



Performance Oriented Packaging (POP)



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Hazardous Material Safety Assistance Team





§173.203

Non-Bulk Packagings for Liquid Hazardous Materials in Packing Group III

- **Combination Packagings**
- **Single Packagings**



1A2 STEEL DRUM
removable head
used as combination packaging



FIBERBOARD BOX
used as combination packaging
showing inner packagings



1A1 STEEL DRUM
non-removable head
used as single packaging





Other Requirements of §173.203

- Packaging Conforms to Subpart B of Part 173
- Packaging Meets Requirements of Part 178 at PG I, II or III level
- Special Provisions of Column 7, HMT are Met





Column 7 Special Provisions

Symbols (1)	Hazardous Materials Descriptions and Proper Shipping Names (2)	Hazard Class or Division (3)	Identification Numbers (4)	PG (5)	Label Codes (6)	Special Provisions (§172.102) (7)	(8) Packaging (§173.***)			(9) Quantity Limitations	
							Exceptions (8A)	Non-bulk (8B)	Bulk (8C)	Passenger aircraft/rail (9A)	Cargo aircraft only (9B)
	Acrolein, stabilized	6.1	UN1092	I	6.1, 3	1. B9, B14, B30, B42, B72, B77, T22, TP2, TP7, TP13, TP38, TP44	None	226	244	Forbidden	Forbidden
	Copper cyanide	6.1	UN1587	II	6.1	IB8, IP2, IP4, T3, TP33	None	204	242	25kg	100kg
G	Flammable liquid, n.o.s.	3	UN1993	I	3	T11, TP1, TP27, 1B2, T7, TP1, TP8, TP28, B1, B52, IB3, T4, TP1, TP29	150	201	243	1L	30L
				II	3		150	202	242	5L	60L
				III	3		150	203	242	60L	220L
	Phosphoric acid solution	8	UN1805	III	8	A7 IB3 N34 T4, TP1	154	203	241	5L	60L





Column 7 Special Provisions

- Identifies additional provisions for the specific hazardous material
 - “1” means poisonous by inhalation, Hazard Zone A
- May impose limitations or additional requirements on packaging
 - A7 requires steel packaging to be corrosion resistant when shipped by air
 - N34 requires aluminum constructed materials not in contact with the hazardous material





Performance-Oriented Packaging



1A2 STEEL DRUM
used as combination packaging



1A1 STEEL DRUM
used as single packaging



Required Tests for Non-Bulk Packagings and Packages

- **Drop Test – §178.603**
 - All packagings
- **Leakproofness Test – §178.604**
 - All packagings intended for liquids
- **Hydrostatic Test – §178.605**
 - Metal, plastic and composite intended for liquids
- **Stacking Test – §178.606**
 - All packaging other than bags
- **Vibration Standard – §178.608**
 - All packaging





Closure Requirements

DOT Specification or UN standard packaging must be closed in accordance with the instructions provided by the packaging manufacturer or subsequent distributor

§173.22 (a)(4)



Manufacturer's Responsibility

§178.2(c) *paraphrased*

...the manufacturer...of that packaging must:

specifying the type(s) and dimensions of the closures, including gaskets and any other components needed to ensure that the packaging is capable of successfully passing the applicable performance tests.



Manufacturer's Responsibility

Continued

§178.2(c) *paraphrased*

This information must include any procedures to be followed, including closure instructions for inner packagings and receptacles, to effectively assemble and close the packaging for the purpose of preventing leakage in transportation.

Closure instructions must provide for a consistent and repeatable means of closure that is sufficient to ensure the packaging is closed in the same manner as it was tested.



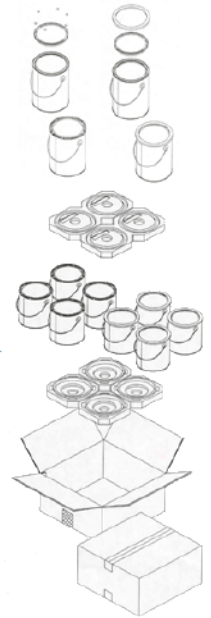
Closure Notifications

- Types of Notifications
 - Written
 - Embossed
 - Printed on the Package



Closure Instructions

1. SEAL PAINT CANS:
FOR GROUND SHIPMENTS ONLY, ATTACH 6 CAN CLIPS.
FOR AIR OR GROUND SHIPMENTS, SEAL WITH LOCKING RING.
(LOCKING RING REQUIRED FOR AIR SHIPMENTS)
2. IF SHIPPING 1 UNIT, SEAL 1 CAN AND ASSEMBLE SINGLE SHIPMENT CORRUGATED BOX.
IF SHIPPING 2 UNITS, SEAL 2 CANS AND ASSEMBLE 2 PACK CORRUGATED BOX.
IF SHIPPING 4 UNITS, SEAL 4 CANS AND ASSEMBLE 4 PACK CORRUGATED BOX.
3. PLACE EPS FOAM CAP INSERTS INTO BASE OF BOX.
4. PUT FILLED CAN/CANS IN EPS FOAM CAP INSERTS.
5. PLACE EPS FOAM CAP INSERTS ON TOP OF CAN/CANS.
6. TAPE BOX CLOSED WITH 3" REINFORCED GUMMED TAPE OR MINIMUM 2 MIL 2" CLEAR CARTON SEALING TAPE.



ATTENTION

To seal can:
Apply downward pressure to lid until seated completely into grooves on can.
Air: Apply downward pressure to locking ring until contacting top of can.
Ground: Lock clips into grooves on can in an evenly spaced pattern.

Outer flaps meet. Use center seam tape pattern 2.5" min. overlap

SINGLE KIT CONTAINS: ONE SINGLE SHIPMENT CARTON AND 2 EPS FOAM CAPS.

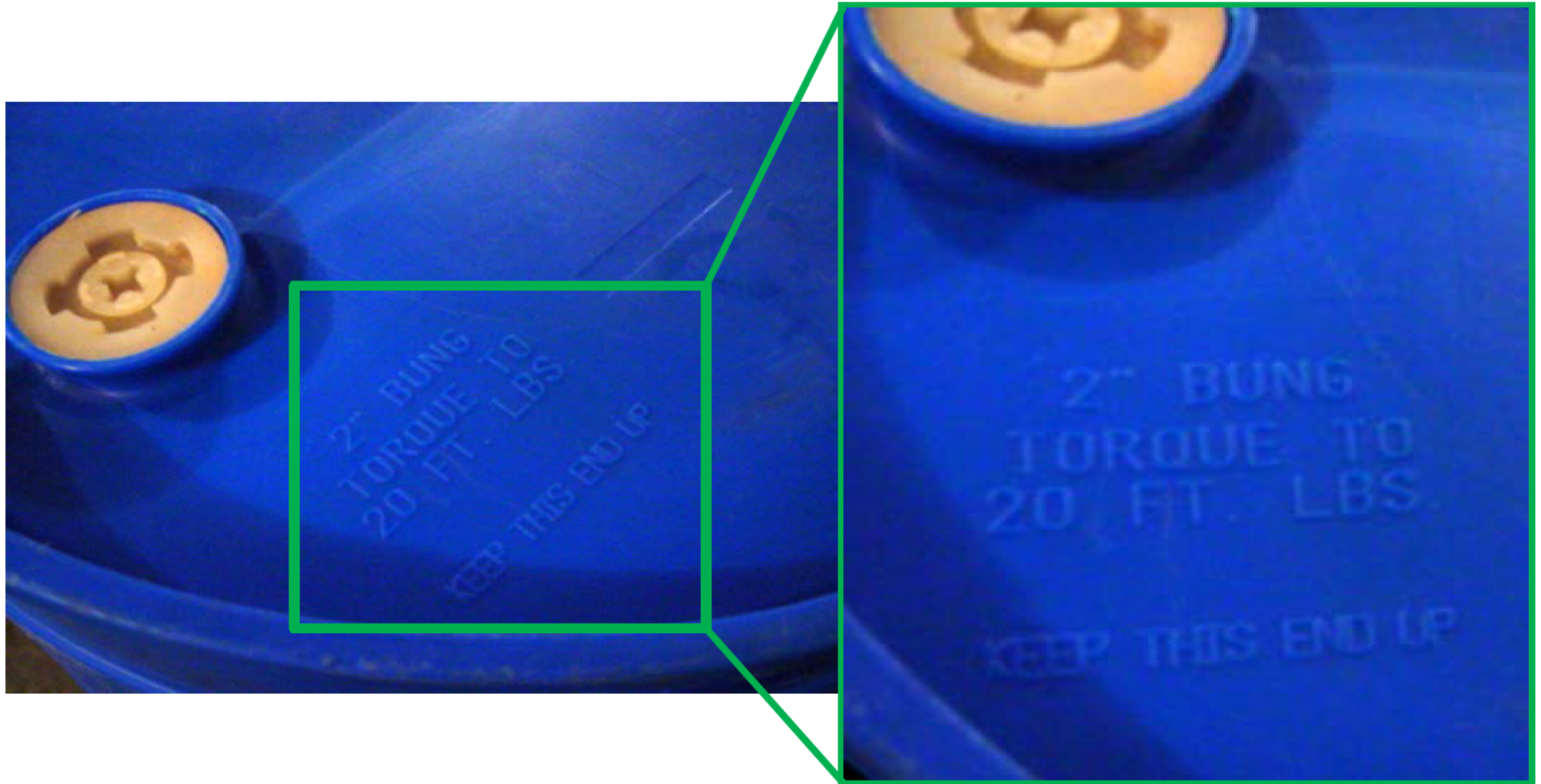
2 PACK KIT CONTAINS: ONE 2 PACK CARTON AND 4 EPS FOAM CAPS.

4 PACK KIT CONTAINS: ONE 4 PACK CARTON AND 8 EPS FOAM CAPS.

***LPS WILL ASSUME RESPONSIBILITY FOR PACKAGE INTEGRITY AND COMPLIANCE WITH ICAO/IATA, IMO AND UN STANDARDS, "ONLY", IF ALL PACKAGE COMPONENTS ARE ASSEMBLED AND PURCHASED AS A SINGLE INTEGRATED UNIT.



Embossed



Printed on Package



Shipper's Responsibility

- § 173.22(a)(4)
 - For a DOT Specification or UN standard packaging subject to the requirements of part 178 of this subchapter, **a person must perform all functions necessary to bring the package into compliance** with parts 173 and 178 of this subchapter, **as identified by the packaging manufacturer or subsequent distributor** (for example, applying closures consistent with the manufacturer's closure instructions) in accordance with §178.2 of this subchapter...



Shipper's Responsibility

- § 173.22(a)(4)
 - A person must maintain a copy of the manufacturer's notification, including closure instructions (see §178.2(c) of this subchapter) unless permanently embossed or printed on the packaging.
- § 173.27
 - General requirements for transportation by aircraft





UN Specification Marking Requirements Part 178, Subpart L

- Manufacturers test and mark packagings according to UN Standards
- Specified Codes used for marking
- Markings must be durable, legible and placed according to Subpart L



Ⓢ4G/Y145/S/83/USA/RA

- UN Symbol - Ⓢ
- packaging identification code – 4G
- performance standard – Y
 - (i) X—for packagings meeting Packing Group I, II and III tests;
 - (ii) Y—for packagings meeting Packing Group II and III tests; or
 - (iii) Z—for packagings only meeting Packing Group III tests;



④ 4G/Y145/S/83/USA/RA

- specific gravity or mass - 145
- single and composite packagings intended to contain liquids, the test pressure in kilopascals or for solids or inner packagings, the letter “S” - S
- the year of manufacture - 83
- state authorizing allocation of the mark – USA
- name and address or symbol of the manufacturer or the approval agency certifying compliance - RA
- metal or plastic drums or jerricans intended for reuse or reconditioning as single packagings or the outer packagings of a composite packaging, the thickness of the packaging material



UN 4G/Y145/S/83/USA/RA

- every new metal drum having a capacity greater than 100 L must bear the marks described in paragraphs (a)(1) through (a)(6), and (a)(9)(i) of this section, in a permanent form, on the bottom
- capacity of the packaging expressed in liters may be marked



Identification Code for UN Standard Packaging


SINGLE PACKAGING



Z – PGIII
(minor danger)

Y – PGII
(medium danger)

X – PGI
(great danger)

 **6HH1/Y2.0/170/96**
USA/0000

[§178.502](#); [§178.503v](#)




Identification Code for UN Standard Packaging

COMBINATION PACKAGING



Removable Head

Inner Packaging

 **1A2/Z40/S/05
USA/0000**





Marking Specification Packagings

- **Durable**
 - Stamped
 - Embossed
 - Burned
 - Printed or otherwise marked
- **Legible**
 - Readily visible
- **Size**
 - Relative to packaging size
- **Location**
 - On non-removable component

§178.503(a)



Completed Examples



Definitions

- *Combination packaging* means a combination of packaging, for transport purposes, consisting of one or more inner packagings secured in a non-bulk outer packaging. It does not include a composite packaging.
- *Composite packaging* means a packaging consisting of an outer packaging and an inner receptacle, so constructed that the inner receptacle and the outer packaging form an integral packaging. Once assembled it remains thereafter an integrated single unit; it is filled, stored, shipped and emptied as such.



Bulk

Bulk packaging means a packaging, other than a vessel or a barge, including a transport vehicle or freight container, in which hazardous materials are loaded with no intermediate form of containment. A Large Packaging in which hazardous materials are loaded with an intermediate form of containment, such as one or more articles or inner packagings, is also a bulk packaging. Additionally, a bulk packaging has:

- (1) A maximum capacity greater than 450 L (119 gallons) as a receptacle for a liquid;
- (2) A maximum net mass greater than 400 kg (882 pounds) and a maximum capacity greater than 450 L (119 gallons) as a receptacle for a solid; or
- (3) A water capacity greater than 454 kg (1000 pounds) as a receptacle for a gas as defined in § 173.115 of this subchapter.



Non-Bulk

Non-bulk packaging means a packaging which has:

- (1) A maximum capacity of 450 L (119 gallons) or less as a receptacle for a liquid;
- (2) A maximum net mass of 400 kg (882 pounds) or less and a maximum capacity of 450 L (119 gallons) or less as a receptacle for a solid;
- (3) A water capacity of 454 kg (1000 pounds) or less as a receptacle for a gas as defined in § 173.115 of this subchapter; or
- (4) Regardless of the definition of bulk packaging, a maximum net mass of 400 kg (882 pounds) or less for a bag or a box conforming to the applicable requirements for specification packagings, including the maximum net mass limitations, provided in subpart L of part 178 of this subchapter.



Kinds of Packagings

“1” means a drum.

“2” means a wooden barrel.

“3” means a jerrican.

“4” means a box.

“5” means a bag.

“6” means a composite packaging.

“7” means a pressure receptacle.



Material of Construction

“A” means steel (all types and surface treatments).

“B” means aluminum.

“C” means natural wood.

“D” means plywood.

“F” means reconstituted wood.

“G” means fiberboard.

“H” means plastic.

“L” means textile.

“M” means paper, multi-wall.

“N” means metal (other than steel or aluminum).

“P” means glass, porcelain or stoneware.



Other

(3) A numeral indicating the category of packaging within the kind to which the packaging belongs. For example, for steel drums (“1A”), “1” indicates a non-removable head drum (*i.e.*, “1A1”) and “2” indicates a removable head drum (*i.e.*, “1A2”).

(b) For composite packagings, two capital letters are used in sequence in the second position of the code, the first indicating the material of the inner receptacle and the second, that of the outer packaging. For example, a plastic receptacle in a steel drum is designated “6HA1”.

(c) For combination packagings, only the code number for the outer packaging is used.

(d) Identification codes are set forth in the standards for packagings in §§ [178.504](#) through [178.523](#) of this subpart.



IBC

- United Nations symbol
- Code number designating IBC design type
- Letter identifying the performance standard
- Month (designated numerically) and year (last two digits) of manufacture.
- Country authorizing the allocation of the mark
- Name and address or symbol of the manufacturer or the approval agency certifying compliance
- Stacking test load in kilograms (kg). For IBCs not designed for stacking, the figure “0” must be shown.
- Maximum permissible gross mass in kg.

**U
n** 11A/Y/02 92/USA/ABC/5500/1500



Cylinders

DOT-3A1800
1234
XY
AB 5-95

DOT-3A1800-1234-XY
AB 5-95

Where:

DOT-3A = specification number
1800 = service pressure
1234 = serial number
XY = symbol of manufacturer
AB = inspector's mark
5-95 = date of test



Cylinders

A1
9 06 X
32

Where:

“9” is the month of requalification

“A123” is the RIN

“06” is the year of requalification, and

“X” represents the symbols described in paragraphs (f)(2) through (f)(8) of this section



Cylinder Symbols

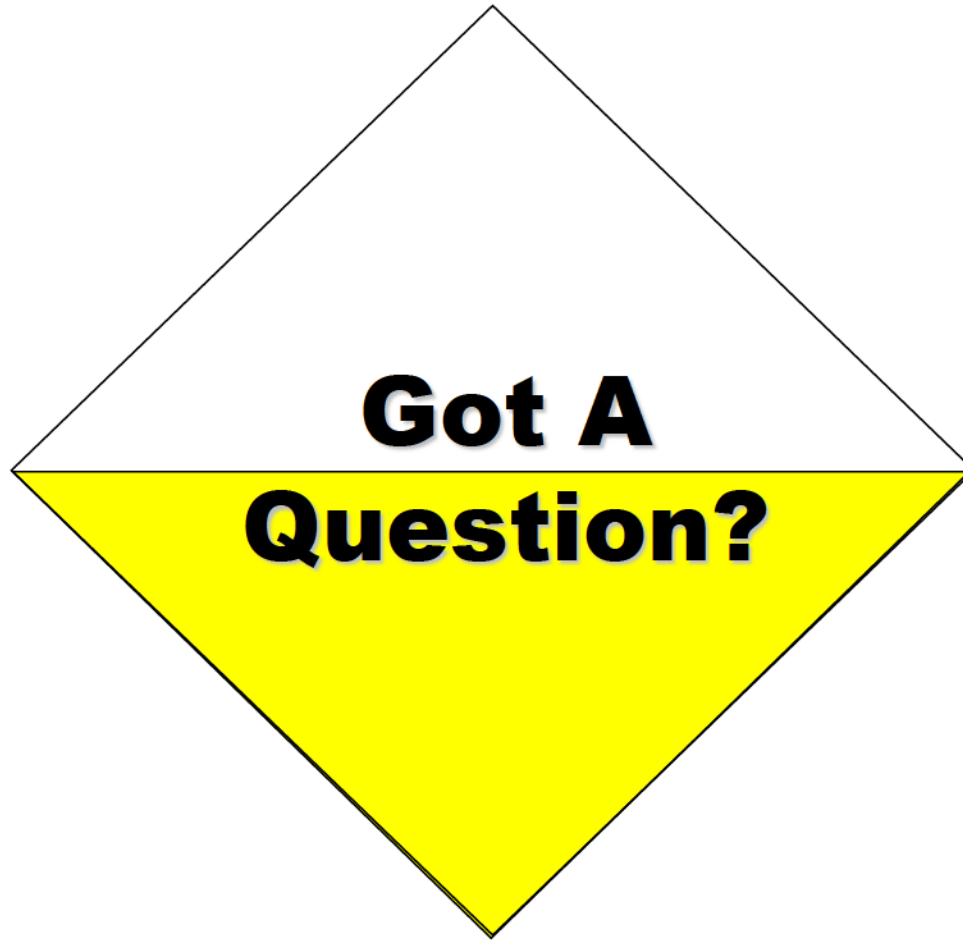
- 10-year volumetric expansion test the “X” is replaced with a five-point star.
- (special filling limits up to 10% in excess of the marked service pressure the “X” is replaced with a plus sign “ + ”.
- proof pressure test the “X” is replaced with the letter “S”.
- 5-year external visual inspection the “X” is replaced with the letter “E”.



Cylinder Symbols

- (DOT 8 series cylinder shell requalification only, the “X” is replaced with the letter “S”.
- DOT 8 series and UN cylinder shell and porous filler requalification, the “X” is replaced with the letters “FS.”
- (nondestructive examination combined with a visual inspection the type of test performed, for example the letters “AE” for acoustic emission or “UE” for ultrasonic examination.
- (eddy current examination combined with a visual inspection, the “X” is replaced with the letters “VE.”





Where to Find More Information . . .

The screenshot shows the PHMSA website interface. At the top left is the PHMSA logo and name, and at the top right is the U.S. Department of Transportation logo with social media icons for Twitter, YouTube, and LinkedIn. Below the header are navigation tabs for 'About PHMSA', 'Pipeline Safety', and 'Hazardous Materials Safety'. A search bar is located to the right of the tabs. The main content area features a large image of the '2016 Emergency Response Guidebook' with the text 'DOT announces release of new 2016 Emergency Response Guidebook'. To the right is a 'News & Updates' section with a list of links: 'U.S. Department of Transportation Announces Flammable Liquid Unit Trains Response Curriculum', 'HM-253 Reverse Logistics Final Rule - March 2016 (PDF)', 'The Fixing America's Surface Transportation (FAST) Act', and 'Briefing Room'. Below this is a 'PHMSA Resources' section with sub-sections for 'Regulations' and 'Data & Reports'. At the bottom left of the screenshot is a 'Find PHMSA Offices' section with a 'Key Officials' dropdown menu and a map of the United States divided into regions: western, central, eastern, southern, and southwest.

<http://www.phmsa.dot.gov/hazmat>





NEW: Hazardous Materials Transportation Training Modules

Free, interactive training modules available online:

<http://phmsa.dot.gov/hazmat>





Hazardous Material Info-Center

1-800-HMR-4922

(1-800-467-4922)

E-mail: infocntr@dot.gov



- Obtain answers to HMR questions
- Request copies of Federal Register, special permits or training materials
- Fax on Demand

39

