Chapter 9

What Are the Rules for Transporting Sources?

Preface

- Packaging.
- Limits.
- Warning labels.
- Transporting sources.

Preface

- US NRC, Agreement States, US DOT.
- Working and non-working hours.
- O&E Manual.

Preface

- Requirements.
- Advertising vs. Not Advertising.
- Withheld from public disclosure.

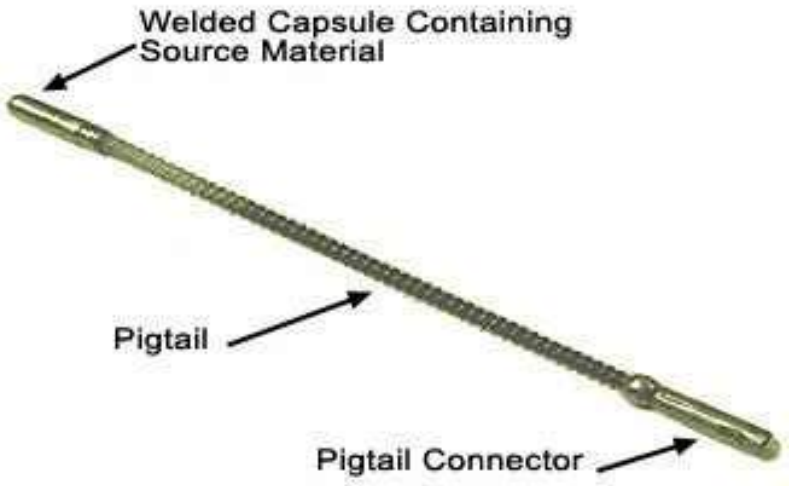
Curies To GBQ

Preface

- GBQ can be considered a RAM transportation unit of measurement.
- # curies x 37 = # Gbq.

Packaging

- Sources must be properly packaged for transportation.
- Special form.
- Normal form.

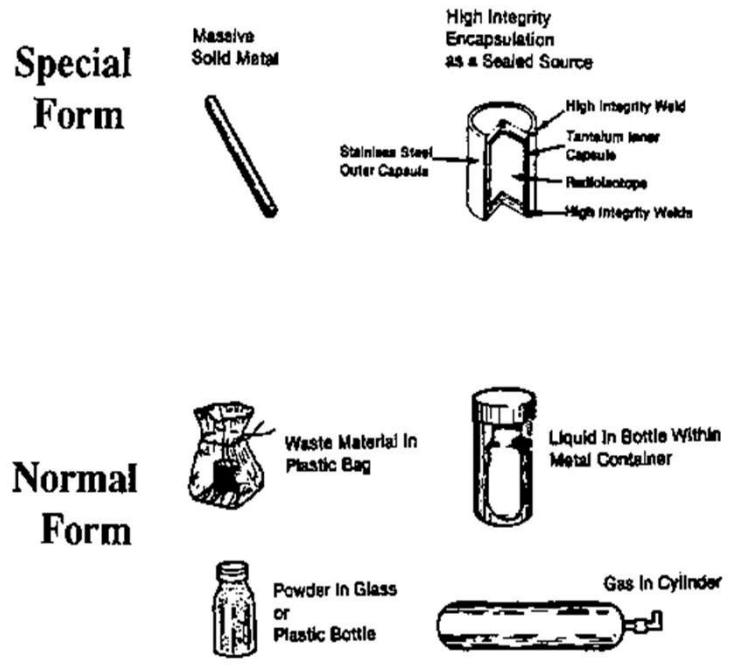


Special Form

- Radioactive material is packaged in a leakproof, escapeproof capsule.
- Prevents the spread of radioactive contamination.

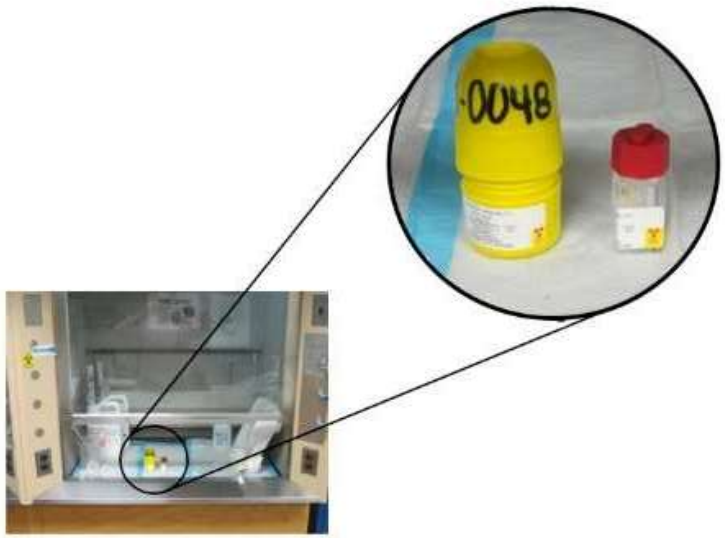
Special Form

- Sealed source contains actual RAM substance from escaping to outside environment.
- How do you know if sealed source opens?



Normal Form

- A form that does not give as much protection against escape of radioactive material.
- Does not qualify as “Special Form”.



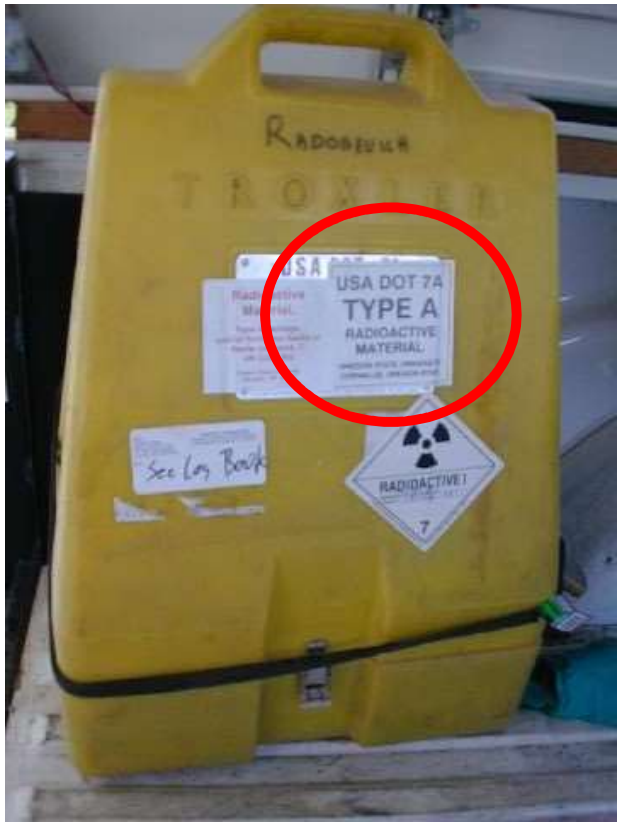
Normal Form

- Not used in industrial settings…mostly medical settings.
- Emits ionizing radiation also.

Packaging Type	Maximum Radiation Activity
Type A	999 GBq (27 Ci) iridium-192 399.6 GBq (10.8 Ci) cobalt-60
Type B	Quantity greater than Type A

Amount of Radioactivity in Packages

- Type A.
- Type B.
- Industrial Radiography – Type B packages.



Type "A" Package

- Type A.
- 27 Ci or less of Ir-192.
- 10.8 Ci or less of Co-60.
- Type A package not as durable as Type B package.

Packaging Type	Maximum Radiation Activity
Type A	999 GBq (27 Ci) iridium-192 399.6 GBq (10.8 Ci) cobalt-60
Type B	Quantity greater than Type A

Amount of Radioactivity in Packages

- Type A.
- Type B.
- Industrial Radiography – Type B packages.


RADIOACTIVE II
DANGER
TYPE B
7274

Type B packaging must pass these tests:

1. A 9.14 m (30 ft) drop onto a hard surface such as concrete.
2. A 101.6 cm (40 in.) drop onto a 15.24 cm (6 in.) diameter steel pin.
3. A fire of 1475 °F for 30 min.

Type B Packaging

- To qualify as Type B packaging, limits exceed that of Type A package.
- The package must be tested.
- Why the tests?

Why the tests?

- Likelihood of Type B package staying intact from traumatic occurrence.
- Emergency personnel would not expect ionizing radiation hazards?

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Overpack

- Some cameras may need additional packaging to meet Type B packaging or to lower surface radiation dose rates for transportation.

Radiation Limits for Packages

- Radiation penetrates material including transport containers.
- US DOT has limits on the dose rate of packages containing RAM.

Radiation Limits for Packages

- Transport Index
- Next slide explains Transport Index.
- The dose rate received is applied to warning labels.

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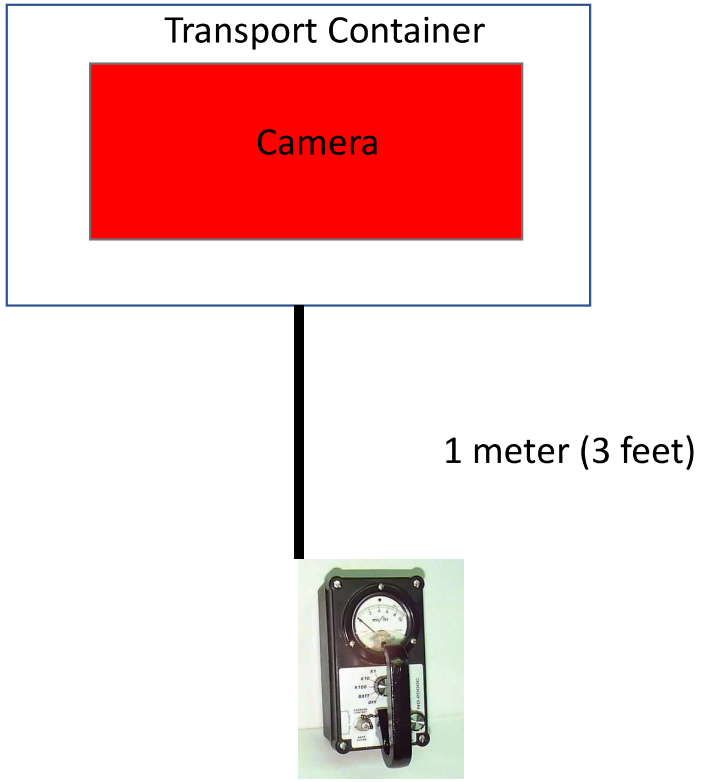
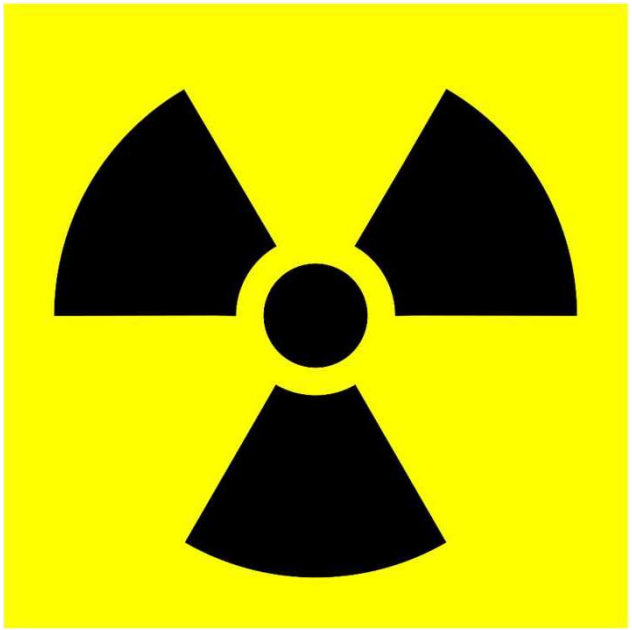
Transport Index





Warning Labels

- Packages containing RAM must be labeled on two opposite side with warning labels.
- Labeling warns people the type of RAM, activity.

Warning Labels

- In transporting RAM during scope of Industrial Radiography work, the package is transported in an approved transport container.

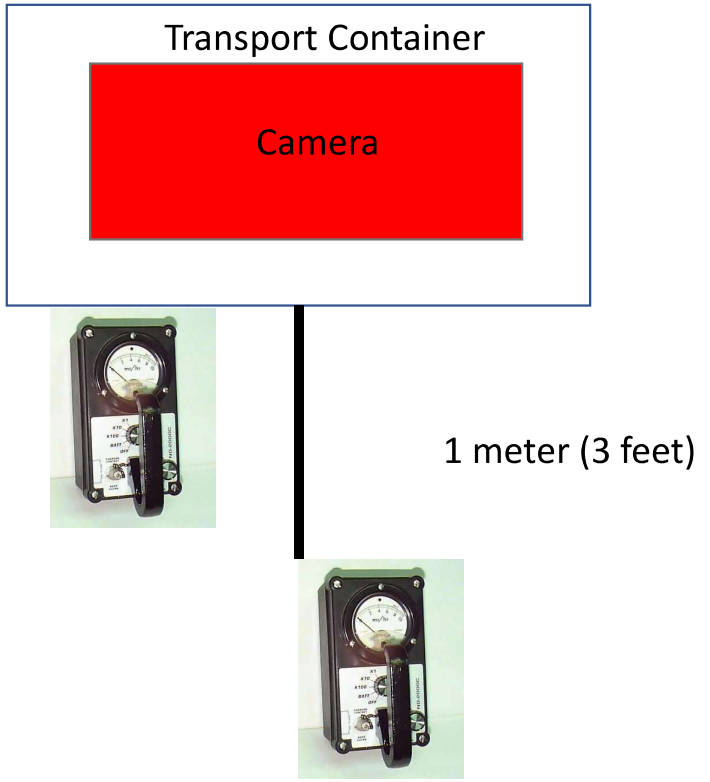
Warning Labels

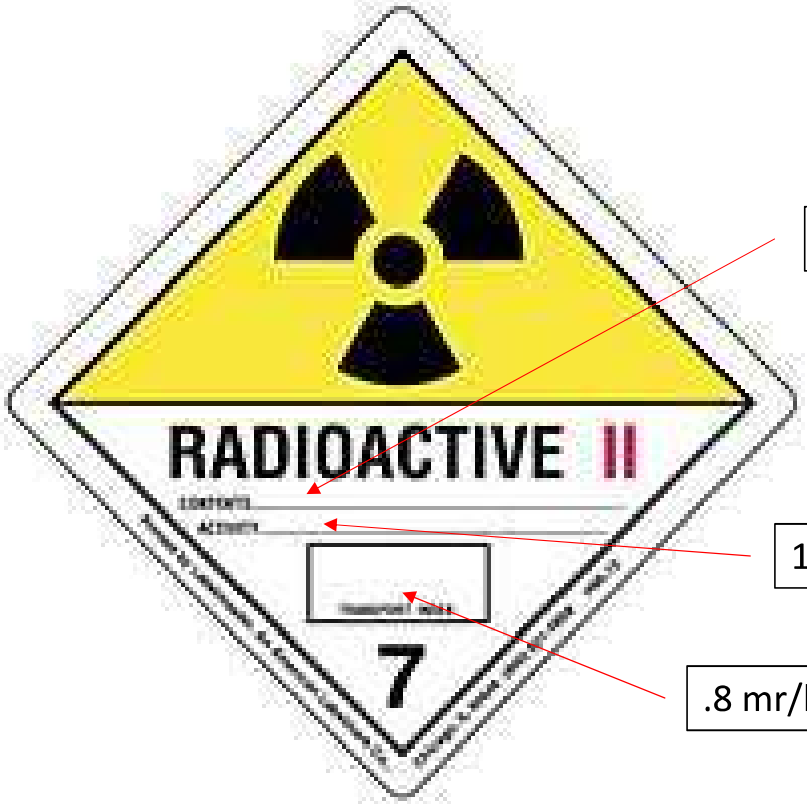
- Warning labels are a RAM transport requirement thus are only in effect during the transport of RAM.

Table 9.1: Dose rates for the three types of warning labels.

Warning label	Maximum dose rate at the surface of the package	Maximum dose rate at 1 m (39.37 in.) from the package (transport index)
Radioactive White I	~~5 μSv/h~~ (0.5 mR/h)	Nil
Radioactive Yellow II	~~500 μSv/h~~ (50 mR/h)	~~10 μSv/h~~ (1 mR/h)
Radioactive Yellow III	~~2 mSv/h~~ (200 mR/h)	~~100 μSv/h~~ (10 mR/h)

Contact Survey & Transport Index





Ir-192

100 Curies (3700 Gbq.)

.8 mr/hr

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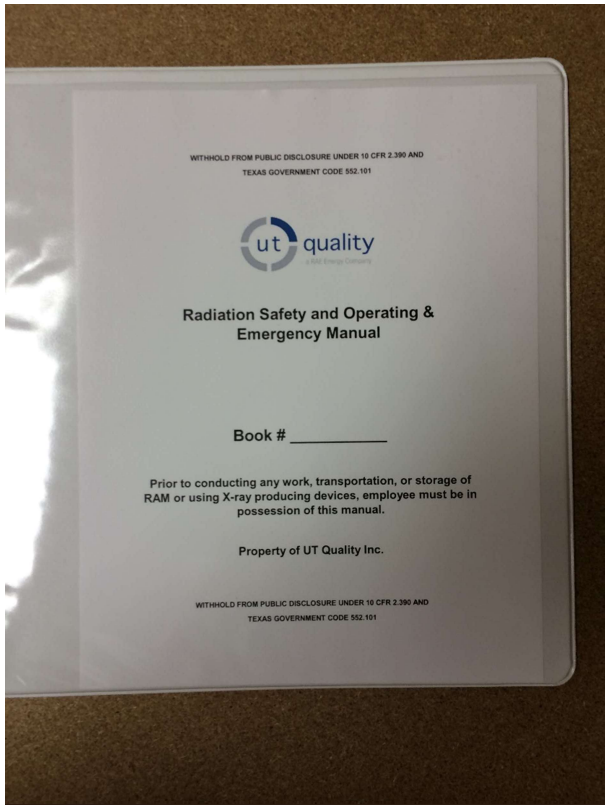
Warning Labels

- The maximum dose rate at the surface of any package containing RAM and in transport is 200 mR/h.
- Emergency!

Moving the Source to the Work Site

- Placards needed?
- Secure camera.
- Required surveys.
- Lock and alarm vehicle.



Moving the Source to the Work Site

- Complete company daily radiation safety reports.
- Procedures?
- Emergencies?

Receiving and Shipping Sources

- Shipping a Source.

- Secure source.
- Surveys made, paperwork completed.
- Affix shipping labels.
- Deliver to shipper.

Reportable Quantity

- Present if package contains a reportable quantity of RAM.

Reportable Quantity

- DOT CFR 172.101 Appendix A, Table 2 contains information regarding Class7 Reportable Quantities

Final Notes

- Daily radiation report.
- Perform and record surveys.
- Complete shipping information.
- Amend warning label information.

Final Notes

- Documents within arms reach in rig.
- ALWAYS lock and alarm vehicle when leaving vehicle unattended.

Making Sense of It All

- Transporting Sources.
- US DOT.
- Correct packaging.
- Radiation limits.
- Warning labels.
- On and off work hours.
- Licensee responsibilities.

Quiz 1 of 8:

Describe the “Transport Index”.

The “Transport Index” is the highest survey reading 1 meter from the package containing radioactive material. This reading is inserted on the warning label.

Quiz 2 of 8:

Radiography sources used for Industrial Radiography are in which form, Special or Normal?

Special form.

Quiz 3 of 8:

The maximum dose rate at the surface of a package containing RAM is _____ mR/h.

200

Quiz 4 of 8:

The surface dose rate of the package is 49 mR/h and the Transport Index is 1.5. Which warning label is affixed to the camera and transport container?

Radioactive Yellow 2 (II).

Quiz 5 of 8:

If a Radioactive Yellow 3 is used as a warning label for transporting a source, what should be placed on the rig?

Placards must be affixed to the rig, on all 4 sides.

Quiz 6 of 8:

An overpack helps secure a package containing radioactive material. What else does an overpack do?

An overpack also helps reduce the surface dose rate of the package.

Quiz 7 of 8:

As part of the qualification process for Type B packages, why are drop tests and fire tests conducted?

These tests simulate accidents that may compromise health and safety if a source becomes unshielded during the course of an accident.

Quiz 8 of 8:

How do you calculate Gbq?

# of curies X 37 = # Gbq

For example, 100 curies X 37 = 3,700 Gbq.

Bonus Quiz:

Without altering actual structure of transport container, what can be done to immediately lower the contact survey rate and Transport Index?

Add additional shielding material around the exposure device within the storage container. For example…sand bags, steel plates, etc.

End of Chapter 9

What Are the Rules for Transporting Sources?