

# NRC INSPECTION MANUAL

NMSS

---

## INSPECTION PROCEDURE 86740

---

### INSPECTION OF TRANSPORTATION ACTIVITIES

PROGRAM APPLICABILITY: 2500, 2515, 2600, and 2800

<u>Contents</u>	<u>Page</u>
86740-01 INSPECTION OBJECTIVES .....	3
86740-02 INSPECTION REQUIREMENTS .....	3
SUBSECTION A BASIC REQUIREMENTS	
02.01 Preparation of Packages for Shipment .....	3
a. Preliminary Determinations .....	3
b. Routine Determinations .....	3
c. Liquid Package Requirements .....	3
d. Packaging Marking .....	3
e. Package Labeling .....	3
f. Radiation Monitoring .....	4
02.02 Delivery of Completed Packages to Carriers .....	4
a. Shipping Paper Documentation .....	4
b. Loading and Placarding Non-Exclusive-Use Shipments .....	4
c. Loading and Placarding Exclusive-Use Shipments .....	4
02.03 Receipt of Packages .....	4
02.04 Records and Reports .....	4
a. DOT Specification 7A Type A Packaging .....	4
b. Special Form Documentation .....	4
c. Incident Reporting .....	5
SUBSECTION B ADDITIONAL REQUIREMENTS	
02.05 General License Requirements .....	5
02.06 Management Controls .....	5
02.07 Indoctrination and Training Program .....	5
02.08 Quality Assurance Program .....	6
02.09 Audit Program .....	6
02.10 Procurement and Selection of Packagings .....	6
a. Fabrication of Packagings .....	6
b. DOT Revalidation of Foreign-Approved Packagings .....	6

<u>Contents</u>	<u>Page</u>
02.11 Preparation of Packages for Shipment .....	6
a. Package Marking .....	6
b. Advance Notification to Consignee .....	6
c. Advance Notification to States .....	6
02.12 Periodic Maintenance of Packagings .....	7
02.13 Records, Reports, and Notifications .....	7
a. Record of Shipment .....	7
b. Quality Assurance Records - Components and Services .....	7
c. Quality Assurance Records - Other .....	7
d. Notification of Excess Contamination or Radiation Level .....	7
e. Reduction in Package Effectiveness Report .....	7
86740-03 INSPECTION GUIDANCE	
03.01 General Guidance .....	7
03.02 Specific Guidance .....	8
SUBSECTION A GUIDANCE FOR BASIC REQUIREMENTS	
a. Inspection Requirement 02.01(c) .....	8
b. Inspection Requirement 02.01(d) .....	8
c. Inspection Requirement 02.01(e) .....	9
d. Inspection Requirement 02.01(f) .....	10
e. Inspection Requirement 02.02(a) .....	10
f. Inspection Requirement 02.02(b) .....	12
g. Inspection Requirement 02.03 .....	12
h. Inspection Requirement 02.04(a) .....	12
i. Inspection Requirement 02.04(b) .....	13
SUBSECTION B GUIDANCE FOR ADDITIONAL REQUIREMENTS	
j. Inspection Requirement 02.06 .....	13
k. Inspection Requirement 02.08 .....	13
l. Inspection Requirement 02.10(a-b) .....	14
m. Inspection Requirement 02.11(a) .....	14
n. Inspection Requirement 02.11(b) .....	15
o. Inspection Requirement 02.11 .....	15
86740-04 RESOURCE ESTIMATE .....	16
86740-05 REFERENCES	
05.01 Regulations .....	16
05.02 NRC Information Notices .....	16
05.03 NRC Regulatory Guides .....	18
05.04 Other Publications .....	19

## 86740-01 INSPECTION OBJECTIVES

To determine whether the licensee has established and is maintaining an effective management-controlled program, to ensure radiological and nuclear safety in the receipt, packaging, delivery to a carrier and, as applicable, the private carriage of licensed radioactive materials; and to determine whether transportation activities are in compliance with the applicable Nuclear Regulatory Commission (10 CFR Parts 20 and 71) and Department of Transportation (DOT) (49 CFR Parts 171-178) transport regulations.

This inspection procedure is organized into two sections: Section 1 covers basic transportation requirements found in 10 CFR Part 20, 10 CFR Part 71, Subpart A, and 49 CFR Parts 171-177. Section 2 covers additional transportation requirements found in 10 CFR Part 71, Subparts C, G, and H, and corresponding parts of 49 CFR.

Use Section 1 to inspect all licensees. Determine whether the licensee meets the exemption criteria in 10 CFR Part 71 Subpart B. If the licensee meets the exemption criteria, the inspection may be concluded after conducting Section 1; Section 2 does not apply. If the licensee does not meet the exemption criteria, use both Sections 1 and 2 to conduct the inspection.

## 86740-02 INSPECTION REQUIREMENTS

### SUBSECTION A BASIC REQUIREMENTS

02.01 Preparation of Packages for Shipment. Examine the licensee's written procedures and shipment records. As the situation allows, observe actual package preparations and operations so as to:

- a. Preliminary Determinations. Verify that before the initial use of any packaging, the licensee performs the required preliminary determinations and quality control relating to construction of the packaging (49 CFR 173.474).
- b. Routine Determinations. Verify that before each use of any packaging the licensee performs the required routine determinations and quality control (49 CFR 173.475 and 10 CFR 71.87).
- c. Liquid Package Requirements
  1. Verify that for non-low specific-activity (LSA) Type A packages with liquid contents, the licensee has provided for the required special testing, double containment system, and absorbent material, as appropriate [49 CFR 173.412( k)].
  2. Verify that when required for packages containing liquid contents exceeding a Type A quantity and destined for air shipment, a test for leakage is performed on the containment system [49 CFR 173.475(g)].
- d. Packaging Marking. Verify that the licensee has marked the package with the applicable general and specific package markings that are required (49 CFR 172.300 - 310). Note that 49 CFR 172.324 addresses reportable quantity (RQ) markings on packages).
- e. Package Labeling. Verify that for non-exempted packages, the licensee provides for and accomplishes labeling of each package with the appropriate category of RADIOACTIVE (White-I, Yellow-II, or Yellow-III) label, one each on two opposite sides of the package; and accurately completes the entry of the required information in the blank spaces thereon (49 CFR 172, Subpart E).

- f. Radiation Monitoring. Verify that the licensee provides for and accomplishes monitoring of each completed package, to ensure that external radiation and removable surface contamination are within the allowable limits [49 CFR 173.441, 49 CFR 173.443, 49 CFR 173.475(i), and 10 CFR 71.87(i) and (j)].

02.02 Delivery of Completed Packages to Carriers. Examine the licensee's written procedures, shipment records, and as the situation allows, observe actual transport operations.

- a. Shipping Paper Documentation. Verify whether the licensee prepared the required shipping paper documentation, and accurately included all the applicable required elements of information, including the shipper's certificate. [NOTE: for licensee private motor vehicle shipments, the certificate is not required (49 CFR 172.204(b))].

In the case of low-level solid radwaste shipments to licensed land burial sites (10 CFR Part 61), verify that the shipping paper documentation also includes the required additional "waste manifest" information (Appendix G, 10 CFR Part 20).

- b. Loading and Placarding Non-Exclusive-Use Shipments. Verify that the licensee provides to a highway carrier, or applies directly to a rail vehicle, the required placards, whenever the licensee delivers any quantity of RADIOACTIVE-Yellow-III labeled packages to such carrier for transport (49 CFR 172.506 and 508).

- c. Loading and Placarding Exclusive-Use Shipments

1. Verify that the licensee ensures that the package and vehicle radiation/contamination levels are within the regulatory limits (49 CFR 173.441 and 443).
2. Verify that, except for uranium or thorium ores, the transport vehicle is placarded by the licensee when delivering to a carrier any exclusive-use shipment for which placarding is required [49 CFR Part 172, Subpart F, and 49 CFR 173.427(a)(6)(v)].
3. Verify that shipping paper documentation provided by the licensee to the carrier contains satisfactory instructions for maintenance of exclusive-use shipment controls [49 CFR 173.441(c) and (e) and 49 CFR 173.427(a)(6)(iv)].
4. Verify that for exclusive-use shipments of LSA materials, the licensee has provided for the additional specific requirements [49 CFR 173.427(a), (b), or (c)].

- d. HAZMAT Employee Training. Verify that persons involved in the packaging preparation and transport have received proper and adequate training, and that this training has been appropriately documented [49 CFR 172.700 - 704].

02.03 Receipt of Packages. Examine the licensee's procedures and records of incoming shipments to verify compliance with the applicable requirements relating to pickup from a carrier, receiving, and safe opening of packages (10 CFR 20.1906).

02.04 Records and Reports. Review licensee's records and procedures for recordkeeping and reports to verify that a system is in place to:

- a. DOT Specification 7A Type A Packaging. Maintain, on file, for at least one year after shipment, the documentation of DOT Spec. 7A safety analysis/testing and/or special form testing [49 CFR 173.415(a), 49 CFR 173.469, and 49 CFR 173.476].
- b. Special Form Documentation. Verify that for packages where the licensee relies on a special form determination, to qualify the package as either a limited or Type A quantity, the licensee maintains on file, for at least one year after any shipment, and

provides, on request, the documentation demonstrating that the special form material meets the applicable test requirements (49 CFR 173.469 and 173.476).

- c. Incident Reporting. Immediately report to DOT, when transporting licensed material as a private carrier, any incident that occurs in which, as a direct result of the radioactive material, any person is killed, receives injuries requiring hospitalization; property damage exceeds \$50,000; or fire, breakage, spillage, or suspected radioactive contamination occurs (49 CFR 171.15 and 49 CFR 171.16).

## SUBSECTION B ADDITIONAL REQUIREMENTS

02.05 General License Requirements. Determine which general license(s) in 10 CFR Part 71, Subpart C, the licensee uses to ship radioactive material packages (e.g., 10 CFR 71.12, 71.14, 71.16, etc.). Verify that:

- a. The licensee has copies of the specific license, NRC Certificate of Compliance (COC), DOT specification, or other approval of the package.
- b. If shipping NRC-certified package(s), has registered with NRC as a user of NRC-certified package(s).
- c. Complies with 10 CFR Part 71, Subparts A, G, and H, as applicable.
- d. Has a quality assurance (QA) program approval issued by the Commission, as applicable.
- e. Complies with other requirements specific to the general license(s) used.

02.06 Management Controls. Review the system of management controls for transportation activities and verify that:

- a. Transportation authorities and responsibilities are delineated among individuals and/or organizational entities, and designated in writing.
- b. Written management-approved instructions have been established to carry out the various transportation activities, including authorized changes.

02.07 Indoctrination and Training Program. Verify implementation of the indoctrination and training program for persons involved in the licensee's transport activities:

- a. Discuss the program with the licensee's representative charged with the responsibility for the training. Identify the major elements of the program: the basis used for selection of personnel to be trained; the schedules and performance of training; and methods used to ensure qualification of competence; and methods to keep people informed of changes in procedures and requirements.
- b. Examine records of training completion for all employees involved in transport activities.
- c. Discuss the training with one or two supervisors and one to five employees, selected at random, to verify their participation in the training program. In addition to discussions, inspectors may review licensee shipping records, and observe licensee activities to check supervision and/or employee knowledge of licensee-related specific procedural requirements.

02.08 Quality Assurance Program. Review the licensee's documented quality assurance (QA) program, to ensure that the licensee has fulfilled all commitments made in the licensee's QA program application, including development of written QA procedures for transporting radioactive material.

02.09 Audit Program. (10 CFR 71.137). Review the report of the most recent audit of transport activities conducted by the licensee and, if possible, discuss the audit program with one to five employees, selected at random, to check their degree of knowledge of the program and to aid in ensuring that the licensee is conducting an adequate program. Employee knowledge may also be evaluated by review of shipping records and directly observing transportation activities. Verify whether:

- a. The most recent audit was conducted in accordance with the licensee's published procedures, and
- b. Identified deficiencies (if any) were corrected, or are being corrected, before any more shipments are made.

02.10 Procurement and Selection of Packagings. For packagings that are used by the licensee to transport or to deliver licensed material to a carrier for transport, review the procedures and records for the following:

- a. Fabrication of Packagings. Verify, by physical examination and examination of records, whether new packagings have been fabricated in accordance with the approved design (i.e., NRC Certificate of Compliance (COC) or DOT specification). For packagings supplied by, procured leased from a vendor or supplier, verify that the licensee has obtained a written statement from such supplier, certifying that the package has been fabricated in accordance with a NRC-approved quality assurance program.
- b. DOT Revalidation of Foreign-Approved Packagings. Verify that for foreign-approved packagings used by the licensee, such designs have been revalidated by DOT, and the licensee possesses a copy of the applicable foreign certificate, DOT revalidations, and documentation referenced therein, which relate to the use and/or maintenance of the packaging and actions to be taken before shipment (49 CFR 173.473 and 10 CFR 71.16).

02.11 Preparation of Packages for Shipment

- a. Package Marking. Verify that, for NRC-certificate packages or DOT-revalidation packages of foreign origin, the outside of the package is durably and legibly marked with the package identification marking indicated in the COC or the DOT Competent Authority Certificate.
- b. Advance Notification to Consignee. Verify that the licensee provides, for notification to the consignee before shipment: the dates of shipment and expected arrival, and any special loading/unloading or operating instructions whenever any non-exempt fissile materials and/or packages containing "highway route controlled quantities" are involved [49 CFR 173.22(c) and 10 CFR 71.89].
- c. Advance Notification to States. Verify that the licensee provides advance notification to the Governor of a State, or his designee, when required, as described in 10 CFR 71.97.

NOTE: This requirement is not the same as that required for safeguards purposes, pursuant to 10 CFR 73.72.

02.12 Periodic Maintenance of Packagings. For reusable NRC-certified, DOT specification, or DOT revalidated foreign-made packagings, examine the licensee's procedures and records for shipments, to verify that, before reuse, all the initial and periodic maintenance required by the certificate, specification, or revalidation has been performed. If possible, observe such maintenance activities (49 CFR 173.474, 49 CFR 173.475, 10 CFR 71.85, and 10 CFR 71.87). For multi-user packages supplied by another party, the licensee-user should obtain written certification that required periodic maintenance and quality control measures have been conducted in accordance with a NRC-approved quality assurance program.

02.13 Records, Reports, and Notifications. Review the licensee's records and procedures for recordkeeping and reports to verify that a system is in place to:

- a. Record of Shipment. Maintain on file for three years after any shipment, a record of each shipment of licensed material (which is not exempt therefrom) and that such records contain the required information [10 CFR 71.91(a)].
- b. Quality Assurance Records - Components and Services. Maintain, for three years after the life of any packaging, sufficient quality assurance records documenting evidence of the quality of packaging components and those services that are of safety significance, including the results of required preliminary determinations before first use of any packaging [10 CFR 71.85 and 10 CFR 71.91(c)].
- c. Quality Assurance Records - Other. Maintain, for three years after the last shipment, sufficient quality assurance records that furnish documented evidence to support the activities affecting quality assurance of transport packages (10 CFR 71.135).
- d. Notification of Excess Contamination or Radiation Level. Immediately notify the appropriate regional office and the delivery carrier for instances in which removable radioactive surface contamination and/or external radiation levels on packages received in a shipment exceed the applicable reporting limits [10 CFR 20.1906(d)].
- e. Reduction in Package Effectiveness Report. Report to the Director, Spent Fuel Project Office (SFPO), Office of Nuclear Material Safety and Safeguards (NMSS), within 30 days, any instances in which there has been a significant reduction in the effectiveness of any packaging during its use, providing additional details of any defects of safety significance to the packaging, after first use, and the means employed to repair such defects, to prevent their recurrence (10 CFR 71.95).

## 86740-03 INSPECTION GUIDANCE

03.01 General Guidance. In fulfilling the inspection requirements and objectives of this procedure, the inspector should assess the adequacy of the various aspects of the licensee's program in view of the licensee's total program. That is, he should consider for the various transportation activities such factors as the volume, quantity, and types of radioactive material involved, the inherent potential radiological hazards, the complexity of the packaging required, the number of shipments made and received over a period of time, the number of licensee employees involved in the activities, etc. In other words, a "graded approach" should be used in assessing the adequacy of the licensee's program, with the smaller programs requiring complete but less complex and extensive controls than larger programs. In the same context, the extent and scope of the inspection coverage may be adjusted accordingly. For example, inspection of the transportation program of a licensed processor/supplier of medical isotopes would require much broader inspection coverage: i.e., package procurement, preparation, delivery to carrier, radwaste shipments, etc., as contrasted with the inspection of a radiography user, wherein the primary focus would be on the transport of devices in private carriage. Correspondingly, the transport program of

a typical nuclear utility would focus on the package preparation and delivery to carriers of large volumes of radwaste materials and spent fuel shipments.

### 03.02 Specific Guidance

#### SUBSECTION A GUIDANCE FOR BASIC REQUIREMENTS

- a. Inspection Requirement 02.01(c). Preparation of Packages for Shipment: Liquid Packaging Requirements. These requirements are very important in examining the packaging configurations used by suppliers of medical and industrial isotopes. Inspectors should verify that in the Type A testing of a given design, the licensee has considered the requirements of 49 CFR 173.412( k) relative to use of absorbent materials and/or a double containment system. For packagings exceeding 50 cc liquid volume, either option is allowed, whereas for less than 50 cc the use of an absorbent material is required. The configuration should be examined visually to verify that the absorbent material is suitably positioned to contact the liquid in the event of leakage. The package testing must also address the results of the additional requirement of 49 CFR 173.466 for liquids, i.e., a 30-ft drop test. For packages containing liquid greater than A<sub>2</sub> and destined for air shipments, the licensee is required to perform a leakage assessment on each package before shipment. Leakage testing methods are described in Regulatory Guide 7.4.
- b. Inspection Requirement 02.01(d). Preparation of Packages for Shipment: Package Marking. The specific requirements for marking of packages include:
  1. DOT proper shipping name (49 CFR 172.101 and 49 CFR 172.301).
  2. Identification number (e.g., UNXXXX or NAXXXX, 49 CFR 172.101 and 49 CFR 172.301).
  3. Gross weight, if greater than 110 pounds, "Type A" or "Type B" as appropriate and radiation symbol for Type B, Type B(U) or Type B(M) packages [49 CFR 172.310(a), (b), and (c)].
  4. For DOT 7A Type A packages, the words "USA DOT 7A Type A" and "Radioactive Material" [49 CFR 178.350].
  5. US NRC packaging approval number [49 CFR 173.471(b)].
  6. For DOT specification packages within a nonspecification outer overpack, a statement, such as, "Inside Package(s) Comply with Prescribed Specification(s)" [49 CFR 173.25(a)].
  7. "RADIOACTIVE -LSA," or "Radioactive-SCO" in the case of LSA or SCO packages transported as exclusive-use [49 CFR 173.427(a)(6)(vi)].
  8. Name and address of the consignee or consignor [49 CFR 172.301(d) ].
  9. "USA," in conjunction with the NRC-certificate or DOT-specification marking, if the package is destined for export [49 CFR 172.310 (d)].
  10. An appropriate arrow symbol to indicate upward positioning, where liquid contents are involved in a combination package [49 CFR 172.312(a)].
  11. "RQ" if reportable quantity of hazardous substance [172.324(b)].

The physical requirements for legibility and location of package markings are found in 49 CFR 172.304. Inspectors should not consider marking requirements as a less important requirement, since they constitute a very important element of the Hazardous Materials "Communications" requirements, along with labels, placards, and shipping papers. Marking deficiencies quite often indicate that the licensee is generally unaware of other regulatory requirements and are often accompanied by more serious packaging deficiencies.

- c. Inspection Requirement 02.01(e). Preparation of Packages for Shipment: Radiation Monitoring. Licensees who package and offer for transportation large numbers of small medical radiopharmaceuticals often use an "assembly-line" process, in which the loaded package travels past a fixed, preset radiation detector. Inspectors should carefully examine such systems, to ensure that they, in fact, are effective in ensuring compliance with the regulatory limits for radiation levels. Another question that frequently arises is the placement of a specification package (e.g., such as a radiography projector within an outer box or other type of enclosure during transportation). The question involves whether the radiation levels at the surface of the outer box and at 1 meter from the outer box may be used to establish the label requirements for the overall "package." Since DOT regulations do not address this, it is therefore permissible to apply labels, to the outer box, that reflect radiation levels around the outer box. The inner package, which is the authorized package, must be labeled to reflect radiation levels from that package, without the outer box.

Assuming that the inner package (the device) is labeled and marked as a specification package, the outer enclosure would, however, need to be further marked with a statement such as "Inside Packages Complies with Prescribed Specification" (49 CFR 173.25), and labeled as required, based on the radiation levels on the outer enclosure. (See also IE Information Notice 81-02.)

In instances where the licensee consolidates more than one inner package into outer overpacks, such as bags or cartons, certain rules for transport index (TI) determination, label entries, and markings are provided in 49 CFR 173.448(g).

On an open, exclusive use vehicle, a package may not exceed the 200-mrem/hr surface limit (i.e., a 1000-mrem/hr package must be in a closed transport vehicle [49 CFR 173.441(b)(1)(i) and 177.842(g)]. Inspectors, as well as licensees, should also be aware that the 1000-mrem/hr package limit applies at the surface. Further discussion on radiation limits and other requirements for exclusive-use shipments is provided in IE Information Notice 80-32 (August 29, 1980) and Rev. 1 thereto (February 12, 1982).

Preparation of Packages for Shipment: Contamination Monitoring. In 49 CFR 173.443, Table 11, the expressed limits applicable to a "wipe" sample are stated in terms of the actual limit on the wipe, itself. A "factor of 10" higher limit is allowed for packages shipped as exclusive use. Such packages are required to be at a "factor of 1" (2200 d/m/100 cm<sup>2</sup> beta/gamma) at the start of transportation, but may rise to a "factor of 10" during transportation (22,000 d/m/100 cm<sup>2</sup> beta/gamma). Exclusive-use vehicles in which the "factor of 10" higher-contamination packages are transported must be surveyed.

NOTE: For packages shipped in closed, exclusive-use vehicles dedicated only to radioactive materials shipments and so marked, the "factor of 10" limits may apply at the start of transport [49 CFR 173.443(d) and 177.843(b)]. This provision does not exist in 10 CFR 71.87(i); however, inspectors should be aware that licensees may still apply this provision even though it is not contained in 10 CFR Part 71.

A question sometimes arises concerning the performance of contamination surveys in those cases where a package, such as a cask, is provided with an external heat barrier or screen to achieve compliance with the heat limits of 49 CFR 173.442(b). The question is whether the contamination limits, as measured by wipe tests, may be taken at the surface of the external barrier or at the surface of the cask within the barrier screen. It is the NMSS position that the contamination limits must be applied at the package surface (including the surfaces between the package and any removable impact limiter) even though the heat limit is applied at the barrier surface. Monitoring of contamination levels at the outer barrier screen might not disclose the existence of contamination from the package or on the package. Monitoring of the surface contamination of the cask inside the barrier is therefore a regulatory requirement, whereas monitoring of both the cask surface and the outer barrier, would constitute a better health physics practice. (See IE Information Notice 83-10, March 11, 1983.)

- d. Inspection Requirement 02.01(f). Preparation of Packages for Shipment: Package Labeling. If possible, the inspector should examine one or more samples of completed, labeled packages to verify the adequacy of this requirement. The proper category of "RADIOACTIVE" label to be applied to each package is based principally, but not solely, on the measured dose rates at the package surface and at 1 meter (TI). Inspectors are also reminded that the TI assigned to the package label may be assigned on the basis of either nuclear safety for fissile materials or radiation, whichever number is higher. What this means is that in inspecting and surveying a package with a recorded TI, the radiation level reading at 1 meter from a fissile package may not be consistent with the recorded TI on the label. This is not a violation if the TI had been assigned on the basis of the nuclear safety value and is a larger number than it would be based on the actual radiation level at 1 meter. [See also 49 CFR 173.403 Transport Index definition].

Inspectors are also reminded that LSA or SCO packages in other-than-exclusive use are required to be labeled, whereas for exclusive use, they only are required to be marked "RADIOACTIVE-LSA", or "RADIOACTIVE-SCO," as appropriate.

NOTE: The package labeling requirements of 49 CFR Part 172, for purposes of transport, should not be confused with the requirements for marking packaged radwaste as Classes A, B, or C, for purposes of shallow land disposal, pursuant to 10 CFR Part 61. Further, the designators Classes A, B, or C waste bear no direct basis to Types A or B packages, for transport purposes.

- e. Inspection Requirement 02.02(a). Delivery of Completed Packages to Carriers: Shipping Paper Documentation. Requirements for shipping paper descriptions constitute a very important part of the hazardous materials regulatory "communications" requirements, the others being labels, marking, and vehicle placards. Generally speaking, as is the case for marking, observation of shipping paper deficiencies may be symptomatic of more serious deficiencies in packaging; therefore, inspectors should be familiar with the detailed shipping paper requirements. Generally speaking, a shipping paper may be any type of transportation document, i.e., bill of lading, shipping invoice, radioactive waste shipment record, etc. However, it must contain the following elements of applicable information [49 CFR 172.201, 172.202, and 172.203 (d)]:
1. The applicable DOT proper shipping name and hazard class, "Radioactive Material," 49 CFR 172.101 (unless the words "Radioactive Material" are already contained in the name). Letters RQ or X in column captioned "HM" [49 CFR 172.203(c)(2)].
  2. The applicable identification number (UNXXXX or NAXXXX) from 49 CFR 172.101.

3. The name of each radionuclide. Abbreviations, as taken from 49 CFR 173.435, are authorized.
4. A description of the physical and chemical form of the material. (For special form sources, this description is "SPECIAL FORM.")
5. The activity contained in each package, measured in SI units.
6. The category of label applied to each package ("RADIOACTIVE WHITE-I," "RADIOACTIVE YELLOW-II," or "RADIOACTIVE YELLOW-III").
7. The TI (dose rate at 1 meter) assigned to each package bearing "RADIOACTIVE YELLOW-II" or "RADIOACTIVE YELLOW-III" labels.
8. For shipments tendered to a common carrier, the appropriate signed shipper's certification; and for shipments by aircraft, the additional statement as to acceptability for either passenger-carrying or cargo-only aircraft. For shipments by passenger-carrying aircraft, the additional statement of intended use in research or medical diagnosis or treatment must also be included [49 CFR 172.204(a); 49 CFR 172.204(c)(3), 49 CFR 172.204(c)(4), 49 CFR 172.204(d)].
9. The words "Highway Route Controlled Quantity" for any shipments containing such quantity [49 CFR 172.203(d)(4)].
10. Any other descriptive information may be included after the basic description, provided it is not inconsistent therewith [49 CFR 172.201(a)(4)].

In shipments where both nonhazardous and radioactive materials are described on the same shipping paper, the radioactive materials must appear as the first entry, or be designated by an "X" in columnar fashion, or be highlighted in a contrasting or other distinguishing fashion from the nonhazardous materials.

NOTE: 10 CFR 20, Appendix G, requires that each shipment of radioactive waste to a land disposal facility be accompanied by a manifest that describes the shipment contents. The waste shipment receiver (e.g., the disposal facility operator) also requires specific additional information. In addition to shipper identification requirements and a certification, the manifests required by 10 CFR 20, Appendix G, must include the following information as a minimum:

- (a) The waste class, pursuant to 10 CFR Part 61;
  - (b) A radiological description; and
  - (c) A physical and chemical description.
11. Emergency response information that can be used in the mitigation of an incident involving hazardous material. The information includes immediate precautions to be taken in case of an accident or incident (49 CFR 172.602). The information may be on a separate document, but must be maintained in the same manner as the shipping papers.
  12. Emergency response telephone number. The number must be monitored at all times that the hazardous material is in transportation, including storage incidental to transportation (49 CFR 172.604).
- f. Inspection Requirement 02.02(b). Delivery of Completed Packages to Carriers: Loading and Placarding of Non-Exclusive-Use Shipments. The licensee/shipper's responsibilities in these cases mainly relate to furnishing the required placards

(based on the presence of any “RADIOACTIVE YELLOW-III”-labeled packages) to a highway carrier or applying the placards to a rail vehicle. The basic responsibility for blocking and bracing packages within the vehicle rests with the carrier, as well as storage distance controls based on the TIs. The shipper does, however, have a responsibility not to offer, to a carrier, for placement in a single non-exclusive-use vehicle, packages bearing a total TI value of more than 50 [49 CFR 177.842(a)].

- g. Inspection Requirement 02.03. Receipt of Packages. Regulatory Guide 7.3 provides additional guidance on these requirements found in 10 CFR 20.1906, which includes provisions for the following:
1. Arrangements for package receipt or expeditious pickup [10 CFR 20.1906(a)].
  2. Monitoring external surfaces and radiation levels for certain packages [10 CFR 20.1906(b), (c) and (f)].
  3. Notification of carrier and NRC when package limits or levels are exceeded [10 CFR 20.1906(d)].
  4. Requirements for package-opening procedures [10 CFR 20.1906(e)].
- h. Inspection Requirement 02.04(a). Procurement and Selection of Packagings: DOT Specification 7A. DOT regulations require that each shipper of a Specification 7A package maintain, on file, a written documentation of the tests and engineering evaluation or comparative data showing that the packaging complies with the specification. If the shipper of a Specification 7A package is not the original designer or user of that package, it is necessary for that shipper to obtain the package evaluation report data from the original supplier/user or to perform the tests himself and document the results.

Further, if a shipper makes any changes to the packaging or its maximum authorized contents, from the description on the original test report furnished by another person, it will be necessary to perform and document a supplemental evaluation, addressing such changes and demonstrating that the package will continue to meet the appropriate performance requirements. In any case, the “bottom line” of the Specification 7A documentation is that the results of how the package meets the applicable environmental and test conditions must be addressed. In this regard, inspectors may find some shippers furnishing and relying on test results and data extracted from several technical reports by the former agency, Energy Research and Development Administration (ERDA), entitled, “Certification of ERDA Contractors Packaging with Respect to DOT Specification 7A Performance Requirements,” Report MLM-2228, June 12, 1975, with one Supplement, (April 15, 1976) and MLM-2324 (October 8, 1976). A question may then arise about the sufficiency of the test data from these reports in any given case. Judgment will then have to be exercised in assessing whether the licensee's specific package falls within the parameters of the tests as reported, with respect to such aspects as maximum package weight tested, type of closure, tested content versus actual content, and content limitations. The licensee's documentation should include an evaluation concluding how the package meets the Spec. 7A test requirements based on the recorded data, or any other independent package tests that have been performed. In any case, inspectors should reject any rationale used by the licensee that the marking alone of “DOT Spec. 7A” on the outside of the package is sufficient fulfillment of this requirement.

- i. Inspection Requirement 02.04(b). Procurement and Selection of Packagings: Special Form Requirements. Radioactive sealed sources classified as “special form” material must meet the physical integrity requirements, as defined in 49 CFR 173.469 and 49 CFR 173.476. These requirements call for each shipper of a

special form source to maintain, on file, a supporting safety analysis or documentation containing the results of the testing performed on the source, to demonstrate that it meets the special form requirements. This does not mean that each shipper has to actually perform the tests, only that he must obtain and retain the documentation of these tests. As a practical matter, each licensee should establish a file of such data for each source design in his inventory. It may be necessary, therefore, for the licensee to procure the required information from the source manufacturer.

In many instances, qualification of the material as special form will have no direct bearing on the type of packaging required, relative to content limit -- for example, where  $A_1 = A_2$  (as in the cases of Co-60, Mn-54, and P-32), Type A packaging for  $A_1$  or  $A_2$  quantities is required, regardless of "form." In such cases, when the material has been encapsulated as a sealed source, but is not described on the shipping paper documents as "special form," the documentation of special form testing is not required [49 CFR 173.476(d)]. If the material however, is described as special form, the backup documentation is required.

### SUBSECTION B GUIDANCE FOR ADDITIONAL REQUIREMENTS

- j. Inspection Requirement 02.06. Management Controls. The inspection effort should be directed at certifying that written procedures have been established in a manner approved by management. The procedures should be readily available to all those having responsibility for any phase of the licensee's transportation activity. The inspector should confirm that the procedures include provisions for all of the applicable transport activities addressed in the Inspection Requirements Section 2 of this procedure.

In reviewing the adequacy of the licensee's program for management controls and associated written documentation thereof, inspectors are reminded to concurrently review, as a cross-check, the licensee's written, approved QA program, which incorporates the elements of 10 CFR Part 71, Subpart H.

In reviewing the program, it will be necessary to review the licensee's procedures that satisfy commitments made in the QA program application.

- k. Inspection Requirement 02.08. QA Program. Further guidance on acceptable QA programs for transport packages is provided in NRC Regulatory Guide 7.10. A key factor in verifying this inspection requirement is to ascertain whether the actual QA program reasonably corresponds to that which has been described to, and approved by, NRC. Questions frequently arise regarding fulfillment of QA requirements in those cases where there are multiple users, as in the case of casks leased from a supplier. The NMSS position on this, as stated in IE Information Notice 83-10, March 11, 1983, is restated below, as follows:

1. Each registered licensee-user should obtain a current certificate from the package owner attesting that the packaging was designed, procured, fabricated, assembled, tested, and is maintained in accordance with an NRC-approved QA program.
2. Each registered licensee-user should provide the owner with a copy of all QA records on maintenance, repair, or modifications to the package, which are conducted under the licensee-user's QA program.
3. Each licensee-user should maintain its own QA program and related records concerning its use/operation and maintenance of the package. The licensee-user is also encouraged to obtain from the package owner copies

of those quality-related documents that may be useful and relevant to the licensee-user's own QA program. (Note: This is not to imply necessarily that the package owner would be expected to provide each user, nor is each user expected to maintain, all of the quality-related documents associated with all of the criteria of 10 CFR Part 71, Subpart H.)

Recognizing the inherent difficulties in maintaining QA records in cases of multi-user packages, it is important to bear in mind that the individual licensee-user is responsible for maintaining as complete a file as possible of the QA records pertaining to package use, and further, to establish mechanisms for exchange of pertinent QA records with the package owner. It remains the responsibility of each licensee-user that his transportation activities meet the requirements of 10 CFR Part 71. As stated above, however, in fulfilling this responsibility, the licensee-user has the prerogative to accept written certifications from package owners and suppliers that certain QA activities, not under the licensee-user's immediate control, were conducted in accordance with an NRC-approved QA program.

- I. Inspection Requirement 02.10(a)-(b). Procurement and Selection of Packagings: General Guidance. For Type B, fissile, and certain Type A package designs certified by NRC, a necessary reference is NUREG-0383, "Directory of Certificates of Compliance for Radioactive Materials Packages," which is issued and updated annually by NMSS. DOT Specification Packaging designs are published and listed in 49 CFR Part 178. Authorizations for DOT specifications packagings are found in 49 CFR 173.415, 49 CFR 173.416, and 49 CFR 173.417.

Inspectors should note that some of the regulatory requirements for packaging and transporting packages of LSA or SCO have changed. NUREG-1608, "Categorizing and Transporting Low Specific Activity Materials and Surface Contaminated Objects," provides further guidance on this subject.

- m. Inspection Requirement 02.11(a). Preparation of Packages for Shipment: Preliminary and Routine Determinations and Package Marking. Inspection of the required preliminary and routine determinations will have some overlap with the inspection of the licensee's QA activities on transport packages. In reviewing the licensee's preliminary and routine determinations, the following additional guidance is offered.
  1. In determining whether a package has any significant damage, the package should be considered to have significant damage if such damage would be likely to preclude the package from meeting the applicable requirements of 10 CFR Part 71 and/or its approved design.
  2. In reviewing the adequacy of package closures, closures that involve attempts at sealing with gaskets having visible or obvious imperfections, field splices that are not part of an approved design, caulking, and rusty or dirty sealing surfaces would not be considered to be free from defects.
  3. The loading and closing of packages in accordance with written procedures should include a determination that the packaging is authorized for the specific intended contents, and that any lid/closure to the main body is properly aligned, with its bolts properly torqued to the specified values in the prescribed pattern.
  4. A record should be established by the licensee for each reusable packaging. Because many packagings are procured in lots and without serial numbers, the record may exist for a large quantity of packagings specified, as in a purchase order. Special emphasis should be placed on records that show

that components important to safety have been inspected for conformance to NRC-approved design. Depending on the type of package, this may include structural, thermal, shielding, containment, closure, and criticality control systems. The records may include visual observations and physical test results.

5. For NRC-certified packaging, the inspector should give special attention to any applicable terms and conditions of the certificate relating to preliminary and routine determinations and routine maintenance.
  6. Package-marking requirements include "TYPE " or "TYPE B" as appropriate, and NRC certificate number.
- n. Inspection Requirement 02.11(b). Delivery of Completed Packages to Carriers: Loading and Placarding of Exclusive-Use Shipments. The requirements herein will relate very frequently to shipments of low-level radwaste to licensed burial sites, quite frequently as LSA materials. Many of the questions that arise concerning these shipments are addressed in IE Information Notice 80-32 (August 29, 1980) and Rev. 1 (February 12, 1982).
- o. Inspection Requirement 02.11. Delivery of Completed Packages to Carriers: Advance Notice to States. A list of the names and mailing addresses of the Governor's designees who are to receive such advance notification of transportation of nuclear waste is published annually in the Federal Register (around June 30). The reporting quantities for the report required by NRC pursuant to 10 CFR 71.97 are currently the same as the quantities designated by DOT as "Highway Route Controlled Quantities."

#### 86740-04 RESOURCE ESTIMATE

Transportation safety inspection resource requirements vary greatly depending on facility size and shipping activity. On-site inspection hours can range from less than 1 hour at material licensee facilities with limited shipping activity, to more than 8 hours at reactor or other large facilities with significant shipments.

#### 86740-05 REFERENCES

##### 05.01 Regulations

- a. 49 CFR Parts 100-178, "Hazardous Materials Regulations," of the US Department of Transportation, revised annually, as of October 1.
- b. 10 CFR Part 71, "Packaging and Transportation of Radioactive Material."
- c. US Postal Service Publication No. 6, Dec. 1975 "Radioactive Material," as amended by US Postal Bulletin, June 30, 1982, pp. 2-5.
- d. International Atomic Energy Agency, "Regulations for the Safe Transport of Radioactive Material," Safety Series No. 6, 1985(As Amended 1990). IAEA, Vienna, Austria.

##### 05.02 NRC Information Notices

- a. 79-21 "Transportation and Commercial Burial of Radioactive Waste," Sept. 7, 1979.
- b. 80-24 "Low-Level Waste Burial Criteria," May 30, 1980.

- c. 80-25 "Transportation of Pyrophoric Uranium," May 30, 1980.
- d. 80-32 "Clarification of Certain Requirements for Exclusive-Use Shipments of Radioactive Materials," Aug. 29, 1980.
- e. 80-32 Rev. 1, Feb. 12, 1982.
- f. 81-02 "Transportation of Radiography Devices," Jan. 1981.
- g. 81-32 "Transfer and/or Disposal of Spent Generators," Oct. 23, 1981.
- h. 82-24 "Water Leaking From UF<sub>6</sub> Overpacks," July 20, 1982.
- i. 82-47 "Transportation of Type A quantities of Non-Fissile Radioactive Material," Nov. 30, 1982.
- j. 83-10 "Clarification of Several Aspects Relating to Use of NRC-Certified Transport Packages," Mar. 11, 1983.
- k. 84-14 "Highlights of Recent Transport Regulatory Revisions by DOT and NRC," March 8, 1984.
- l. 84-50 "Clarification of Scope of Quality Assurance Programs for Transport Packages Pursuant to 10 CFR 50, Appendix B."
- m. 84-72 "Clarification of Conditions for Water Shipments Subject to Hydrogen Gas Generation."
- n. 85-46 "Clarification of Several Aspects of Removable Radioactive Surface Contamination Limits for Transport Packages."
- o. 86-18 "NRC On-Scene Response during a Major Emergency."
- p. 86-67 "Portable Moisture/Density Gauges: Recent Incidents and Common Violations of Requirements for Use, Transportation, and Storage."
- q. 86-86 "Clarification of Requirements for Fabrication and Export of Certain Previously Approved Type B Packages."
- r. 87-2 "Cracks in Stiffening Rings on 48-inch Diameter UF<sub>6</sub> Cylinders."
- s. 87-31 "Blocking, Bracing, and Securing of Radioactive Materials Packages in Transportation."
- t. 87-37 "Compliance with the General License Provisions of 10 CFR Part 31."
- u. 87-47 "Transportation of Radiography Devices."
- v. 87-55 "Portable Moisture/Density Gauges: Recent Incidents of Portable Gauges Being Stolen or Lost."
- w. 88-06 "(Bulletin) Actions to be Taken for the Transportation of Model No. SPEC 2-T Radiographic Exposure Device."
- x. 88-16 "Identifying Waste Generators in Shipments of Low-Level Waste to Land Disposal Facilities."
- y. 88-18 "Malfunction of Lockbox on Radiography Device."

- z. 88-33 "Recent Problems Involving the Model SPEC- 2T Radiographic Exposure Device."
  - aa. 88-62 "Recent Findings Concerning Implementation of Quality Assurance Programs by Suppliers of Transport Packages."
  - bb. 88-66 "Industrial Radiography Inspection and Enforcement."
  - cc. 88-101 "Shipment of Contaminated Equipment Between Nuclear Power Stations."
  - dd. 89-24 "Nuclear Criticality Safety."
  - ee. 89-74 "Clarification of Transportation Requirements Applicable to Return of Spent Radiopharmacy Dosages from Users to Suppliers."
  - ff. 90-24 "Transportation of Model SPEC 2-T Radiographic Exposure Device."
  - gg. 90-27 "Clarification of the Recent Revisions to the Regulatory Requirements for Packaging of Uranium Hexafluoride (UF6) for Transportation."
  - hh. 90-35 "Transportation of Type A Quantities of Non-Fissile Radioactive Materials."
  - ii. 90-50 "Minimization of Methane Gas in Plant Systems and Radwaste Shipping Containers."
  - jj. 90-66 "Incomplete Draining and Drying of Shipping Casks."
  - kk. 90-82 "Requirements for Use of NRC-Approved Transport Packages for Shipment of Type A Quantities of Radioactive Material."
  - ll. 91-39 "Compliance with 10 CFR Part 21, "Reporting of Defects and Noncompliance."
- 05.03 NRC Regulatory Guides
- a. 7.1 "Administrative Guide for Packaging and Transporting Radioactive Material," 06/74.
  - b. 7.2 "Packaging and Transportation of Radioactively Contaminated Biological Material," 06/74.
  - c. 7.3 "Procedures for Picking Up and Receiving Packages of Radioactive Materials (For Comment)," 06/75.
  - d. 7.4 "Leakage Tests on Packages for Shipment of Radioactive Materials (For Comment)," 06/75.
  - e. 7.5 "Administrative Guide for Obtaining Exemptions From Certain NRC Requirements Over Radioactive Material Shipments," 06/75 or 05/77.
  - f. 7.6 "Design Criteria for the Structural Analysis of Shipping Cask Containment Vessels," 02/77 or 03/78.
  - g. 7.7 "Administrative Guide for Verifying Compliance With Packaging Requirements for Shipments of Radioactive Materials (For Comment)," 08/77.
  - h. 7.8 "Load Combinations for the Structural Analysis of Shipping Casks (For Comment)," 05/77.

- i. 7.9 "Standard Format and Content of Part 71 Applications for Approval of Packaging of Type B, Large Quantity, and Fissile Radioactive Material," 03/79 or 01/80.
- j. 7.10 "Establishing Quality Assurance Programs for Packagings Used in the Transport of Radioactive Material," 01/83.
- k. 7.11 "Fracture Toughness Criteria of Base Material for Ferritic Steel Shipping Cask Containment Vessels with a Maximum Wall Thickness of 4 Inches (0.1 m)."
- l. 7.12 "Fracture Toughness Criteria of Base Material for Ferritic Steel Shipping Cask Containment Vessels with a Wall Thickness Greater than 4 Inches (0.1 m) But Not Exceeding 12 Inches (0.3 m)."

05.04 Other Publications

- a. U.S. Department of Transportation, "2000 Emergency Response Guidebook,"
- b. U.S. Department of Transportation, "Radioactive Material Regulations Review," RAMREG 001-98.
- c. NUREG-1608, "Categorizing and Transporting Low Specific Activity Materials and Surface Contaminated Objects."
- d. NUREG-1660, "U.S. Specific Schedules of Requirements for Transport of Specified Types of Radioactive Materials Consignments."
- e. Generic Letter 96-07, "Interim Guidance on Transportation of Steam Generators."

END