

Placarding for Radioactive Materials

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Nevada National Security Site

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Vision – Service – Partnership

Preparation for Shipment or Transfer

- The U.S. Department of Transportation, *Hazardous Materials Regulations*, apply to both shippers and motor carriers.
- Data concerning the contents drives shipping name and packaging selection
- The shipper must consider “activity”, dose rate, and contamination.
- Not everything that is radioactive is “radioactive for the purposes of transportation”
 - Non-regulated
 - Class 7



Preparation for Shipment or Transfer

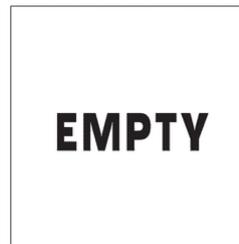
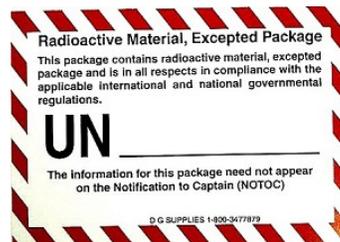
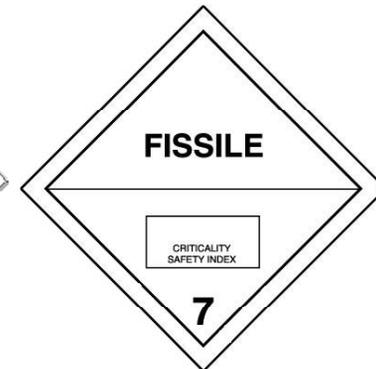
- Common Class 7 Shipping Names and Packagings
 - Empty
 - Limited Quantity and Instruments and Articles
 - Excepted Package
 - Low Specific Activity (LSA) and Surface Contaminated Objects (SCO)
 - Excepted Package
 - Exclusive Use Shipment
 - Industrial Packagings (IP-1, IP-2, or IP-3)
 - Type A
 - Fissile
 - Type B
 - Fissile
 - Highway Route Controlled Quantity



Preparation for Shipment or Transfer

- Packaged Class 7 material must be surveyed to determine Dose Rates and Contamination Levels
 - Non-fixed contamination is virtually eliminated.
 - Dose Rate information is used to determine the category of LABELS that must be affixed to the package.

- Empty Label
- Limited Quantity
- White – I
- Yellow – II
- Yellow – III
- Fissile



Placarding for Radioactive Materials

- Display of hazardous materials placards is another hazard communication requirement.
 - Package marking
 - Package labeling
 - Shipping papers
- All hazard communication elements must be consistent!



- The shipper must offer placards to the motor carrier.
- Visibility and Display
 - Securely attached
 - Adhesive backing or in a holder
 - Clearly visible from the direction they face
 - Each side and each end of the transport vehicle
 - The front of truck-tractor by display the placard instead of the front of the semi-trailer.
 - Upright, on-point such that words read horizontally, left to right



- Placards must be displayed for Class 7 materials ONLY for the following scenarios:
- Any package required to display RADIOACTIVE YELLOW – III labels.
- LSA / SCO shipments in EXCEPTED PACKAGES shipped as EXCLUSIVE USE.
- HIGHWAY ROUTE CONTROLLED QUANTITIES



Summary

- Hazardous materials shipping rules for Class 7 materials acknowledge package integrity as a fundamental control.
- Hazard communication includes marking, labeling, shipping papers and, in limited circumstances, placarding.
- Placarding is required for Class 7 materials under only 3 scenarios:
 - RADIOACTIVE YELLOW – III LABEL
 - LSA / SCO, EXCEPTED PACKAGE, EXCLUSIVE USE
 - HIGHWAY ROUTE CONTROLLED QUANTITY



Reference Sheet for Discussion Only (side 1)



RADIOACTIVE MATERIAL SHIPMENT QUICK REFERENCE SHEET TRANSPORTATION EMERGENCY PREPAREDNESS PROGRAM



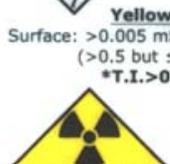
LABELS



White I label

Surface: ≤ 0.005 mSv/h (≤ 0.5 mrem/h)

*T.I. = 0 (0.0-0.05)



Yellow II label

Surface: > 0.005 mSv/h but ≤ 0.5 mSv/h
(> 0.5 but ≤ 50 mrem/h)

*T.I. > 0 but ≤ 1.0



Yellow III label

Surface: > 0.5 mSv/h
(> 50 mrem/h)

*T.I. > 1.0

*T.I. is Transport Index, which is highest reading in mrem/hr at one meter from pkg. (Not shown on White-I labels)

Fissile Label

For packages with fissile material. Has Criticality Safety Index (for limiting fissile mass in a shipment).



EMPTY

Empty Label

For packages that previously contained RAM

PLACARDS

- Packages with Yellow III labels
- Exclusive Use LSA/SCO shipments in excepted package
- Highway Route Controlled Quantity (HRCQ)**

DOT Hazard Class 7

HRCQ Placard (Highway Shipments)



**Highway Route Controlled Quantity (HRCQ) is a high activity shipment and will always be in Type B packaging and require a yellow III label. Shipments by highway will have the square white background.

DMW/DRO/2004

DEFINITIONS AND CONCEPTS

Becquerel (Bq): A measure of the quantity of radioactivity. May also see units in Curies (Ci) on shipping papers and labels.

Criticality Safety Index (CSI): A number assigned to control the number of fissile packages in a shipment based upon criticality concerns. CSI appears on the fissile label.

Excepted package: Will survive routine, incident-free transport without release of contents.

Fissile Material: Except for natural/depleted uranium, any material containing U-233, U-235, Pu-239 or Pu-241. Packages requiring criticality controls will have the Fissile Label. If no criticality controls are needed, the shipping papers will indicate "Fissile Excepted."

Sievert (Sv)/h: A dose rate. Used to express amount of radiation energy deposited in tissue over time. Use of Sv (Sievert) is mandated in regulations. Customary unit of dose is the Rem.

Special Form: Radioactive material in an accident-tested, non-dispersible form.

Type A package: Designed to survive normal transport conditions (minor mishaps and rough handling) without release of contents.

Type B package: Designed to survive severe accidents (impact, fire, water immersion) with minimal or no release of contents.

PUBLIC SAFETY

• CALL Emergency Response Telephone Number on Shipping Papers first. If Shipping Papers not available or no answer, refer to appropriate telephone number listed on the inside back cover of the Emergency Response Guidebook.

• Priorities for rescue, lifesaving, first aid, and control of fire and other hazards are higher than the priority for measuring radiation levels.

• Radiation Authority must be notified of accident conditions, and is usually responsible for radiological decisions about radiological consequences and closure of emergencies.

• Isolate spill or leak area immediately for at least 25 to 50 meters (80 to 160 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.

PERSONAL PROTECTION MEASURES

- Minimize time in radiation area
- Maximize distance from radioactive material
- Use shielding if necessary, as available

MAXIMUM RADIATION LEVELS

EXCEPTED PKG (e.g. Ltd. Qty. and Empty pkgs)

PKG SURFACE: 0.005 mSv/h (0.5 mrem/h)

MIXED LOAD (other than excepted pkg)

PKG SURFACE: 2 mSv/h (200 mrem/h)

1 METER (T.I.): 10

EXCLUSIVE USE

PKG SURFACE: 2 mSv/h (200 mrem/h)*

VEHICLE SURFACE: 2 mSv/h (200 mrem/h)

2 METERS FROM VEHICLE: 0.1 mSv/h (10 mrem/h)

OCCUPIED POSITION: 0.02 mSv/h (2 mrem/h)

*If also Closed Transport Vehicle, this level can be up to 10 mSv/h (1,000 mrem/h)

SHIPPING PAPER/PACKAGE MARKING INFORMATION

(as applicable, and unless excepted)

Proper Shipping Name, Hazard Class, ID# (PSN/ID# also as package marking)

• Reportable Quantity (RQ) of hazardous substance (also as package marking)

• Radionuclide(s) (will also be shown on labels)

• Physical & Chemical form (if not special form)

• Activity per package in TBq, MBq, etc. (will also be shown on labels)

• Category of Label applied

• Transport Index (for Yellow II and III labels)

• Fissile Excepted or Criticality Safety Index (for fissile materials only)

• Package certification information, e.g. USA/9952/B(U)F (TYPE A, TYPE B, TYPE IP-1, IP-2, IP-3, will be marked on pkg.)

• Exclusive Use

• Highway Route Controlled Quantity or "HRCQ" (on shipping papers only)

• 24 hr. emergency contact number

Activity Conversion Table

pCi	nCi	nCi	µCi	µCi	mCi	mCi	Cl	Cl	kCi
27	27	1	27	1	27	1	27	1	37
Bq	Bq	kBq	kBq	MBq	MBq	GBq	GBq	TBq	TBq

New Unit of Quantity = Becquerel (Bq) formerly Curie (Ci) (1 Ci = 3.7x10¹⁰ dps)
1 Becquerel = 1 Disintegration/sec (dps)

Exposure Conversion Table

µSv	µSv	µSv	µSv	mSv	mSv	mSv	Sv
0.01	0.1	1	10	100	1	10	100
µrem	µrem	mrem	mrem	mrem	rem	rem	rem



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Reference Sheet for Discussion Only (side 2)

EXCEPTED PACKAGE SHIPMENTS

- 2908 Radioactive material, excepted package, empty packaging
- 2909 Radioactive material, excepted package-articles manufactured from natural uranium or depleted uranium or natural thorium
- 2910 Radioactive material, excepted package-limited quantity of material
- 2911 Radioactive material, excepted package-instruments or articles

PACKAGING: Excepted packaging; entire contents could be released under accident conditions.

RADIOLOGICAL INFORMATION

Activity: Very low; MBq-GBq range.

Dose rate: Very low [< 0.005 mSv/h (0.5 mrem/h)] at surface of undamaged package.

Contamination: low levels of removable contamination possible from damaged package.

COMMUNICATION

Excepted from shipping papers, marking and labeling, however, UN ID number will be marked on outer package and "Radioactive" will be marked on either outer or inner packaging.

ERG GUIDE NUMBER: 161

LSA and SCO SHIPMENTS

(Low Specific Activity and Surface Contaminated Objects)

- 2912 Radioactive material, low specific activity (LSA-I)
- 3321 Radioactive material, low specific activity (LSA-II)
- 3322 Radioactive material, low specific activity (LSA-III)
- 2913 Radioactive material, surface contaminated objects (SCO-I or SCO-II)

PACKAGING: Unpackaged; bulk shipments; Type A, Type B; IP-1, 2, or 3. Not all packaging is designed to withstand accident conditions without release of contents. SCO materials will not be readily dispersible; LSA materials can be very dispersible. Majority of these shipments are waste materials being shipped for disposal.

RADIOLOGICAL INFORMATION

Activity: Low to Moderate (MBq – TBq).

Dose rate: Low – High [0.005 mSv/h – 10 mSv/h (0.5 mrem/h - 1 R/h)] at surface of undamaged package.

Contamination: Moderate to High levels of removable contamination possible from damaged package with dispersible materials (e.g., contaminated soils).

COMMUNICATION

Shipping papers; most shipments under exclusive use are excepted from marking and labeling, however packages/items will be marked "Radioactive-LSA or -SCO," as appropriate; and placarded Radioactive.

ERG GUIDE NUMBER: 162

FISSILE MATERIAL SHIPMENTS

- 3327 Radioactive material, Type A package, fissile
- 3333 Radioactive material, Type A package, special form, fissile
- 3328 Radioactive material, Type B(U) package, fissile
- 3329 Radioactive material, Type B(M) package, fissile

PACKAGING: Type A and Type B packaging; most fissile packages have multiple barriers and/or shielding, and are designed to withstand severe accident conditions, including impact, fire, and water immersion, with minimal or no release of contents and remaining subcritical.

RADIOLOGICAL INFORMATION

Activity: Moderate – High (GBq – 1,000's of TBq).

Dose rate: Low – High [0.005 mSv/h – 10 mSv/h (0.5 mrem/h - 1 R/h)] at surface of undamaged package.

Contamination: Materials may be in dispersible form; however, integrity of the package will greatly reduce probability of release of material from package.

COMMUNICATION

Shipping papers; marking (proper shipping name, ID#, "Type A," "Type B," and trefoil symbol); labeling based upon radiation levels and also for any subsidiary hazards; fissile label; placarded based upon labeling.

ERG GUIDE NUMBER: 165

TYPE A PACKAGE SHIPMENTS (non-fissile)

- 2915 Radioactive material, Type A package
- 3332 Radioactive material, Type A package, special form

PACKAGING: Type A package; designed to withstand rough handling without release of contents; packages usually contain multiple barriers and/or shielding, however, entire contents could be released under severe accident conditions; special form sources will not be dispersible, but may have high associated dose rates. Contains non life-endangering amounts of radioactive material.

RADIOLOGICAL INFORMATION

Activity: Moderate – High (GBq – 1,000's of TBq).

Dose rate: Low – High [0.005 mSv/h – 10 mSv/h (0.5 mrem/h - 1 R/h)] at surface of undamaged package, very high dose rates possible from damaged packages with special form sources.

Contamination: Breached packages may release significant quantities of dispersible material (if not in special form), however integrity of package should greatly reduce the probability of complete release of contents except under severe accident conditions.

COMMUNICATION

Shipping papers; marking (proper shipping name, ID#, "Type A"); labeled "Radioactive" based upon radiation levels and also for any subsidiary hazards; placarded based upon labeling.

ERG GUIDE NUMBER: 163 / 164

TYPE B PACKAGE SHIPMENTS (non-fissile)

- 2916 Radioactive material, Type B(U) package
- 2917 Radioactive material, Type B(M) package

PACKAGING: Type B packaging; most packages have multiple barriers and shielding; all are designed to withstand severe accident conditions, including impact, fire and water immersion, with minimal or no release of contents.

RADIOLOGICAL INFORMATION

Activity: Moderate – High (GBq – 1,000's of TBq).

Dose rate: Low – High [0.005 mSv/h – 10 mSv/h (0.5 mrem/h - 1 R/h)] at surface of undamaged package.

Contamination: Materials may be in dispersible form, however, integrity of package should greatly reduce the probability of complete release of contents even under severe accident conditions.

COMMUNICATION

Shipping papers; marking (proper shipping name, ID#, "Type B," and trefoil symbol); labeled "Radioactive" based upon radiation levels and any subsidiary hazards; placarded based upon labeling.

ERG GUIDE NUMBER: 163

URANIUM HEXAFLUORIDE (UF₆) SHIPMENTS

- 2978 Radioactive material, uranium hexafluoride
- 2977 Radioactive material, uranium hexafluoride, fissile

PACKAGING: UF₆ is shipped in specially designed cylinders that are pressure vessels; the material is in solid form when shipped, but will convert to Hydrogen Fluoride gas if package is breached and material is exposed to moisture. Non-fissile shipments with less than 100 g UF₆ could be in bare cylinders; UF₆ greater than 100 g will have thermal overpacks; fissile shipments will be in protective overpacks that are designed to withstand severe accident conditions including impact, fire and water immersion.

RADIOLOGICAL INFORMATION

Activity: Low to Moderate (MBq – TBq).

Dose rate: Low – Moderate [0.005 mSv/h – 0.5 mSv/h (0.5 mrem/h to 50 mrem/h)] at surface of undamaged package.

Contamination: Moderate levels of removable contamination possible from damaged package with dispersible materials; UF₆ is also a corrosive material, and when exposed to water, will produce a highly toxic gas.

COMMUNICATION

Shipping papers; marking; labeled "Radioactive," based upon radiation levels and also "Corrosive;" placarded Radioactive and Corrosive.

ERG GUIDE NUMBER: 166

DMW/ORD/2004



HAZTRAK Shipments Sample www.nv.energy.gov/emprograms/haztrak.aspx

Tracking Number BWL11291
Originating Company Name BWXT Y-12, LLC
Destination Company Name NSTEC
Guide Number 162
UN NA Number 3321
Inhalation Hazard
Description RADIOACTIVE MATERIAL, LOW SPECIFIC ACTIVITY
 (LSA-II)
Units 40100 POUND(S)
Packages 1 SEALAND CONTAINER

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Tracking Number BWL11299
Originating Company Name BWXT Y-12, LLC
Destination Company Name NSTEC
Guide Number 161
UN NA Number 2910
Inhalation Hazard
Description RADIOACTIVE MATERIAL, EXCEPTED PACKAGE, LIMITED
 QUANTITY OF MATERIAL
Units 4688 KILOGRAM(S)
Packages 40 DRUM, METAL

=====

Tracking Number BWL11299
Originating Company Name BWXT Y-12, LLC
Destination Company Name NSTEC
Guide Number 165
UN NA Number 3327
Inhalation Hazard
Description RADIOACTIVE MATERIAL, TYPE A PACKAGE, FISSILE
Units 927 KILOGRAM(S)
Packages 22 DRUM, METAL

This data current as of: 15-SEP-2011, 11:00 AM



Placard Samples Poster (side 1)



Placard Samples Poster (side 2)

