

## **RADIOACTIVE MATERIAL TRANSPORTATION AND PACKAGING SAFETY**

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### **1.0 SCOPE**

This performance assessment guide for radioactive material transportation and packaging safety is used to perform the U.S. Department of Energy (DOE) Brookhaven Group oversight responsibility. It is prepared to assist in conducting performance-based assessments of prime contractors and subcontractors to ensure that their transportation and packaging programs effect satisfactory facility performance.

Radioactive material transportation and packaging safety assessments will be directed at all prime contractors and subcontractors working at DOE sites. DOE line management must ensure that these contractors comply with DOE Orders and Federal and State regulations. Information developed from this assessment will determine the degree of line management's oversight effectiveness, as well as the effectiveness of the laboratory's program. In addition, DOE line management has responsibilities to perform technical reviews and approvals of transportation and packaging documents.

### **2.0 ATTRIBUTES AND LINES OF INQUIRY**

This section provides lines of inquiry to help assess whether the organization has implemented a program that ensures that radioactive material transportation and packaging safety requirements are incorporated into line activities. This section will be used to evaluate the laboratory's line organization. Guidelines and regulations that are unique to transportation and packaging safety are contained in the sections below. These sections are separated into two distinct areas, radioactive material transportation safety and radioactive material packaging safety, to permit independent assessments, if desired.

This section covers radioactive material packaging safety.

**2.1** The laboratory has a program with formal procedures, that provides systematic instructions and pertinent training, for ensuring that the packaging safety requirements are met.

- Does the laboratory maintain written procedures that specify the approved packaging, labeling, and verification of the packaging used to transport hazardous materials?

- Does the laboratory provide documented training (and re-qualification training) in the areas of approved handling, packaging, labeling, and verification of the hazardous materials?
- Do the laboratory's personnel follow the written procedures?
- Does the laboratory have regular and periodic inspection procedures to ensure that these procedures are followed?
- Do the procedures contain checklists that are used to ensure that the packing material and labeling requirements are met?
- Are these checklists periodically reviewed to ensure their compliance with the latest regulations?
- Are the checklists independently verified prior to transportation?
- How does the laboratory identify, track, resolve, and trend packing deficiencies?
- Are the operating procedures adequate to ensure that the determinations and controls required by regulations are accomplished?
- Are the regular and periodic inspection procedures adequate to ensure that the controls established under regulations are followed?

**2.2** The laboratory has a quality assurance program that consists of formal procedures to ensure that the requirements for packaging safety are met.

- How are the required standards of quality met in the fabrication, assembly, and testing of each package?
- Does the laboratory maintain the required standards of quality for in-use packages?
- How does the laboratory require that specific responsibilities be assigned to designated units (including the vendor, the fabricator, and the laboratory) for ensuring specified quality at all stages of construction?
- Does the laboratory designate codes, standards, and specifications for materials, equipment, methods of fabrication, testing, and performance specifications?
- How is the quality control of materials, equipment, and services ensured?

- Are the quality assurance records maintained in an auditable file during the service life of the container?
- How does quality control ensure that packages procured for use from other sources meet regulatory requirements?
- Are there established acceptance criteria in terms of measurable characteristics?
- Is there a program of routine maintenance inspection and, where necessary, retesting to ensure that all reusable containers used by DOE continue to meet the applicable design standards?
- Does the laboratory provide the required training, testing, and certification of manufacturing and inspection personnel involved in special processes?
- Is there a program that certifies the equipment and procedures used in the performance of special processes?

**2.3** The laboratory conducts a preliminary determination to ensure packaging safety requirements are met.

- Prior to the first use of any packaging for the shipment of more than a Type A quantity of radioactive material or fissile materials, is the packaging inspected to ascertain that there are no cracks, pinholes, uncontrolled voids, or other defects that could significantly reduce its effectiveness?
- Prior to the first use of any packaging for the shipment of more than a Type A quantity of radioactive material or fissile materials, where the maximum normal operating pressure will exceed 5 pounds per square inch gauge, is the containment vessel tested to ensure that it will not leak at an integral pressure 50 percent higher than the maximum normal operating pressure?
- Is the packaging marked conspicuously and durably with its model number?
- Prior to applying the model number, was an inspection performed to determine that the packaging had been fabricated in accordance with the approved design?

**2.4** The laboratory verifies that the packaging standards required by regulations are complied with prior to shipment of radioactive or fissile materials.

- Is required moderator and non-fissile neutron absorbing material used?

- Does the laboratory have a process that ensures that the package is undamaged and that critical components required to ensure the package's integrity are free from defects and properly installed?
- Does the packaging ensure that contamination of the primary coolant will not exceed the limits prescribed by regulations?

**2.5** The laboratory maintains shipping records for a minimum of 2 years for shipments of packages containing fissile material or greater than Type A quantities of radioactive material.

- Do shipping records include certificate of compliance information, package serial number, volume and type of coolant, type and quantity of material in each package, total volume in the shipment, date of shipment, name and address of the transferee, and the address of the delivery location?
- Is irradiated fissile material identified by model, irradiation decay history, and any unusual condition related to radiation safety?
- Are special controls provided for Fissile Class III shipments?
- Are the results of the Preliminary Determinations and Routine Determinations included in the shipping documentation as required by regulations?

**2.6** The laboratory maintains technical backup support documentation for certified, exempt, and specification packaging to ensure packaging safety requirements are met.

- Does the laboratory prepare a distributable document for each new specification or certified packaging designed, developed, and fabricated for off shipment of fissile and other radioactive materials in quantities exceeding Type A?
- Is there a complete physical and technical description for each specific package used?
- Does each package have a unique safety analysis report for packaging, including considerations for meeting the requirements for packaging and transport safety, nuclear criticality safety, and radiological safety? (Does Type B packaging meet the Type B hypothetical accident test conditions?)
- Does the design and development information include pertinent data, analytical methods, test criteria, and test results?
- Does the documentation contain test data, graphs, drawings, pictures, and technical references as required to give a clear treatment of the subject?

**2.7** The laboratory prepares a safety analysis report for packaging (SARP) for all Type B and fissile material packaging designs, certified by DOE, in accordance with DOE regulations?

- Does the SARP include a detailed description of the design basis engineering assumptions applicable to the package?
- Does the SARP identify established codes and standards proposed for use in package design, fabrication, assembly, testing, maintenance, and use?
- Does the SARP include a description of the proposed packaging in sufficient detail to identify the packaging accurately, and provide the basis for evaluating the packaging?
- Are detailed instructions for operations and maintenance included in the SARP?
- In the absence of any codes and standards, does the applicant describe the basis and rationale used to formulate the packaging quality assurance program?
- Does the SARP include a description of the quality assurance program for the design, fabrication, assembly, testing, maintenance, repair, modification, and use of the proposed packaging?
- Does the SARP identify any specific provisions of the quality assurance program that are applicable to the particular packaging design under consideration, including a description of the leak-test procedure?

**2.8** The laboratory maintains documentation to demonstrate that each package meets the testing requirements of DOE regulations.

- How does the laboratory verify and document that the specific packaging requirements are met for vendor-supplied packages?
- Is there a documented test plan for each package that details the testing requirements, testing results, and the acceptance criteria, if applicable?
- For each package type, have the appropriate tests been included as required by regulations, if applicable?
- For each package type, do the test results satisfactorily meet the acceptance criteria of regulations, if applicable?

**2.9** Upon completion of a satisfactory DOE review of the SARP by the certifying official, the official prepares and issues a DOE Certificate of Compliance (COC) using DOE F 5822.1. The COC is signed by the certifying official (or a formal designee) and contains the appropriate information.

- Are there procedures describing the review process for the COC?
- Is there a unique COC available for each package?
- Does the COC contain a certificate number, revision number, package identification in accordance with DOE regulations, date of issue, date of expiration, and approval signature?
- Are all pages of the COC numbered, dated, and identified by the COC number?
- Is the SARP identified in the COC in accordance with DOE regulations?
- Does the appendix list alternative package contents, identify modifications and amendments, and provide other necessary technical data?

**2.10** The laboratory has a program with formal procedures that ensures that the transportation safety requirements are met.

- Is the transportation report submitted annually by the field organizations and the director of administrative services?
- When the DOE Field Organization serves as the actual consignor (shipper), are there independent internal procedures established by the responsible head of the Field Organization that ensure compliance with the standards contained in DOE regulations?
- Does the shipper maintain written procedures that specify the approved transportation requirements for hazardous materials?
- Does the shipper provide documented training (and requalification training) in the regulations governing transportation safety?
- Does the shipper have regular and periodic inspection procedures to ensure that the transportation requirement procedures are followed?
- Do the shipper's personnel follow a written procedure for the transportation of hazardous materials?

- Are the motor carrier drivers that transport irradiated reactor fuel qualified and trained in the Federal Highway Administration regulations in 49 CFR parts and titles as specified in DOE regulations?
- Are there specific procedures that cover general requirements for physical protection of irradiated reactor fuel in transit?
- Do the procedures include checklists that are used to ensure that the transportation requirements are met prior to departure?
- Are these procedures periodically reviewed to ensure their compliance with the latest regulations?
- Are the checklists independently verified prior to departure?
- How does the laboratory identify, track, resolve, and trend transportation problems?
- Does the shipper have an emergency response procedure?
- Are the operating procedures adequate to ensure that the determinations and controls required by DOE regulations are accomplished?
- Are the regular and periodic inspection procedures adequate to ensure that the controls established under DOE regulations are followed?

**2.11** The laboratory has a program that ensures that the vehicle is appropriate for safely transporting the load.

- Is the vehicle selected appropriate for the weight, concentration, and center of gravity of the load? (This is a joint responsibility of the shipper and carrier.)
- Before a shipment is loaded on a transport vehicle, does the shipper visually survey the equipment externally to determine its general operating condition, its capability to transport the shipment, the existence of appropriate restraint devices in good condition, and does the shipper ensure the estimated gross weight of the shipment does not exceed the authorized carrying capacity of the conveyance?
- Does the shipper routinely give the carrier prior notification of overweight or overdimensional shipments? Does the carrier ensure that highway weight and clearance restrictions are met?

**2.12** The laboratory has a program that ensures that the vehicle is safely loaded and unloaded.

- Are reasonable precautions such as wheel chocking taken to prevent motion of the conveyance during loading or unloading?
- Is the loading device used to load or unload a shipment appropriate for the dimensions and weight of the package? (Loading devices that may possibly damage any packages of a shipment shall not be used.)

**2.13** The laboratory has a program that ensures that the load is properly secured to the transporting vehicle.

- Do heavy containers not shipped on specially designed vehicles have skids or load spreaders to maintain load distribution within the area load-rating of the vehicle, or to less than 500 pounds per square foot, whichever is less?
- Is the shipment positioned on the conveyance in such a way that the weight is equally distributed over the width and length of the conveyance?
- Is the shipment secured in accordance with the acceptable practices of DOE regulations?
- Is the load inspected thoroughly by the shipper and carrier prior to release of the shipment?
- Does the shipper require the carrier to check the tiedowns periodically during transit, and tighten them as necessary?

**2.14** The laboratory maintains notification procedures for shipment and nonreceipt of radioactive materials to ensure that transportation safety requirements are met.

- Prior to each shipment of fissile radioactive materials, or shipments of more than Type A quantity or radioactive material, does the shipper notify the consignee of the dates of the shipment and of the expected arrival?
- Does the shipper notify each consignee of any special loading or unloading instructions prior to the first shipment?
- If the shipment has not been received within 4 days of the estimated arrival date, does the consignee immediately notify the shipper?
- Are lost, strayed, or stolen shipments that are not recovered or accounted for reported to the field organization transportation officer as an unusual occurrence?

- For all radioactive material shipments (Type A, Type B, low specific activity) is a return receipt requested?
  - Does the shipper followup on the shipment status if the return receipt is not received within 1 month?
- 2.15** The laboratory has a process to ensure that the hazardous material packages are properly labeled prior to shipment.
- Is the package labeled with the appropriate category and transport index in accordance with 49 CFR Parts 171 through 179.
- 2.16** The shipping papers provide an adequate description of the contents of the hazardous material shipment and other applicable information.
- Do the shipping papers include the name of the shipper, the number of pages, an emergency response telephone number, the shipping name of the hazardous material, a description of the physical and chemical form of the material, the hazard class, the hazard material identification number, the total quantity by weight or volume, the activity (in terms of curies, millicuries, or microcuries), and the transport index?
  - Is there an annotation to indicate that the exclusive use of a vehicle was requested and was furnished by the carrier, if applicable?
  - When applicable, is there an annotation to indicate that a signature is required?
- 2.17** The laboratory has a program to control and account for inter- and intra-laboratory transfers of nuclear material.
- Does this program include documented procedures that specify requirements for authorization, documentation, tracking, verification, and response to abnormal situations?
  - Has the shipper verified that the intended receiver is authorized to accept the material being transferred?
  - Immediately after receipt, are shipments checked for confirmation of shipping container, tamper-indicating device integrity, and identification and comparison with shipping documentation?
  - Are transfers of nuclear material between facilities having different Reporting Identification Symbols documented by DOE/NRC Form 741?

- Are measurement requirements met for external transfers of nuclear materials?
- 2.18** The laboratory implements a program for assessing material control indicators in order to provide assurance against the loss and unauthorized removal of nuclear material.
- Does each facility have written procedures for evaluating the shipper/receiver differences, and for investigating and reporting significant differences?
  - Are significant shipper/receiver differences resolved within 1 hour of detection?
- 2.19** A program exists to ensure that the transport requirements for low specific activity (LSA) radioactive materials are met.
- Are packaged shipments of LSA material consigned as exclusive use in a DOT Specification 7A Type A package, if applicable?
  - Are materials packaged in strong, tight packages so that there will be no leakage of radioactive material under conditions normally incident to transport?
  - Are packages verified to not have any significant removable surface contamination?
  - Do external radiation levels comply with 49 CFR 173.441?
  - Is the exterior of each package marked "Radioactive-LSA"?
  - Are specific instructions for maintenance of exclusive use shipment controls provided by the shipper to the carrier?
  - Is transportation by air prohibited?
  - Are unpackaged (bulk) shipments of LSA materials transported only in exclusive-use closed-transport vehicles and in compliance with 49 CFR 173.425?

### **3.0 STANDARDS AND REQUIREMENTS**

#### **3.1** Specific DOE Orders and Standards.

- DOE O 232.1A, "Occurrence Reporting and Processing of Operations Information."
- DOE O 440.1A, "Worker Protection Management for DOE Federal and Contractor Employees."
- DOE 2300.1B, "Audit Resolution and Followup."

- DOE 2321.1B, "Auditing of Programs and Operations."
- DOE 5632.1C, "Protection and Control of Safeguards and Security Interests."
- DOE 5633.3B, "Control and Accountability of Nuclear Materials."
- DOE 5660.1B, "Management of Nuclear Materials."
- DOE 5820.2A, "Radioactive Waste Management."

### **3.2** NRC Title 10 CFR Requirements.

- 10 CFR Part 71, "Packaging and Transportation of Radioactive Material."
- 10 CFR Part 871, "Air Transportation of Plutonium."

### **3.3** DOT Title 49 CFR Requirements.

- 49 CFR Parts 100-199, Research and Special Programs Administration, Department of Transportation.

## **4.0** **GUIDANCE TO ASSESSOR**

This assessment guide is intended to assist in conducting a performance assessment of radioactive material transportation and packaging safety. It is not to be considered as all-inclusive, inflexible, or limiting reasonable assessment concentration; especially when lines of inquiry responses dictate that an area must be more thoroughly probed.