

D.O.T. HAZMAT / DANGEROUS
GOODS
TRAINING
FOR
HEALTHCARE WORKERS
including the
Nuclear Medicine Technologist
(NMT)

Jason S. Tavel, PhD, DABR

Astarita Associates, Inc.



Why The NMT?

- The NMT routinely ships Excepted Packages
- The NMT may need to ship a Radioactive I or II Package (i.e., flood sources, therapy sources, calibration sources) and
- The NMT may need to sign the “Shippers Declaration for Dangerous Goods Form” as indicated on the air bill



REQUIREMENTS

- The training must include:
 - a. General awareness with the regulations
 - b. Function specific regulations
 - c. Safety
 - d. Security awareness
 - e. Driver training –N/A for the NMT



FREQUENCY OF TRAINING

- Initial within 90 days
- Recurrent at least every 3 years



RECORDS

Must include

- Employee's name
- Completion date of training
- Training materials
- Name and address of hazmat trainer
- Certification that the hazmat employee has been trained and tested



DEFINITIONS

■ Training

A systematic program (consistent approach, testing and documentation) that ensures a hazmat employee has knowledge of hazardous material and the regulations, and can perform assigned hazmat functions properly

From US DOT publication DH M50-0029-0403



DEFINITIONS

■ Hazmat Employer

a person who uses one or more employees in connection with:

1. Transporting hazmat in commerce
2. *Causing hazmat to be transported or shipped in commerce*
3. Representing, *marking, certifying*, selling, offering, reconditioning, testing, repairing, or modifying packages as qualified for use in the transportation of hazmat

From US DOT publication DH M50-0029-0403



DEFINITIONS

- Hazmat Employee

a person who is employed by a hazmat employer and who directly affects hazmat transportation safety including:



DEFINITIONS- HazMat Employee

1. An owner/operator of a motor vehicle which transports hazmat

AND / OR



From US DOT publication DH M50-0029-0403



DEFINITIONS- HazMat Employee

2. A person who

- loads, unloads, or *handles hazmat*
- tests, reconditions, repairs, modifies, marks, or otherwise represents packaging as qualified for use in the transportation of hazmat
- responsible for safety of transporting hazmat
- operates a vehicle used to transport hazmat

From US DOT publication DH M50-0029-0403



REGULATIONS

49CFR106-107

49CFR171-178

<http://ecfr.gpoaccess.gov>



FUNCTION SPECIFIC

- 3 types of packages NMT may ship
 - ◆ Excepted (UN2910 class 7)
 - ◆ Radioactive I (UN2915 class 7)
 - ◆ Radioactive II (UN2915 class 7)



EXCEPTED PACKAGE

Most common type for NMT

- ◆ Must be $<0.5\text{mR/hr}$ on the surface (ion chamber)
- ◆ Must have $<6600\text{dpm}/300\text{cm}^2$
surface contamination for beta/gamma emitters
- ◆ Package quantity must be less than a specified amount.....→



EXCEPTED PACKAGE TABLE

49CFR173.435 A1 & A2 VALUES

(2006)

Isotope	Form	Derived Value ²
Co57	Normal	270mCi
Cs137	Normal	16mCi
Ge68	Normal	14mCi
Gd153	Normal	240mCi
Ba133	Normal	81mCi
I125	Normal	81mCi
Pd103	Normal	1100mCi
Cs131	Normal	810mCi

Notes : 1. If a package has more than one isotope, the max quantity defaults to the lower limit.

2. Normal Form – $10^{-3} * A2$

Rev. 11-08



EXCEPTED PACKAGE TABLE

49CFR173.435 A1 & A2 VALUES

(2006)

Isotope	Form	Derived Value ²
Tc99m	Liquid	11mCi
Tl201	Liquid	11mCi
Ga67	Liquid	8.1mCi
I123	Liquid	8.1mCi
I131	Liquid	1.9mCi
F18	Liquid	1.6mCi
In111	Liquid	8.1mCi
Xe133	Liquid	27mCi
Mo99	Liquid	1.6mCi

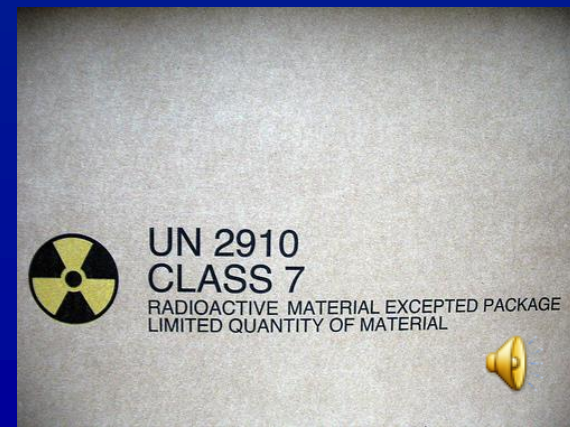
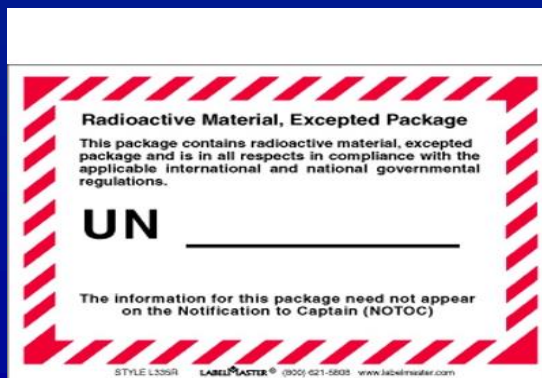
- Notes :
1. If a package has more than one isotope, the max quantity defaults to the lower limit.
 2. Liquid Form – $10^{-4} * A2$

Rev. 11-08



EXCEPTED PACKAGE

- Package is marked
“This package conforms to the conditions and limitations specified in 49CFR173.421 for radioactive material, excepted package-limited quantity of material – UN2910”
- Include emergency response form and packing slip



RADIOACTIVE I-white label

- Activity exceeds table of limited quantities
- Surface $\leq 0.5\text{mR/hr}$
- Must have $<6600\text{dpm}/300\text{cm}^2$ surface contamination for beta/gamma emitters



RADIOACTIVE I

- Package must be labeled with white I label which includes the contents and activity. UN2915
- Include packing slip and appropriate emergency response form.
- Air bill may need to be completed (i.e. FedEx, DHL)
- Dangerous Goods Declaration Required (if ship via air)



RADIOACTIVE II-YELLOW LABEL

- Activity exceeds table of limited quantities
- Surface $>0.5\text{mR/hr}$ BUT $\leq 50\text{mR/hr}$
- TI – Transport Index is exposure at 1 Meter $\leq 1.0\text{mR/hr}$
- Must have $<6600\text{dpm}/300\text{cm}^2$ ($22\text{dpm}/\text{cm}$) surface contamination for beta/gamma emitters



RADIOACTIVE II

- Package must be labeled with yellow II label which includes the contents and activity and Transport Index (1 meter survey). UN2915
- Include packing slip and appropriate emergency response form.
- Air bill may need to be completed
- Dangerous Goods Declaration Required (if ship via air)



RADIOACTIVE III-YELLOW LABEL

- Surface $>50\text{mR/hr}$ BUT $\leq 200\text{mR/hr}$
- 1 Meter $1.0\text{-}10\text{mR/hr}$ (TI)
- Must have $<6600\text{dpm}/300\text{cm}^2$
surface contamination for beta/gamma emitters
- **OPINION:** Not for NMT to handle



Labels – 2 sides of container!



Emergency Response Form for Excepted, I and II packages

EMERGENCY RESPONSE INFORMATION

(49CFR 172.600,602,604)

1. PROPER SHIPPING NAME AND HAZARD CLASS

- ☒ a) Radioactive Material, Excepted Package, Limited Quantity of Material UN2910, Class 7

(Excepted Packages)

- ☐ b) Radioactive Material, Excepted Package, Instruments or Articles, UN2911, Class 7
☐ c) Radioactive Material, Excepted Package, Empty Packaging, UN2908, Class 7
☐ d) Radioactive Material, Type A Package, Special Form, Non-fissile or Fissile Excepted, UN3332, Class 7
☐ e) Radioactive Material, Type A Package, Fissile, Non-Special Form, UN3327, Class 7

- OR ☒ f) Radioactive Material, Type A Package, Non-special form, Non-fissile or Fissile Excepted, UN2915, Class 7

(Rad I or Rad II)

- ☐ g) Radioactive Material, Type B (u) Package, Non-fissile or Fissile Excepted, UN2916, Class 7
☐ h) Radioactive Material, Low Specific Activity (LSA-I) Non-fissile or Fissile Excepted, UN2912, Class 7
☐ i) Radioactive Material, Low Specific Activity (LSA-II) Non-fissile or Fissile Excepted, UN3321, Class 7
☐ j) Radioactive Material, Type A Package Special Form, Fissile, UN3333, Class 7
☐ k) Radioactive Material, Surface contaminated objects (SCO-I) Non-fissile or Fissile Excepted, UN2913, Class 7
☐ l) Radioactive Material, Surface contaminated objects (SCO-II) Non-fissile or Fissile Excepted, UN2913, Class 7
☐ m) Radioactive Material, Type B (M) Package, Non-fissile or Fissile Excepted, UN2917, Class 7

2. IMMEDIATE HAZARDS TO HEALTH: No significant hazards

3. RISKS OF FIRE OR EXPLOSION

- ☐ a) None
☐ b) Compressed gas: could explode on exposure to intense heat or flame

4. IMMEDIATE PRECAUTIONS: Keep non-essential people away from area; notify radiation safety authorities.

5. EMERGENCY FIRE MEASURES: Self-contained breathing apparatus and firefighters' protective gear should be used.

6. FIRST AID: Use standard first aid measures as required. Advise medical personnel that victim may be contaminated with low-level radioactive material.

7. Twenty-four (24) hour emergency response numbers call _____



PACKAGES

- Excepted Quantity: “strong tight packaging”

or

- I and II: Type A container/box



TYPE A-package

- Water spray test - simulates package left in rain for 30 min.
- Drop test - of 4 feet to hard surface
- Puncture Test – with a 13 pound rod dropped onto damp package
- Crush Test – equal to force of 5 times the weight of the package
- Best to keep the packaging the source came in if not damaged!



FEDEX/DHL AIR BILL

- For types I and II packages, the Dangerous Goods Declaration must be answered as “yes” and a Dangerous Goods (candy stripe) form must be completed
- For limited quantity packages that exceed the *Reportable Quantity*, the dangerous goods form must be completed



Reportable Quantity (RQ)

49cfr172.101

Isotope	Reportable Quantity (RQ)	Isotope	Reportable Quantity (RQ)
Co57	100Ci	Tl201	1000Ci
Cs137	1Ci	Ga67	100Ci
Ge68	10Ci	I123	10Ci
Gd153	10Ci	I131	0.01Ci (10mCi)
Ba133	10Ci	F18	1000Ci
I125	0.01Ci (10mCi)	In111	100Ci
Pd103	100Ci	Xe133	1000Ci
Cs131	1000Ci	Mo99	100Ci
Tc99m	100Ci		



EXAMPLE OF FEDEX AIR BILL

FedEx USA Airbill Tracking Number **823965345329**

1 From Please print and press hard

Date _____ Sender's FedEx Account Number _____

Sender's Name _____ Phone _____

Company _____

Address _____

City _____ State _____ ZIP _____

2 Your Internal Billing Reference OPTIONAL

3 To

Recipient's Name _____ Phone _____

Company _____

Address _____
To "HOLD" at FedEx location, print FedEx address. We cannot deliver to P.O. boxes or P.O. ZIP codes.

City _____ State _____ ZIP _____

Questions? Call 1-800-Go-FedEx® (800-463-3339)
Visit our Web site at www.fedex.com

By using this Airbill you agree to the service conditions on the back of this Airbill and in our current Service Guide, including terms that limit our liability.

4a Express Package Service Packages up to 150 lbs.
Delivery commitment made for order in some areas.

☐ FedEx Priority Overnight Next business morning ☐ FedEx Standard Overnight Next business afternoon ☐ FedEx First Overnight Earliest next business morning delivery to select locations

☐ FedEx 2Day* Second business day ☐ FedEx Express Saver* Third business day

4b Express Freight Service Packages over 150 lbs.
Delivery commitment made for order in some areas.

☐ FedEx 1Day Freight* Next business day ☐ FedEx 2Day Freight Second business day ☐ FedEx 3Day Freight Third business day

* Call for Confirmation

5 Packaging * Declared value limit \$500

☐ FedEx Envelope/Letter* ☐ FedEx Pak* ☐ Other Pkg. Includes FedEx Box, FedEx Tube, and customer pkg.

6 Special Handling Includes FedEx address in Section 3.

☐ SATURDAY Delivery Available for FedEx Priority Overnight and FedEx 2Day to select ZIP codes. ☐ SUNDAY Delivery Available for FedEx Priority Overnight to select ZIP codes. ☐ HOLD Weekday at FedEx Location Not available with FedEx First Overnight. ☐ HOLD Saturday at FedEx Location Available for FedEx Priority Overnight and FedEx 2Day to select locations.

Does this shipment contain dangerous goods? **See box must be attached.**

☒ No ☐ Yes No per attached Shipper's Declaration. ☐ Yes Shipper's Declaration not required. ☐ Dry Ice Dry Ice, U.S. DOT 185 ☐ Cargo Aircraft Only

7 Payment Bill to: ☐ Sender ☐ Recipient ☐ Third Party ☐ Credit Card ☐ Cash/Check

Bill to: _____
FedEx Acct. No. in Section 1 will be billed.

Total Packages _____ Total Weight _____ Total Declared Value* \$ _____ .00

*Our liability is limited to \$100 unless you declare a higher value. See back for details. FedEx Use Only

8 Release Signature Sign to authorize delivery without obtaining signature.

By signing you authorize us to deliver this shipment without obtaining a signature and agree to indemnify and hold us harmless from any resulting claims.


360

RETAIN THIS COPY FOR YOUR RECORDS.

Special Handling-"yes" for dangerous goods X



Dangerous Goods Declaration for UN2915 and/or EXCEEDING RQ

SHIPPER'S DECLARATION FOR DANGEROUS GOODS				(Provide at least three copies to the airline.)		
Shipper Jason Tavel Astarita Associates 414 Rt. 111 Smithtown, NY 11787				Air Waybill No. 827276427955 Page 1 of 1 Pages Shipper's Reference Number		
Consignee Isotope Products 1800 North Keystone Avenue Burbank, Ca 91504						
<i>Two completed and signed copies of this Declaration must be handed to the operator</i>				WARNING Failure to comply in all respects with the applicable Dangerous Goods Regulations may be in breach of the applicable law, subject to legal penalties.		
TRANSPORT DETAILS This shipment is within the limitations prescribed for: (delete non applicable) <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;">PASSENGER AND CARGO AIRCRAFT</div> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;">XXXX</div> <div style="border: 1px solid black; padding: 2px;">T</div> </div>				Airport of Departure New York JFK		
Airport of Destination: Burbank, Ca				Shipment type: (delete non applicable) <input type="checkbox"/> Other <input type="checkbox"/> Other <input type="checkbox"/> Other		
NATURE AND QUANTITY OF DANGEROUS GOODS						
Dangerous Goods Identification				Quantity and type of packaging	Packing Inst.	Authorization
UN or ID No.	Proper Shipping Name	Class or Division (Subsidiary Risk)	Packaging Group			
UN 2915	Radioactive Material Type A Package	7		Ge-68 Solid Ceramic x 55MBq 1 Type A Package	Type II Yellow TI=0.2 Dim. 77x 23x 23cm	
Additional Handling Information						
Emergency Telephone Number 631 265-2950						
I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labelled/placarded, and are in all respects in proper condition for transport according to applicable International and National Governmental Regulations. I declare that all of the applicable air transport requirements have been met.				Name/Title of Signatory Jason Tavel, Medical Physicist Place and Date Smithtown, NY November 27, 2009 Signature (all writing above)		
FOR RADIOACTIVE MATERIAL SHIPMENT ACCEPTABLE FOR PASSENGER AIRCRAFT, THE SHIPMENT CONTAINS RADIOACTIVE MATERIAL INTENDED FOR USE IN OR INCIDENT TO RESEARCH, MEDICAL DIAGNOSIS, OR TREATMENT.						



Dangerous Goods Declaration

■ EMERGENCY RESPONSE PHONE NUMBER

A person who offers a hazardous material for transportation must provide an emergency response telephone number, including the area code or international access code, for use in the event of an emergency involving the hazardous material. The telephone number must be—



Dangerous Goods Declaration

- EMERGENCY RESPONSE PHONE NUMBER

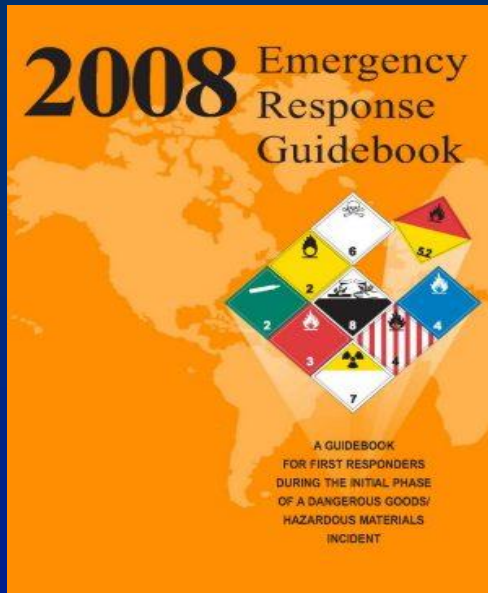
- (1) Monitored at all times the hazardous material is in transportation, including storage incidental to transportation;
- (2) The telephone number of a person who is either knowledgeable of the hazardous material being shipped and has comprehensive emergency response and incident mitigation information for that material, or has immediate access to a person who possesses such knowledge and information.
- (3) A telephone number that requires a call back (such as an answering service, answering machine, or beeper device) does not meet the requirements of paragraph (a) of this section



49cfr172.604



Emergency Response



EMERGENCY RESPONSE INFORMATION
(49CFR 172.600, 602, 604)

1. PROPER SHIPPING NAME AND HAZARD CLASS

☒ a) Radioactive Material, Excepted Package, Limited Quantity of Material, UN2910, Class 7
(Excepted Packages)

☐ b) Radioactive Material, Excepted Package, Instruments or Articles, UN2911, Class 7

☐ c) Radioactive Material, Excepted Package, Empty Packaging, UN2908, Class 7

☐ d) Radioactive Material, Type A Package, Special Form, Non-fissile or Fissile Excepted, UN3332, Class 7

☐ e) Radioactive Material, Type A Package, Fissile, Non-Special Form, UN3337, Class 7

OR ☒ f) Radioactive Material, Type A Package, Non-special form, Non-fissile or Fissile Excepted, UN2915, Class 7
(Rad I or Rad II)

☐ g) Radioactive Material, Type B (U) Package, Non-fissile or Fissile Excepted, UN2916, Class 7

☐ h) Radioactive Material, Low Specific Activity (LSA-I) Non-fissile or Fissile Excepted, UN2912, Class 7

☐ i) Radioactive Material, Low Specific Activity (LSA-II) Non-fissile or Fissile Excepted, UN3321, Class 7

☐ j) Radioactive Material, Type A Package-Special Form, Fissile, UN3333, Class 7

☐ k) Radioactive Material, Surface-contaminated objects (SCO-I) Non-fissile or Fissile Excepted, UN2913, Class 7

☐ l) Radioactive Material, Surface-contaminated objects (SCO-II) Non-fissile or Fissile Excepted, UN2913, Class 7

☐ m) Radioactive Material, Type B (M) Package, Non-fissile or Fissile Excepted, UN2917, Class 7

2. IMMEDIATE HAZARDS TO HEALTH: No significant hazards

3. RISKS OF FIRE OR EXPLOSION

☐ a) None

☐ b) Compressed gas: could explode on exposure to intense heat or flame

4. IMMEDIATE PRECAUTIONS: Keep non-essential people away from area; notify radiation safety authorities.

5. EMERGENCY FIRE MEASURES: Self-contained breathing apparatus and firefighters' protective gear should be used.

6. FIRST AID: Use standard first aid measures as required. Advise medical personnel that victim may be contaminated with low-level radioactive material.

7. Twenty-four (24) hour emergency response numbers call _____



Emergency Response



GUIDE 163

RADIOACTIVE MATERIALS (LOW TO HIGH LEVEL RADIATION)

ERG2008

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.
- Type B packages, and the rarely occurring Type C packages, (large and small, usually metal) contain the most hazardous amounts. They can be identified by package markings or by shipping papers. Life threatening conditions may exist only if contents are released or package shielding fails. Because of design, evaluation and testing of packages, these conditions would be expected only for accidents of utmost severity.
- The rarely occurring "Special Arrangement" shipments may be of Type A, Type B or Type C packages. Package type will be marked on packages, and shipment details will be on shipping papers.
- Radioactive White-I labels indicate radiation levels outside single, isolated, undamaged packages are very low (less than 0.005 mSv/h (0.5 mrem/h)).
- 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/h one meter from a single, isolated, undamaged package.
- Some radioactive materials cannot be detected by commonly available instruments.
- Water from cargo fire control 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. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
- 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.

ERG2008

RADIOACTIVE MATERIALS (LOW TO HIGH LEVEL RADIATION)

GUIDE 163

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 fire zone.

Small Fire

- Dry chemical, CO₂, water spray or regular foam.

Large Fire

- 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

- Call 911 or emergency medical service.
- 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.

SAFETY

■ Remote handling techniques (tongs, cart)

■ Time

■ Distance

■ Shielding

■ Gloves



SAFETY

- Remote handling techniques (tongs, cart)

- Time —

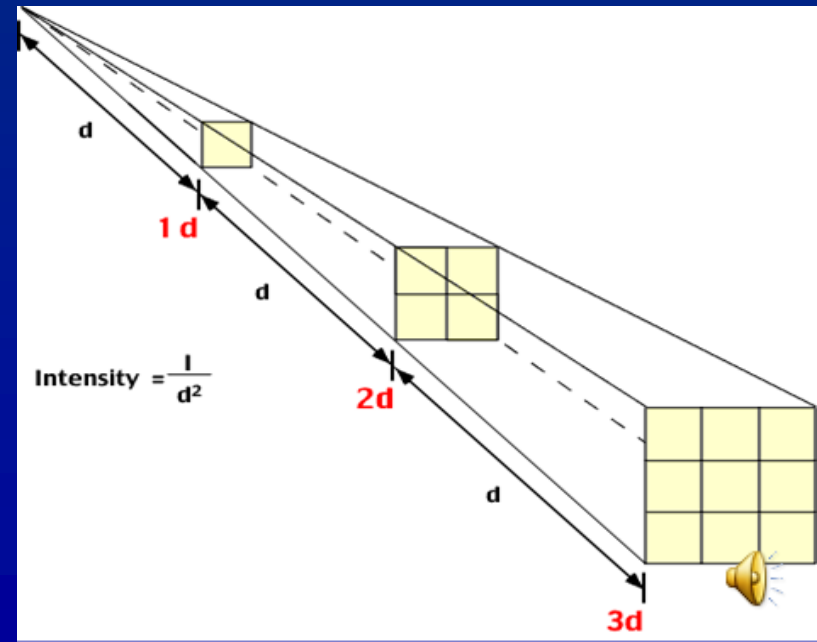
decrease time around radioactive sources
10mR/hr is only <1 mR of exposure
when around source for 5 minutes

- Distance
- Shielding
- Gloves



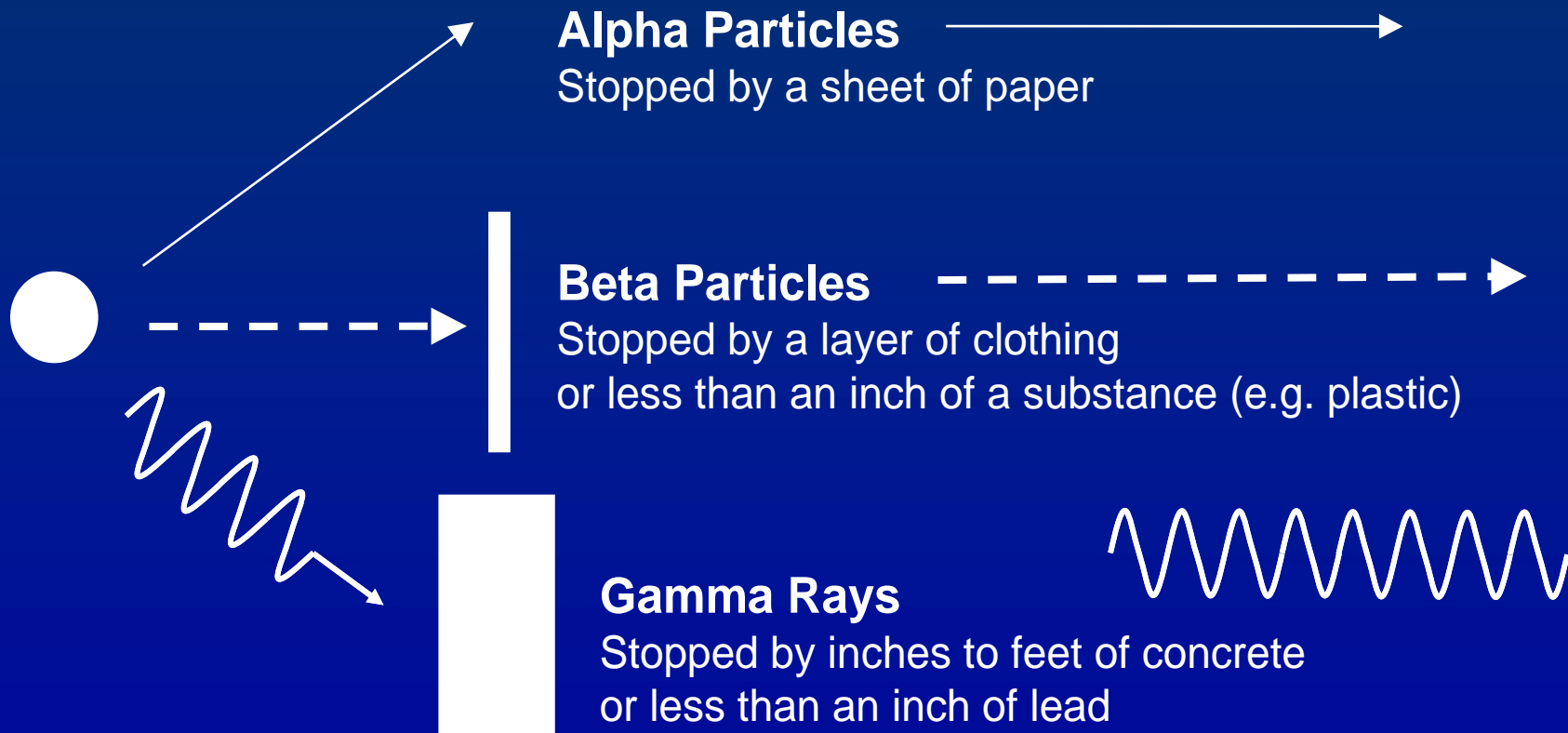
SAFETY

- Remote handling techniques
- Time
- Distance - inverse square law
 - 10mR/hr at 1 meter is
 - 2.5mR/hr at 2 meters
 - 1.1mR/hr at 3 meters
- Shielding
- Gloves



SAFETY

■ Shielding



SAFETY

- Remote handling techniques (tongs, cart)
- Time
- Distance
- Shielding
- **Gloves**



SECURITY AWARENESS

- Secure all sources from un-authorized personnel (i.e. not left on loading dock)



- Secure sources like we do every day with patient doses!



FAQ'S

- Who certifies that an instructor is qualified to train and test?

Except for certain FAA requirements, the DOT does not review and approve training programs. The employer must determine a trainers qualifications based on the employers need.

From US DOT publication DH M50-0029-0403



FAQ'S

- May hazmat employers train and test themselves?

Yes – providing the requirements are met.

From US DOT publication DH M50-0029-0403



FAQ'S

- If an outside source trains but does not test, must the employee be tested?

Yes – it is the responsibility for the employer to train and test.

From US DOT publication DH M50-0029-0403



FAQ'S

- Must the test be written?

No – testing may be written, verbal, or performance based.

From US DOT publication DH M50-0029-0403



Post Test suggestions

- Identify types of radioactive placards
- Define the exposure limits for each placard
- Define “excepted package”
- Define Transport Index
- Complete a FedEx air bill
- Complete a Dangerous Goods Declaration



Post Test.....

Isotope	Form	Limited Quantity Derived Value	Reportable Quantity (RQ)
Co57	Normal	270mCi	100Ci
Cs137	Normal	16mCi	1Ci
Ge68	Normal	14mCi	10Ci
Gd153	Normal	240mCi	10Ci
Ba133	Normal	81mCi	10Ci
I125	Normal	81mCi	0.01Ci (10mCi)
Pd103	Normal	1100mCi	100Ci
Cs131	Normal	810mCi	1000Ci
Tc99m	Liquid	11mCi	100Ci
Tl201	Liquid	11mCi	1000Ci
Ga67	Liquid	8.1mCi	100Ci
I123	Liquid	8.1mCi	10Ci
I131	Liquid	1.9mCi	0.01Ci (10mCi)
F18	Liquid	1.6mCi	1000Ci
In111	Liquid	8.1mCi	100Ci
Xe133	Liquid	27mCi	1000Ci
Mo99	Liquid	1.6mCi	100Ci

- What are the exposure limits for a Type II radioactive package?
0.5 to 50mR/hr surface
1mR/hr at 1 meter
6600dpm/300cm²
- What type of label is required for 15mCi of Tc99m liquid with a package surface exposure of 0.3mR/hr?
Radioactive Type I (exceeds LQ)

 What if exposure was 0.9mR/hr?
Radioactive Type II

 What if package is <0.5mR/hr and quantity is 8mCi?
Excepted Package Limited Quantity
- What is the TI (transportation index)
The exposure at 1 meter
- Does 20mCi I125 with a surface exposure of <0.5mR/hr need a Dangerous Goods Declaration?
Yes (exceeds RQ)



Post Test.....

5. True or false: The emergency contact number must be manned 24hrs a day until the package is received by the recipient.

True

6. True or false: An excepted package limited quantity must be shipped in a Type A container.

False (only strong tight packaging is required)

7. True or false: A package may be left unattended on a loading dock provided the carrier has been notified and is in route.

False (a radioactive package must be secured at all times)

8. True or false: A GM meter is an appropriate device for determining surface exposure and transportation index (TI).

False (Ion chamber)





CERTIFICATE OF COMPLETION

DOT HazMat / Dangerous Goods Training for Healthcare Workers

Method of Training:

Narrated power point presentation with review questions

Material Presented:

General awareness with the regulations, function specific regulations, and safety & security awareness pertaining the preparation and shipment of radioactive material

Trainer/Presenter:

Jason Tavel, PhD, DABR, Licensed Medical Physicist

I hereby certify that I have reviewed the entire narrated power point presentation with review questions. In addition to this presentation, I have reviewed my performance of these tasks.

Name: _____ Signature: _____ Date: _____

ASTARITA ASSOCIATES
414 ROUTE 111 SMITHTOWN, NY 11787
(631) 265-2950
www.AstaritaAssociates.com



EXCEPTED PACKAGE /RQ Table

	Form	Limited Quantity Derived Value ²	Reportable Quantity (RQ) ³
Co57	Normal	270mCi	100Ci
Cs137	Normal	16mCi	1Ci
Ge68	Normal	14mCi	10Ci
Gd153	Normal	240mCi	10Ci
Ba133	Normal	81mCi	10Ci
I125	Normal	81mCi	0.01Ci (10mCi)
Pd103	Normal	1100mCi	100Ci
Cs131	Normal	810mCi	1000Ci
Tc99m	Liquid	11mCi	100Ci
Tl201	Liquid	11mCi	1000Ci
Ga67	Liquid	8.1mCi	100Ci
I123	Liquid	8.1mCi	10Ci
I131	Liquid	1.9mCi	0.01Ci (10mCi)
F18	Liquid	1.6mCi	1000Ci
In111	Liquid	8.1mCi	100Ci
Xe133	Liquid	27mCi	1000Ci
Sr82	Liquid	0.5mCi	Not Listed
Sr85	Liquid	5.4mCi	10Ci
Rb82	Liquid	Not Listed	Not Listed
Sr89	Liquid	1.6mCi	10Ci
Sm153	Liquid	1.6mCi	100Ci
Mo99	Liquid	1.6mCi	100Ci

Notes :

1. If a package has more than one isotope, the max quantity defaults to the lower limit.
2. Normal Form – $10^{-3} \cdot A^2$ Liquid Form $10^{-4} \cdot A^2$ (49cfr173.435 2006 version)
3. RQ Value – 49cfr172.101



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Must repeat every three years!!!

