

# ***HAZMAT Employee Training***

## **DOT/ NRC- Radioactive Materials Shipments Compliance with 49CFR and 10CFR 71**

The transfer and/or shipment of packages that contain radioactive materials are considered hazardous materials shipments and are governed by the following federal regulations:

- 49CFR Part 107- ***Hazardous Materials Program Procedures***
- 49CFR Parts 171-180, 390-397- ***Hazardous Materials Regulations- Department of Transportation (DOT)***
- 10CFR Part 30.34(c) and Part 30.41- ***Nuclear Regulatory Commission (NRC)***
- 10CFR Part 71- ***Nuclear Regulatory Commission - Packaging and Transportation of Radioactive Material***

### **Training and Record-Keeping Requirements**

***All employees involved with the packaging, marking, labeling, measuring, loading, transporting, and storage of packages containing radioactive material are classified as “Hazmat Employees” and must have DOT training within 90 days of employment and every 3 years thereafter. (If an employee will be performing duties before being trained, they may do so under the supervision of a fully trained individual. This training must include the following topics: general awareness, function-specific training, safety training, security awareness training, and proof that the person has been tested in these areas. The most current certificate documenting training and testing must be on file and available at all times. (49CFR172.704)***

As per 10CFR71.5, “Each licensee who transports licensed material outside the site of usage, as specified in the NRC license, or where transport is on public highways, or who delivers licensed material to a carrier for transport, shall comply with the applicable requirements of DOT regulations in 49CFR parts 107, 171 through 180, and 390 through 397, appropriate to the mode of transport. .

***The most applicable exception to this rule is detailed in 10CFR71.13, exemption of physicians. This rule states that “any physician licensed by a State to dispense drugs in the practice of medicine is exempt from 10CFR71.5 with respect to transport by the physician of licensed material for the use in the practice of medicine. However, any physician operating under this exemption must be licensed under 10CFR35 or the equivalent Agreement State regulations.”***

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## **Verification of Authorization to Receive Radioactive Material (10CFR30.41)**

Regulations require that, before transfer or transportation of radioactive material to another licensee, the transferor must confirm that the transferee has a nuclear materials license from either the NRC, an agreement state, or for licensees abroad, a licensee who has been issued an equivalent license that is recognized by the Atomic Energy Commission.

Methods for verification include:

- A current copy on file at the shipper's facility of the transferee's license
- A verification in writing of the transferee's authorization to receive the type, form, and quantity of byproduct material to be transferred, specifying the license or registration certificate number, issuing agency, and expiration date
- For emergency shipments, the transferor may accept oral certification, but must confirm this in writing within 10 days.
- A verification from another source (i.e. NRC website) with the above information
- A formal verification from the NRC, Agreement State, or foreign equivalent licensing agency

## **Limited Quantity vs. Normal Form Shipments**

The difference between these two types of radioactive shipments is determined by activity **and** external exposure per radionuclide. The Limited Quantity limits as of 10/1/2009 are noted below. Any activity above these limits is considered a Normal Form Shipment. ***These limits are important because you should always send containers back to the Nuclear Pharmacy as Limited Quantity packages.***

If combinations of radionuclides are shipped together in the same package, the total activity for the package must not exceed the lowest activity limit noted below for the radionuclides to be shipped. Sealed/solid sources noted below have been multiplied by ten. ***If the package is below the activity level but exceeds the White I limit of 0.5 mR/hr at the surface, it will be considered a Yellow II package, NOT a limited quantity package.***

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## Maximum Activity Levels for Limited Quantity Packages

Liquid Radionuclides	mCi Max Activity	MBq Max Activity
F-18	1.6	59
P-32	1.4	52
Ga-67	8.1	300
Sr-89	1.6	59
Y-90	0.81	30
Mo-99 generators	1.6	59
Tc-99m	11	407
In-111	8.1	300
I-123	8.1	300
I-125	8.1	300
I-131	1.9	70
Ho-166	1.1	41
Tl-201	11	407

Sources- Solid Radionuclides	mCi Max Activity	MBq Max Activity
Na-22 source	14	518
Co-57 sources	270	9990
Gd-153 sources	0	0
Pd-103 seeds	1100	40700
I-125 seeds	81	2997
Ba-133 source	81	2997
Cs-137 source	16	592

Gas Radionuclides	mCi Max Activity	MBq Max Activity
Xe-133 gas	270	10000

### Limited Quantity Packages (49CFR173.421)

If a package conforms to the above listed activity levels, is less than 0.5 mrem/hr at the surface, and there is no removable surface contamination above limits in 173.443(a), the package *does not require* shipping papers, Type A packaging, emergency response information, labeling, or marking, with the exception of the UN identification number, which is required to be marked on the outer container. The inner packaging (or outer if there is no inner) must also be marked "Radioactive." The proper shipping name does not need to be marked, only the UN identification number. The package must also meet the General Standards for all packages (see below).

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## **Packages/ Containers**

General Standards for all packages (10CFR71.43)

The smallest overall dimension of the package may not be less than 10 cm (4 in). The outside of a package must incorporate a feature, such as a seal, that is not readily breakable and that, while intact, would be evidence that the package has not been opened by unauthorized persons. Each package must include a containment system securely closed by a positive fastening device that cannot be opened unintentionally or by pressure that may arise within the package. It must be made of a material and construction that assures there will not be a significant reaction among the packaging components themselves, with water damage, or with materials under irradiation. It must be designed so that under normal conditions of transport, no loss or dispersal of radioactive material will occur, no significant increase in external surface radiation levels, and no substantial reduction in the effectiveness of the packaging. There are also maximum temperature levels for radioactive materials packages. The level of removable contamination must also be as low as reasonable achievable on the outer packaging (10CFR71.87(i)).

Type A packages or containers must pass a series of physical and environmental abuse tests and hypothetical accident conditions, i.e. vibration test, corner drop test, drop test, water spray test, penetration test, and compression test. Once a container has passed these various tests, it is classified as a "Type A" container and is therefore suitable for Normal Form Shipments.

Certification of Type A testing is typically performed by a professional testing agency and must be on file. If packaging from a third party is being used, paperwork documenting appropriate testing must be obtained from the initial sender of the packaging.

## **Labels, Signs, and Marking**

### **Labeling Packages (49CFR172.406)**

***The contents and activity are to be noted on the diamond shaped DOT labels, designated as White I, Yellow II, and Yellow III. The contents section must contain all of the radionuclides in the container.*** These labels must be placed on two opposite sides of the package. The activity must be listed in units of Bq but traditional units, such as mCi, may be used if they are in parentheses in addition to the Bq units. The conversion for mCi to MBq is 1 mCi= 37MBq. ***The "7" listed at the bottom of the label is the Hazard Class designation for radioactive material listed in the HMR.*** The Yellow II and Yellow III both require the notation of a "***Transport Index***" (TI), which is the reading at one meter, rounded up to one decimal point with no units. For example, a 0.17 mR/hr reading would be a TI of 0.2. The minimum TI is 0.1.

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Any vehicle used to carry Yellow III packages must display placards with a special diamond sign. (49CFR172.404 and 172.556)

The diamond label used is determined by the exposure measurements noted below (49CFR172.403):

	<u>Surface</u>	<u>One meter</u>
<u>WHITE I</u>	< 0.5 mR/hr (<0.005 mSv/hr)	Background
<u>YELLOW II</u>	0.5- 50 mR/hr (0.005-0.5 mSv/hr)	<1 mR/hr (<0.01 mSv/hr)
<u>YELLOW III</u>	50-200 mR/hr (0.5-2.0 mSv/hr)	1-10 mR/hr (0.01-0.1 mSv/hr)
<u>YELLOW III</u> exclusive use only	200-1000 mR/hr (2.0-10.0 mSv/hr)	>10 mR/hr (>0.1 mSv/hr)

10CFR Part 20 requires that **all packages** containing radioactive material except exclusive gaseous and Special Form shipments must be wipe tested on the exterior of the package to check for removable contamination. The limit is **22 dpm/cm<sup>2</sup> over 300 cm<sup>2</sup>** or 6600 dpm/300 cm<sup>2</sup>. This includes limited quantity packages. This must be done before shipment and upon receipt of radioactive material.

If any of the removable contamination limits above are exceeded **upon receipt**, stop and immediately notify the RSO, the final delivery carrier, and by the NRC Operations Center by telephone at 301-816-5100. **NRC phone numbers are also posted in your department and can also be found on the NRC Form 3.**

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## **Identification Numbers and Proper Shipping Names (49CFR172.101)**

The most common materials shipped by medical personnel include the following:

- Radioactive material, excepted package- empty packaging, UN2908
- Radioactive material, excepted package- instruments or articles, UN2911
- Radioactive material, excepted package- limited quantity of material, UN2910
- Radioactive material, Type A package, non-special form, non fissile, UN2915
- Radioactive material, Type A package, special form, non fissile, UN3332

## **Marking Packages (49CFR172.301)**

The package must be marked with the proper shipping name and identification number from the 172.101 table and marked with the technical name, if applicable. Each person who offers a non-bulk hazardous material shall mark the package with the name and address of the consignor or consignee except when the package is transported by highway only and will not be transferred from one motor carrier to another. If a package was previously marked as required for the material being shipped, it need not be remarked. If the package contains previous markings that are no longer appropriate, all markings must be removed before reusing the container.

Markings required in this subpart must be durable, in English, and printed on or affixed to the surface of a package or on a label, tag, or sign. Markings must be displayed on a background of sharply contrasting color, must not be obscured by labels or attachments, and must be located away from any other marking (such as advertising) that could substantially reduce its effectiveness.

Packages containing radioactive material must be marked with a gross mass if greater than 50 kg (110 lb) must have its gross mass including the unit of measurement marked on the outside of the package. Type A packages must have the international vehicle registration code of the origin of the design. If designed in the United States, the symbol is USA.

## **Limited Quantity/ Excepted Package Markings**

If a package contains limited quantities, only the UN identification number must be marked on the package. The proper shipping name does not need to be marked on the package and no other labels are required.

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## Shipping Papers

Packages containing radioactive material above Limited Quantity limits will require a Shipping Paper and Shipper's Certification. (49CFR172.202) The Shipping Paper must include:

1. The identification number as per the 49CFR171.101 table, column 4;
2. The proper shipping name as per the 49CFR171.101 table, column 2
3. The hazard class as per the 49CFR171.101 table, column 3
  - a. The word "Class" must be preceding the number
4. The packing group, as per column 9 (not applicable with Radioactive Materials)
5. The name of each radionuclide, a description of the physical and chemical form, the activity in SI units (Bq), standard units are allowed if in parentheses behind SI units., the label category (White I , Yellow II, or Yellow III),

The Shipper's Certification (49CFR172.204) requires the following to be declared on the shipping paper:

1. "This is to certify that the above-named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation."
2. The certification must be legibly signed manually, by typewriter, or by other mechanical means.

### **If shipping by air, the following additional requirements are applicable:**

1. The Shipper's Certification must also state "I declare that all of the applicable air transport requirements have been met"
2. Each person who offers any radioactive material for transportation aboard a passenger-carrying aircraft shall sign a printed certificate stating that the shipment contains radioactive material intended for use in, or incident to, research, or medical diagnosis or treatment.

### **If shipping by motor carrier, the following additional requirements are applicable:**

1. The sum of all radioactive materials packages in one vehicle must not be greater than 50 TI.
2. All packages must be blocked and braced.
3. Shipping papers must be kept within immediate reach of the driver restrained by a lap belt. (49CFR177.817) Ordinarily, a glove compartment does not meet this requirement. When the driver leaves the vehicle without removing the radioactive materials packages, the shipping and emergency documents must be placed on the driver's seat, with the doors locked and the parking brake on.
4. Areas of the motor vehicle carrying passengers must not exceed 2 mR/hr or 200 mR/hr in exclusive use vehicles.

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- See below for a table listing the distance required between packages and passengers or film based on package TI.(49CFR177.842)

Total transport index	Minimum separation distance in meters (feet) to nearest undeveloped film in various times of transit					Minimum distance in meters (feet) to area of persons, or minimum distance in meters (feet) from dividing partition of cargo compartments
	Up to 2 hours	2-4 hours	4-8 hours	8-12 hours	Over 12 hours	
None .....	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)	0.0 (0)
0.1 to 1.0 .....	0.3 (1)	0.6 (2)	0.9 (3)	1.2 (4)	1.5 (5)	0.3 (1)
1.1 to 5.0 .....	0.9 (3)	1.2 (4)	1.8 (6)	2.4 (8)	3.4 (11)	0.6 (2)
5.1 to 10.0 .....	1.2 (4)	1.8 (6)	2.7 (9)	3.4 (11)	4.6 (15)	0.9 (3)
10.1 to 20.0 .....	1.5 (5)	2.4 (8)	3.7 (12)	4.9 (16)	6.7 (22)	1.2 (4)
20.1 to 30.0 .....	2.1 (7)	3.0 (10)	4.6 (15)	6.1 (20)	8.8 (29)	1.5 (5)
30.1 to 40.0 .....	2.4 (8)	3.4 (11)	5.2 (17)	6.7 (22)	10.1 (33)	1.8 (6)
40.1 to 50.0 .....	2.7 (9)	3.7 (12)	5.8 (19)	7.3 (24)	11.0 (36)	2.1 (7)

NOTE: The distance in this table must be measured from the nearest point on the nearest packages of Class 7 (radioactive) material.

**Packages requiring shipping papers must have an Emergency Response telephone number designated (49CFR172.604).** This telephone number must be entered on the shipping paper in a clearly visible location. The telephone number must be monitored at all times the material is in transportation. The person who answers must be knowledgeable of the hazardous material being shipped as well as emergency response information or the person must have immediate access to such a person. A telephone number that requires a call back, such as an answering service, machine, or pager, does not meet this requirement. Hospital operators do not meet the requirements of this recommendation. It is recommended that the person answering the phone number listed on the shipping paper have a copy of the shipping paper and emergency information the entire time the package is in transit. There are companies that can also be contracted to act as emergency response contacts, please contact your physicist for more information.

## Shipping Paper Recordkeeping Requirements

**Each person or facility who prepares a shipping paper for transport must retain a copy of the paperwork and it must be immediately available for review by an inspector. This paperwork must be retained for two years after the material is accepted by the carrier.** (49CFR172.201(e)). The only exception is if the material is a radioactive waste. In this case, the paperwork must be retained for three years. There are no requirements for facilities to retain records that they receive, only those that they prepare. Persons or companies that transport by highway only, who do not prepare or receive radioactive materials, only need to retain shipping papers for one year (49CFR177.817).

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As per 10CFR71.91, each licensee shall maintain for a period of three years after shipment, *a record* of each shipment (not necessarily the shipping paper) of licensed material showing where applicable-

1. identification of the packaging by model number and serial number,
2. verification that there are no significant defects in the packaging, as shipped,
3. volume and identification of coolant, if applicable,
4. type and quantity of licensed material in each package, and the total quantity of each shipment,
5. date of shipment,
6. name and address of transferee,
7. address to which the shipment was made, and
8. records of package approval.

## **Emergency Response Information**

***For Non-Special Form shipments***, Title 49 CFR Part 172.602 requires the existence of emergency response information. This information must note the following and a sample is attached for your reference. It is recommended that this is copied onto the back of your shipping paper. If it is not on the shipping paper, it can be in another document attached and cross-referenced to the shipping paper.

Shipping papers are important in case of accident, loss, or theft. These documents must be immediately accessible to the driver or carrier and not with the package.

The following information must be contained on the Emergency Response Information paperwork:

- Description and technical name of the hazardous material
- Immediate health hazards
- Risk of fire and explosion
- Immediate precautions
- Immediate methods for handling fires
- Initial methods for handling spills or leaks in absence of fire
- First Aid

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## **Shipment of Sealed Sources**

When returning sealed sources to the pharmacy or manufacturer, most companies will provide you with a source return kit. You will need the following documentation and/or items in order to properly ship the item:

- Notation or proof of a recent leak test for the source (you can make a copy of the latest leak test from your MPC audit report)
- External surface contamination survey of container to be returned
- Labels for either "Type A, Non-special Form" or "Limited Quantity" shipment
- A return box that allows the shielded source to properly fit and is Type A container if shipping Non-Special Form
- If the source is above Limited Quantity limits, or exceeds the 0.5 mR/hr at the surface, you will need shipping papers and emergency information documentation to offer with shipment. (Please ask your physicist for help with this type of shipment.)

## **Package Receipt**

The package should be surveyed and wipe tested within 3 hours of receipt if during normal working hours. If the package is delivered while the facility is closed, it should be surveyed and wipe tested within 3 hours of the next business day.

## **Security Awareness**

When a package is delivered, make sure the package is secure. The package should be placed in an area that is secured from unauthorized access, preferably the hot lab. It should be under direct supervision when not locked in a secure location. When transporting packages, make sure the package is in a locked vehicle at all times that it is not in line of sight of the transporter.

If you are transporting packages containing hazardous materials, you must be aware of your surroundings at all times. ***Be sure to have doors locked, material secured, and remain in constant surveillance of your surroundings.*** If you receive or perceive a threat pertaining to the materials that you are transporting, notify the local authorities, the Emergency Response person on the shipping paper, and your RSO immediately. Try to move the vehicle to a secure area, away from the public or busy roadways if at all possible, unless the authorities instruct you otherwise. ***If you must leave the vehicle, apply the parking brake and assure that all doors are locked. Do not advertise the presence of radioactive materials unless vehicle placarding is required. Shipping papers are however, required to be on the driver seat if leaving the vehicle.***

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**Methods to improve the security of your packages include, but are not limited to tamper-evident closures on packages.** These will notify you if the package has been tampered with while out of your direct control. Blocking and bracing packages will also help prevent easy removal from the vehicle and/or loss of the package in the event of a collision or other impact of the vehicle. The proper Type A packaging, if required, will also keep hazardous materials properly secured within the package and are meant to withstand significant damage and/or impact. (See section on Packages/Containers)

## **Mobile Nuclear Medicine Facilities**

**Mobile Nuclear Medicine trucks and vehicles are not exempt from any DOT regulations.** This means that every QC source as well as all radiopharmaceuticals that are transported on the truck must be properly stored, packaged, labeled, and documented. Keep in mind sources must be below limited quantity limits AND below 0.5 mR/hr at the surface of the container. Flood sources, for example are below the limit of 270 mCi of Co-57 but are usually higher than 0.5 mR/hr, when first received. Additional shielding can be constructed and/or cases designed that reduce the exposure levels to below limited quantity and reduce your documentation requirements. Please discuss with your physicist any questions you may have regarding mobile nuclear facilities.



# HAZMAT Employee Training

## Hazardous Materials Shipping Paper- Non-Special Form Materials

**To:** \_\_\_\_\_ **Date:** \_\_\_\_\_  
 Facility \_\_\_\_\_  
 License # \_\_\_\_\_  
 Address \_\_\_\_\_  
 Contact Person \_\_\_\_\_  
 Phone \_\_\_\_\_

**From:** \_\_\_\_\_  
 Facility \_\_\_\_\_  
 License # \_\_\_\_\_  
 Address \_\_\_\_\_  
 Contact Person \_\_\_\_\_  
 Phone \_\_\_\_\_

Radioactive Material, Type A package, <i>non special form, non fissile</i>	Isotope(s)	Quantity (MBq)	Quantity and Type of Package(s)	Label (circle one)	Transport Index <i>(exp @ 1 meter- only for Yellow II and Yellow III)</i>
<b>Class 7 Radioactive Material</b>			1 Type A container	White I or Yellow II	
<b>UN 2915</b>					

### Survey Results:

Contamination:  
 Wipe Results in DPM/300 cm<sup>2</sup> \_\_\_\_\_  
 Instrument Used \_\_\_\_\_  
*(must be less than 6600 dpm in 300 cm<sup>2</sup> swipe)*  
 Condition of the package \_\_\_\_\_

Exposure:  
 \_\_\_\_\_ mR/hr at surface  
 \_\_\_\_\_ mR/hr at 1 meter  
*(white I- <=0.5 @ surface, bkg @ 1m.)*  
*(yellow II- 0.5- 50 @ surface, <1 @ 1m.)*

### Shipper's Certification:

*This is to certify that the above-named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.*

\_\_\_\_\_  
 Signature

\_\_\_\_\_  
 Date

**EMERGENCY RESPONSE NUMBER** \_\_\_\_\_

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## Hazardous Materials Shipping Paper- Special Form Materials

<b>To:</b>	<b>Date:</b> _____
Facility _____	
License # _____	
Address _____	
Contact Person _____	
Phone _____	

<b>From:</b>
Facility _____
License # _____
Address _____
Contact Person _____
Phone _____

Radioactive Material, Type A package, <i>special form, non-fissile</i>	Isotope(s)	Quantity (MBq)	Quantity and Type of Package(s)	Label (circle one)	Transport Index
<b>Class 7 Radioactive Material</b>  <b>UN 3332</b>			1 Type A container	White I	N/A
				Yellow II	
				Yellow III	

### Survey Results:

#### Contamination:

Wipe Results in DPM/300 cm<sup>2</sup> \_\_\_\_\_

Instrument Used \_\_\_\_\_

(must be less than 6600 dpm in 300 cm<sup>2</sup> swipe)

Condition of the package \_\_\_\_\_

#### Exposure:

\_\_\_\_\_ mR/hr at surface

\_\_\_\_\_ mR/hr at 1 meter

(white I- <=0.5 @ surface, bkg @ 1m.)

(yellow II- 0.5- 50 @ surface, <1 @ 1m.)

### Shipper's Certification:

*This is to certify that the above-named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.*

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

**EMERGENCY RESPONSE NUMBER** \_\_\_\_\_

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## Emergency Response Information- Non Special Form Radioactive Material, UN 2915, Class 7

(from DOT Emergency Response Guidebook, 2004)

### POTENTIAL HAZARDS

#### Health

- Radiation presents minimal risk to transport workers, emergency response personnel and the public during transportation accidents. Packaging durability increases as potential hazard of radioactive content increases.
- Undamaged packages are safe. Contents of damaged packages may cause higher external radiation exposure, or both external and internal radiation exposure if contents are released.
- Type A packages (cartons, boxes, drums, articles, etc.) identified as "Type A" by marking on packages or by shipping papers contain non life-endangering amounts. Partial releases might be expected if "Type A: packages are damaged in moderately severe accidents.
- Radioactive White-I labels indicate radiation levels outside single, isolated, undamaged packages are very low (less than 0.005 mSv/hr (0.5 mrem/hr))
- Radioactive Yellow-II and Yellow-III labeled packages have higher radiation levels. The transport index (TI) on the label identifies the maximum radiation level in mrem/hr at one meter from a single, isolated, undamaged packaged.
- Some radioactive materials cannot be detected by commonly available instruments.
- Water from cargo fire may cause pollution.

#### Fire or Explosion

- Some of these materials may burn, but most do not ignite readily.
- Radioactivity does not change flammability or other properties of materials
- Type B packages are designed and evaluated to withstand total engulfment in flames at temperatures of 800°C (1475° F) for a period of 30 minutes.

### PUBLIC SAFETY

- **CALL Emergency Response Telephone Number on Shipping Paper first.**
- **Priorities for rescue, life-saving, first aid, fire control and other hazards are higher than the priority for measuring radiation levels.**
- Radiation Authority must be notified of accident conditions. Radiation Authority is usually responsible for decisions about radiological consequences and closure of emergencies.
- As an immediate precautionary measure, isolate spill or leak area for at least 25 meters (75 feet) in all directions. Stay upwind. Keep unauthorized personnel away.
- Detain or isolate uninjured persons or equipment suspected to be contaminated; delay decontamination and cleanup until instructions are received from Radiation Authority.

#### Protective Clothing

- Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide adequate protection against internal radiation exposure, but not external radiation exposure.

#### Evacuation

- **Large spill**
  - Consider initial downwind evacuation for at least 100 meters (330 feet)
- **Fire**
  - When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 meters (1000 feet) in all directions

### EMERGENCY RESPONSE

#### Fire

- Presence of radioactive material will not influence the fire control processes and should not influence selection of techniques.
- Move containers from fire area if you can do it without risk.
- Do not move damaged packages; move undamaged packages out of the fire zone.
- **Small fires**
  - Dry chemical, CO<sub>2</sub>, water spray, or regular foam
- **Large fires**
  - Water spray, fog (flooding amounts)
  - Dike fire-control water for later disposal.

#### Spill or Leak

- Do not touch damaged packages or spilled material.
- Damp surfaces on undamaged or slightly damaged packages are seldom an indication of packaging failure. Most packaging for liquid content have inner containers and/or inner absorbent materials.
- Cover liquid spill with sand, earth or other non-combustible absorbent material.

#### First Aid

- Medical problems take priority over radiological concerns.
- Use first aid treatment according to the nature of the injury.
- Do not delay care and transport of a seriously injured person.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Injured persons contaminated by contact with released material are not a serious hazard to health care personnel, equipment, or facilities.
- Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

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## Emergency Response Information- Special Form Radioactive Material, UN 3332, Class 7

(from DOT Emergency Response Guidebook, 2004)

### POTENTIAL HAZARDS

#### Health

- Radiation presents minimal risk to transport workers, emergency response personnel and the public during transportation accidents. Packaging durability increases as potential hazard of radioactive content increases.
- Undamaged packages are safe. Contents of damaged packages may cause higher external radiation exposure, or both external and internal radiation exposure if contents are released.
- Type A packages (cartons, boxes, drums, articles, etc.) identified as "Type A" by marking on packages or by shipping papers contain non life-endangering amounts. Radioactive sources may be released if packages are damaged in moderately severe accidents.
- Radioactive White-I labels indicate radiation levels outside single, isolated, undamaged packages are very low (less than 0.005 mSv/hr (0.5 mrem/hr))
- Radioactive Yellow-II and Yellow-III labeled packages have higher radiation levels. The transport index (TI) on the label identifies the maximum radiation level in mrem/hr at one meter from a single, isolated, undamaged packaged.
- Radiation from the package contents, usually in durable metal capsules, can be detected by most radiation instruments.
- Water from cargo fire control is not expected to cause pollution.

#### Fire or Explosion

- Some of these materials may burn, but most do not ignite readily.
- Radioactivity does not change flammability or other properties of materials
- Radioactive source capsules and Type B packages are designed and evaluated to withstand total engulfment in flames at temperatures of 800°C (1475° F) for a period of 30 minutes.

### PUBLIC SAFETY

- **CALL Emergency Response Telephone Number on Shipping Paper first.**
- **Priorities for rescue, life-saving, first aid, fire control and other hazards are higher than the priority for measuring radiation levels.**
- Radiation Authority must be notified of accident conditions. Radiation Authority is usually responsible for decisions about radiological consequences and closure of emergencies.
- As an immediate precautionary measure, isolate spill or leak area for at least 25 meters (75 feet) in all directions. Stay upwind. Keep unauthorized personnel away.
- Delay final cleanup until instructions or advice is received from Radiation Authority.

#### Protective Clothing

- Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide adequate protection against internal radiation exposure, but not external radiation exposure.

#### Evacuation

- **Large spill**
  - Consider initial downwind evacuation for at least 100 meters (330 feet)
- **Fire**
  - When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 meters (1000 feet) in all directions

### EMERGENCY RESPONSE

#### Fire

- Presence of radioactive material will not influence the fire control processes and should not influence selection of techniques.
- Move containers from fire area if you can do it without risk.
- Do not move damaged packages; move undamaged packages out of the fire zone.
- **Small fires**
  - Dry chemical, CO<sub>2</sub>, water spray, or regular foam
- **Large fires**
  - Water spray, fog (flooding amounts)

#### Spill or Leak

- Do not touch damaged packages or spilled material.
- Damp surfaces on undamaged or slightly damaged packages are seldom an indication of packaging failure. Contents are seldom liquid. Content is usually a metal capsule, easily seen if released from package.
- If source capsule is identified as being out of package, DO NOT TOUCH. Stay away and await advice from Radiation Authority.

#### First Aid

- Medical problems take priority over radiological concerns.
- Use first aid treatment according to the nature of the injury.
- Do not delay care and transport of a seriously injured person.
- Persons exposed to special form sources are not likely to be contaminated with radioactive material.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Injured persons contaminated by contact with released material are not a serious hazard to health care personnel, equipment, or facilities.
- Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.