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RECORD #83

TITLE: Transportation of Radiography Devices

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
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IE Information Notice No. 81-02: TRANSPORTATION OF RADIOGRAPHY DEVICES

Background:

Recent inspections by NRC have identified frequent noncompliance with transportation regulations by radiography licensees. As of December 3, 1979, the NRC inspection program has included inspection/enforcement of DOT regulations in 49 CFR 170-178 as direct NRC requirements (see 10 CFR 71.5).

The nature of radiography operations is somewhat unique in that radiography devices most frequently serve a dual function; that is, they serve as operational radiography cameras/source changers and as transportation packages. Historically, this has caused some confusion on the part of radiography users, particularly with respect to sorting out the transport regulatory requirements of 49 CFR/10 CFR 71 from the operational requirements of 10 CFR 34 and the specific license which has been issued to the radiography user. Another source of confusion for the radiography operator is that he most frequently functions, with respect to the transportation regulations, in the dual role of both shipper and carrier.

This notice discusses some of the pertinent transportation requirements for radiography devices when used as transport "packages." The explanations should help to clarify the application of operational licensing requirements versus transport requirements applicable to shippers and carriers, thereby enhancing regulatory compliance with the requirements.

Discussions:

Source Design -- Radiography sources contained within a device are always encapsulated (Co-60 or Ir-192) and, therefore, meet the physical integrity requirements of "special form" as defined in 49 CFR 173.389(g) and 173.398(a). Radiography transporters are reminded that these requirements call for each shipper of a special form source to maintain a file of 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 obtain and retain the documentation of the tests. As a practical matter, each radiographer should establish in his records a file of such data for each source design in his inventory. It may be necessary, therefore, for the radiographer to request the required information from his source supplier.

Package Design -- Radiography sources in special form will constitute a Type B quantity when in excess of 20 ci, with Type B packaging required for transportation purposes. An exception to this rule is the DOT Specification 55 (referred to as "Spec. 55") which is not necessarily a Type B package (see 49 CFR 178.250; note that DOT no longer includes this specification in its annual printing of 49 CFR). Spec. 55 (see Appendix A) is authorized for limited Type B quantities (up to 300 ci) of special form radioactive materials in domestic shipments only [see 49 CFR 173.394(b)(1)]. Under this provision, however, only Spec. 55 devices that were constructed prior to March 31, 1975 are authorized (DOT has recently announced its intention to "phase out" DOT Spec. 55; see 44 Federal Register 1852, Part II, January 8, 1979.)

For those radiography devices that exceed 20 Ci activity and are not contained in DOT Spec. 55, an NRC Certificate of Compliance (COC) must be issued pursuant to 49 CFR 173.393a and 173.394(b)(3). Such approved designs may be used by other than the original COC applicant provided that such user registers with the NRC Office of Nuclear Materials Safety and Safeguards (NMSS), has a copy of the applicable COC, and complies with its terms and conditions [see 10 CFR 71.12(b)]. A listing of radiography devices for which NRC has issued a COC is given in Table 1 (see Enclosure 2). Copies of COCs are included in the NRC/NMSS reports, "Directory of Certificates of Compliance for Radioactive Materials Packages" (NUREG-0383), which is updated annually.

CAUTION: The fact that a radiography device has been approved by NRC under a specific license provision pursuant to 10 CFR Part 34 as an operational device does not mean that it has been approved as a Type B transport package pursuant to 10 CFR Part 71.

Specification Overpacks -- Pursuant to 49 CFR 173.394(b)(5) and (6) and 173.394(c)(4), Spec. 55 packages may be used to transport quantities of activity exceeding 300 ci (domestic service) or 20 ci (international service), provided that a Spec. 20 WC (49 CFR 178.194) or Spec. 21 WC (49 CFR 178.195) protective overpack is used. Again, however, this authorization is restricted to the use of Spec. 55 packages constructed prior to March 31, 1975. For international shipments, shippers must additionally register as a user under the applicable DOT Certificate of Competent Authority issued by that agency pursuant to 49 CFR 173.393b. DOT further requires that this certificate be supplied to the foreign consignee and Competent National Authority of the destination country.

Type A Packages -- For radiography devices not exceeding 20 ci of activity as special form, the applicable transport specification is either DOT Spec. 7A [49 CFR 173.394(a)(1) and 178.350] or Spec. 55 [49 CFR 173.394(a)(2) and 178.250]. For Spec. 7A, as in the case of a special form source, DOT regulations require that each shipper of a Spec. 7A package maintain on file written documentation attesting to the results of the Spec. 7A performance tests performed on the package design [49 CFR 173.394 (a)(1)].

If the shipper of a Spec. 7A package is not the original designer or user of that package, it will be necessary for the shipper to obtain the test report data from the original supplier/user or to perform the tests.

Package Labeling -- Each radiography device (package) must be properly labelled with the appropriate category of RADIOACTIVE label in accordance with 49 CFR 172.403(a) through (d). This requires affixing two labels, with one label on each of two opposite sides of the package, based on the radiation dose rates at the surface and at 3 ft (transport index) from the package. The dose rates are limited to 200 mrem/hr at contact with any point on the external surface of the package and 10 mrem/hr at 3 ft from any point on the surface [49 CFR 173.393(i)].

A question frequently arises regarding the labeling of radiography devices when enclosed in an outer "convenience" box, enclosure, foot locker, etc., during transportation. The question is whether or not the radiation levels at the surface of such an outer enclosure may be used to establish the labeling requirements for the overall "package." Since this situation is not addressed in 49 CFR, it is permissible to use such enclosures and to establish labeling on the basis of the dose rates at the exterior of the outer enclosure. Assuming that the inner component (the device) is a proper DOT Spec. 55 device or is designed according to NRC/COC requirements, and is marked as such, the outer enclosure would also have to be marked with the words "Inside Package Complies with Prescribed Specification" [see 49 CFR 173.25(a)] and also be labeled as required based on the dose rates at the surface and 3 ft from the outer enclosure.

CAUTION: The fact that a particular device has been issued an NRC certificate of compliance does not necessarily mean that, when fully loaded with its contents as authorized in a specific license, the dose rates will be within the regulatory limits. Each package must be surveyed to assure that proper labeling is applied.

Packages exceeding the limits of 49 CFR 173.393(i) may be transported in a closed, exclusive-use vehicle, such as a radiographer's van, provided that the following limits are met:

1,000 mrem/hr at 3 ft from the external surface of the package,
200 mrem/hr at any point on the external surface of the vehicle,
and 10 mrem/hour at 6 ft from the vehicle [49 CFR 173,393 (j)].

This means that a radiographer may transport a package reading more than 200 mrem/hr at the surface, but less than 1000 mrem/hr at 3 ft from the surface, in his own exclusive-use vehicle. The radiographer may not deliver the same package to a carrier for transport unless the carrier's vehicle is consigned for the radiographer's exclusive use.

Shipping Papers -- A shipping paper is required for each transfer of radioactive material from the confines of the licensee's plant, whether transported by the licensee or delivered to a carrier for transport. The shipping paper must include the information required by 49 CFR 172.203(d) for radioactive material, including the following:

1. The DOT proper shipping name. (For radiography devices, this will always be "RADIOACTIVE MATERIAL, SPECIAL FORM-N.O.S").
2. The name of each radionuclide.
3. A description of the physical and chemical form of the material. (For radiography sources this description is "SPECIAL FORM").
4. The activity contained in each package measured in curies.
5. The category of label applied to each package (RADIOACTIVE WHITE-I, RADIOACTIVE-YELLOW II, or RADIOACTIVE YELLOW-III).
6. The transport index assigned to each package bearing RADIOACTIVE YELLOW-II or RADIOACTIVE YELLOW-III labels.
7. The package certificate identification, if it is an NRC-certified package.
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), 172.204(c)(3), (4), and (d)].

NOTE: Most radiography shipments would therefore not be authorized for passenger-aircraft shipments, since the intended use of the radiography equipment is not for research or medical applications.

9. Instructions for maintenance of exclusive-use shipment controls, in the case of packages transported with the higher dose rates allowed by 49 CFR 173.393(j).

NOTE: The repetitive nature of radiography transportation lends itself to the preparation, of a "permanent" type of shipping paper documentation that is specific to each particular source/device configuration. Such documentation could even take the form of laminated cards retained in the vehicle glove compartment.

Vehicle Placarding -- The transport vehicle must be placarded by the licensee on the front, rear, and each side with the appropriate DOT placard (see 49 CFR 172.506 and 172.508) if any quantity of packages bearing the RADIOACTIVE-YELLOW III labels is to be carried in the vehicle. For packages

tendered to a common motor carrier, the licensee must provide the required placards to the carrier at the time the packages are picked up.

NOTE: DOT placard requirements should not be confused with radiography area posting requirements of 10 CFR 20.203 and 34.42.

Securing Cargo Within Vehicle -- Radiography licensees who transport devices (packages) in their own vehicles must provide for adequate blocking, bracing, or tie-down of the package to prevent its shifting or movement during normal transport. Incidents frequently occur wherein devices are thrown off and lost from moving vehicles, often without the driver's awareness. These incidents are usually caused by the failure to properly secure the device, combined with a failure to secure the cargo door of the vehicle. Recent cases of this type have resulted in civil penalty for failure to comply with 49 CFR 177.842(d).

Recommended Action

Licensees should review all movements of radiography devices away from their place of storage to ensure that they are (1) using appropriate packages, (2) properly controlling radiation levels on packages shipped, (3) providing proper shipping documents, and (4) following the applicable carrier requirements when transporting devices in their own vehicles.

No written response to this notice is required. If you require additional information regarding this matter, contact the Fuel Facility and Materials Safety Branch of the appropriate Regional Office.

Enclosures:

1. Appendix A, DOT Specification 55
2. Table I

APPENDIX A

DOT SPECIFICATION 55

§ 172.250 Specification 55; metal-cased, lead or uranium metal-shielded, radioactive materials container.

§ 172.250-1 Compliance

(a) Required in all details.

§ 172.250-2 Requirements for design and construction.

(a) Lead or uranium metal shield to be encased in mild steel or equally fire-resistant metal of minimum wall thickness as follows:

(1) One-eighth inch ($\frac{1}{8}$ ") thick for not more than 6 inches of lead or uranium metal (see Note 1).

(2) One-fourth inch ($\frac{1}{4}$ ") thick for more than 6 inches of lead or uranium metal (see Note 1).

Note 1: Thickness of lead to be measured from outer edge of source cavity to nearest point on outer container wall.

(b) Lead or uranium metal shield to be completely encased so that molten lead or uranium metal will not flow away or lose its shielding efficiency if involved in a fire. The shield must be supported in the outer container in such manner that it cannot change position under any ordinary conditions. Parts of the shield must be so designed that radiation cannot be "beamed" at point where sections join (offset design required).

(c) Containers weighing more than 500 pounds must be fitted with skids or otherwise designed so that excessive weight will be prevented on small areas of car or truck floors.

(d) Containers weighing more than 500 pounds must be provided with hooks, handles, skids or other devices to facilitate handling.

(e) Containers must be of such size and design as are necessary to reduce the radiation from the container to within the limits prescribed in § 173.293 of this chapter.

(f) Containers constructed with tubing for drainage purpose must have the opening exterior to the shipping container plugged or capped. Drain lines must be plugged or capped with a material which will have a melt-point at or below that of lead, for example, lead hard rubber or plastic.

§ 172.250-3 Welding and brazing.

(a) When used to join parts of the container must be performed in a workmanlike manner and shall provide a joint efficiency of not less than 25 percent. The melting point of brazing material must be in excess of 1000° F.

§ 172.250-4 Closure.

(a) Closure must be by positive fastening device capable of withstanding severe impacts without failure.

(b) Lead or uranium metal shielding forming part of closing device must be completely encased in mild steel or equally fire-resistant metal.

(c) Closure must be of off-set design where inserted into other parts of the container.

(d) A means must be provided on the closure to accommodate a seal of a type that must be destroyed if container is opened for any purpose.

§ 172.250-5 Marking.

(a) Marking on each container in an unobstructed area, by embossing or die-stamping on the container, or on a metal plate attached to the container by welding or brazing, in letters and figures at least $\frac{1}{4}$ " in height as follows:

(1) DOT-55*** (stars to be replaced by the tare weight of the container (for example: DOT-55 850)). These marks shall be understood to certify that the container complies with all specification requirements.

(2) The words "RADIOACTIVE MATERIAL."

(3) Name or symbol (letters) of maker or user assuming responsibility for compliance with specification requirements; this must be recorded with the Bureau of Explosives.

TABLE 1

RADIOGRAPHIC DEVICES HAVING NRC CERTIFICATES
OF COMPLIANCE

| Manufacturer Name and Model Number | Type | Certificate Number |
|---|-----------------|-----------------------|
| <u>Automation Industries</u> | | |
| 500 - SU | Source changer | 9006 |
| 520 | Exposure device | 9007 |
| <u>GAMMA Industries</u> | | |
| 6717-B | Overpack | 6717 |
| 20, 20A, 50, 50A | Exposure device | 9126 |
| 100, 100A, 200, 200A | Exposure device | 9127 |
| C-8 | Source charger | 9128 |
| <u>St. Louis Testing Labs</u> | | |
| STL-201 | Exposure device | 9024 |
| <u>Source Product and Equipment Company</u> | | |
| C-1 | Source changer | 9036 |
| SPEC 2-T | Exposure device | 9056 |
| <u>Magnaflux Corporation</u> | | |
| MX-1C-100 | Exposure device | 9110 |
| <u>Technical Operations</u> | | |
| 650 | Source changer | 9032 |
| 660, 660E | Exposure device | 9033 |
| 676, 676E | Exposure device | 9035 |
| 680, 680E | Exposure device | 9035 |
| 683 | Overpack | 9053 |
| 684, 684W | Exposure device | 9028 |
| 715 | Overpack | 9039 |
| 741, 741E | Exposure device | 9027 |
| 750 | Source changer | 9021 |
| 771 | Source changer | 9107 |
| 820 | Source changer | 9137 |
| 900 | Exposure device | 9141 |