

2002 EDITION

INSTRUCTOR

Hazardous Materials Transportation Training Modules

MODULE 5 **Packaging**



U.S. Department of Transportation
Research and Special Programs
Administration



Script

Visual

Narrative

1



This module presents the DOT requirements for the packaging of hazardous materials using the HMT and Part 173.

2



Who is required to comply with the HMR?

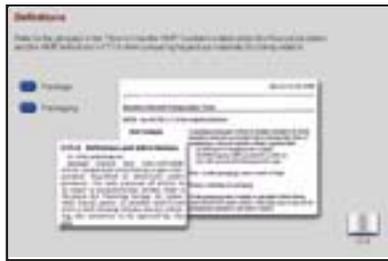
According to 171.2(a) of the HMR, anyone who offers or accepts a hazardous material shipment must comply with the HMR. No person, individual or company may offer or accept a hazardous material for transportation in commerce unless the shipment complies with the HMR.

3



If you transport hazardous materials in the course of commercial business, you are regulated and must comply with the HMR. The purpose of HMR packaging requirements is to assure that hazardous materials stay in the package during transportation.

4



The packaging of hazardous materials has its own vocabulary. Common terms take on new meanings when applied to the HMR. Refer to the glossary in the “How to Use the HMR” booklet located under the Resources button, and the HMR definitions in 171.8 when preparing hazardous materials for transportation.

5



The term package or outside package refers to the packaging plus its contents, and is used throughout the HMR.

6



The term 'packaging' refers to a receptacle and any other components or materials necessary to perform its containment function in conformance with the minimum packing requirements of the HMR. A package must meet minimum packaging requirements. Packaging includes fiberboard boxes, drums, jerricans, portable tanks, cargo tanks, tank cars, multi-unit tank car tanks, and containers other than freight containers and overpacks. The term packaging is also used extensively throughout the HMR, and is another of the terms frequently misused by those who use the HMR.

7



A shipment of hazardous material that is not prepared in accordance with the HMR may not be offered for transportation by any mode.

8



If you offer hazardous materials for transportation, you must train your hazmat employees. Training must be in accordance with the applicable parts of the HMR. Train every officer, agent and employee that has any responsibility for preparing the hazardous materials for shipment. Every person such as a freight forwarder, agent or broker, who performs a function required by Part 173 must perform that function according to the HMR. This means that all hazardous materials must be properly classified, described, and packaged.

9



For example: If a carrier repackages a hazardous material for any reason, the carrier is preparing the shipment for transportation. The material must be repackaged in accordance with all applicable HMR provisions. It makes no difference that the carrier is not the shipper; the carrier is functioning as a shipper. Sometimes more than one person performs an “offeror” or shipper function. Each person performing an “offeror” function is accountable for HMR packaging responsibilities.

Quick Review #1

Instructions: Select the term that correctly completes each statement.

Terms:

- A. requests B. package C. truck D. consignee
E. offers F. storage G. carrier H. freight forwarder
I. packaging

Statements:

1. The shipper and the _____ share responsibility to offer and/or accept only hazardous materials that comply with the HMR.
2. The purpose of HMR packaging requirements is to assure that hazardous materials stay in the _____ during transportation.
3. Anyone who _____ hazardous materials for transportation must train his/her hazmat employees in the applicable requirements of the HMR.
4. Anyone, shipper or carrier, who performs a _____ function must comply with applicable HMR packing requirements.

Correct Answers:

1. G carrier
2. B package
3. E offers
4. I packaging

10



Packaging of hazardous materials for transportation in all modes must be as specified in the HMR. The initial carrier and the U.S. Department of Transportation and its designated agencies are authorized to inspect hazardous materials packages for HMR compliance. They may inspect for methods of manufacture, packing, and storage of hazardous materials that affect safety in transportation.

11



Preparation of hazardous materials for transportation is the responsibility of the person, or persons, who offers the material for transportation. Unless otherwise provided, a hazardous material may be offered for transportation in an HMR approved packaging or container only if the material is properly classed, properly described, in a properly manufactured and tested packaging or container, in a packaging marked in accordance with the HMR, and the package is in full compliance with Part 178.

Quick Review #2

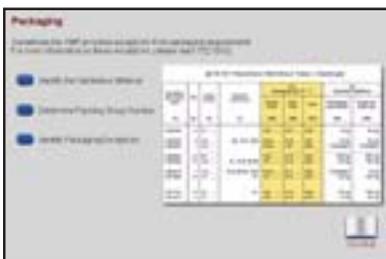
Instructions: Select the best answer from the four choices provided.

The packaging of hazardous materials for all modes of transportation must be as specified in the HMR. Packages of hazardous materials may be inspected for safety by _____ and the initial carrier.

- A. FBI
- B. USDOT
- C. local police
- D. anyone

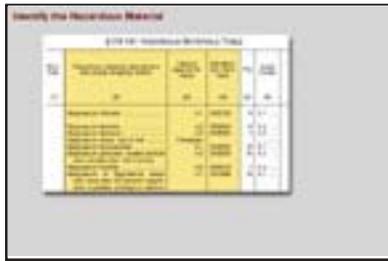
Correct Answer: B USDOT

12



The HMR prescribes packaging authorizations for the transport of hazardous materials. In the HMT, Columns (8A), (8B), and (8C) direct you to specific packaging requirements for each hazardous material. The correct packaging is determined by the hazard class/division of the material, the packing group and the quantity of materials being shipped. For this module, we are assuming that the material has been properly classified and assigned a proper shipping name. Click on each button to learn more.

13



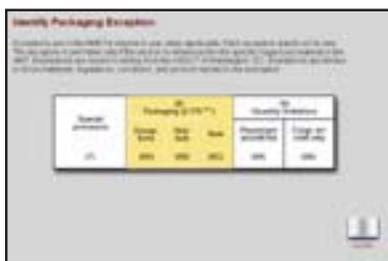
The first step in selecting proper packaging is to turn to the Hazardous Materials Table. Identify the material’s proper shipping name, hazard class, and identification number in columns 2, 3, and 4.

14



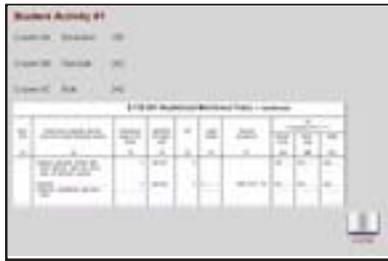
The second step is to determine the packing group in Column 5. The packing group is indicated by the letters PG plus the roman numerals I, II, or III. These reflect the degree of danger within certain hazard classes. Packing Group I represents the greatest danger, Packing Group II represents a medium danger, and Packing Group III represents a minor danger.

15



Now follow across the HMT to Column 8 “Packaging (Section 173.***)” Column (8A) provides exceptions to the packaging requirements if certain conditions are met. Column (8B) provides authorized packaging for non-bulk, and Column (8C) provides authorized packaging for bulk. To find the reference section, please replace the asterisk after 173 in the heading with the references found in Columns (8A), (8B), and (8C). Remember that Column (8A) lists exceptions, not exemptions.

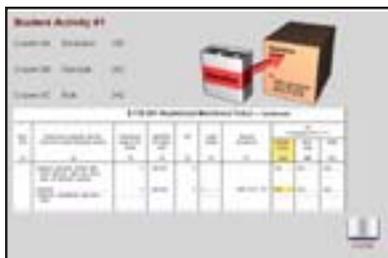
16



Determine the proper packaging authorization for a shipment consisting of 1 liter of gasoline.



The gasoline is in a metal can and packaged in a strong outer container.



Gasoline is a Class 3, PG II material. The packaging authorizations in Column 8 of the HMT read as follows:
8A, exceptions, 150



8B, non-bulk, 202



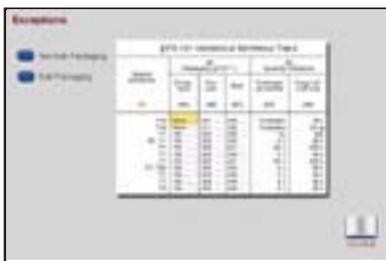
8C, bulk, 242
Check 173.150 to see if an exception applies. Section 173.150(b)(2) states that for flammable liquids in Packing Group II, not over 1.0L net capacity, packed in a strong outer packaging is authorized. This package meets the provisions of 173.150. Therefore, the package may be shipped as a “Limited Quantity”.

17



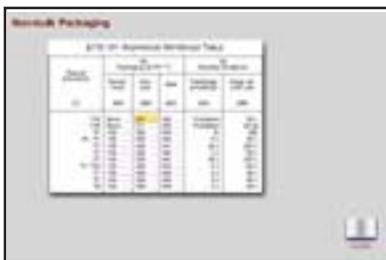
When shipped as a Limited Quantity, the hazardous material is excepted from specification packaging and placarding in all modes of transportation. It is also excepted from labeling in all modes, except air. Section 171.8 defines “Limited Quantity” as the maximum amount of a hazardous material for which there is a specific labeling or packaging exception.

18



If Column (8A) contained the entry “none,” then compliance with the specific packaging sections, listed in Columns (8B) or (8C) would be required. Also, compliance with a specific packaging section is required when the package does not meet the requirements of the section referenced in Column (8A). Click on the buttons to learn more.

19



Column (8B) refers you to the section in Part 173 of the HMR that contains the non-bulk packaging authorizations. A shipper may choose any appropriate packaging listed in the authorization section shown in Column (8B).

20



In the packaging section, it is important to read the heading of each paragraph as well as the entire packaging section. Also read any other sections mentioned within the section. Some paragraphs might specify packaging for other than the material you are shipping. Other sections provide exceptions from specific packaging authorizations; that is, in addition to the exceptions listed in Column (8A).

21

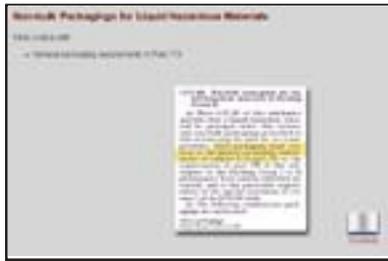


It is important to become acquainted with the different types of packages in each of the packaging sections. Non-bulk packaging for liquids is found in 173.201, 173.202, and 173.203. If a shipper wanted to package gasoline in 55-gallon metal drums, 173.202 offers a choice of drums made from steel, aluminum or other metals. Review 173.202 to see specifically what it says about packaging requirements for gasoline in 55-gallon metal drums.

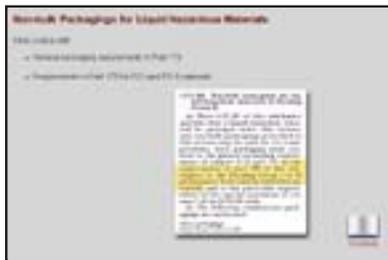
22



Notice that 173.202(a) specifies that non-bulk packaging used for a shipment of gasoline must meet three sets of requirements:



the general packaging requirements of subpart B of Part 173,



the requirements for PG I or PG II materials in Part 178,



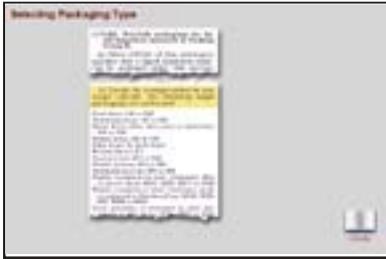
and the particular requirements of special provisions in Column 7 of the HMT.

23



If a shipper wanted to ship 8,000 gallons of gasoline in a cargo tank, Column (8C) contains the reference 242. This means that 173.242 offers a selection of bulk packaging. That is, a list of rail cars, portable tanks, cargo tanks, and intermediate bulk containers that may be used and the conditions for their use.

24



In selecting a packaging, you must also consider quantity and modal limitations that may restrict your choices. For example, in 173.202(c), single packagings are not authorized for the transportation of gasoline by passenger aircraft.

Quick Review #3

Instructions: Select the correct answer from the choices provided.

Limited quantities of Class 3 (Flammable liquid) materials are exempted from specification packaging and Placarding in all modes of transportation.

- A. True
- B. False

Correct Answer: A True

Quick Review #4

Instructions: Select the term that correctly completes the statement.

Terms:

- A. specific
- B. previous
- C. next
- D. needs
- E. packaging

Statements:

1. If HMT Column (8A) says “None” or the exception criteria are not met, compliance with the _____ packaging section, referenced in either Column (8B) or Column (8C) of the HMT, is required.
2. Quantity and modal limitations may restrict _____ selection.

Correct Answers:

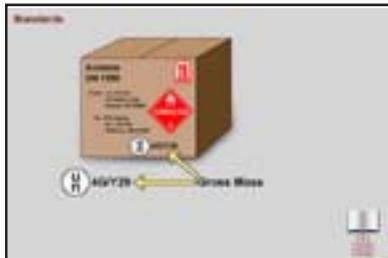
1. A specific
2. E packaging

25



Performance testing requirements for all packaging designs are contained in Part 178. Packagings tested to meet the Part 178 performance requirements are called “UN Standard Packagings.” Section 171.8 defines “UN standard packaging” as a packaging conforming to standards in the UN Recommendations on the Transport of Dangerous Goods. Click on the buttons to learn more.

26



Every UN standard packaging must be marked with the appropriate United Nations certification mark, which contains the ID code letters and number(s), preceded by the UN symbol. In addition, the specification packaging must be marked with a letter to indicate the packing group performance level, (for example: X for PG I, II, and III; Y for PG II and III; or Z for PG III); and a number designating the specific gravity for liquids or maximum gross mass (in kilograms) for solids of the tested packaging design. The example shown here is a packaging for solids, the mark “4G/Y29” indicates a UN specification 4G-fiberboard box tested to Packing Group II performance requirements with a maximum gross of 29 kilograms. UN standard packaging can be built and tested to a variety of performance levels and capacities. It is very important that the UN standard you select is authorized for the packing group of the material you want to ship. The package must be tested for the specific gravity or mass for the hazardous material being shipped.



All UN non-bulk packagings are required to be marked in a method similar to that shown here in the graphic. The markings must include the following: the hydrostatic test pressure for single and composite packagings intended for liquids, or the letter “S” for packagings intended for solids or inner packagings; the last two digits of the year of manufacture; the state or country authorizing allocation of the mark; and the name and address or registered symbol of the manufacturer or approval agency certifying compliance with Part 178.

Quick Review #5

Instruction: Select the best answer from the four choices provided.

Unless stated otherwise, packaging for hazardous materials must meet the _____ tests in Part 178 and must be marked with the United Nations certification mark.

- A. drop
- B. stacking
- C. performance
- D. leakproofness

Correct Answer: C performance

This screenshot shows a portion of the Hazardous Materials Table (HMT) with a yellow highlight on the row for 'Corrosive solids, n.o.s.'. The packaging reference '173.213' is visible in Column (8B).

In Column (8B) opposite Corrosive solids, n.o.s. are the following packaging references:

- PG I 173.211
- PG II 173.212
- PG III 173.213

This screenshot shows the same HMT row as above, but with a callout box overlaid. The callout box contains text explaining that 173.213(a) provides non-bulk packaging authorizations for solid hazardous materials in PG III and authorizes the use of packaging tested for PG I, II, or III performance levels.

Let's assume that we have determined the material is a PG III material. Note that 173.213(a) provides non-bulk packaging authorizations for solid hazardous materials in PG III. It lists and authorizes the use of packaging tested for PG I, II, or III performance levels.

We will now do Practical Exercise #1. Please open your manual to Practical Exercise #1, page 36-37, and follow the directions to student(s).

29

This screenshot shows the HMT with a yellow highlight on a row. Column 7 contains code letters and numbers, which are 'Special Provisions' for that material.

In addition to the packaging authorizations in Columns (8A), (8B), and (8C), a hazardous material may be subject to "Special Provisions" indicated by code letters and/or numbers in Column 7 of the HMT.

This screenshot shows the HMT entry for 'Phosphoric acid'. Column (8B) contains the non-bulk reference '173.203'. Column 7 contains three references: 'A7', 'N34', and 'T7'.

Find "Phosphoric acid" in the HMT. Notice that in Column (8B) there is a non-bulk reference to 173.203; and Column 7 contains three references: A7, N34, and T7.

30



The HMR prescribes general packaging requirements for all hazardous materials, while certain hazardous materials must meet additional specific packaging requirements. Click on the buttons to learn more.

31



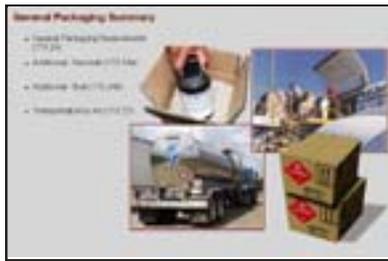
Many liquid hazardous materials expand when heated. For this reason, all containers of liquid hazardous materials must have vacant space or outage. This space is also referred to as vapor space. In other words the packaging must not be liquid full.

32



In addition to the requirements for outage, also called vapor space, containers of liquid hazardous materials must be tightly and securely closed. A combination package containing liquid hazardous materials must be packed so that closure on the inner packages remains upright. They must be packed and cushioned to prevent breakage or leakage. Packagings used for solids that may become liquid during transportation must be capable of containing the material in a liquid state.

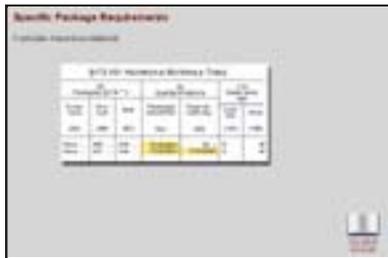
33



In summary, general packaging requirements are found in 173.24 and include packaging design criteria and filling limits based on the physical nature of the material to be packaged. Additional general packaging requirements are located in 173.24a for non-bulk; 173.24b for bulk; and 173.27 for air transportation.

We will now do Practical Exercise #2. Please open your manual to Practical Exercise #2, page 38-40 and follow the directions to student(s).

34



Column 9 lists the quantity limitations for hazardous materials that can be transported by passenger railcars, passenger aircraft or cargo aircraft. When Column (9A) of the HMT indicates a material is “Forbidden”, it may not be offered for transportation aboard passenger aircraft or passenger railcars. The word “Forbidden” in Column (9B) indicates it may not be offered for transportation on a cargo aircraft. The first entry on this example has the word “Forbidden” in Column (9A), which means it cannot be transported by passenger aircraft or passenger railcar. The second entry in this example has the word “Forbidden” in both Column (9A) and (9B), indicating it may not be transported by either passenger or cargo aircraft or passenger railcars.

35



Hazardous material packaging for air shipment must be designed and constructed to prevent leakage caused by altitude and temperature changes. Additionally, air shipments of hazardous materials must meet the general packaging requirements for transportation by aircraft; and the UN standard packaging requirements.

36

Packaging closures must be held securely in place by positive means to prevent leakage. Combination packaging containing certain hazardous liquids must contain sufficient non-reactive absorbent materials to absorb any leakage. Where absorbent material is required and the outer package is not leak-tight, a leak proof liner, plastic bag or other means of containment must be used.

37

All cylinders transported by air must have protection to prevent operation of or damage to valves. Equip cylinders with securely attached valve caps, protective headrings or place cylinders in a box or crate. Vented closures are used to reduce internal pressure and prevent the unintentional release of the product. Aircraft may not transport cargo tanks, tank cars or packages with vented closures.

Quick Review #6

Instructions: Select the term that correctly completes each statement.

Terms:

- | | | | |
|---------------|-----------------------|----------------|--------------|
| A. seepage | B. exemptions | C. head covers | D. absorbent |
| E. damping | F. special provisions | G. cargo | H. leakage |
| I. passengers | J. valve caps | | |

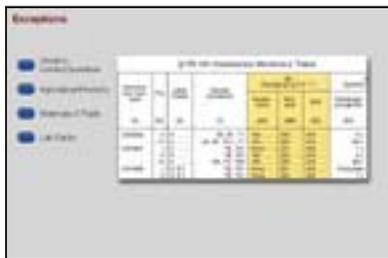
Statements:

1. In addition to the packaging authorizations in Columns (8A), (8B), and (8C), the hazardous materials may be subject to _____ in Column (7) of the HMT.
2. “Forbidden” in Column (9A) means the hazardous material(s) cannot be transported or offered for transportation by aircraft or railcars carrying _____.
3. Hazardous materials packaging for air shipments must be designed and constructed to prevent _____ caused by altitude and temperature changes.
4. Package closures must be held securely in place to prevent leakage. Some materials must be packaged with sufficient non-reactive _____ material to absorb any leakage.
5. Cylinders must be protected from valve operation and damage when shipped by air. Equip cylinders with _____ or protective headrings or put cylinders in a box or crate.

Correct Answers:

1. F special provisions
2. I passengers
3. H leakage
4. D absorbent
5. J valve caps

38



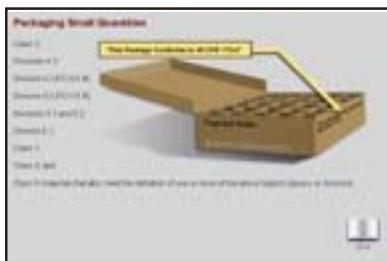
Specific exceptions are referenced in Column (8A) of the HMT. In addition, the HMR provides general exceptions that, if applicable, apply to small quantities of some hazard classes. Click on each of the buttons to learn about these exceptions.

39



The criteria for determining “small quantities” and exceptions for small quantities of certain hazardous materials are found in 173.4 of the HMR. The term “small quantity” is not synonymous with the term “Limited Quantity”. The definition for “Limited Quantity” is found in 171.8 of the HMR. These two terms have entirely different meanings and uses; both are excepted from specification packaging.

40



Some small quantities are subject only to 173.4 of the HMR. The notation “This package conforms to 49 CFR 173.4” must be marked on the package. Gross mass must not exceed 64 lbs.

41



Section 173.5 of the HMR contains exceptions for farmers when they transport agricultural products, other than hazardous wastes, between fields of their own farm or to or from their farm. Agricultural products are defined as hazardous materials used to support farming operations, and include but are not limited to fertilizers, pesticides, soil amendments and fuel. Agricultural products are limited to materials in Classes 3, 8, 9, Divisions 2.1, 2.2, 5.1, 6.1, and ORM-Ds.

42



Farmers transporting agricultural products other than gases between fields of the same farm using local roads are excepted from the requirements in the HMR. The farmer must be an intrastate private motor carrier. Class 2 gases, such as liquefied petroleum gas or anhydrous ammonia, are not within this exception. The agricultural products must be for use on the farmer's own farm. Each state must authorize these exceptions by law or regulation and compliance with all state requirements is mandatory.

43



Farmers transporting agricultural products to or from a farm, within 150 miles of the farm, are excepted from the requirements in Subpart G - Emergency Response Information, and Subpart H - Training, and Specification packaging requirements. They must comply with Subpart C - Shipping Papers, Subpart D – Marking, Subpart E – Labeling, and Subpart F,- Placarding.

44



All requirements and exceptions for Materials of Trade transported by motor vehicle are found in 173.6 of the HMR. Materials of Trade is defined as a hazardous material, other than a hazardous waste, that is carried on a motor vehicle for at least one of the three following purposes: to protect the health and safety of the motor vehicle operator or passengers; or to support the operation or maintenance of a motor vehicle or auxiliary equipment; or to directly support, by a private motor carrier, a principal business that is other than transportation by motor vehicle.

45



To qualify for the Materials of Trade exception, the materials must be less than the quantity limitations outlined in 173.6(a). Except for a diluted mixture of Class 9 material, the aggregate gross weight of all Materials of Trade on a motor vehicle may not exceed 200 kg (440 lbs).

46



Each material must be packaged in the manufacturer's original packaging or a packaging of equal or greater strength. The packaging must be leak tight for liquids and gases, sift proof for solids, and securely closed, secured against movement, and protected against damage. Outer packagings are not required for receptacles that are secured in cages, bins, boxes or compartments. Gasoline must be in DOT authorized or OSHA approved metal or plastic cans. Cylinders and pressure vessels must conform to the HMR except that outer packagings are not required.

47



The operator of a motor vehicle transporting Materials of Trade must be informed about the presence of the hazardous materials, including the reportable quantity, and the requirements contained in 173.6.

48



Waste materials classed in specific Hazard Classes or Divisions are excepted from the HMR specification packaging requirements for combination packages, also called lab packs, if:

- packaged in combination packagings in accordance with 173.12(b);
- transported for disposal or recovery; and
- transported by highway only.

49



For lab packs, the outside packaging must be a UN1A2 or UN1B2 metal drum, UN1D plywood drum, UN1G fiber drum, or UN1H2 plastic drum tested and marked at least for Packing Group III materials. Gross weight may not exceed 205 kg (452 lbs). Any lab pack drum must be tested and marked as authorized at least for Packing Group III materials. The outside packaging may contain only one hazard class and the materials must be chemically compatible.

50



Inside packagings of glass must not be over 4 liters or one gallon capacity; inside packagings of metal or plastic must not be over 20 liters capacity. Inside packagings of liquids must be surrounded by enough compatible absorbent material to absorb all of the liquid content.

51



Materials not authorized for lab packs include materials that meet the definition of Division 6.1, Packing Group I, or Division 4.2, Packing Group I.

We will now do Practical Exercise #3. Please open your manual to Practical Exercise #3, page 41-43 and follow the directions to student(s).

Quick Review #7

Instructions: Select the correct answer from the choices provided.

- | | | |
|------|-------|---|
| True | False | 1. Lab Packs of waste materials in Hazard Class 4.5 are excepted from specification packaging requirements. |
| True | False | 2. For a lab pack, use an authorized (UN standard) metal, fiber, or plastic drum for waste materials; its gross weight must not exceed 205 kg., and only two hazard classes per package is allowed. |
| True | False | 3. Materials listed in 173.12(b)(3) may not be shipped under lab pack provisions. |

Correct Answers:

1. False
2. False
3. True

52



Damaged or leaking packages of hazardous materials and spilled or leaked hazardous materials may be placed in a metal or plastic removable head salvage drum. The drum must be compatible with the material and be shipped for repackaging or disposal. Click on each button to learn more.

53



The salvage drum used must be of a specific type, tested and marked for Packing Group III or higher performance standards; or a “Salvage Drum” manufactured and marked prior to October 1, 1993. The drum capacity must not exceed 450 liters or 119 gallons. Additionally, each salvage drum, if necessary, must contain enough absorbent and cushioning material that is compatible with the hazardous materials, to prevent excessive package movement and absorb all free liquid at the time of closing.

Quick Review #8

Instructions: Select the best answer from the four choices provided.

Salvage drums must meet PG III (or higher) performance standards or be a pre-October 1, 1993 “Salvage Drum.” Capacity must not exceed 450 liters or _____ capacity.

- A. 119 kg.
- B. 119 quarts
- C. 119 gallons
- D. 238 lbs.

Correct Answer: C 119 gallons

54



The salvage drum must be marked with the proper shipping name of the hazardous material inside the packaging, the name and address of the consignee; and the word(s) “Salvage” or “Salvage Drum.” The drum must be properly labeled for the material it contains. The ID No. marking is not required on salvage drums.

Quick Review #9

Instructions: Select the correct answer from the choices provided.

Salvage drums must have sufficient compatible cushioning and absorbent material to prevent excessive package movement and absorb liquid.

- A. True
- B. False

Correct Answer: A True

55

The shipper of a hazardous material in a salvage drum must prepare shipping papers for the material in accordance with the HMR.

Quick Review #10

Instructions: Select the best answer from the four choices provided.

Salvage drums must be marked with the proper shipping name, name and address of the consignee, and the word _____ or Salvage Drum.

- A. Waste
- B. Trash
- C. Recycled
- D. Salvage

Correct Answer: D Salvage

56



When a salvage drum is used to ship a damaged or leaking package, the salvage drum is not subject to HMR overpack requirements.

Quick Review #11

Instructions: Select the correct answer from the choices provided.

When shipping damaged or leaking packages, the salvage drum is still subject to overpack regulations.

- A. True
- B. False

Correct Answer: B False

57



Hazardous wastes that are required to be shipped in a closed head drum, may be placed in an equivalent open head drum - provided the wastes contain solids or semi-solids that would make placement of the wastes in a closed head drum impractical.

58



Hazardous materials offered for transportation by, for, or to the U.S. Department of Defense (DOD) must be packaged in accordance with the HMR or in DOD-certified packagings of equal or greater strength and efficiency. This rule includes commercial shipments under government contract. Click on each button to learn more about the special requirements for DOD Packaging.

59



Hazardous materials offered by DOD under these provisions may be reshipped by any shipper to any consignee as long as the packaging hasn't been altered or damaged.

60



Hazardous materials sold by DOD in packaging not marked in accordance with the HMR may be shipped from DOD installations; but the DOD must certify in writing that the strength and efficiency of the packaging are equal to or greater than the packaging required by the HMR.

61



For each shipment, shippers must obtain the certification, in duplicate, from DOD. Shippers must provide the originating carrier with a copy and retain the other copy for at least one year.

62



Exemptions are waivers from specific requirements of the HMR, but which provide an equal level of safety and protection to the public. Exemptions are usually specific as to the hazardous material, the hazard class, the regulations affected, and any special safety provisions necessary. Exemptions that are granted are assigned their own individual number, for example, DOT-E 8308. Unless exempt by provisions of the exemption, the number must be marked on the package and on the shipping paper in association with the shipping description for the material. Other sections which address the use of exemptions are located in 172.203(a), 172.301(c), 172.302(c), and 173.22a.

63



Authorized packages of hazardous materials may be offered for transportation when packed in an overpack. Packages may not contain prohibited material and must meet standard packaging requirements. Overpacks are not packages. Overpacks are used to consolidate packages that could, under normal conditions, be offered and transported individually. Click on the buttons to learn more.

64



An overpack must be marked with the proper shipping name and ID No. and labeled for each material it contains. If inner package markings and labels are visible, overpack marking and labeling may be omitted.

65



If specification packagings are required for the inner packages, the overpack must state that the inner packages comply with those requirements. The statement may be omitted if specification markings on the inside packages are visible. If the packages inside the overpack are required to be packed with closures upward, the overpack must be marked with orientation arrows (pointing in the upward direction) on two opposite vertical sides of the overpack.

66



Packages containing Class 8 (corrosive) materials, PG I, or Division 5.1 (oxidizing) materials, PG I, may not be overpacked with any other hazardous materials.

67



Hazardous materials required to be labeled “POISON” or “TOXIC” may be transported in the same vehicle with foodstuffs, feed, or any edible material intended for human or animal consumption, if the hazardous material has been marked, labeled, packaged, and overpacked in accordance with the HMR. These requirements are found in 173.25(c).

68

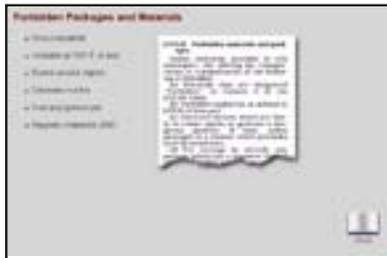


When offered in accordance with 173.28, certain containers may be used more than once to transport hazardous materials. Some non-bulk packaging used more than once must be retested and/or reconditioned as required by 173.28(b-d). You may review the reuse provisions for specific types of packages in 173.28.

69



An emptied, but not cleaned and purged packaging containing only residue of a hazardous material may not be offered for transportation — unless offered in the same manner as before being emptied. This includes proper closure of all openings and valves. The conditions and exceptions associated with this requirement are found in 173.29.

70

Hazardous materials in certain packages or under certain conditions are prohibited from transportation. Section 173.21 lists those prohibitions.

71

It is the responsibility of the person offering a hazardous material for transportation to assure that the packagings are compatible with the lading. Plastic packaging must not be permeable to an extent that a hazardous condition occurs during transportation. Parts 178, 179, and 180 provide standards for the manufacture, testing and certification of packagings.

Quick Review #12

Instructions: Select the term that correctly completes each statement.

Terms:

- | | | | |
|--------------|---------------|--------------|--------------|
| A. HMR | B. residue | C. HMT | D. certified |
| E. exemption | F. registered | G. letter | H. labeled |
| I. grain | J. foodstuffs | K. placarded | L. vapors |

Statements:

1. Hazardous materials offered by, for, or to the DOD must be packaged as required by the HMR or in packaging _____ by the DOD. DOD packages may be reshipped by any shipper to any consignee if unaltered and undamaged.
2. A hazardous material may be transported in accordance with the procedures specified in a DOT _____, which has been issued by the USDOT headquarters in Washington, D.C.
3. Authorized packages of hazardous materials may be consolidated into overpacks. Overpacks must be properly marked and _____ for the materials inside.
4. POISON-labeled or TOXIC-labeled materials, properly overpacked, may be transported in the same motor vehicle with _____ and animal feed.
5. Containers may be reused provided they comply with the — _____.
6. To transport emptied – but not cleaned and purged – packagings containing only _____, treat them as though they still contain the hazardous material. The emptied packaging must be described, marked, and labeled as required before being emptied.

Correct Answers:

1. D certified
2. E exemption
3. H labeled
4. J foodstuffs
5. A HMR
6. B residue

Packaging Summary

Selection of proper authorized packaging for a hazardous material is not a difficult task if you follow a set procedure. Remember, it all starts with the HMT.

Selecting the proper packaging:

- Identify what it is you want to ship and check for compliance.
- Check Col. 8 of the HMT and determine if an exception is provided in Col. (8A).
- If an exception is not used, check whether some other provision is used, such as small quantities or an exemption.
- If no exception or exemption is provided or used, check Col. (8B) to determine specific non-bulk packaging and Col. (8C) to determine bulk packaging requirements.
- Check for any general or additional packaging requirements, including quantity limitations and modal restrictions.

Student Activity

Packaging Selection and Compliance Student Activity

Student Activity #1

Directions to Student(s)

The objective of this student activity is to provide a practical exercise in hazardous materials packaging requirements. You are given a list of eight hazardous materials in column 1 of Student Activity #1. In the HMT, locate the hazardous materials. In the spaces provided, enter the references for Special Provisions, packaging exceptions (if none, write “none”) and packaging authorizations for non-bulk and bulk packagings.

Self-Evaluation

The student activity will evaluate your skill and facility in locating general packaging requirements beyond those indicated in the HMT for materials in different hazard classes and divisions. When you have completed and checked your work for accuracy, either review the student activity with the instructor or check the answers on page 50.

General Packaging Requirements Student Activity

Student Activity #1

Hazardous Materials	Special Provisions	Packaging Authorization		
		Exceptions (if any)	Packaging Authorization Bulk	Packaging Authorization Non-Bulk
Glycidaldehyde UN2622				
Propylene UN1077				
Picric acid, wet NA1344				
Sodium borohydride UN1426				
Copper chlorate UN2721				
Epichlorohydrin UN2023				
Butyl acid phosphate UN1718				
Potassium peroxide UN1491				

Packaging Selection and Compliance Student Activity

Student Activity #2

Directions to Student(s)

The objective of this student activity is to provide a practical exercise in hazardous materials packaging selection and compliance.

Student Activity #2 lists six hazardous materials shipments for transportation by motor carrier. The proper shipping name, hazard class and ID No. of each material, as shown in the HMT, is provided along with the selected packaging.

Determine whether or not the given packaging is authorized for the described material. Check “yes” if the packaging is authorized; “no” if it is not. Cite the HMR reference(s) you used to determine your answer. If the packaging is not authorized, identify a packaging that would be authorized.

Self-Evaluation

The student activity will evaluate your skill and facility in selecting authorized packaging and in determining whether a packaging is in compliance with the HMR. When you have completed and checked your work for accuracy, either review the student activity with the instructor or check the answers on page 51.

Packaging Selection and Compliance Student Activity

Student Activity #2

1. Ten five gallon UN1A1 steel drums of Acetone, 3, UN 1090, PG II:

Authorized	Packaging section(s)
Yes _____	_____
No _____	_____

If not authorized, what package is authorized?
 _____ (List only one.)

2. Six polyethylene (plastic) receptacles of one gallon each containing 100% Formic acid, 8, UN1779, PG II, inside a UN4G specification fiberboard box weighing 50 pounds:

Authorized	Packaging section(s)
Yes _____	_____
No _____	_____

If not authorized, what package is authorized?
 _____ (List only one.)

3. Four one-liter metal cans of Compound, cleaning liquid, 3, NA 1993, PG III, packed inside a strong fiberboard box:

Authorized	Packaging section(s)
Yes _____	_____
No _____	_____

If not authorized, what package is authorized?
 _____ (List only one.)

4. One UN4C1 wooden box with four 25-pound metal cans of Aldrin, solid, 6.1, NA 2761, PG II packed inside:

Authorized	Packaging section(s)
Yes _____	_____
No _____	_____

If not authorized, what package is authorized?

_____ (List only one.)

5. Two five-gallon metal cans of Paint, 3, UN 1263, PG III, packed in a strong fiberboard box:

Authorized	Packaging section(s)
Yes _____	_____
No _____	_____

If not authorized, what package is authorized?

_____ (List only one.)

6. A fifty-five gallon steel drum, UN1A1, of Corrosive, solid, n.o.s., 8, UN 1759, PG I:

Authorized	Packaging section(s)
Yes _____	_____
No _____	_____

If not authorized, what package is authorized?

(List only one.)

Packaging Selection and Compliance Student Activity

Student Activity #3

Directions to Student(s)

The objective of this packaging student activity is to provide a practical exercise in basic packaging requirements. There are nine (9) questions in Student Activity #3. Please select the correct answer and cite the appropriate supporting HMR section reference.

Self-Evaluation

The student activity will evaluate your skill and facility in finding and determining basic packaging requirements. When you have completed and checked your work for accuracy, either review the student activity with the instructor or check the answers on page 52.

Packaging Selection and Compliance Student Activity

Student Activity #3

Please select the correct answer and when indicated, provide the supporting HMR section reference.

1. The term package means
 - a. an outside package
 - b. an outside packaging and required markings
 - c. a packaging plus its contents
 - d. a packaging plus required labelsHMR Section _____

2. The term packaging means the assembly of _____ or _____ receptacles and any other components necessary to assure compliance with the minimum packaging requirements.
HMR Section _____

3. The offeror and the carrier are both responsible to assure that hazardous materials shipments are in proper condition for transportation.
 - a. True
 - b. FalseHMR Section _____

4. Damaged or leaking packages of hazardous materials may be placed in a(n) _____ .
 - a. salvage drum
 - b. paper bag
 - c. strong outside fiberboard
 - d. overpackHMR Section _____

5. The term “small quantities” means the same as “Limited Quantity (Ltd. Qty.)”
 - a. True
 - b. FalseHMR Section _____

-
6. A shipment of hazardous materials that is not prepared in accordance with the HMR may not be offered for transportation by any mode.
- a. True
 - b. False
- HMR Section _____
7. Shipments of hazardous materials made for or to the Department of Defense (DOD) are not subject to the HMR.
- a. True
 - b. False
- HMR Section _____
8. Waste materials meeting the definition of Class 3 (Flammable liquid) are excepted from UN standard packaging when packaged in accordance with _____ and transported for disposal or recovery by highway.
- a. 173.23
 - b. 173.9
 - c. 173.12
 - d. 173.24
9. For shipments by air, general packaging requirements are found in section _____ .
- a. 173.4
 - b. 173.27
 - c. 173.1
 - d. 173.3

Module 5 Test

1. A shipment of hazardous materials that is not prepared in accordance with the HMR may not be offered for transportation by any mode.

- A. True
- B. False

2. Hazardous materials packaging may be used more than once provided they comply with Section _____.

- A. 173.29
- B. 173.28
- C. 173.23
- D. 173.25

3. The shipper of a hazardous material in a salvage drum must prepare shipping papers for the material.

- A. True
- B. False

4. A shipment of four one-liter metal cans of Compound, cleaning liquid, a Class 3 (Flammable liquid), being offered for transportation by aircraft, does not require _____.

- A. label(s)
- B. marking
- C. Specification packaging
- D. any of the above

5. A waste Class 3 material (Flammable liquid) is not subject to the specification packaging requirements of the HMR if packaged in accordance with _____.

- A. 173.29
- B. 173.9
- C. 173.10
- D. 173.12

6. The standard packaging requirements for all hazardous materials packages are found in _____.

- A. 173.156
- B. 173.154
- C. 173.24
- D. 173.153

7. Four one-liter metal cans of Compound, cleaning liquid, a Class 3 (Flammable liquid), may be packed in a strong outside container and offered as a Limited Quantity (Ltd. Qty.) according to _____.

- A. 173.156
- B. 173.154
- C. 173.150
- D. 173.153

8. Hazardous materials offered by, for, or to the Department of Defense (DOD), including commercial shipments under government contract, are not subject to the HMR.

- A. True
- B. False

9. According to section _____, Acetone, Class 3 (Flammable liquid), with a flash point of -9.4°C (15°F), may be packaged and offered for transportation in a UN1A1 steel drum.

- A. 173.212
- B. 173.202
- C. 173.205
- D. 173.211

10. Packages of hazardous materials found to be damaged or leaking may be placed in a metal or plastic removable head salvage drum, provided _____.

- A. the drum is compatible with the cargo
- B. the drum is being reshipped for repackaging or disposal
- C. the drum is a UN1A2, UN1B2, UN1N2, or UN1H2 drum
- D. all of the above

11. It is the duty of each person who offers hazardous materials for transportation to instruct each employee that has any responsibility for preparing hazardous materials for shipment in the HMR.

- A. True
- B. False

12. If a carrier repackages a hazardous material for any reason, the packaging must be _____.

- A. approved by the shipper
- B. repackaged in accordance with the HMR
- C. inspected by DOT prior to the offering of the packaging
- D. None of the above

13. Section 173.4 of the HMR provides exceptions for certain hazardous materials in small quantities.

- A. True
- B. False

14. The general packaging requirements relating to outage for non-bulk packages of hazardous materials are found in Section _____.

- A. 173.24(b)
- B. 173.24(g)
- C. 173.24(h)
- D. 173.24b

15. For waste hazardous materials packaged in a “lab pack”, the inside packaging must be either _____.

- A. glass not exceeding 4L (one gal.) rated capacity
- B. metal not exceeding 40 L (10 gal.) rated capacity
- C. plastic not exceeding 20 L (five gal.) rated capacity
- D. a and c

16. Overpacks are used for the purpose of consolidating packages of hazardous materials.

- A. True
- B. False

17. When properly over packed, poison-labeled material may be transported in the same motor vehicle with foodstuffs.

- A. True
- B. False

18. Column 8A of the HMT lists the section in the HMR which provides packaging exceptions for that particular proper shipping name.

- A. True
- B. False

19. What is the non-bulk packaging reference for Nitric Acid, less than 70% ?

- A. Nonbulk 173.227
- B. Nonbulk 173.242
- C. Nonbulk 173.158
- D. Nonbulk 173.243

20. Shipments of hazardous materials by aircraft must meet certain general packaging requirements in 173.27 in addition to specific modal requirements.

- A. True
- B. False

Module 5 Test Answers

<u>Question</u>	<u>Answer/Explanation</u>	<u>49 CFR Reference</u>
1.	A. True.	173.1(b)
2.	B. 173.28. A, C, and D are not correct. None of these refers to reuse of hazardous materials packagings.	173.28
3.	A. True.	173.3(c)(5)
4.	C. Specification packaging. A, B, and D are not correct. The shipment is not excepted from marking and labeling.	173.150(b)
5.	D. 173.12. A, B, and C are not correct. None of these references hazardous waste.	173.12
6.	C. 173.24. A, B, and D are incorrect. 173.156 references exceptions for ORM materials. 173.154 references exceptions for Class 8 materials. 173.153 references exceptions for Division 6.1 materials.	173.24
7.	C. 173.150. A, B, and D are incorrect. 173.156 references exceptions for ORM materials. 173.154 references exceptions for Class 8 (corrosive) materials. 173.153 references exceptions for Division 6.1 (poisonous) materials.	173.150
8.	B. False.	173.7
9.	B. 173.202. A, C, and D are incorrect. None of these provides for packaging for Class 3 (Flammable liquids).	173.202
10.	D. all of the above.	173.3(c)
11.	A. True.	173.1(b)
12.	B. repackaged in accordance with the HMR. The carrier is now performing a shipper function and must properly package the shipment of hazardous materials. Approval by DOT or the shipper is not required.	173.1(c)
13.	A. True.	173.4(a)

-
14. C. 173.24(h). A, B, and D are not correct. None of these refers to outage requirements for non-bulk packages.
15. D. a and c. B isn't correct because the metal packaging exceeds the five-gallon rated capacity limitation. 173.12(b)
16. A. True. 171.8
17. A. True. 173.25(c)
18. A. True. 172.101
19. C. Nonbulk 173.158. 172.101
20. A. True. 173.27

Packaging Selection and Compliance

Student Activity Answers

Student Activity #1

Hazardous Materials	Special Provisions	Exceptions (If any)	Packaging Authorization Non-Bulk	Packaging Authorization Bulk
Glycidaldehyde UN2622	T8	173.150	173.202	173.243
Propylene UN1077	19	173.306	173.304	173.314/ 173.315
Picric acid, wet NA1344	A19,A20, N41	None	173.211	None
Sodium borohydride UN1426	B100, N40	None	173.211	173.242
Copper chlorate UN2721	A1	173.152	173.212	173.242
Epichlorohydrin UN2023	T14	None	173.202	173.243
Butyl acid phosphate UN1718	T7	173.154	173.203	173.241
Potassium peroxide UN1491	A20, N34	None	173.211	None

Packaging Selection and Compliance

Student Activity Answers

Student Activity #2

Question	Answer/Explanation	49 CFR Reference
1.	Authorized – yes;	Packaging section 173.202(c)
2.	Authorized – yes;	Packaging section 173.202(b)
3.	Authorized – yes;	Packaging section 173.150(b)
4.	Authorized – yes;	Packaging section 173.212(b)
5.	Authorized – no;	Packaging section(s) 173.173/173.203 Could be used if outer packaging is UN4G box.
6.	Authorized – yes;	Packaging section 173.211(c)

Packaging Selection and Compliance

Student Activity Answers

Student Activity #3

Question	Answer/Explanation	49 CFR Reference
1.	c. The term means a packaging plus its contents.	171.8
2.	One or more.	171.8
3.	True	171.2
4.	a. Leaking or damaged packages of hazardous materials must be placed in a metal or plastic drum identified as a salvage drum.	173.3(c)
5.	b. Small quantities and Limited Quantities (Ltd. Qty.) have separate meanings and uses. Both are exceptions. Small quantities are subject only to 173.4 and no other part of the regulations unless so stated. Limited quantities (Ltd. Qty.), when applicable to a particular material, with the exception of Division 6.1 materials, are the amount of material for which there are specific labeling and packaging exceptions.	171.8; 173.4
6.	a. 173.1 references the purpose and scope of packaging.	173.1(b)
7.	b. Hazardous materials offered for transportation by, for or to the U.S. Department of Defense, including commercial shipments, are subject to the HMR.	173.7
8.	c. 173.12 provides packaging exceptions for waste material. A, b, and d are not correct. 173.23 references previously authorized packaging. 173.9 references the fumigation of cars, truck bodies or trailers on rail cars. 173.24 references standard requirements for all packages.	173.12
9.	b. 173.3 references packaging and exceptions. 173.4 references small quantities.	