

UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS  
WASHINGTON, D.C. 20555

May 24, 1990

NRC INFORMATION NOTICE NO. 90-35: TRANSPORTATION OF TYPE A QUANTITIES OF  
NON-FISSILE RADIOACTIVE MATERIALS

Addressees: All U.S. Nuclear Regulatory Commission (NRC) Licensees.

Purpose:

This notice is provided to summarize and clarify the basic requirements of the U.S. Department of Transportation (DOT) Hazardous Materials Regulations (HMR) that are most frequently cited as deficiencies or violations during inspections of transportation activities of NRC licensees. Such deficiencies are most commonly noted during inspections of byproduct materials licensees, particularly when such licensees are first-time users of the regulations or those who package and deliver such packages to carriers only occasionally. However, the information here should be useful to any type of licensee who prepares and delivers radioactive material packages to carriers or transports packages in his own vehicle as a private carrier.

It is expected that addressees will review the information here for applicability to their licensed activities and consider actions, as appropriate, to avoid problems in transport of such materials. However, suggestions contained in this notice do not constitute any new requirements, and no written response is required.

Background:

In 1979, NRC incorporated into its own regulations (10 CFR Part 71) the DOT regulations contained in 49 CFR Parts 170 to 178. (See 10 CFR 71.5.)

This notice is an update of NRC IE Information Notice No. 82-47 (Ref. 1), bearing the same title, issued November 30, 1982, and a series of three articles which appeared in NRC NMSS Licensee Newsletter, during 1989. (Refs. 2, 3, 4.)

Discussion:

Special Form vs. Normal Form Determination

For transportation purposes, radioactive materials are classified either as "special form" or "normal form," as defined in 49 CFR 173.403(s) and (z). Radioactive materials classified as "special form," such as sealed sources,

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may be transported with fewer restrictions than other materials with equal radioactivity. However, sealed sources must meet the physical integrity requirements defined in 49 CFR 173.469. All other radioactive materials are considered "normal form." For a particular shipping package specification, the activity limits for special form material usually are greater than those for normal form materials (49 CFR 173.435). That is, if the material is in special form, a greater quantity of material usually is permitted in the package.

Any licensee who ships or transports special form material, and declares it as such on shipping papers and package marking, must maintain documentation containing the results of the testing performed on the material or source, to demonstrate that it meets the special form requirements [49 CFR 173.476(a)]. This does not mean that each shipper or transporter must perform the tests, but that each must obtain and retain the test documentation. Each licensee should establish a file of such data for each special form design in its possession. It is usually necessary for the licensee to obtain this information from the source or device manufacturer.

#### Type A vs. Type B Package Determination

Normal form materials in quantities no greater than applicable  $A_2$  limits (curies), specified in 49 CFR 173.435, may be shipped in a package called a "Type A" package (i.e., one which is expected to maintain its integrity only during normal conditions of transport). Similarly, special form materials may be shipped in larger quantities up to the  $A_1$  limit, in a Type A package. Shipment of materials in a single package in excess of these limits requires the use of the higher quality "Type B" package. (i.e., one which is expected to maintain its integrity during both normal and severe accident conditions of transport).

Examples of  $A_1$  and  $A_2$  limits (in curies) from 49 CFR 173.435 are as follows:

<u>Radionuclide</u>	<u><math>A_1</math> (special form)</u>	<u><math>A_2</math> (normal form)</u>
Am-141 (in AmBe sources)	20	0.008
Co-60	7	7
Cs-137	30	10
Ir-192	20	10
Mo-99	100	20

In some instances, qualification of the material as "special form" will have no bearing on the type of packaging required, relative to the activity of the material shipped. For example, in the case of shipment of less than seven curies of Co-60, Type A (rather than Type B) packaging may be used regardless of form (normal or special), because the Type A package limit prescribed in 49 CFR 173.435 is seven curies for both special form (the  $A_1$  limit) and normal form (the  $A_2$  limit). This contrasts with CS-137, where any quantity exceeding 10 curies (the  $A_2$  limit) in normal form requires Type B packaging, and as much as 30 curies (the  $A_1$  limit in special form) are allowed in Type A packaging.

In any situation where the material is described on shipping papers and package marking as "Radioactive material, special form, n.o.s." (n.o.s. means "not otherwise specified"), the shipper is required to maintain the special form documentation prescribed by 49 CFR 173.476(a). To avoid this requirement, the shipper may elect to describe the material as "Radioactive material, n.o.s." However, this description may only be used if the special form material in the Type A package does not exceed the normal form limit (the  $A_2$  limit).

#### DOT Specification 7A, Type A Packages

As indicated previously, normal form materials can be shipped in a "Type A" package, as long as the contained quantity does not exceed the  $A_2$  limits (in curies) specified in 49 CFR 173.435. Similarly, special form materials that do not exceed the  $A_1$  limits (which, for certain materials, may be higher than the  $A_2$  limits) also may be shipped in a Type A package.

The usual Type A package specification is referred to as "DOT Specification 7A" in 49 CFR 173.415(a). This is a pure "performance" specification and is not based on any specific and detailed design specifications. For Specification 7A, DOT regulations require that each shipper of a Specification 7A package must maintain on file written documentation attesting to the results of the Specification 7A performance tests performed on the package design. Remember that a "shipper" also includes any NRC licensee transporting licensed material in his own vehicle, (i.e., a "shipper" acting as a "private carrier").

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 test result data from the original supplier. Alternately, the shipper may perform the tests and document the results. The tests are described in 49 CFR 173.465-466. Type A packages also must meet the design requirements described in 49 CFR 173.411-412.

If a shipper makes any changes, to the packaging or its maximum authorized contents, from those described on the original test report furnished by another person, the shipper must perform and document a supplemental evaluation, addressing such changes, demonstrating that the package will continue to meet the appropriate performance requirements.

(Reference 5, a U.S. Department of Energy (DOE) evaluation document for Type A packaging, is a useful document which may be of value to shippers in the preparation of their DOT Specification 7A documentations.)

#### Labeling (Labels are for packages.)

Each package must be labeled with one of the three "RADIOACTIVE" labels described in 49 CFR 172.403. The three labels are referred to as RADIOACTIVE WHITE-I, RADIOACTIVE YELLOW-II, and RADIOACTIVE YELLOW-III. RADIOACTIVE WHITE-I is the lowest category label and RADIOACTIVE YELLOW-III is the highest. Labels must be affixed on each of two opposite sides of the package (49 CFR 172.406) and must measure 4 inches on each side (49 CFR 172.407). DOT regulations display the formats of these labels in 49 CFR 172.436-440.

All the labels include spaces for marking (1) the contents (the name of the radionuclide) and (2) the activity (in curies, millicuries, or microcuries). The YELLOW labels also include spaces for marking the Transport Index (TI). The TI is a number expressing the maximum radiation level in millirem per hour at 1 meter (3.3 feet) from the external surface of the package.

The appropriate label is selected based on the measured radiation levels anywhere on the external surface of the package and based on the package TI. A WHITE-I label may be used if the radiation level at any point on the surface of the package does not exceed 0.5 mrem/hr. A YELLOW-II label indicates that the surface rate does not exceed 50 mrem/hr and the TI does not exceed 1. Higher radiation levels require use of the YELLOW-III label. Pursuant to 49 CFR 173.441, package radiation levels are limited to 200 mrem/hr at the surface and 10 mrem/hr at 1 meter (i.e., a TI of 10).

#### Placarding (Placards are for vehicles.)

The outside of the transport vehicle must be placarded by the carrier on the front, rear, and each side with the RADIOACTIVE placard (identified in 49 CFR 172.556) only if any package in the vehicle bears the RADIOACTIVE YELLOW-III label. The licensee (shipper) is required to furnish the placards to a common or contract carrier at the time the packages are delivered to, (i.e., picked up by) that carrier. In the case of a licensee acting as a shipper/private carrier, obviously, the licensee must apply the placards. Vehicles are not required to be placarded when the shipment includes only WHITE-I or YELLOW-II packages. [Note: In the case of exclusive-use shipments of low specific activity (LSA) materials, the shipper must placard the vehicle, even though such LSA packages are excepted from labeling.]

DOT placard requirements should not be confused with the posting requirements of 10 CFR 20.203. Any temporary storage on a loading dock or transport vehicle at a licensee's facility must also comply with the applicable requirements of 10 CFR Part 20, as well as with other appropriate NRC regulations.

Labels and placards should be procured commercially. They are not obtainable from NRC.

### Package Marking

The outside of each package must be marked with the following:

1. Applicable DOT Proper Shipping Name (see 49 CFR 172.101 List of Hazardous Materials); and "RQ," if a "reportable quantity" is present (see 49 CFR 172.101, Appendix Table 2, for radionuclide reportable quantities);
2. Identification Number (49 CFR 172.101);
3. Applicable DOT Specification, (e.g., "DOT-7A," "Type A");
4. Gross Weight [for packages in excess of 110 lbs (50 kilograms)];
5. The Marking "USA," if the package is destined for export;
6. The name and address of the consignee or consignor. (Both are recommended.)

### Shipping Papers

A shipping paper is required for each transport of radioactive material from the confines of the licensee's facility, whether transported by the licensee in his own vehicles or delivered to a common carrier for transport. A properly certified shipping paper is an indicator of compliance with DOT regulations and is of prime importance to authorities in case of an accident, loss, or theft. It must include the information required by 49 CFR 172.202-203, including the following:

1. The applicable DOT proper shipping name from 49 CFR 172.101. (For sources that are shipped as special form, this will always be "Radioactive material, special form, n.o.s." For normal form materials, the shipping name will generally be "Radioactive material, n.o.s.")
2. The applicable Identification Number from 49 CFR 172.101. (For materials shipped as "Radioactive material special form, n.o.s.," this number is UN2974. For materials shipped as "Radioactive material, n.o.s.," this number is UN2982.)
3. For a radionuclide as a "hazardous substance" in a quantity exceeding the applicable "reportable quantity," the entry "RQ" shall immediately precede or follow the entries in 1 and 2, above.

4. The name of each radionuclide. (For example, "Co-60.")
5. A description of the physical and chemical form of the material. (For special form sources, this description is "SPECIAL FORM.")
6. The activity contained in each package, measured in curie units.
7. The category of label applied to each package ("RADIOACTIVE WHITE-I," "RADIOACTIVE YELLOW-II," OR "RADIOACTIVE YELLOW-III").
8. The transport index (radiation level at 1 meter) assigned to each package bearing YELLOW-II or YELLOW-III labels. (For packages destined for carriage on passenger-carrying aircraft, the maximum TI is 3 rather than 10.)
9. For shipments tendered to a common carrier, the appropriate signed shipper's certification (49 CFR 172.204). 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, medical diagnosis, or treatment must also be included.
10. An emergency response telephone number, for use in the event of an emergency involving the package.

When licensees transport sealed source packages in their own vehicles repetitively, a reusable type of shipping paper documentation may be used that is specific to each particular package configuration. Such documentation can take the form of laminated cards retained in the cab of the vehicle, thereby eliminating the need for preparing a new shipping paper document every time a shipment is made.

Shipping papers must be maintained in the vehicle, within the immediate reach of the driver restrained by the lap belt. Ordinarily, a glove compartment does not meet this requirement. [49 CFR 177.817(e) provides detailed information on accessibility of shipping papers within vehicles.]

#### Blocking, Bracing, and Securing of Packages

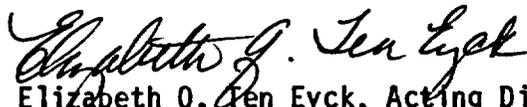
Licensees who transport packages in their own vehicles must provide for adequate blocking, bracing, or tie-down of the packages to prevent shifting or movement during normal transport. Licensees also are required to provide security measures adequate to prevent the unauthorized removal of materials from the place of storage during transport, pursuant to 10 CFR 20.207. This may involve locking the packages within an external, permanently-attached compartment of the vehicle, or within the cargo compartment, itself. In either case, it is necessary to remove the keys from the vehicle. (See Reference 6, Information Notice No. 87-31, for further information on blocking, bracing and securing of packages during transport.)

A Caution - Obtain a Copy of the Regulations !

This notice is for information and guidance. Reference 7, a review of DOT regulations on radioactive material transport, may also be useful to readers of this notice. Neither source should be considered as a substitute for the actual copy of the regulations. All licensees who package or transport radioactive packages are urged to avail themselves of up-to-date copies of the applicable NRC and DOT regulations. Copies of these regulations (i.e., Title 49 of the Code of Federal Regulations) can be obtained from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402-9371 (202) 783-3238.

Future Regulatory Revision

This notice is based on the DOT and NRC regulations in effect at the time of issuance of this notice. Readers are advised that both NRC and DOT are currently in the midst of rulemaking actions to effect revisions to the regulations of the U.S. so as to incorporate the latest standards of the International Atomic Energy Agency in the 1985 edition (as supplemented) of its Safety Series No. 6, "Regulations for the Safe Transport of Radioactive Materials." (Ref. 8) The Notices of Proposed Rulemaking by each agency are listed in References 9 and 10. It is estimated that final action on the regulatory requirements will be taken in late 1990 or early 1991.

  
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Attachments:

1. References
2. List of Recently Issued NMSS Information Notices
3. List of Recently Issued NRC Information Notices

REFERENCES

1. U.S. Nuclear Regulatory Commission, IE Information Notice No. 82-47, "Transportation of Type A Quantities of Non-Fissile Radioactive Materials."
2. U.S. Nuclear Regulatory Commission, NMSS Licensee Newsletter, Office of Nuclear Materials Safety and Safeguards, NUREG/BR-0117, No. 89-1, March 1989.
3. Ibid, No. 89-2, June 1989.
4. Ibid, No. 89-3, September 1989.
5. D. A. Edling et al., "DOE Evaluation Document for DOT 7A Type A Packaging," MLM-3245 (DOE/DO/0053-H1), March 1987.
6. NRC Information Notice No. 87-31, "Blocking, Bracing, and Securing of Radioactive Materials Packages In Transportation," July 10, 1987.
7. U.S. Department of Transportation, "A Review of the Department of Transportation Regulations for Transportation of Radioactive Materials," revised 1983. Available from U.S. Department of Transportation, Research and Special Programs Administration, Washington, DC (202-366-2301) or U.S. Government Printing Office.
8. International Atomic Energy Agency, "Regulations for the Safe Transport of Radioactive Material, Safety Series No. 6, 1985 Edition," as supplemented. Available in the U.S. from: BERNAN-UNIPUB, 4611-F Assembly Drive, Lanham, Maryland 20706-4341.
9. U.S. Nuclear Regulatory Commission, "Transportation Regulations: Compatibility with the International Atomic Energy Agency," Federal Register, Vol. 53, No. 110, June 8, 1988. (Proposed Rule, 10 CFR Part 71.)
10. U.S. Department of Transportation, Research and Special Programs Administration, "Transportation Regulations: Compatibility with Regulations of the International Atomic Energy Agency: Notice of Proposed Rule," (49 CFR Part 171, et al.), Federal Register, Vol. 54, No. 218 (Part II), November 14, 1989.

LIST OF RECENTLY ISSUED  
NMSS INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to:
90-27	Clarification of the Recent Revisions to the Regulatory Requirements for Packaging of Uranium Hexafluoride (UF <sub>6</sub> ) for Transportation	04/30/90	All Uranium Fuel Fabrication and Conversion Facilities
90-24	Transportation of Model SPEC 2-T Radiographic Exposure Device	04/10/90	All NRC licensees authorized to use, transport, or operate radiographic exposure devices and source changers
90-20	Personnel Injuries Resulting from Improper Operation of Radwaste Incinerators	03/22/90	All U.S. NRC licensees who process or incinerate radioactive waste
90-16	Compliance with New Decommissioning Rule	03/07/90	All materials licensees
90-15	Reciprocity: Notification of Agreement State Radiation Control Directors before Beginning Work in Agreement States	03/07/90	All holders of NRC materials licenses that authorize use of radioactive material at temporary job sites
90-14	Accidental Disposal of Radioactive Materials	03/06/90	All NRC byproduct materials licensees
90-09	Extended Interim Storage of Low-Level Radioactive Waste by Fuel Cycle and Materials Licensees	02/05/90	All holders of NRC materials licenses

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Correct Number for IN 90-01 should be 9001080145.

LIST OF RECENTLY ISSUED  
 NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
90-34	Response to False Siren Activations	5/10/90	All holders of OLs or CPs for nuclear power reactors.
90-33	Sources of Unexpected Occupational Radiation Exposures at Spent Fuel Pools	5/9/90	All holders of OLs or CPs for nuclear power reactors.
90-32	Surface Crack and Subsurface Indications in the Weld of A Reactor Vessel Head	5/3/90	All holders of OLs or CPs for nuclear power reactors.
90-31	Update on Waste Form and High Integrity Container Topical Report Review Status, Identification of Problems with Cement Solidification, and Reporting of Waste Mishaps	5/4/90	All holders of OLs or CPs for nuclear power reactors, fuel cycle licenses, and certain by-product materials licenses.
90-30	Ultrasonic Inspection Techniques for Dissimilar Metal Welds	5/1/90	All holders of OLs or CPs for nuclear power reactors.
90-29	Cracking of Cladding and Its Heat-Affected Zone in the Base Metal of a Reactor Vessel Head	4/30/90	All holders of OLs or CPs for nuclear power reactors.
90-28	Potential Error in High Steamline Flow Setpoint	4/30/90	All holders of OLs or CPs for BWRs.
90-27	Clarification of the Recent Revisions to the Regulatory Requirements for Packaging of Uranium Hexafluoride (UF <sub>6</sub> ) for Transportation	4/30/90	All uranium fuel fabrication and conversion facilities.

OL = Operating License  
 CP = Construction Permit