

U.N. CONTAINER SELECTION GUIDE



(REVISED EDITION)

A COMPANY DRIVEN BY CUSTOMER SATISFACTION . . .



Cleveland Steel Container Corporation

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USING THE U.N. CONTAINER SELECTION GUIDE

This container selection guide is intended to assist our Customers in determining the proper marking for their container and product in accordance with the "Recommendations by the United Nations Committee on the Transport of Dangerous Goods".

These "Recommendations" have been codified from the Docket #HM-181 to their final acceptance as Title 49 CFR (Code of Federal Regulations).

There are over 3,100 "Dangerous Goods" as referenced in the Hazardous Materials Table (CFR 49 172.101). In addition, there are "*special provisions*", including without limitation, provisions relating to flash point, percentage of dilution, degree of toxicity, and compatibility with the container, and these must also be considered in determining which of the three Packaging Groups (X, Y, Z) the "Dangerous Goods" or "Hazardous Materials" belongs in.

Obtaining the proper markings for your container may be accomplished by filling out the attached data sheets on pages 8-10 and forwarding them to CLEVELAND STEEL CONTAINER'S Customer Service Department for container testing/review. The required information may be obtained by referencing the product MSDS, an in-house chemist and the U.N. list of "Dangerous Goods" and/or CFR 49 Hazardous Materials Table in order to determine the following:

- the *proper* product name and **packaging class**
- any of the "**Special Provisions**" listed in the Tables
- the **Specific Gravity** of your product
- determining the **Vapor Pressure** of your product (for liquids)
- package weights for solids
- mode of transportation

The Packager (or Filler) knows his product best and is in sole control of the consistency of their product, whether Hazardous Materials or Dangerous Goods. Therefore, the Packager assumes the sole responsibility in the selection of the correct Packaging Group, U.N. Marking and container to be used.

Please note that according to the DOT, a DOT Certified Laboratory may *not* certify their *own* containers thereby requiring third party testing. However, a *non-certified in house laboratory* may qualify for self certification. CLEVELAND STEEL CONTAINER CORPORATION provides full range in-house laboratory testing for all UN Certification requirements.

In order to help you in determining your proper UN Packaging requirements, technical assistance is available through our U.N. Manager 1-800-UN-PAIS (1-800-867-2457).

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DEFINITIONS: Clarification of Terminology

UN Chapter 9:

General *Recommendations* on the Transport of Dangerous Goods. (Orange Book)

HM-181:

Docket # assigned to UN Recommendations in US before acceptance as 49 CFR.

CFR 49:

Code of Federal Regulations Title 49 (DOT Hazardous Materials Regulations).

DOT:

Department of Transportation. US Regulatory Agency for Transportation.

POP:

Performance Oriented Packaging. Emphasis behind UN Recommendations.

Specific Gravity (S.G.):

Ratio of the density of a substance in relation to water.

Vapor Pressure:

Pressure variation within closed container attributed to change in temperature of medium and/or environment.

Hydrostatic Pressure:

Water pressure measured in kPA (kilo Pascals).

COG Drop:

Center-of-gravity drop. Concentrates entire mass of pail on chime. (October 1, 1992)

Weight designation for Solids:

Shown in Kilograms (kg) followed by "S".

Flash Point:

Means the minimum temperature at which a liquid gives off vapor within a test vessel in sufficient concentration to form an ignitable mixture with air near the surface of the liquid.

RECAP OF COMPLIANCE DATES FOR UN CONTAINERS

- 01-01-91 Exports - must comply to UN Chapter 9:
Start of the use of UN performance recommendations and UN Markings.
- 10-01-91 Domestic - Effective date of Docket HM-181:
Voluntary compliance authorized. Compliance with revised hazard classification and hazard communication requirements applying to new explosives becomes mandatory.
- 10-01-92 Domestic - Compliance with revised hazard communication requirements for materials poisonous by inhalation and infectious substances becomes mandatory.
- 10-01-92 Domestic - Diagonal drop testing on top/bottom chime changed to center-of-gravity (COG).
- 12-31-92 Code of Federal Regulations Title 49 (CFR) parts 100-199 published. This publication is a codification of the general and permanent rules containing current regulations issued by the DOT and supersedes the CFR's Docket #HM-181.
- 10-01-93 Domestic - Compliance with *all* provisions of CFR Title 49 (parts 100-199) and with the revised classification and hazard communication requirements becomes mandatory.
- 10-01-94 Domestic - Cease manufacture of *all* packages rendered obsolete by the CFR Title 49: Those DOT specification packaging that are eliminated under the final rule are authorized for manufacture and marking up to **this date**. Newly manufactured and marked packaging must perform in accordance with revised CFR Title 49, Parts 173 and 178. In addition, conversion to the new placarding system is required for all materials (other than PIH materials).
- 10-01-96 Domestic - Use of packages as of 09-30-91 to allow use of existing inventories. Packages manufactured and marked *prior* to 10-01-94 and in accordance with Title 49 CFR requirements are authorized for use out of inventory for depletion purposes.

OVERVIEW OF REGULATIONS AND REQUIREMENTS

Purpose of HM-181 (CFR 49)

- °Performance Oriented Packaging (POP).
- °Simplify Hazardous Materials Regulations.
- °Reduce volume of Hazardous Materials Regulations.
- °Promote package flexibility and innovation.
- °Promote safety.
- °Reduce exemptions.
- °Facilitate International Commerce.

Testing Requirements

| <u>Test Type</u> | <u>Ability of Package/Packaging To:</u> |
|----------------------|--|
| Drop Test | Contain and protect the Dangerous Goods if package is dropped. |
| Leakproofness | Prevent leakage of liquids under conditions of normal transport. |
| Hydrostatic Pressure | Prevent leakage of liquids under pressure. |
| Stacking | Maintain stability while stacked with similar type packages. |
| Vibration test | Duplication of actual shipment. |

Product to Package Conversion

- °Packaging Group - determined by Hazard listing of product (Group I/II/III).
- °Packaging Authorization - determines which package you can use (173.201 173.202-173.203).
- °Quantity Limitation - degree of danger and means of transportation (172.101).

Information required to further define package by customer:

| <u>Info Required</u> | <u>Source</u> |
|--|-----------------------------|
| • Evaluate product and determine packing group | Federal Register |
| • Provide Specific Gravity (S.G.) | MSDS/In-house Chemist |
| • Provide Vapor Pressure (kPa) at 55°C | In-house chemist/conversion |
| • Provide package weight for solids (kg) | In-house chemist/testing |
| • Provide Mode of Transportation (Air/cargo) | End-use/Federal Register |

Container Specifications as Applied to Above

| <u>Customer Provided Product Info</u> | <u>Result</u> |
|---------------------------------------|--|
| Packaging Group/Product | I, II, or III Container Markings Drop and Leakproofness Test Levels |
| Specific Gravity (S.G.) or Weight | Container Drop Test Heights Stack Test Weights |
| Vapor Pressure | Container Test Rating for Hydraulic Testing |
| Mode of Transportation | Hydrostatic Minimum Rating |

Hazardous Materials/Flammable Liquids Table

| | | | |
|---|---|--|----------------------------------|
| X VERY HAZARDOUS | | Boiling Point (Less than) 95°F | Packing Group I |
| Y MEDIUM HAZARDOUS | Flash Point (Less than) 73°F | Boiling Point (Greater than) 95°F | II |
| Z MINOR HAZARDOUS | Flash point 73°F to 141°F | Boiling Point (Greater than) 95°F | III |

Note: Flammable liquids with a flash point <73°F may be placed in Pkg. III if it meets the four criteria in CFR 49..173.121, i.e. the Solvent Separation test (for mixture percentage) and Viscosity Test for flow rate test.

Combustible Liquids:

- ° Flammable Liquid with a flash point at or above 100°F.
- ° Material does not meet the definition of any other hazard class.
- ° Non-bulk package.
- ° Domestic ground transportation only.
- ° Material must not contain any environmentally hazardous substances.

Selection of Container:

Drum Types

| | | | |
|-----|------------------------------|-----------------|---------------|
| 1A | Drums and pails, steel | 1 - Closed Head | 2 - Open Head |
| 1H | Drums and pails, plastic | 1 - Closed Head | 2 - Open Head |
| 6HA | Composite, steel and plastic | | |

Ratings

Group I

Group II

Group III

Code

X = Very Hazardous

Y = Medium Hazard

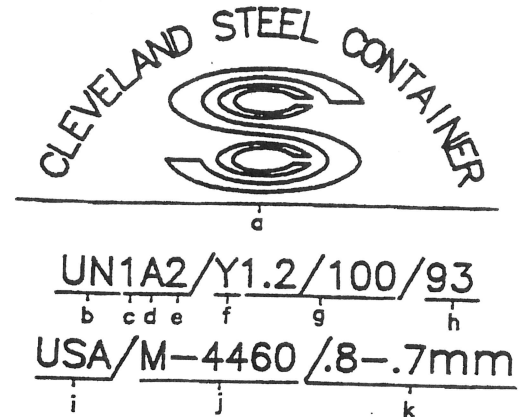
Z = Minor Hazard


Shippers Responsibility (173.22):

- **Properly** class and describe the **Hazardous Material**.
- Determine that the Container has been manufactured, marked, assembled, and closed properly.

U.N. CONTAINER MARKINGS

*Container markings referenced
by corresponding letter designation
and description.*



- a.) Cleveland Steel Container embossing.
- b.) U.N. Symbol. Note, may also be: 
- c.) "1" designation for drum.
- d.) "A" designation for Steel; "H" designation for Plastic.
- e.) "1" designation for Tight Head ; "2" designation for Open Head.
- f.) Packing Group: "X" designates Groups I, II, III
 "Y" designates Groups II, III
 "Z" designates Groups III
- g.) Liquids must show specific gravity and max. test pressure in kPa.
Solids must show max. gross weight in kilograms and "S" i.e. 30/S.
- h.) Year of manufacture for Steel; month and year for Plastics.
(Month may appear elsewhere on bottom of Plastic container).
- i.) Country of Mfg. and Competent Authority.
- j.) Mfg.'s name, initials, or "M" registration number as registered with Competent Authority.
 M-4460 CLEVELAND STEEL CONTAINER CORP., Niles, Ohio
 M-4461 CLEVELAND STEEL CONTAINER CORP., Quakertown, Pa.
 M-4369 CLEVELAND STEEL CONTAINER CORP., Peotone, IL
- k.) Container size in millimeters (reusable containers *only*.)

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U.N. PRODUCT TO PACKAGE CONVERSION

For certification and testing, please fill out the following (3) pages and send copy to CLEVELAND STEEL CONTAINER, in care of Customer Service to determine your proper packaging needs.

- (1) **Hazardous Materials Description and Proper Shipping Name(s):**
(Column 2 of Hazardous Material Table)

- (2) **Hazard Class/Division:**
(Column 3 of Hazardous Material Table)

- (3) **U.N. Identification Number:**
(Column 4 of Hazardous Material Table)

- (4) **Packaging Group (I, II, III):**
(Column 5 of Hazardous Material Table)

- (5) **Special Provisions:**
(Column 7 of Hazardous Material Table)

- (6) If *all* three Packing Groups are listed in column 5, refer to CFR 49 173.121 "Assignment of Packing Group" (i.e. Flammable liquid Packing Groups are determined by flash point)

Proper Packing Group Assignment:

CONTAINER TESTING / MARKING INFORMATION

NOTE: Container Testing / Marking information available from an MSDS, in-house Chemist, and product specification sheets.

- (7) **What is the specific gravity of your product:**
Note: Relative density equals Specific Gravity.

Weight of one gallon of product divided by weight of one gallon of water (8.34 lbs) = Specific Gravity

- (8) **Do you intend to ship this product by Air Shipment ?**

Note: Currently the International Air Transportation Association (I.A.T.A.) require all 5 gallon container that are shipped by air, to be embossed with the proper UN number .

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(9) What is the *Vapor Pressure* of your Product in kPa at 55°C: _____ kPa

Note: 1.) Vapor Pressure required for liquids only.

2.) A 250 kPa **Minimum** Test Pressure is required for all Class I (X) containers.

3.) For Air shipment of Hazardous Materials. The **Minimum** Hydrostatic pressure are:

Class I 250 kPa Class II 100 kPa Class III 80 kPa

If you do not have the Vapor Pressure in kPa at 55°C, give us what you have and we can convert it for you.

atm _____ at what temperature _____ = _____ kPa

mm Hg _____ at what temperature _____ = _____ kPa

Torr _____ at what temperature _____ = _____ kPa

PSI _____ at what temperature _____ = _____ kPa

*** Solids**

(10) What is the package weight of your product in kilograms: _____ kg

Conversion Formulas: Total weight of package multiplied by .454 = Kilograms

Solid Definition - Means a material which has a vertical flow of two inches or less within a three-minute period, or a separation of one gram or less of liquid when determined in accordance with the procedure specified in ASTM D 4359-84 "Standard Test Method for Determining whether a material is a liquid or solid".

(10A) What is the *material consistency* of your product:

(Please check {√} one)

____ Liquid

____ Paste

____ Solid

According to CFR 49 (173.22), it is the Shipper's responsibility to determine which marking should be applied to his container.

(11) I have met all the requirements for properly marking the container as required in CFR 49 173.22 "Shipper's Responsibility".

Customer/Company: _____

Signature of Person Responsible: _____

Date: _____

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TYPE OF CONTAINER

(12) What type of container are you currently packaging in?

Open Head _____ gauge

-Nested _____

-Straght sided _____

Cover _____ gauge

- Plain/fitting _____

- Gasket _____

Tight Head _____ gauge

- Fitting _____

(13) Drum Size in gallons (US): _____ (US) gallons

(14) Fittings:

Note: Rieke type fittings produce ideal test results.

(15). Gaskets Required:

Note: Flow In Gaskets Preferred for UN Package.

SAMPLE CERTIFICATION SHEET

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Design Qualification Testing for Drums in accordance with the U.N. Recommendations on the Transport of Dangerous Goods; Code of Federal Regulations Title 49 (CFR 49).

CONTAINER (DRUM) DESCRIPTION:

| | | | |
|-----------------------|-----------|-----|--------|
| Drum Type: | # Beads: | | |
| Material: | Capacity: | gal | liters |
| Gauge (Bdy/Btm): | Fittings: | | |
| Gauge (Cover): | Gasket: | | |
| Closing Instructions: | | | |
| Packaging Group: | | | |
| Specific Gravity: | (liquids) | | |
| Solids Gross Weight: | kg | lbs | |
| Hydro Test Pressure: | kPa | psi | |

U.N. MARKING:

DROP TESTS: (49 CFR;178.603)

A. Center of Gravity to Top/Bottom chime (or curl) from height of: 0.0 m 0.0 ft

B. Flat side (at seam) from height of: 0.0 m 0.0 ft

LEAKPROOFNESS TEST: (49 CFR;178.604)

A. Internal air pressure leak test at 20 kPa (2.9 psi) for packaging groups II and III, 30 kPa (4.4 psi) for Packaging Group I.

HYDRAULIC (Hydrostatic) TEST: (49 CFR;178.605)

A. Constant internal pressure of: 0.0 kPa 0.0 psi
maintained for 5 minutes.
Packing Group I requires a minimum of 250 kPa (36.3 psi).

STACK TEST: (49 CFR;178.606)

| | | | |
|--|-----------|---------|---------|
| | Total | Total | |
| A. Static 24 hour top load. Test applied equal to: | | 0.00 kg | 0.0 lbs |
| Minimum force for this design is: | 8 drums x | 0.00 kg | 0.0 lbs |

By: _____
Department: _____
Signature: _____
Customer: _____
Date: _____

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CONVERSIONS

English⇒Metric

Length:

meters = feet x .3048

meters = inches x .0254

millimeters = inches x 25.4

Volume:

liters = U.S. gallons x 3.754

liters = Imperial gallons x 4.546

cubic centimeters = cubic inches x 16.387

Weight:

kilograms = pounds x .454

Pressure:

kiloPascals = psi x 6.895

1mm H₂O = 0.0098 kPa

1mm Hg = 0.1333 kPa

1 " H₂O = 0.248 kPa

1 " Hg = 3.386 kPa

1 psi = 6.895 kPa

Temperature:

°C = (temp. in °F -32) 5/9

Metric⇒English

feet = meters x 3.281

inches = meters x 39.37

inches = millimeters x .0394

U.S. gallon = liters x .2642

Imperial gallon = liters x .220

cubic inches = cubic centimeters x .06102

pounds = kilograms x 2.2046

psi = kiloPascals x .145

°F = temp. in °C x 9/5 + 32

§ 172.101 HAZARDOUS MATERIALS TABLE—Continued

| (1) Symbols | (2) Hazardous materials descriptions and proper shipping names | (3) Hazard class or Division | (4) Identification Number | (5) Packaging group | (6) Landing required (if not accepted) | (7) Special provisions | (8) Packaging authorization (if 173.33) | | (9) Quantity limitations | | (10) Vessel stowage requirements | |
|----------------|---|---------------------------------|------------------------------|------------------------|---|---------------------------|--|---------------------------|------------------------------------|--------------------------|-------------------------------------|--------------------------------|
| | | | | | | | Except solids (8A) | Other bulk packaging (8C) | Passenger aircraft or railcar (9A) | Cargo aircraft only (9B) | Vessel stowage (10A) | Other stowage provisions (10B) |
| W | Fish meal or fish scrap stabilized | 9 | UN2216 | III | None | A1 | None | 210 | No limit | No limit | A | 98, 120 |
| | Fish meal, unstabilized or fish scrap, unstabilized | 4.2 | UN1374 | II | SPONTANEOUSLY COMBUSTIBLE. | A1, A19 | None | 212 | 15 kg | 50 kg | A | 119, 120 |
| | Flammable compressed gas, see Compressed or liquefied gas, flammable, etc. | | | | | | | | | | | |
| | Flammable compressed gas (small receptacles not fitted with a dispersion device, not refillable), see Receptacles, etc. | | | | | | | | | | | |
| | Flammable gas in lighters, see Lighters for cigars or cigarettes, with flammable gas. | | | | | | | | | | | |
| | Flammable liquids, corrosive, n.o.s. | 3 | UN2024 | I | FLAMMABLE LIQUID. | T42 | None | 201 | 0.5 L | 2.5 L | E | 40 |
| | | | | II | CORROSIVE, FLAMMABLE LIQUID. | T15, T20 | None | 202 | 1 L | 5 L | B | 40 |
| | | | | III | CORROSIVE, FLAMMABLE LIQUID. | D1, T15, T26 | 150 | 203 | 5 L | 50 L | A | 40 |
| | Flammable liquids, n.o.s. | 3 | UN1993 | I | CORROSIVE, FLAMMABLE LIQUID. | T42 | 150 | 201 | 1 L | 30 L | E | |
| | | | | II | FLAMMABLE LIQUID. | 16, T31 | 150 | 202 | 5 L | 60 L | B | |
| | | | | III | FLAMMABLE LIQUID. | B1, B52, T7, T30 | 150 | 203 | 60 L | 220 L | A | |
| | Flammable liquids, poisonous, n.o.s. | 3 | UN1992 | I | FLAMMABLE LIQUID, POISON. | T42 | None | 201 | Forbidden | 30 L | E | 40 |
| | | | | II | FLAMMABLE LIQUID, POISON. | T18 | None | 202 | 1 L | 60 L | B | 40 |
| | Flammable solids, corrosive, n.o.s. | 4.1 | UN2925 | II | FLAMMABLE SOLID, CORROSIVE. | | None | 212 | 15 kg | 50 kg | D | 40 |
| | | | | III | FLAMMABLE SOLID, CORROSIVE. | A1 | 151 | 213 | 25 kg | 100 kg | D | 40 |
| | Flammable solids, n.o.s. | 4.1 | UN1325 | II | FLAMMABLE SOLID. | | 151 | 212 | 15 kg | 50 kg | B | |
| | | | | III | FLAMMABLE SOLID. | | 151 | 213 | 25 kg | 100 kg | B | |
| | Flammable solids, poisonous, n.o.s. | 4.1 | UN2926 | II | FLAMMABLE SOLID, POISON. | | None | 212 | 15 kg | 60 kg | B | 40 |
| | | | | III | FLAMMABLE SOLID. | A1 | 151 | 213 | 25 kg | 100 kg | D | 40 |
| | Flares, aerial | 1.3G | UN0093 | II | EXPLOSIVE 1.3G | | None | 62 | Forbidden | 75 kg | B | 24E |
| | Flares, aerial | 1.4G | UN0403 | II | EXPLOSIVE 1.4G | | None | 62 | Forbidden | 75 kg | A | 9E |
| | Flares, aerial | 1.4S | UN0404 | II | EXPLOSIVE 1.4S | | None | 62 | 25 kg | 100 kg | A | |
| | Flares, aerial | 1.1G | UN0420 | II | EXPLOSIVE 1.1G | | None | 62 | Forbidden | Forbidden | B | |
| | Flares, aerial | 1.2G | UN0421 | II | EXPLOSIVE 1.2G | | None | 62 | Forbidden | Forbidden | B | |
| | Flares, signal, see Cartridges, signal | | | | | | | | | | | |
| | Flares, surface | 1.1G | UN0418 | II | EXPLOSIVE 1.1G | | None | 62 | Forbidden | Forbidden | B | |
| | Flares, surface | 1.2G | UN0419 | II | EXPLOSIVE 1.2G | | None | 62 | Forbidden | Forbidden | B | |
| | Flares, surface | 1.3G | UN0082 | II | EXPLOSIVE 1.3G | | None | 62 | Forbidden | 75 kg | B | |
| | Flares, water-activated, see Candles, water-activated, etc. | | | | | | | | | | | |
| | Fish powder | 1.1G | UN0094 | II | EXPLOSIVE 1.1G | | None | 62 | Forbidden | Forbidden | B | 1E, 5E |
| | | 1.3G | UN0305 | II | EXPLOSIVE 1.3G | | None | 62 | Forbidden | Forbidden | B | 1E, 5E |

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Responsibility

178.2 (2) Notification:

The manufacturer or other person certifying compliance with the requirements of this part, and each subsequent distributor of that packaging shall:

- (1) Notify in writing each person to whom that packaging is transferred,
 - (i) Of all requirements in this part not met at the time of transfer, and
 - (ii) Of the type and dimensions of any closures, including gaskets, needed to satisfy performance test requirements.
- (2) Retain copies of all written notifications for at least one year of insurance; and
- (3) Make copies of all written notifications available for inspection by a DOT inspector.

178.601 (b) Responsibility:

It is the responsibility of the packaging manufacturer and the person who offer hazardous materials for transportation, to the extent that the assembly functions, including final closure are performed by the latter, to assure that each package is capable of passing the prescribed tests.

173.22 Shipper's Responsibility:

A person may offer a hazardous material for transportation in a packaging or container required by this part only in accordance with the following:

- (1) The person shall class and describe the hazardous material in accordance with parts 172 and 173.
- (2) The person shall determine that the packaging or container is an authorized packaging, assembled and marked.