



# TEPP/MERRTT

## Radioactive Material Shipping Packages



# Module Objectives

- Identify typical packages used to transport radioactive material.
- List examples of radioactive material that are shipped in various shipping packages.
- Identify the risks associated with the various shipping packages.
- Identify the testing methods for Type A and B Packages.
- Identify some commonly transported sources of radioactive material.

# Transporting Radioactive Material

- Radioactive materials are a vital part of our modern society
- They are used in hospitals, factories, laboratories, and our homes
- Radioactive material is generally shipped in its most stable form



# Hazard Evaluation

- Radioactive material is transported according to very strict federal regulations that are designed to protect the public and the environment from risks associated with radioactive material during normal and accident conditions.
- Two part philosophy of radioactive material transport says that:
  - Safety is primarily focused on the package
  - Package integrity is directly related to the hazard of the material it contains

# Radioactive Material Packaging

- Radioactive material, like other commodities, is transported every day in the U.S.
- Four Package Types are used:
  - Excepted Packaging
  - Industrial Packaging
  - Type A Packaging
  - Type B Packaging



# Industrial Packaging

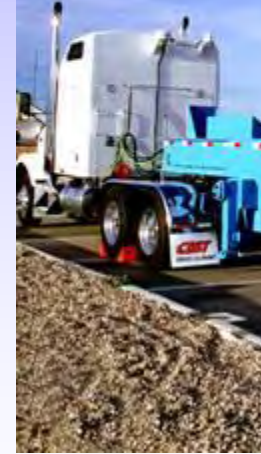


# Type A Packaging





# Type B Packaging



# Risks Associated with Shipping Packages

- Package type can indicate level of risk
- Excepted, Industrial, & Type A Packages contain non life-endangering quantities
- Type B Packages are built to withstand severe accidents
- No injuries or death resulting from the release of radioactive material in a transportation incident

# Package Testing

- Two agencies regulate testing:
  - Department of Transportation (DOT)
  - Nuclear Regulatory Commission (NRC)
- DOT and NRC regulations are based on international regulations issued by the International Atomic Energy Agency (IAEA)
- Package designs are tested using computer simulations, scale model testing, and/or full-scale testing



# Type A Tests



**WATER**

Water spray for 1 hour to simulate rainfall of 2 inches per hour.



**DROP**

Free drop test onto a flat, hard surface.



**STACKING**

Stacking test of at least 5 times the weight of the package. This test is conducted for at least 24 hours.



**PENETRATION**

Penetration test by dropping a 13-pound, 1.25-inch diameter bar vertically onto the package from a height of 3.3 feet.

Package Mass	Free Drop Distance
< Mass 11,000 lbs.	4 feet
11,000 to 22,000 lbs.	3 feet
22,000 to 33,000 lbs.	2 feet
> 33,000 lbs.	1 feet

# Type B Tests



**FREE DROP**

A 30-foot free drop onto a flat, un-yielding surface so that the package's weakest point is struck



**PUNCTURE**

A 40-inch free drop onto a 6-inch diameter steel rod at least 8 inches long, striking the package at it's most vulnerable spot.



**THERMAL**

Exposure of the entire package to 1475° for 30 minutes.



**IMMERSION**

Immersion of the package under 50 feet of water for at least 8 hours.

[View Video](#)



# Common Sources

- Consumer products



M03-Shipping Packages





# Common Sources

- Radiopharmaceuticals



M03-Shipping Packages

# Common Sources

- Industrial sources





# Common Sources

- Nuclear fuels
- Radioactive waste



# Summary

This type of packaging, along with its radioactive contents, must meet standard testing requirements designed to ensure that the package retains its containment integrity and shielding under normal transport conditions.

- a. Type A packaging
- b. Type B packaging
- c. Industrial packaging
- d. Excepted packaging



# Summary

Type B packaging must be able to withstand a series of tests that simulate severe or “worst case” accident conditions.



# Summary

Radiopharmaceuticals are typically shipped in Type A packagings and spent nuclear fuel is typically shipped in Type B packagings.

# Summary

Which of the following statements best applies to the risks associated with material shipped in Type A Packages?

- a. Type A Packages are used to transport very high levels of radioactive material
- b. Type A Packages are used to transport exempt quantities of radioactive material
- c. Type A Packages are built to withstand the most severe accident conditions
- d. Type A Packages contain non life-endangering amounts of radioactive material

# Summary

One common source of radioactive material is:

- a. radio waves
- b. visible light
- c. radiopharmaceuticals
- d. microwaves



# Questions

?

