipments of radioactive material. This is achieved through approval and routing of documentation to the Radiation Protection Group (HSE-1), the Safety and Risk Assessment Group (HSE-3), the Chemistry Health Protection Group (HSE-10), or the Accelerator Health Protection Group (HSE-11). Furthermore, the Radwaste Section (HSE-7) must maintain records of all radioactive material, packaging, and transportation.

Waste Generators

A waste generator is responsible for complying with all packaging and transportation regulations. A waste generator must not transport radioactive waste to Area G without an approved SOP for the operation or approval from HSE-1/-10/-11, the HSE-3 HAZPACT Section, and the HSE-7 Radwaste Section.

A waste generator shall

- Provide information to permit classification and characterization of materials to be transferred or shipped
- Ensure that hazardous material packages meet established standards and requirements
- Prepare hazardous materials transfer forms (HMTFs)
- Prepare radioactive material transfer forms (RMTFs)

Waste Management Coordinator

Waste management coordinators are designated by the line manager of each waste-generating organization. The waste management coordinator will be assisted by the Waste Management Group (HSE-7) to help achieve the goal of managing the waste in the generating organization. Waste management coordinators may be assigned at a group or division level. Waste management coordinators will have approval authority on waste management matters for operations pertaining to the generating organizations that they oversee. The waste management coordinator will also act as the waste generator's first point of contact for packaging and shipping guidance.

The waste management coordinators will

- Control the keys to radioactive waste dumpsters in their areas
- Review and sign all required documentation
- Ensure that all waste generators under their authority are aware of the proper procedures for disposal and storage of radioactive waste
- Respond to questions regarding the proper handling of waste.

WRITTEN PROCEDURES

All operations and procedures involving the packaging and transportation of hazardous, radioactive, and mixed waste must be management-approved written documents.

Packaging and transportation of hazardous material to, from, and within the Laboratory will follow appropriate regulations and guidance. Written procedures will provide guidance to applicable laws, regulations, and requirements. These include the Code of Federal Regulations (CFR), U.S. Department of Energy (DOE) Orders, U.S. Department of Transportation (DOT) regulations, applicable state and local laws and ordinances, the relevant LANL Director's Policies, and LANL Administrative Requirements.

Specified in these written procedures will be levels and lines of authority, as well as a description of responsibility for all organizations and entities that are involved in waste packaging and transportation operations.

These written procedures will include the following sections:

- Introduction
- Definitions
- Responsibilities
- Standard operating procedures
- Detailed operating procedures (when applicable)
- References
- Appendices

- **Forms**

Upon development of a new operation, written procedures must also be developed to address the above sections. The draft, final, and subsequent revisions of the procedure must be reviewed and controlled for quality by BUS-6.

AUTHORIZED PACKAGING FOR RADIOACTIVE AND HAZARDOUS WASTE

All packaging used for hazardous waste must meet the applicable requirements of 49 CFR 173.24, 173.24a, and 173.24b. Also, packages for radioactive materials must meet the requirements of 49 CFR 173.411, 173.421, 173.441, 173.442, and 173.443. Any exceptions to these requirements for on-site shipment must have the approval of BUS-6. Appendix A of this chapter will provide specific details on authorized waste packaging.

QUALITY ASSURANCE

This section will provide additional guidance in the area of Quality Assurance. It will outline specific quality assurance requirements that are applicable to the packaging and transport of hazardous and radioactive waste, which are in addition to the programmatic requirements established in the Quality Assurance Plan for Hazardous Materials Packaging and Transportation.

The application of quality assurance to packaging and transportation is guided by the U.S. Department of Energy Order 5600.6C and 10 CFR 71. These provide guidance and requirements that must be met in all levels of an organization. The following outline identifies specific quality assurance requirements above the programmatic requirements set forth in the QAP.

Management

Senior management retains and exercises the responsibility for the scope and implementation of the Quality Assurance Program.

This is achieved through

- Designing requirements of the HMPT QAP
- Defining responsibility for line managers and employees

Line management is responsible for activities performed and conducted in a manner to ensure quality and safety. These tasks include, but are not limited to,

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- Ensuring specific HMPT training requirements are identified
  - Verifying employees are qualified for their jobs
  - Providing a first line of communication for the employees, thus allowing for transfer of knowledge and ideas

Personnel Training and Qualification

It is the responsibility of the organization to ensure that personnel are trained and qualified, and that they are capable of performing their assigned work. Additionally, training and qualification of personnel shall be a continuous process.

Continuous Improvement of Quality

The Laboratory shall demonstrate a commitment to quality improvement. A plan shall be in place that identifies and prevents quality problems through the identification, control, and correction of these problems. Corrective actions will identify the root cause of a quality issue and provide for prevention of recurrence. This plan will also address the issues of reliability, process implementation, and other quality-related information through the use of data analysis to identify and control quality improvement.

Documents and Records

The QAP must provide for control of document issuance, including instructions, procedures, and drawings. These documents and changes to these documents must include:

- Documentation of changes made
- A review for adequacy
- Approval for release by authorized personnel
- Distribution to affected locations or in replacement of previously controlled documents

Work Process

When special processes are employed, qualified personnel and qualified procedures outlined by applicable codes, standards, specifications, criteria, and other special requirements must be used to control and accomplish the tasks.

Design

Quality assurance is achieved in the design phase of an item or process through the application of established engineering and scientific principles and technical standards. The process of design and design changes for the manufacture or implementation of an item or process will incorporate applicable requirements. The adequacy of an item or process will be verified or validated by groups independent from those who performed the work. This verification and validation must approve an item or process prior to manufacture or implementation.

Procurement

Management is responsible to ensure that contractors or subcontractors have a Quality Assurance Plan consistent with the Quality Assurance Plan for HMPT. Additionally, guidelines and procedures must be in place that ensure documents for the procurement of material, equipment, and services comply with the guidance set forth in the QAP for HMPT. This includes verification that purchased material, equipment, and services conform to the procurement documents. Documentary evidence must be maintained for the life of the package to ensure that the requirements set forth in the procurement documents are met. Furthermore, Management is responsible for assessing the effectiveness of the contractor's and subcontractor's quality control at intervals consistent with the importance, complexity, and quantity of the product or services.

Inspection and Acceptance Testing

An established and executable program must be in operation for inspection of quality-affecting activities or for the organization performing those activities. This program will verify conformance with instructions, procedures, and drawings. The inspections must be conducted by individuals other than those who performed the activity being inspected. This inspection may be direct, performed by an individual, or indirect, by process monitoring; in some cases, both direct and indirect methods should be used.

A test program must be developed and followed that ensures satisfactory testing of packaging components for proper in-service performance. Procedures must ensure that all prerequisites for the given tests are met. These tests shall be documented for possible requirement verification.

Management Assessment

Management audits shall verify compliance with all aspects of the Quality Assurance Program. These audits will be planned and performed periodically to help verify the Quality Assurance process. These audits must be documented and reviewed by management having responsibility in the area audited.

Independent Assessment

Independent audits shall verify compliance with all aspects of the Quality Assurance Program. These audits will be planned and performed periodically to help verify the Quality Assurance process. These audits must be documented and reviewed by management having responsibility in the area audited. These independent audits will provide systematic and autonomous documentation that can be used with internal (management assessment) audits.

DOCUMENTATION FOR HAZARDOUS AND RADIOACTIVE WASTE SHIPMENTS

This section will identify the general requirements for shipping papers and the information that they must contain. The requirement for BUS-6 to review and approve this documentation prior to transport will also be identified. The specific criteria that BUS-6 will use in conducting its review will be outlined.

Additional guidance will be provided to the preparer on the completion of these documents, including the identification of requirements from DOE Order 5820.2A; 49 CFR 172, Subpart C; and 40 CFR 262, Subpart B. Documentation requirements from other sections of the Hazardous Materials Regulations will be included. The specific forms that are to be used at the Laboratory will be described.

Prior to material shipment, all shipping papers must be reviewed and approved by BUS-6. BUS-6 will be responsible for reviewing the following:

For Shipments to and from LANL

- General entries, as outlined in 49 CFR 172.201.

These include:
  - Contents
  - Name of shipper
  - Emergency response telephone number
- Description of hazardous material on shipping papers, as outlined in 49 CFR 172.202
- Additional description requirements, as outlined in 49 CFR 172.203

These include:

- Exemptions

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- Limited quantities
  - Hazardous substances
  - Radioactive material
  - Empty packagings
  - Transportation by air
  - Transportation by rail
  - Transportation by highway
  - Transportation by water
  - "Dangerous when wet" material
  - Technical names for "n.o.s." and other generic descriptions
  - Marine pollutants
  - Poisonous materials
  - Elevated-temperature materials

- Shipper's certification, as outlined in 49 CFR 172.204.

These include:

- General
  - Exceptions
  - Transportation by air
  - Signature
- Hazardous waste manifest, as outlined in 49 CFR 172.205.

These include:

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- EPA Form 8700-22 and 8700-22A (when necessary) hazardous waste manifest prepared in accordance with 40 CFR 262.

For Shipments On-Site at LANL

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The review of these shipping papers and documents will be aided by the use of standardized forms for the packaging and transportation of hazardous, radioactive, and mixed waste.

The following forms will be used when applicable:

- Form 252-R, Disposal of Contaminated and/or Classified Property
- Form Number 797, Equipment/Material Pick-Up/Transfer
- Form Number 1118, Shipping Manifest
- Form 1468 (formerly Form HMT 1-1), Hazardous Materials Transfer Form
- Form 1541A, "SPENT" or "PROCESS" Waste Continuation Sheet
- Form 1586 (ES&H Form 3-5A), Radioactive Materials Transfer
- Form ES&H 3-5B, Radioactive Materials Shipping Data Sheet
- Form ES&H 3-5C, Certification of Type A Packaging
- Form ES&H 3-5D, General Certification of Type B Packaging
- Form ES&H 3-5E, Certification for "EMPTY" Radioactive Materials Packaging
- Form ES&H 3-5F, Log of Incoming Radioactive Material Shipments
- Form 1354 (ES&H Form 10-2A), Radioactive Solid Waste Disposal (RSWD) Record Application for Storage/Disposal
- Form ES&H 10-2B, Waste Generator Nonconformance Report
- Form 1562 (ES&H Form 10-5A), TRU Waste Storage Record

MARKING, LABELING, AND PLACARDING REQUIREMENTS

Marking

The marking requirements for hazardous materials are set forth in 49 CFR 172, Subpart D. Additional requirements specific to hazardous and radioactive waste (material) are in 40 CFR 262.32 and 49 CFR 172.310 (a), respectively.

The markings submitted on Chemical Waste Disposal Requests (CDWRs) for containers of hazardous and mixed wastes are preprinted from the Waste Management computer system. These markings are used to fulfill the requirements of 40 CFR 262 and 49 CFR 172, Subpart D.

Labeling

Labeling requirements for hazardous materials are found in 49 CFR 172, Subpart E. There are no additional labeling requirements specific to hazardous waste. Labeling requirements specific to radioactive waste (material) are in 49 CFR 172.403. The containers must be labeled prior to loading for transport.

Placarding

49 CFR 172, Subpart F, contains the requirements for placarding hazardous material shipments. The generator must offer the appropriate placards to the truck driver.

LOADING AND TIEDOWN OF HAZARDOUS AND RADIOACTIVE WASTE SHIPMENTS

This section will identify the general requirements for loading, blocking, bracing, and tiedown of hazardous and radioactive waste packages on transport vehicles. The applicable requirements of 49 CFR 392.9 and 393.100-106 will be used to develop "Appendix C—Transportation of Hazardous and Radioactive Waste." In addition, the appendix will include applicable sections contained in 49 CFR 177, Subpart B, dealing with loading and unloading.

Hazardous and radioactive waste must be loaded safely and secured with blocking, bracing, and tiedowns to prevent cargo from shifting or falling during transportation. Loading, unloading, blocking, bracing, and tiedown requirements are found in 49 CFR 392.9; 49 CFR 393, Subpart I; and 49 CFR 177, Subpart B. These requirements are outlined in Appendix B of Chapter 5.

PRESHIPMENT INSPECTIONS

Prior to the shipment of hazardous or radioactive waste, an inspection of the containers must be conducted by the generator/shipper. This inspection shall be documented and copies of the inspection will be distributed to BUS-6, and the Waste Management Facility. The following guidelines and requirements must be met to ensure safe and compliant transportation of hazardous materials.

This preshipment inspection will include a review of the:

- Waste manifest
- Proper shipping name
- Hazard class
- Proper UN/NA identification number
- Appropriate mode of transportation
- Proper label or labels and their application
- Proper package or packages
- Marking of the package or packages
- Proper placards

Criteria for nonconformance will be measured with the requirements for transportation of hazardous waste set forth in The Hazardous Materials Table, 49 CFR 172.101 and 40 CFR 262.

ON-SITE ROUTING OF WASTE SHIPMENTS

Routing of hazardous materials, except radioactive materials, is subject to the requirements of 49 CFR 397.9. This section requires that hazardous materials must not be transported over routes through or near heavily populated areas, places where crowds are assembled, tunnels, narrow streets, or alleys, unless there is no practicable alternative.

BUS-6 will conduct formal routing evaluations of placarded radioactive waste shipments to verify that the requirements of 49 CFR 397.101 are met. 49 CFR 397.101 contains routing evaluation criteria, instructions to be provided to the driver, carrier reporting requirements, and driver training documentation requirements.

PACKAGING AND TRANSPORTATION RISK EVALUATIONS

This section will establish the requirement to submit SOPs, DOPs, and other written procedures to the Risk Management Support Group (HS-3) for review and approval. The section will also require risk evaluations when shipments are being made under a DOE exemption or when the package being transported is a non-DOT approved container.

Upon completion of written procedures for all packaging and transportation issues, copies will be submitted to the Risk Management Support Group (HS-3) for review and approval. HS-3 will review these documents and provide necessary comment concerning

For material being shipped under DOE exemption, 49 CFR 107 Subpart B, or in packaging not DOT approved (guidance for approved DOT packaging is found in 49 CFR 171—180), HS-3 will perform risk evaluations. These risk evaluations will comply with procedures and assessment criteria outlined in the Risk Assessment Guidance for Superfund, EPA/540/1-89/002.

PACKAGING AND TRANSPORTATION ASSESSMENT AND OVERSIGHT PROGRAM

This section will establish a requirement that all organization perform ongoing surveillance of their own packaging and transportation activities. The section will establish guidelines and criteria for this surveillance activity. The section will also identify the requirement for BUS-6 to conduct routine and periodic surveillance of waste packaging and transportation activities at LANL.

NONCONFORMANCE REPORTING

This report describes specific deficiencies, the related technical or procedural requirements, and the initiating individual. The report also documents the agreed-upon action and closure of the issue.

Upon receipt of a hazardous-, radioactive-, or mixed-waste package, the inspector must document the results of the inspection. These results must appear on the item or package, or with the documents traceable to the item or package.

This inspection will follow the form presented in the Preshipment Inspection and will address all issues presented in the *Packaging and Transportation Manual*. If any item is nonconforming, a copy of the nonconformance report (NCR) will be sent to BUS-6, and a copy will remain with the item or package. BUS-6 will then review and track NCRs to

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determine if additional training in a specific area should be included as a part of the packaging and transportation training.

TRAINING OF PERSONNEL

This section will identify the personnel training requirements of 49 CFR 172, Subpart H, in general terms. It will direct the reader to Chapter 2 of the *P&T Manual* for specific requirements.

All Hazmat employees are required by 49 CFR to have initial and recurrent hazardous materials training. A Hazmat employee is defined by 49 CFR 171.8 as a person employed by a Hazmat employer and who, in the course of employment, directly affects hazardous material transportation safety. There are three types of required training:

- General awareness and familiarization training
- Regulatory function-specific training
- Safety training

Recurrent training is required a minimum of every two years. Employees must be tested and certified as being trained to Subpart H of 49 CFR 172. Records must be kept in accordance with 49 CFR 172.704(d)(5).

Additional details on required training can be found in Chapter 2 of the *P&T Manual*.

EMERGENCY RESPONSE INFORMATION

This section will identify the requirement to include emergency response information with each shipment of hazardous and radioactive waste. Chapter 1 of the *P&T Manual* will be referenced for specific details. The section will identify that for compliance with this requirement, each shipment must include a copy of the appropriate sections of the *Emergency Response Guidebook* and Material Safety Data Sheets to the top of which the DOT Proper Shipping Description has been added.

Emergency response information is required for each hazardous material shipment by 49 CFR 172, Subpart G. Two types of information are required: minimum initial responder information (on or with the shipping papers), and comprehensive, product-specific emergency response/incident mitigation information (24-hour emergency response telephone number on the shipping papers).

Initial responder information is supplied with each shipment by including a copy of the appropriate sections of the Emergency Response Guidebook section(s) and Material Safety Data Sheets to the top of which the DOT Proper Shipping Name and ID number have been added. The 24-hour emergency number is *****. Further details on emergency response information can be found in Chapter 1 of the *P&T Manual*.

INCIDENT AND OCCURRENCE REPORTING

The incident and occurrence reporting requirements for hazardous and radioactive waste shipments are found in Chapter 1 of the *Packaging and Transportation Manual*.

APPENDIX A

PURPOSE

The purpose of this appendix is to provide information and guidance on packaging used for the transport of hazardous and radioactive waste. Also, the purpose of this appendix is to provide additional detail, references, and guidance on packaging for hazardous and radioactive waste.

Scope

The scope of the appendix includes requirements for packaging hazardous and radioactive waste as found in 49 CFR and applicable DOE Orders.

Performance Oriented Packaging

In October of 1991, 49 CFR authorized the use of the UN Performance Oriented Packaging (POP) standards for nonbulk packaging for most domestic transportation of hazardous materials. As of October 1, 1996, the use of UN POP Standards, unless excepted, will be mandatory. Until that date, nonbulk packaging (except for poison-by-inhalation materials) authorized by the 1990 edition of 49 CFR (and manufactured prior to October 1, 1994) may still be used for hazardous materials packaging, as provided in Part 171.14(b)(6).

The UN POP standards are based on anticipated performance of the package during transportation, not the detailed design and construction of the packaging. The primary goal of the standards is to ensure the ability of packages to pass a series of tests designed to evaluate the ability of the packages to withstand the normal conditions incident to transportation.

General criteria for All Packaging

Packages must be designed, constructed, maintained, filled, their contents limited, and closed, so that under conditions normally incident to transportation:

- There will be no identifiable release
- The effectiveness of the package will not be reduced
- There will not be a mixture of gases or vapors that will damage the package through a credible increase in heat or pressure

The packaging must be authorized in the hazardous materials table for the specific hazardous material, or allowed by exception (see 49 CFR 173.24(c)(2) for the specific references).

The packaging must be compatible with the lading.

General Criteria for Bulk Packaging

As defined in 49 CFR 171.8, bulk packaging is a packaging, other than a vessel or barge, including a transport vehicle or freight container, in which hazardous materials are loaded with no intermediate form or containment, and which has:

- (1) A maximum capacity greater than 450 liters (119 gallons) for a liquid
- (2) A maximum net mass greater than 400 kg (882 pounds) or a maximum capacity greater than 450 liters (119 gallons) as a receptacle for solids
- (3) A water capacity greater than 454 kilograms (1,000 pounds) as a receptacle for a gas, as defined in 49 CFR 173.115.

The Chemical and Mixed Waste Operations Section defines bulk packaging as waste material placed directly in a 55-gallon drum with no inner containment. This packaging description would meet the definition of nonbulk packaging in 49 CFR 171.8.

The general requirements for bulk packaging can be found in 49 CFR 173.24b. Subpart F of 49 CFR 173 describes the types of bulk packaging allowed for hazardous materials other than Class 1 and Class 7. The allowable bulk packaging for Class 7 material (LSA) is described in 49 CFR 173.425.

General Criteria for Nonbulk Packaging

49 CFR 173.24a contains additional general requirements for nonbulk packaging. These requirements address packaging design, liquid and solid filling limits, and mixed contents. Subpart F of 49 CFR 173 describes the types of bulk packaging allowed for hazardous materials other than Class 1 and Class 7. Nonbulk packaging requirements for Class 1 material are in Subpart C of 49 CFR 173. Nonbulk packaging requirements for radioactive (Class 7) material are located in Subpart I of 49 CFR 173. These requirements are outlined in the next section of this appendix.

General Criteria for Radioactive Packaging

This section will identify the specific additional general requirements for radioactive waste classified as Low Specific Activity being shipped by exclusive use. Using DOE Order 5480.3 and 49 CFR 173.425 it will provide additional information on Strong tight containers, unpackaged bulk shipments, and bulk liquids. Appendix A of Chapter 5 will be referenced for TYPE A and TYPE B radioactive material packaging requirements.

General requirements for radioactive packaging (except limited quantity) are located in 49 CFR 173.411. Specific requirements for Low Specific Activity (LSA) radioactive material are found in 49 CFR 173.425. LSA may be transported in DOT Specification 7A containers; strong, tight containers (exclusive use only); or exclusive-use, unpackaged (bulk) shipments. The requirements for packaged, exclusive-use shipments include:

- Waste must be packaged in strong, tight containers so that no leakage will occur under conditions normally incidental to transportation.
- Removable contamination must meet the criteria in 49 CFR 173.443.
- External radiation levels must comply with 49 CFR 173.441.
- Shipments must be loaded by the consignee and unloaded by the consignor
- No radioactive material may be loose in the conveyance.
- Packages and their contents must be braced to prevent shifting during transportation.
- Placards must be displayed in accordance with Subpart F of 49 CFR 172, except for shipments of uranium or thorium ore.
- packages must be marked "Radioactive-LSA." Packages less than 110 gallons that contain a hazardous substance must be marked "RQ Radioactive-LSA."
- Specific instructions for maintenance of exclusive use shipment controls must be provided by the shipper to the carrier. Such instructions must be included with the shipping papers.
- Aircraft transport is not allowed.

The requirements for unpackaged (bulk) exclusive use shipments include:

- The form and radioactivity concentration must meet the criteria listed in 49 CFR 173.425(c)(1).
- Bulk liquids must be transported in cargo tanks or tank cars authorized in 49 CFR 173.425(c)(2).
- External radiation levels must comply with 49 CFR 173.441.
- Shipments must be loaded by the consignee and unloaded by the consignor.

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- Placards must be displayed in accordance with Subpart F of 49 CFR 172, except for shipments of uranium or thorium ore.
  - There must be no leakage of radioactive materials from the vehicle.
  - Specific instructions for maintenance of exclusive-use shipment controls must be provided by the shipper to the carrier. Such instructions must be included with the shipping papers.
  - Aircraft transport is not allowed.

The design requirements for Type A and Type B packages can be found in 49 CFR 173.412 and 172.413, respectively. Authorized Type A and Type B packages are listed in 49 CFR 173.415 and 173.416., respectively.

Previously Approved Packaging

In October of 1991, 49 CFR authorized the use of the UN Performance Oriented Packaging (POP) standards for nonbulk packaging for most domestic transportation of hazardous materials. As of October 1, 1996, the use of UN POP Standards, unless excepted, will be mandatory. Until that date, nonbulk packaging (except for poison-by-inhalation materials) authorized by the 1990 edition of 49 CFR (and manufactured prior to October 1, 1994) may still be used for hazardous materials packaging, as provided in 49 CFR 171.14(b)(6).

DOT specification packaging is based on detailed design and construction of the packaging rather than performance testing. The specifications for the packaging is in the 1990 edition of 49 CFR 178. The specification covers items such as the minimum thickness of construction, leakage tests, rated capacity, and closures. The specification marking requirements are contained within each specification section in 49 CFR 178. The general specification marking is DOT-XXX, where XXX is the specification number, such as 17C or 17E for a steel drum.

Packaging Exceptions

Salvage drums may be used to transport damaged, leaking, or defective packages or spilled hazardous materials under the requirements found in 49 CFR 173.3(c). The marking, labeling, and shipping paper requirements from 49 CFR apply to salvage drums along with the following requirements:

- The salvage drum is an open-head metal or plastic drum that is compatible with the lading. The drum must be a UN 1A2, 1BG2, 1N2, or 1H2 tested and marked for Packing Group III or higher performance standards for liquids or solids with a leakproofness test of 20 kPa (3 psi). Alternately, a drum manufactured and marked prior to October 1, 1993, as a salvage drum in

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accordance with the provisions of 49 CFR 173.3 in effect on September 30, 1991, is authorized. Capacity of the drum may not exceed 450 liters (119 gallons).

- Each drum shall be filled with sufficient cushioning and absorption material to prevent excessive movement of the damaged package and to absorb any free liquid present at the time the salvage drum is closed. The cushioning and absorbent material must be compatible with the lading.
- In addition to the normally required marking, the drum shall be marked "Salvage Drum."
- The overpack requirements of 49 CFR 173.25 do not apply to salvage drums used in accordance with 49 CFR 173.3(c).

49 CFR 173.4 provides regulatory relief for small-quantity shipments of Class 3, Division 4.1, Division 5.1, Class 8, Division 6.1, Class 7, and Class 9 materials. Shipments that meet the requirements of 49 CFR 173.4 are not subject to any other requirements in Subchapter C of 49 CFR (which includes parts 171–178). The quantity limits for the inner receptacles are:

- Thirty milliliters (1 ounce) for authorized liquids, other than Division 6.1, Packing Group I, materials
- Thirty grams (1 ounce) for authorized solids, other than Division 6.1, Packing Group I, materials
- One gram (0.04 ounce) for authorized materials classed as Division 6.1, Packing Group I, materials
- An activity level not exceeding that specified in 49 CFR 173.421, 173.422, or 173.424, as appropriate, for a package of Class 7 material.

Refer to 49 CFR 173.4 to find the inner container, packaging, certification, testing, closure, and gross weight requirements for small-quantity shipments.

49 CFR 173.12(a) allows open-head drums to be used for waste materials required to be in closed-head drums if the waste contains solid or semisolid materials that make its placement in a closed head drum impractical. Lab packs are excepted from specification packaging if packaged in combination packaging using the requirements of 49 CFR 173.12(b). The general requirements are:

- Waste material classed as Class or Division 3, 4.1, 4.2, 4.3 5.1, 6.1, 8, or 9. Division 6.1, Packing Group I, Division 4.2, Packing Group I, bromine

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pentafluoride, bromine trifluoride, choric acid, and oleum (fuming sulfuric acid) may not be packaged using the provisions of 49 CFR 173.12(b).

- The outer packaging is limited to a UN 1A2 or UN 1B2 metal drum, a UN 1D plywood drum, a UN 1G fiber drum, or a UN 1H2 plastic drum tested and marked at least for Packing Group III performance level for liquids or solids.
- The inner packaging must be either glass—not exceeding 4 liters rated capacity—or metal or plastic—not exceeding 20 liters rated capacity.
- Each drum is limited to one class of hazardous material.
- Inner packaging containing liquid must be surrounded by chemically compatible absorbent material in sufficient quantity to absorb the total liquid contents.
- The gross weight of the drum is limited to 205 kilograms (452 pounds).

There is additional information in 49 CFR 173.12(b) regarding reuse of packaging and technical names for n.o.s. descriptions for lab packs.

Shipments eligible to be shipped as limited quantities are generally excepted from one or more of the 49 CFR requirements, such as labeling, specification packaging, and placarding. The limited-quantity definitions and requirements can be found in 49 CFR 173.150 through 173.156 (Class/Division 3, 4.1, 5.1, 5.2, 6, 8, and 9), 173.306 (Class 2), and 173.421 (Class 7). The use of a limited quantity exception must be authorized by the 49 CFR 172.101 Hazardous Materials Table with the proper shipping name for the hazardous material.

Shipper's Responsibilities

LANL Administrative Requirement 10-3 and the Waste Acceptance Criteria (WAC) for chemical, hazardous, and low-level mixed waste require the generator or shipper of the waste to complete a Chemical Waste Disposal Request (CWDR) form whenever these wastes are offered for transportation. This form is reviewed and approved by EM-7 Chemical and Mixed Waste Operations Section. For further detail on the CDWR, see Section 4.1.4 of the WAC.

General shipper's responsibilities for all hazardous materials shipments are found in 49 CFR 173.22. That section describes the shipper's responsibility to classify, describe, and package hazardous materials in accordance with 49 CFR. 49 CFR 173.22(a)(3) lists documentation or markings that may be excepted from the packaging manufacturer to aid the shipper's determination that the packaging is authorized for the shipment. Requirements specific to radioactive-fissile and Type B or highway route controlled shipments are listed in 49 CFR 173.22(c).

Quality control requirements for the construction of radioactive material packaging is in 49 CFR 173.474. That section requires the shipper to ensure the packaging meets the quality of design and construction required, and to determine the shielding, containment, and heat transfer characteristics (when required) necessary to operate within design requirements. These requirements must be met prior to the first usage of the package.

49 CFR 173.475 requires that before every shipment of a radioactive materials package, the following items shall be examined for compliance with 49 CFR and the package design:

- The package is proper for the contents
- The packaging is in unimpaired physical condition
- Closure devices and gaskets are installed, free of defects, and secure
- Moderators and neutron absorbers, if required for fissile material are present
- Each special instruction for filling, closing, and preparation of the packaging has been followed
- All openings in the containment system are secure
- Leak testing for liquids containing more than an A2 quantity of activity
- Internal pressures are within design pressure specifications
- External radiation and contamination levels

Qualification, Maintenance and Use of Portable Tanks

Portable tanks used for the transportation of hazardous materials must be qualified and maintained using the requirements of 49 CFR 173.32. 49 CFR 173.32 applies to all portable tanks except Specification IM. Specification IM portable tank requirements can be found in 49 CFR 173.32a through 173.32c.

The qualification and maintenance requirements for portable tanks cover:

- Manufacturer's data reports
- Exterior finish
- Modal restrictions

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- Substitution of specification tanks
  - Rerating working pressure
  - Retesting of tanks
  - Special tanks
  - Deteriorated tanks
  - Damaged tanks
  - Unused tanks
  - Repair of tanks
  - Piping and fitting bursting strength
  - Tank construction material compatibility
  - Automatic excess-flow valves for liquified compressed gases
  - Insulation, heating, and cooling for carbon dioxide and nitrous oxide
  - Maximum lading pressure
  - Minimum tank design pressure
  - Pressure relief valves

Procurement and Documentation of Packaging

The procurement of packaging for hazardous and radioactive waste packages must meet the requirements provided in 10 CFR 71.109 and 71.115 and 49 CFR 173. These documents provide for the establishment of quality standards that vendors, contractors, and subcontractors must adhere to. Procured packaging must conform to procurement documents. These conformance shall be measured through the inspection and examination of the product upon delivery.

The documentation of a procured item must provide evidence of conformance to specifications prior to installation or use. This documentation must remain on file until the life of the item has terminated.

Evaluation of the procured product shall occur at intervals consistent with the importance, complexity and quantity of the package.

The quality assurance requirements for procurement and documentation of packaging will comply with guidelines developed in the Quality Assurance section of the Packaging and Transportation Manual.

APPENDIX B

PURPOSE

This purpose of this appendix is to provide guidance for the on-site transport of hazardous and radioactive waste.

SCOPE

This section will outline that this appendix applies to both LANL and contractor organizations. It will also only reference those areas that are already covered in Chapter 1 & 2 and appendix A of the P&T Manual.

The scope of this appendix is on-site transport requirements for both LANL and contractors. The appendix includes the topics of driver qualifications, vehicle and load inspection, emergency equipment, protection against shifting and falling cargo, vehicle driving, and evaluation of contractors.

DRIVE QUALIFICATIONS

This section will establish the requirement that only drivers that have been trained and qualified in accordance with the requirements in Chapter 2 of the P&T Manual may be used to transport hazardous and radioactive waste.

Drivers must be trained and qualified according to the requirements of Chapter 2 of the P&T Manual prior to transporting hazardous or radioactive waste.

INSPECTION, REPAIR, AND MAINTENANCE

Using 49 CFR 396 as a reference, this section will establish general requirements for the inspection, repair and maintenance of all vehicles used to transport hazardous and radioactive waste. This section will cover such topics as driver vehicle inspection reports, drivers inspections, periodic inspections and record keeping. This section will also reference Appendix A of the P&T Manual.

49 CFR 396 requires that motor carriers systematically inspect, repair, and maintain all motor vehicles under its control. The motor carrier must maintain and retain records for any vehicle it controls for 30 consecutive days or more as specified in 49 CFR 396.3.

Drivers are required to prepare a written driver vehicle inspection report by 49 CFR 396.11 at the end of each day's work on each vehicle operated. The report shall cover the following parts and accessories:

- Service brakes including trailer brake connections
- Parking (hand) brake
- Steering mechanism
- Lighting devices and reflectors
- Tires
- Horn
- Windshield wipers
- Rear vision mirrors
- Coupling devices
- Wheels and rims
- Emergency equipment

49 CFR 396.11 contains details on the report content and corrective actions. Also, the driver is required to inspect the vehicle prior to driving, in accordance with 49 CFR 396.13.

Periodic inspections of motor vehicles are required by 49 CFR 396.17. The minimum parts and accessories to be inspected are set forth in 49 CFR Appendix G of Subchapter B (located after 49 CFR 399). The inspection is required each 12 months. The report content is specified in 49 CFR 396.17. The inspector qualifications and recordkeeping requirements are set forth in 49 CFR 396.19 and 396.21, respectively. Qualifications for brake inspectors are found in 49 CFR 396.25

EMERGENCY EQUIPMENT

Using 49 CFR 393.95, this section will identify what emergency equipment must be carried on all vehicles that transport hazardous and radioactive waste.

Each vehicle used to transport hazardous or radioactive waste is required to have the following emergency equipment, in accordance with 49 CFR 393.95.

- Fire extinguisher(s) (49 CFR 393.95(a))
- Spare fuses (49 CFR 393.95[c])
- Warning devices for stopped vehicles (49 CFR 393.95(f) through 393.95 [k])

PROTECTION AGAINST SHIFTING AND FALLING CARGO

Using 49 CFR 393 subpart I, this section will establish the requirement that each vehicle that transport hazardous and radioactive waste be loaded and equipped to prevent the shifting or falling of the cargo. It will require that the driver inspect the load prior to each movement of the vehicle. The section will provide general criteria which must be met to ensure protection against shifting and falling cargo. Information for ANSI N-14.2 "TieDowns For Truck Transport of Radioactive Materials" will also be used as an information source.

Packages containing hazardous or radioactive waste shall be blocked, braced, and tied down to prevent any change in position under conditions normally incident to transportation. The packages must be secured through utilization of an approved method, and this must be accomplished in a manner which will insure the integrity of the packaging. Blocking and bracing must also insure that the load will continue to remain stable for unloading after the restraints (tiedowns) are removed.

Tie-down assemblies, systems, and materials used to restrain packages must meet the requirements of 49 CFR 393.102. Acceptable guidelines for procedures consistent with good industrial practice include, but are not limited to, the following:

- Individual components of a tie-down system must be utilized other than in the manner intended. The use of plastic or fiber rope, any damaged material, or any material of unknown strength is prohibited. Materials used in tie-downs must be considered for their elastic properties. They must be protected from excessive exposure to contaminants (i.e. dirt, chemicals, water, etc.) and inclement weather conditions when not in use.
- The principle tie-down forces should be transmitted to the vehicle frame and not to the wood or metal decking. The rub-rail (located alongside the trailer bed framework) must never be used as a tie-down attachment point. Its strength is unknown and normally insufficient for load bearing. The hook, bolt, weld, or other connector by which the tie-down assembly is attached to the vehicle, and the mounting place shall be at least as strong as the strength of the tie-down

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assembly when the connector is attached in any direction in which the assembly may be applied.

ANSI N-14.2 "Tiedowns For Truck Transport of Radioactive Materials" is a source of specific information for securing radioactive waste.

In addition, each transport vehicle shall conform to the applicable requirements of 49 CFR 393.100, 393.102, 393.104, and 393.106 for protection against falling or shifting cargo, securing systems, blocking, bracing, and front-end structures.

Each vehicle transporting hazardous or radioactive waste shall be equipped with devices against shifting or falling cargo that meet the requirements of one of the following options.

- Option A. The vehicle must have sides, side-boards, or stakes, and a rear tail gate, end board, or stakes. Those devices, must be strong enough, and high enough to assure that any packages does not shift upon, or fall form the vehicle. Those devices must have no aperture large enough to permit the packages in contact with one of more of the devices to pass through it.
- Option B. The vehicle must have at least one tie-down assembly that meets the requirements of 49 CFR 393.102 for each ten linear feet of lading or fraction thereof.

DRIVING OF VEHICLES

Using 49 CFR 392 and 397, this section will establish specific requirements which must be met during the operation of vehicles carrying hazardous and radioactive waste.

49 CFR 392 contains many general requirements for driving any motor vehicle. The only requirement specific to hazardous or radioactive waste is to stop at railroad grade crossings unless excepted (49 CFR 392.10).

Placarded shipments of hazardous waste and radioactive waste must comply with the requirements of 49 CFR 397. These requirements include:

- Attendance of the vehicle when it is located on a public street or highway or on the shoulder of a public highway (49 CFR 397.5)
- No parking on or within 5 feet of the traveled portion of a public street or highway (49 CFR 397.7)

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- No parking within 300 feet of an open fire (49 CFR 397.11)
  - No smoking within 25 feet of explosives, oxidizing substances, flammable materials, or an empty tank placarded for flammable liquid or flammable gas residues (49 CFR 397.13)
  - During fueling, the engine must not be operating and the person must be in control of the fueling process at the point the fuel tank is filled (49 CFR 371.15)
  - Tires inspected in compliance with 49 CFR 397.17

PRE-TRANSPORT INSPECTION

This section will establish the requirement that prior to transport the driver inspect the packaging, documentation, marking, labeling, and placarding of the shipment. It will require that the inspection be documented and provide general criteria to be used for the inspection.

Prior to transporting hazardous and radioactive waste, the driver shall perform an inspection of the packaging, shipping papers, marking, labeling, and placarding of the shipment. The inspection is documented and filed with the XXXX (ASK CLIENT) organization. The minimum criteria for the inspection is:

- Packaging—the packaging must be intact with no leakage of waste visible.
- Shipping papers—Emergency response information (DOT Response Guide and MSDSs) is required with the shipping paper. In addition, a signed manifest and approved Chemical Waste Disposal Request is required for hazardous or mixed waste.
- Marking—The required DOT Identification numbers must be displayed on bulk packaging (DOT-defined bulk packaging). The marking must be securely attached to the containers.
- Labeling—Non-bulk packaging must be labeled consistently with the proper shipping name on the shipping papers. The labels must be securely attached to the containers.
- Placarding—The vehicle must be placarded with the placards (or similar placards) as offered by the shipper. All four sides of the vehicle require the same placard.

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- Segregation—Are different hazard classes segregated according to the requirements in 49 CFR 177.848.

EVALUATION OF CONTRACTORS

This section will establish the requirement that BUS-6 evaluate all contractors used to transport hazardous or radioactive waste. The section will identify the criteria that BUS-6 should use in conducting this evaluation.

BUS-6 will evaluate contractors that will be involved in the transportation of hazardous and radioactive waste. The minimum criteria are:

- All contractors that meet the definition of a Hazmat employee will have the training required by 49 CFR 704 and Appendix A of Chapter 5.
- Compliance with the Hazardous Materials Transportation and Fee Assessment Program, as applicable to the work to be performed.
- Experience with hazardous and radioactive waste packaging and transportation, applicable to the work scope. Project references shall be contacted.

The following criteria apply only to carriers:

- For carriers, any hazardous materials incident reports within the last twelve months.
- Check with off-site TSDF to be used to see if they have a list of carriers approved for their facility
- General management of carrier's off-site facility
- Standing emergency response plan; spill response contractor on call
- Adequate liability insurance and company financial stability

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APPENDIX C (LIST OF ACRONYMS)

ANSI	American National Standards Institute
CFR	Code of Federal Regulations
CMWO	Chemical and Mixed Waste Operations
CWDR	Chemical Waste Disposal Request
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
ES&H	Environment, Safety, and Health
GFP	Government-Furnished Property
HAZMAT	Hazardous Materials
HMPT	Hazardous Materials Packaging and Transportation
HMTF	Hazardous Materials Transfer Form
ID	Identification
LANL	Los Alamos National Laboratory
LSA	Low-Specific Activity
MSDS	Material Safety Data Sheet
NCR	Nonconformance Report
P&T	Packaging and Transportation
PATS	Packaging and Transportation Services
POP	Performance-Oriented Packaging
QAP	Quality Assurance Program
RMTF	Radioactive Material Transfer Form
RQ	Reportable Quantity
RSWD	Radioactive Solid Waste Disposal
SNM	Special Nuclear Material
SST	Safe-Secure Trailer
TSDF	Treatment, Storage, and Disposal Facility
UN	United Nations

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