HAZARDOUS MATERIALS PACKAGING

Understanding Performance-Oriented Packaging Standards For Steel Drums

APRIL 2002 -- NINTH EDITION
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I. PERFORMANCE ORIENTED PACKAGING

Background

Evolution of Performance Oriented Packaging

Time Table

Transition Dates §171.14

Old System - Specification Based Packaging

New System - Performance Oriented Packaging

Major Changes

Definitions §171.8

Reference §171.9

II. MARKINGS

Drum Markings §178.503

III. PACKAGE SELECTION

Responsibility § 173.22

Assembly Notification §178.601(b) & §178.2 (c)

Package Selection

UN Performance Oriented Packaging Specification Sheet

IV. TESTING §178.600

Design Type §178.601(c)(4)

Design Qualification Testing §178.601 (c) (1)

Periodic Retesting §178.601 (c) (2)

Production Testing §178.601 (c) (3)
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Contact the Department of Transportation for formal interpretations of the Hazardous Material Regulations.

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I. PERFORMANCE ORIENTED PACKAGING

BACKGROUND
For over forty years, the Department of Transportation used a specification based regulations system that had become routine for packagers of hazardous materials. Terms such as DOT 17H and DOT 17E indicated to manufacturers how to construct and test a container.

As the world moves toward a global economy, barriers to free trade are being eliminated. The Performance-Oriented Packaging standards embodied in the DOT’s Hazardous Material Regulations (HMR) are based on an international system developed in the United Nations with the purpose to promote harmonization in hazardous materials regulations worldwide, thereby reducing obstacles to the free flow of commerce. Countries that operate under this international system are not obligated to, but attempt to, adopt these standard into their national regulations with as little change as possible. Yet, differences among nations do exist and must be monitored.

All phases of hazardous materials shipment are subject to change. This includes: packaging specification, placarding, labeling, manifesting and employee training.

UN RECOMMENDATIONS ON THE TRANSPORT OF DANGEROUS GOODS “ORANGE BOOK”
Developed by the Committee of Experts on the Transport of Dangerous Goods under the authority of the UN’s Economic and Social Council, the UN Recommendations are the basis for the U.S. regulations on the transport of hazardous materials by air, ocean vessel, rail, road carrier or intermodal. The Recommendations, authorized in 1957, are revised every two years and are presently formatted as Model Regulations.

HAZARDOUS MATERIALS TRANSPORTATION ACT OF 1974
The legislative authority for the U.S. Department of Transportation in the area of hazardous materials regulations. It is usually reauthorized every three years.

TITLE 49, PARTS 100-199, CODE OF FEDERAL REGULATIONS
The body of regulations administered by the Research and Special Programs Administration of the DOT. The Hazardous Materials Regulations are found in Parts 171 – 180. Part 171 is general information, Part 172 is the hazardous materials tables and communications regulations, Part 173 general requirements for shippers and packagings, and Part 178 packaging specifications. Title 49 is revised every October 1.
HM-181
On December 19, 1990 the United States published its final rule in Docket No. HM-181 which adopted UN standards for the packaging and shipping of hazardous materials developed by the UN Committee of Experts in the sixth revision of the UN Orange Book. For the most part, the UN Orange Book recommendations were accepted by the DOT. Several significant changes did appear in the US DOT version due to practices that applied specifically to the United States (i.e. minimum steel thickness requirements, reconditioning provisions, etc.). Certain thickness marking requirements were phased out by HM-215A.

HM-215A
On December 29, 1994 the DOT published its final rule in Docket No. HM-215A, which updated the HM-181 final rule to reflect changes made in the Seventh and Eighth Revised Editions of the UN Orange Book. On May 18, 1995, editorial corrections were made to HM-215A. Provisions for this rule were effective October 1, 1996.

HM-215B AND HM-181H
On May 6, 1997, and September 26, 1996, DOT issued final rules for Dockets HM-215B and HM-181H, respectively. For steel drum users, these primarily affected provisions on salvage drums, minimum thickness, certain transitional provisions, and design type variations. These provisions are included herein.

United Nation Countries
(i.e. France, Belgium, United
United Kingdom, Germany,

UN Committee of Experts
UN Orange Book
Meet in Geneva every 2 years

HM-181

UN Member
Adopt
Regulations
ICAO, IMO,
RID/ADR

CFR 49 §100-178
DOT Regulations

HM-215A, 215B, 181H
<table>
<thead>
<tr>
<th>Time Table</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UN Performance Standards Required for International Shipments</strong></td>
</tr>
<tr>
<td><strong>HM-181 allows P.O.P. for domestic shipments</strong></td>
</tr>
<tr>
<td><strong>Hazardous Materials must be shipped under HM-181 Rules</strong></td>
</tr>
<tr>
<td><strong>DOT specification drums can still be manufactured</strong></td>
</tr>
<tr>
<td><strong>DOT specification drums can still be filled and shipped</strong></td>
</tr>
</tbody>
</table>

HM-215A Authorized 1/1/95
TRANSITION DATES §171.14

OCTOBER 1, 1993
Packagers and shippers of hazardous materials must use the new shipping papers, labeling, emergency response, training and documentation as outlined in 49 CFR §171 et al. New packaging requirements for Poisonous Inhalation Hazard (PIH) materials.

OCTOBER 1, 1994
New placarding requirements. DOT specification drums can no longer be manufactured. This includes:

- DOT-17E
- DOT-17C
- DOT-17H
- DOT-37A
- DOT-37M
- DOT-5B
- DOT-6D

JANUARY 1, 1995
Voluntary Compliance with HM-215A

OCTOBER 1, 1996
Mandatory compliance for provisions accepted in HM-215A
Hazardous materials packaged after October 1, 1991 may no longer be shipped in DOT specification drums. (Products packaged prior to October 1, 1991 may be shipped until October 1, 2001.)

OCTOBER 1, 1999
(Products packaged prior to October 1, 1991 may be shipped until October 1, 2001.) Hazardous materials packaged in DOT specification drums prior to 10/01/96 and never emptied and refilled after that date may no longer be shipped.
OLD SYSTEM - SPECIFICATION BASED PACKAGING

DOT-17H

- 16 Gauge Head
- Reinforcement Ring
- 12 Ga. Bolt Ring
- 4" x 5/8" Bolt
- 3 Swedges
- 18 Gauge Body & Bottom

Ladings
- Flammables
- Paints
- Hazardous Waste

DOT-17E

- 2 Swedges
- 20/18 Gauge Body & Bottom

Ladings
- Flammables
- Solvents
**PERFORMANCE ORIENTED PACKAGING**

The new hazardous materials regulations are based on performance oriented packaging. A container can be manufactured in any fashion as long as the resulting package successfully conforms to the test provisions located in §178.600.

1A1/Y1.8/300/00

The following items are not specified under the regulations:

- Capacity
- Steel thickness
- Height or diameter requirement
- Closures
MAJOR CHANGES

SHIPPING PAPERS §172.200
MARKINGS §172.300
LABELING §172.400
PLACARDING §172.500
EMERGENCY RESPONSE §172.600
TRAINING §172.700
SHIPPER'S RESPONSIBILITIES §173.00
MANUFACTURER'S RESPONSIBILITIES §178.00
HAZMAT DEFINITIONS §171.8
HAZMAT TABLE §172.101
HAZARD CLASSIFICATION CODES
Classification codes replace word descriptions for product categories. For example, Flammable Liquids are now referred to as Class 3 products. Class 9 is used to describe most ORM-E (other regulated materials).

<table>
<thead>
<tr>
<th>Description</th>
<th>Hazard Code</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explosives</td>
<td>Class 1</td>
<td>§173.50</td>
</tr>
<tr>
<td>Flammable Gases</td>
<td>Class 2, Division 2.1</td>
<td>§173.115</td>
</tr>
<tr>
<td>Nonflammable Gases</td>
<td>Class 2, Division 2.2</td>
<td>§173.115</td>
</tr>
<tr>
<td>Poisonous Gases</td>
<td>Class 2, Division 2.3</td>
<td>§173.115</td>
</tr>
<tr>
<td>Flammable Liquids</td>
<td>Class 3</td>
<td>§173.120</td>
</tr>
<tr>
<td>Flammable Solids</td>
<td>Class 4, Division 4.1</td>
<td>§173.124</td>
</tr>
<tr>
<td>Spontaneously Combustible</td>
<td>Class 4, Division 4.2</td>
<td>§173.124</td>
</tr>
<tr>
<td>Dangerous-When-Wet</td>
<td>Class 4, Division 4.3</td>
<td>§173.124</td>
</tr>
<tr>
<td>Oxidizers</td>
<td>Class 5, Division 5.1</td>
<td>§173.127</td>
</tr>
<tr>
<td>Organic Peroxides</td>
<td>Class 5, Division 5.2</td>
<td>§173.127</td>
</tr>
<tr>
<td>Poisons</td>
<td>Class 6, Division 6.1</td>
<td>§173.132</td>
</tr>
<tr>
<td>Infectious Substances</td>
<td>Class 6, Division 6.2</td>
<td>§173.132</td>
</tr>
<tr>
<td>Radioactive</td>
<td>Class 7</td>
<td>§173.403</td>
</tr>
<tr>
<td>Corrosive</td>
<td>Class 8</td>
<td>§173.136</td>
</tr>
<tr>
<td>Misc. Hazards (hazardous waste)</td>
<td>Class 9</td>
<td>§173.140</td>
</tr>
</tbody>
</table>

ADDITIONAL REGULATED PRODUCTS
Some products that previously were considered non-hazardous are now regulated under the new regulations. The flash point has been changed to include products that previously were exempt. It is the responsibility of the packager/shipper to evaluate each lading to determine the correct packaging.

<table>
<thead>
<tr>
<th>Class 3 Flammable Liquids</th>
<th>§173.120</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Regulated Flash Point</td>
<td></td>
</tr>
<tr>
<td>32 °F</td>
<td>100 °F</td>
</tr>
<tr>
<td>0 °C</td>
<td>37.8 °C</td>
</tr>
</tbody>
</table>

* A flammable liquid with a flashpoint at or above 38°C (100°F) that does not meet the definition of any other hazard class may be reclassified as a combustible liquid. Combustible liquids are those with a flash point above 141°F.
DEDICATED REUSE §173.28
Drums must be inspected, leakproofness tested and marked prior to reuse even if they are filled with the same product.

HAZMAT EMPLOYEE TRAINING §172.700
A Hazmat employee is any person who in the course of their employment directly affects hazardous materials transportation safety. Hazmat employees must receive specific training. Topics include: Hazardous materials handling, emergency response, self-protection, accident prevention, etc. Documented training and testing must have been completed by October 1, 1993 and every three years thereafter. A hazmat employee must be trained within 90 days of starting a new hazardous materials function.

- Hazardous Awareness Training
- Function Specific Training
- Safety Training
- OSHA or EPA Training
- Testing & Documentation
**Reconditioning Requirements for Hazardous Materials §173.28**

Under HM-181H, drums with a capacity greater than 100 liters (26.5 gallons) may only be reused after proper reconditioning if the steel thickness is a minimum of .92 mm (0.0362 inch). Drums constructed before January 1, 1997 with a minimum of 0.82 mm (0.0323 inch) body and 1.09 mm (0.0429 inch) heads and bottoms may be reused. Drums constructed after January 1, 1997 and intended for reuse must have a minimum of 0.82 mm (0.0323 inch) body and 1.11 mm (0.0437 inch) heads and bottoms.

**Salvage Drum Testing §173.3**

Two types of salvage drums for hazardous materials are allowed:

1. A 1A2 drum tested and marked for Packing Group III or higher for liquids or solids and a leakproofness test of 20 kPa(3psi).

2. A 1A2 drum marked “T” in accordance with the UN Recommendations. According to Chapter 6.1 of the UN Orange Book, salvage drums marked “T” shall be tested as Packing Group II packagings for solids where water is the test substance filled to not less than 98% of maximum capacity, and the drums must pass a leakproofness test of 30 kPa.

Myers Container Corporation can produce steel drums to the minimum steel thickness allowed for reconditioning and for reuse with Hazardous Materials. This provides the emptier with the greatest value when sending empty drums to a reconditioner. Myers will emboss drums meeting the 1.11/.82/1.11mm thickness as a nominal marking of 1.2/.9/1.2mm as required by the D.O.T. (see Appendix 1).
DEFINITIONS §171.8

**Non-Bulk Packaging**
Maximum capacity of 450 L (119 gallons) or less for liquids.
Maximum net mass of 400 kg (882 pounds) or less for solids.

**Bulk Packaging**
Maximum capacity greater than 450 L (119 gallons) for liquids.
Maximum net mass greater than 400 kg (882 pounds) for solids.

**Composite Packaging**
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.

**Gross Mass**
The weight of a packaging plus the weight of the contents.

**Hazard Class**
The category of hazard assigned to a hazardous material under the definition criteria of Part 173 and the provisions of the hazardous material Table §172.101.

**Hazardous Material**
A substance or material, including a hazardous substance, which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce.

**Hazmat Employee**
A person who is employed by a hazmat employer and who in the course of employment directly affects hazardous materials transportation safety.

**Liquid**
A material that has a vertical flow of over 2 inches (50 mm) within a three minute period, or a material having one gram or more liquid separation, when determined in accordance with the procedures specified in ASTM D 4359.

**Packing Group §172.101**

<table>
<thead>
<tr>
<th>Packing Group</th>
<th>Degree of Danger</th>
<th>Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packing Group I</td>
<td>Great</td>
<td>X</td>
</tr>
<tr>
<td>Packing Group II</td>
<td>Medium</td>
<td>Y</td>
</tr>
<tr>
<td>Packing Group III</td>
<td>Minor</td>
<td>Z</td>
</tr>
</tbody>
</table>
DEFINITIONS CON’T

**FLASH POINT**
The minimum temperature at which a substance gives off flammable vapors which, in contact with sparks or flame, will ignite (§173.121).

**REGULATORY AGENCIES**
DOT     U. S. Department of Transportation
IAEA    International Atomic Energy Agency
IATA    International Air Transport Association
ICAO    International Civil Aviation Organization
IMO     International Maritime Organization
REFERENCE §171.9

**METRIC CONVERSIONS**

1 kilogram (kg)............................... = 2.204622 pounds  
1 millimeter (mm)......................... = 0.03937008 inches  
1 meter ....................................... = 39.37008 inches  
1 kiloPascal (kPa) ......................... = 0.1450377 PSI  
1 liter....................................... = 0.2641720 gallons

**SPECIFIC GRAVITY (RELATIVE DENSITY)**

The ratio of the density of a substance to the density of water. The specific gravity of water is 1.0.

**VAPOR PRESSURE**

The pressure exerted by a vapor that is in equilibrium with its solid or liquid form.

**CODE OF FEDERAL REGULATIONS (CFR 49 100-199)**

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**DEPARTMENT OF TRANSPORTATION**

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U.S. Department of Transportation  
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**AMERICAN NATIONAL STANDARDS INSTITUTE**

11 West 42nd Street  
New York, NY 10036
II. MARKINGS

DRUM MARKINGS §178.503

The marks must contain the information outlined in Section 178.503 and the inch equivalents of the minimum thicknesses in millimeters listed in table of Section 173.28 are found by dividing the number of millimeters by 25.4. Disregard the inch equivalents shown in parentheses; these are not accurate conversions.

1) NON-BULK STEEL CONTAINERS UP TO 30 KG GROSS MASS

A) Single Trip Containers Only --
- Mark may be durable or permanent but must be “readily visible”. The marking cannot be applied to only a removable cover.

- The mark must include the country of manufacture and the manufacturer’s symbol or name and address.

B) Intended For Reuse Or Reconditioning --
- If applying only one mark, it must be permanent and have the country of manufacture and manufacturer’s symbol or name and address. This permanent mark may be applied on the top, side or bottom. However, the marking cannot be applied to only a removable cover.
2) NON-BULK STEEL CONTAINERS ABOVE 30 KG. BUT LESS THAN 100 LITERS

A) Single-Trip Containers --
- Durable or permanent mark must be on the top or the side of the container, whether you mark the bottom or not. However, the marking cannot be applied to only a removable head.

- All marks must include the country of manufacture and the manufacturer’s symbol or name and address.

B) Intended For Reuse Or Reconditioning --
- If applying only one mark, it must be permanent and have the country of manufacture and the manufacturer’s symbol or name and address. This permanent mark must be applied on the top or side. However, the marking cannot be applied to only a removable head.

- If a durable mark is applied on top or side, then the permanent mark on the bottom need not have the country of manufacture and the manufacturing symbol.

- Nominal thickness mark is required as part of the permanent and durable marks. If the head or the bottom is thinner than the body, then all three nominal thickness marks are required.

Nominal thickness requirement for reuse or reconditioning is 0.7mm (0.63mm minimum) for containers up to and including 20 liters, from 20 to 40 liters the nominal thickness requirement is 0.8mm (0.73mm minimum), from 40 to 100 liters the nominal thickness requirement is 1.0mm (0.92mm minimum). Also, drums with a minimum head and bottom thickness of 1.11mm and body thickness of 0.82mm are allowed.
3) NON-BULK STEEL CONTAINERS ABOVE 100 LITERS

A) Single-Trip Containers --
- Durable mark must be on the top or the side of the container. It must include the country of manufacture and the manufacturer’s symbol but need not have the thickness mark. However, the marking cannot be applied to only a removable head.

- Permanent mark must be on the bottom. The country of manufacture and the manufacturer’s symbol need not be part of the permanent mark. The thickness mark must be included.

- Nominal thickness mark showing the thickness of the body is required. If the head or the bottom is thinner than the body, then all three nominal thickness marks are required (top head/body/bottom head).

B) Intended For Reuse Or Reconditioning --
- Same as above.

Nominal thickness requirement for reuse or reconditioning is 1.0mm (0.92mm minimum). For containers over 220 liters, the nominal thickness requirement is 1.9mm (1.77mm minimum). Also, drums with a minimum head and bottom thickness of 1.11mm and body thickness of 0.82mm are allowed.
SAMPLE PERMANENT MARKING – TIGHTHEAD-NEW DRUM

SAFETY DATA SHEET (SDS) – 2001-00-0000/REV 0.9.1

(For embossed metal drums, the letters “UN” may be applied in place of the United Nations symbol. Letter height must be a minimum of 12mm for Containers over 30 liters, or 6mm for containers under 30 liters.)

SAMPLE DURABLE MARKING- TIGHTHEAD- NEW DRUM
### SAMPLE PERMANENT MARKING- OPENHEAD LIQUID- NEW DRUM

Drum | Packing Group | Level Tested | Open Head | Specific Gravity | Hydrostatic Pressure kPa | Year of Manufacture
---|---|---|---|---|---|---

**1A2/Y1.2/100/02**

- **Nominal Steel Thickness (Head/Body/Bottom)**: 1.1
- **Liter Capacity (optional)**: 208

(For embossed metal drums, the letters “UN” may be applied in place of the United Nations symbol. Letter height must be a minimum of 12mm for Containers over 30 liters, or 6mm for containers under 30 liters.)

### SAMPLE PERMANENT MARKING- OPENHEAD SOLID-NEW DRUM

Drum | Packing Group | Level Tested | Open Head | Maximum Gross Mass (kg) | Solid | Year of Manufacture
---|---|---|---|---|---|---

**1A2/X425/S/02**

- **Nominal Steel Thickness (Head/Body/Bottom)**: 1.1

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**SAMPLE PERMANENT MARKING – TIGHTHEAD-RECONDITIONED DRUM**

For embossed metal drums, the letters “UN” may be applied in place of the United Nations symbol. Letter height must be a minimum of 12mm for Containers over 30 liters, or 6mm for containers under 30 liters.

**SAMPLE DURABLE MARKING - TIGHTHEAD- RECONDITIONED DRUM**
III. PACKAGE SELECTION

RESPONSIBILITY § 173.22

It is the responsibility of the packager/shipper, not the container manufacturer, to determine the proper package specification for each lading. The shipper determines that the drum is authorized, assembled and marked for packaging. The shipper may request a certificate of compliance from the manufacturer to demonstrate that each container conforms with the performance testing provisions in §178.600.

Since the test for the old specification testing and the new performance standard testing are not the same, it is necessary to perform complete testing for each marking appearing on the container. Some container specifications that have been used for years may become obsolete under the new performance standard testing requirements. There is no conversion chart to look up the equivalent UN marking for a DOT-17E.

ASSEMBLY NOTIFICATION §178.601(B) & §178.2 (C)

It is the shipper’s responsibility to assemble the container for shipment in accordance with the manufacturer’s instructions.

Please see our website for complete information or refer to the Appendix herein entitled “UN Drum Assembly Instructions”.

PACKAGE SELECTION

To order UN marked packaging, purchasers of steel drums must supply the following information to their drum manufacturer found in the Hazardous Material Table (§172.101)

- **Packing Group §172.101**

<table>
<thead>
<tr>
<th>Packing Group</th>
<th>Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packing Group I</td>
<td>X</td>
</tr>
<tr>
<td>Packing Group II</td>
<td>Y</td>
</tr>
<tr>
<td>Packing Group III</td>
<td>Z</td>
</tr>
</tbody>
</table>

- **Specific Gravity (Liquids Only) §178.503 (A)(4)(I)**
  Relative density of the material, rounded up to the first decimal.

- **Net Mass (Solids Only) §178.503 (A)(4)(II)**
  The total weight, in kilograms, of the material placed in the drum. Drum must be marked with the maximum gross mass.

- **Hydrostatic Pressure Test (Liquids Only) §173.24(A)**
  The pressure in kiloPascals (kPa) that the packaging must be capable of withstanding, which relates to the vapor pressure of the lading at certain reference temperatures.

<table>
<thead>
<tr>
<th>Packing Group Level Tested</th>
<th>Drum</th>
<th>Steel</th>
<th>Tight Head</th>
<th>Specific Gravity</th>
<th>Hydrostatic Pressure kPa</th>
<th>Year of Manufacture</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A1/Y1.8/300/02</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Packing Group Level Tested</th>
<th>Drum</th>
<th>Steel</th>
<th>Open Head</th>
<th>Maximum Gross Mass (kg)</th>
<th>Solid</th>
<th>Year of Manufacture</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A2/X425/S/02</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**SINGLE PRODUCT CHARACTERISTICS §172.101**
To determine packaging requirements for pure products, such as acetone, reference the Hazardous Material Table located in the Code of Federal Regulations.

**MULTIPLE PRODUCT CHARACTERISTICS §173.2A**
To determine packaging requirements for a mixture of chemicals (i.e. formulations, hazardous waste, etc.) reference the Precedence of Hazard Table. Laboratory testing must be performed to determine the characteristics of the formulation. In some cases, animal testing may be necessary.

Packagers should contact their suppliers or trade associations for assistance in determining the proper packaging requirements.
# UN PERFORMANCE ORIENTED PACKAGING SPECIFICATION SHEET

**Product Name**: 

**Classification**
Items 1 through 5 below are from the CFR 49 172.101 Hazardous Materials Table

1. **Hazardous materials description and proper shipping name** (Column 2)
2. **Hazardous class/division** (Column 3)
3. **UN Identification Number** (Column 4)
4. **Packing Group (I,II,III)** (Column 5)
5. **Special Provisions** (Column 7)

**Container Testing/Marking Data**

<table>
<thead>
<tr>
<th>Specific Gravity</th>
<th>Material Consistency (check one)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Liquid Solid</td>
</tr>
<tr>
<td></td>
<td>See ASTM D4359-90</td>
</tr>
<tr>
<td>(Solids Only)</td>
<td>(Liquids Only)</td>
</tr>
</tbody>
</table>

**Net weight in Kilograms**: 

**Product Vapor Pressure**: ____ kPa @ 55 C

**Type of Container**

<table>
<thead>
<tr>
<th>Openhead</th>
<th>Tighthead</th>
<th>Capacity</th>
<th>US Gallons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Fittings required**: 

**UN MARKING**: 

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9/16/2002 © Myers Container Corporation 2002 Page 26
IV. TESTING §178.600

It is the responsibility of the container manufacturer to perform and document design qualification testing, periodic retesting and production testing in accordance with Subpart M - Testing of Non-Bulk Packagings and Packers. Each manufacturer must certify the packaging is capable of passing the prescribed tests (§178.601(b)). All records are to be kept at each location where the packaging is manufactured and at each location where design qualification tests are conducted for as long as the packaging is produced and for at least two years thereafter. All records must be made available to the Department of Transportation upon inspection.

Each container must be manufactured and assembled so as to be capable of successfully passing the prescribed tests. The DOT secures containers randomly to determine compliance.

Container manufacturers may use a DOT approved third party testing facility to perform the design qualification and the periodic retests.

DESIGN TYPE §178.601(c)(4)

This is the description that represents each unique container.

For steel drums with a capacity greater than 50 L (13 Gallons), a change in any one of the following design elements constitutes a different drum design type requiring full design qualification testing [§178.601(g)(8)]:

1. the packaging type and category, i.e. 1A1 or 1A2;
2. the style, i.e. straight-sided or tapered;
3. the rated capacity and outside dimensions (except if the change is 25% or less than the original type);
4. the physical state for which the packaging was originally approved, e.g. for solids or liquids;
5. an increase in the marked level of performance (i.e. to a higher packaging group, hydrostatic test pressure and specific gravity);
6. type of side seam welding;
7. type of steel;
8. an increase of greater than 10% or any decrease in steel thickness of the head, body or bottom;
9. end seam type, e.g. triple or double seam;
10. a reduction in the number of rolling hoops which equal or exceed the diameter over the chimes;
(11) the location, type or size, and material of closures (other than the cover of UN 1A2 drums); and

(12) for UN 1A2 drums:
   (a) gasket material or properties affecting the performance of the gasket;
   (b) configuration or dimensions of the gasket;
   (c) closure ring style including bolt size (e.g. square or round back, 0.625” bolt); and
   (d) closure ring thickness.

The design qualification test is applicable for containers shorter than the original design as long as all other construction is identical. For example, a certification for a 208 liter (55 gallon) drum is valid for a 197 liter (52 gallon) drum made on the same diameter. §178.601 (c)(4)(v).

**DESIGN QUALIFICATION TESTING §178.601 (C) (1)**

To determine the capabilities of a container, design qualification testing is performed on the initial design type. No UN marking may appear on the container.

- Drop Test
- Stack Test
- Hydrostatic Test
- Leakproofness Test (closures in place)
- Vibration Standard *

(*§178.608 states that each packaging must be capable of withstanding the vibration test procedure.)

**PERIODIC RETESTING §178.601 (C) (2)**

To ensure integrity of the design qualification test results, periodic retesting is performed on an annual basis. Each container must be embossed with the UN marking to which it is being tested.

- Drop Test
- Stack Test
- Hydrostatic Test
- Leakproofness Test (closures in place)
PRODUCTION TESTING §178.601 (C) (3)
Must be performed on every container produced.

- Leakproofness Testing
- Chime Cut Retains* (each design change)

(*Required only if the solution over partial seams test method is used. Part 178 Appendix B, Option 4.)
DROP TEST §178.603

Design Qualification and Periodic Retest
The drop test for containers to contain liquids is a vented drop, i.e. the plugs must be vented after dropping the drum to equalize the internal and external pressures. The container must be at least 98 percent full with liquid and dropped from the height determined by the packing group designation.

The drop test for containers to contain solids must be filled to at least 95 percent capacity with a material having physical properties (grain, size, viscosity) similar to the intended lading. Drop height is determined by the packing group designation.

The container is to be dropped using the orientation most likely to result in failure.

Drop Heights

<table>
<thead>
<tr>
<th>Packing Group</th>
<th>Solids/Liquids</th>
<th>Liquids (SG &gt; 1.2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packing Group I</td>
<td>1.8 m (5.9 feet)</td>
<td>SG x 1.5 m (4.9 feet)</td>
</tr>
<tr>
<td>Packing Group II</td>
<td>1.2 m (3.9 feet)</td>
<td>SG x 1.0 m (3.3 feet)</td>
</tr>
<tr>
<td>Packing Group III</td>
<td>.8 m (2.6 feet)</td>
<td>SG x .67 m (2.2 feet)</td>
</tr>
</tbody>
</table>

Criteria for Passing
There is no leakage of the filling substance from the drum.
LEAKPROOFNESS TEST §178.604

Design Qualification and Periodic Retest
Containers must be tested with closures in place. Once filled with the pressure listed below, containers must be restrained under water for a minimum of five (5) minutes time to pressurize the interior of the packaging and determine if there is any air leakage from the container. Alternative methods outlined in Appendix B to Part 178 are also authorized.

Test Pressures

<table>
<thead>
<tr>
<th>Packing Group</th>
<th>Manufacturing</th>
<th>Reconditioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packing Group I</td>
<td>30 kPa (4 PSI)</td>
<td>48 kPa (7 PSI)</td>
</tr>
<tr>
<td>Packing Group II</td>
<td>20 kPa (3 PSI)</td>
<td>20 kPa (3 PSI)</td>
</tr>
<tr>
<td>Packing Group III</td>
<td>20 kPa (3 PSI)</td>
<td>20 kPa (3 PSI)</td>
</tr>
</tbody>
</table>

Criteria for Passing
There is no leakage of air from the container.
HYDROSTATIC PRESSURE TEST §178.605

Design Qualification and Periodic Retest
Containers are filled with water and pressurized according to §178.605 (d)(1-3). Containers must be tested for a minimum of five (5) minutes.

Packing Group I must be tested to a minimum test pressure of 250 kPa (36 PSI).

Criteria for Passing
There is no leakage of liquid from the container.
STACKING TEST §178.606

**Design Qualification and Periodic Retest**
Filled as for shipment, containers must be subjected to a force applied to the top surface of the drum for twenty-four hours equal to the total weight of identical packages which might be stacked on it during transport. Minimum stack height is three meters.

**Criteria for Passing**
There is no leakage of substance from the container; no distortion or deformation.
STEEL DRUM SCHOOL - HAZ MAT EXAM
(For Compliance With HM-126F)

1) What is a Haz Mat Employee?

2) What does “DOT” stand for?

3) What five tests are required for Design Qualification Testing?

4) Who is responsible for the final assembly of a package for hazardous transport?

5) What does kPa stand for?

6) What is the minimum steel thickness and nominal marking required for reconditioning a drum for hazardous shipments?

7) What are the three requirements for having a drum prepared for reconditioning?

8) Does an empty drum meeting the three above requirements require a manifest for shipment to a drum reconditioner?

9) What is ISO 9002?

10) Name three advantages of a steel drum.

11) Sample: UN 1A1/Y1.2/100

What does UN stand for? ___________________
What does 1A1 stand for? ___________________
What does Y stand for? ___________________
What does 1.2 stand for? ___________________
What does 100 stand for? ___________________
STEEL DRUM SCHOOL - HAZ MAT EXAM ANSWERS
(For compliance with HM-126F)

1) What is a Haz Mat employee?
Anyone who, during the course of their job, may influence the safety of transporting, storing or using hazardous materials.

2) What does “DOT” stand for?
Department of Transportation

3) What five tests are required for Design Qualification Testing?
Stack, Leakproofness, Drop, Hydrostatic and Vibration

4) Who is responsible for the final assembly of a package for hazardous transport?
The final person offering the package for shipment.

5) What does kPa stand for?
Kilopascal - the metric measure for internal pressure. Relates to PSI (Pounds per Square Inch)

6) What is the minimum steel thickness required for reconditioning a drum for hazardous shipments?
Minimum 1.11/.82/1.11mm, Nominal 1.2/0.9/1.2mm

7) What are the three requirements for having a drum prepared for reconditioning?
Drip Dry, Label Intact, Closures Secure

8) Does an empty drum meeting the three above requirements require a manifest for shipment to a drum reconditioner?
No, a legally empty steel drum that meets the criteria in #7 is considered “empty” and does not have to be manifested when sent to a licensed reconditioner.

9) What is ISO 9002?

10) Name three advantages of a steel drum.
100% Recyclable, Vermin Proof, Stacking Strength, Fire Protection, Lower Insurance Rates, etc.

11) Sample: UN 1A1/Y1.2/100

What does UN stand for? United Nations
What does 1A1 stand for? Tighthead Steel Drum
What does Y stand for? Packing Group II - Moderate Hazard
What does 1.2 stand for? Specific Gravity
What does 100 stand for? Kilopascal Pressure Rating
**Myers Container Corporation**

UN Test Summary

Non-Bulk Steel Packagings

**Design Qualification**

<table>
<thead>
<tr>
<th>Design Number</th>
<th>930</th>
<th>5501</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Date</td>
<td>4/8/02</td>
<td></td>
</tr>
<tr>
<td>UNUM#</td>
<td></td>
<td>55-T1</td>
</tr>
<tr>
<td>Style</td>
<td>1A1</td>
<td></td>
</tr>
<tr>
<td>Condition</td>
<td>NEW</td>
<td></td>
</tr>
<tr>
<td>Capacity</td>
<td>208 liters</td>
<td>55 gal</td>
</tr>
<tr>
<td>Overfill</td>
<td>221 liters</td>
<td>98.4 gal</td>
</tr>
<tr>
<td>Tare</td>
<td>17.0 kg</td>
<td>37.5 lbs</td>
</tr>
<tr>
<td>Height</td>
<td>881 mm</td>
<td>34.7&quot;</td>
</tr>
<tr>
<td>Diameter</td>
<td>872 mm</td>
<td>22.5&quot;</td>
</tr>
<tr>
<td>Steel-Head</td>
<td>1.2 mm</td>
<td></td>
</tr>
<tr>
<td>Steel-Bottom</td>
<td>1.2 mm</td>
<td></td>
</tr>
<tr>
<td>Special Construction</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

### Drop Test - Liquid (§178.603)

Six samples are filled to 90% capacity with water. Each sample is dropped from the indicated height onto a solid surface using various altitudes. Drums are verified after each drop. Tightness, second drop is flat on solid surface. Open heads second drop diagonal on head.

<table>
<thead>
<tr>
<th>Meter</th>
<th>Sample</th>
<th>Altitude</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>1</td>
<td>No Leak</td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>2</td>
<td>No Leak</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>No Leak</td>
<td></td>
</tr>
</tbody>
</table>

---

### Leakproofness Test - Liquid (§178.604)

Three samples, with all closures in place, are subjected to the following internal pressure and maintained under water for a minimum of five minutes.

<table>
<thead>
<tr>
<th>Test</th>
<th>Sample</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 kPa</td>
<td>1</td>
<td>No Leak</td>
</tr>
<tr>
<td>2.1 Meters</td>
<td>2</td>
<td>No Leak</td>
</tr>
<tr>
<td>1 Meter</td>
<td>3</td>
<td>No Leak</td>
</tr>
</tbody>
</table>

---

### Hydrostatic Pressure Test - Liquid (§178.605)

Three samples are filled to 90% capacity with water and subjected to the following internal hydrostatic pressure for five minutes.

<table>
<thead>
<tr>
<th>Test</th>
<th>Sample</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>300 kPa</td>
<td>1</td>
<td>No Leak</td>
</tr>
<tr>
<td>2.1 Meters</td>
<td>2</td>
<td>No Leak</td>
</tr>
<tr>
<td>1 Meter</td>
<td>3</td>
<td>No Leak</td>
</tr>
</tbody>
</table>

---

### Stacking Test - Liquid (§178.606)

Three samples are filled to 90% capacity with water and subjected to a force applied to the top surface of the drum for 24 hours equal to the total weight of identical packages which might be stacked on it during transport. Minimum stack height is 3.1 meters.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>2234 Kilograms</td>
<td>No Deformation</td>
</tr>
</tbody>
</table>

---

### Vibration Standard - (§178.608)

This packaging is capable of withstanding, without rupture or leakage, the vibration test outlined in this section.

---

### General Requirements - (§173.24, §173.24a, §176.601)

This packaging complies with the general requirements for packagings and packages.

---

### Package Assembly Instructions

- For correct package assembly see assembly instructions provided with your order, or visit our website at "www.myerscontainer.com" and click on UN Assembly Instructions.

---

Drums were assembled for testing as specified in the current version of the Drum Assembly Instructions.

---

**Document Information**

- **Design Qualification**
- **UN Test Date**: 4/8/02
- **UN Test Lab Coordinator**: Dana Zanone
- **Designator**: Myers Container Corporation
- **Document #: UC09498053
- **Issue Date**: 9/16/02
- **Revision #: 2
- **Authority**: Sean Reynolds

---

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## UN Test Summary

### Non-Bulk Steel Packagings

#### Design Qualification

<table>
<thead>
<tr>
<th>Test Date</th>
<th>2/28/02</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Number</td>
<td>926</td>
</tr>
<tr>
<td>UNUM</td>
<td>5585</td>
</tr>
</tbody>
</table>

#### Myers Container Corporation

- **Style**: 1A2
- **Condition**: NEW
- **Capacity**: 268 liters 55 gal
- **Overflow**: 212 liters 56 gal
- **Tare**: 21.3 kg 47 lbs
- **Height**: 846 mm 33.25" in
- **Diameter**: 672 mm 22.6" in
- **Steel-Head**: 1.4 mm
- **Steel-Bottom**: 1.1 mm
- **Special**: Cargill cur, DOT T-A compliant
- **Construction**: with 4-10 mil bag, UNUM 909

#### Drop Test - Liquid ($\$178.603$)

Six samples are filled to <= 98% capacity with water. Each sample is dropped from the indicated height onto a solid surface using various attitudes. Drums are vented with a 2" hose prior to being subjected to a second drop in flat or side seam. Open-head second drop diagonal on head.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Attitude</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Close Degrad No Leak</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Close Degrad No Leak</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Close Degrad No Leak</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Washed Pot No Leak</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Washed Pot No Leak</td>
<td></td>
</tr>
</tbody>
</table>

#### Leakproofness Test - Liquid ($\$178.604$)

These samples, with all closures in place, are subjected to the following internal pressure and retained under water for a minimum of five minutes.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Attitude</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No Leak</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>No Leak</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>No Leak</td>
<td></td>
</tr>
</tbody>
</table>

#### Hydrostatic Pressure Test - Liquid ($\$178.605$)

These samples are filled to <= 98% capacity with water and subjected to the following internal hydraulic pressure for five minutes.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Attitude</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No Leak</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>No Leak</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>No Leak</td>
<td></td>
</tr>
</tbody>
</table>

#### Stacking Test - Liquid ($\$178.606$)

These samples are filled to <= 98% capacity with water and subjected to a torque applied to the top surface of the drum for 24 hours equal to the total weight of identical packages which might be stacked on it during transport. Minimum stack height is 2m.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Attitude</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No Deformation</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>No Deformation</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>No Deformation</td>
<td></td>
</tr>
</tbody>
</table>

### As required by

49 CFR 178

#### Drop Test - Solid ($\$178.603$)

Six samples are filled to 98% capacity with a small grain coating. Each sample is dropped from the indicated height onto a solid surface using various attitudes.

<table>
<thead>
<tr>
<th>Packing Group</th>
<th>1.8 Meters</th>
<th>1.8 Meters</th>
<th>1.8 Meters</th>
</tr>
</thead>
<tbody>
<tr>
<td>420</td>
<td>420</td>
<td>420</td>
<td></td>
</tr>
</tbody>
</table>

#### Leakproofness Test - Solid ($\$178.604$)

These samples, with all closures in place, are subjected to the following internal pressure for five minutes.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Attitude</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Close Degrad No Leak</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Close Degrad No Leak</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Close Degrad No Leak</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Close Degrad No Leak</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Close Degrad No Leak</td>
<td></td>
</tr>
</tbody>
</table>

#### Hydrostatic Pressure Test - Solid ($\$178.605$)

These samples are filled to <= 98% capacity with water and subjected to the following internal hydraulic pressure for five minutes.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Attitude</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No Leak</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>No Leak</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>No Leak</td>
<td></td>
</tr>
</tbody>
</table>

#### Stacking Test - Solid ($\$178.606$)

Three samples are filled to 98% capacity with a small grain coating and subjected to a force applied to the top surface of the drum for 24 hours equal to the total weight of identical packages which might be stacked on it during transport. Minimum stack height is 2m.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Attitude</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No Deformation</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>No Deformation</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>No Deformation</td>
<td></td>
</tr>
</tbody>
</table>

### Vibration Standard ($\$178.608$)

This packaging is capable of withstanding, without rupture or leakage, the vibration test outlined in this section.

### General Requirements ($\$173.24$, $\$173.24a$, $\$178.601$)

This packaging complies with the general requirements for packagings and packages.

### Package Assembly Instructions

For correct package assembly see assembly instructions provided with your order, or visit our website at "www.myerscontainer.com" and click on UN Assembly Instructions.

### drums were assembled for testing as specified in the current version of the Drum Assembly Instructions

#### Test Type

UN Testing Lab Coordinator - Dana Zanone

---

**Design Qualification**: 2/28/02

**UNUM**: 926

**UN Test Date**: 2/28/02

**Test Type**: UN Testing Lab Coordinator - Dana Zanone

---

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Page 38
Steel Thickness

49 CFR Part 173.28
Updated 3/13/98

800-40 Myers

0.8 MM
22 Gauge
0.28
0.30
0.31
0.32

0.9 MM
20 Gauge
0.029
0.032
0.035
0.039

1.0 MM
19 Gauge
0.029
0.030
0.035
0.042

1.1 MM
1.11 MM
18 Gauge
1.2 MM
0.037
0.043
0.049
0.053

1.3 MM
1.4 MM
16 Gauge
1.9% Steel Increase
0.042
0.046
0.050
0.053
0.060

Prior to 1/1/97
DOT minimum head & bottom thickness for reconditioning for hazardous materials
1.11 mm (0.0437")

Begin 1/1/97
DOT minimum head & bottom thickness for reconditioning for hazardous materials
1.09 mm (0.0429")

0.033
0.037
0.050
0.053
0.060

Final Rule h-M-18114: DOT ruled that it would increase the minimum head thickness regulatory requirement for reconditioning of "20" drums from 1.09 mm (.0429") to 1.11 mm (.0437"). This minimum thickness requirement is mandatory on January 1, 1997.
UN Drum Assembly Instructions

In order for your Myers Container drum to safely perform to its rated ability, these assembly instructions need to be strictly adhered to. Any other method of assembly, or the use of any drum components (rings, gaskets, or fittings) that are not specified in this design type will immediately invalidate the UN and DOT performance rating of the drum.

1.4 Bolt Ring Installation

a. Place the cover on the drum, making sure the cover gasket is seated against the lip of the drum opening (the curb) and the gasket recess on the cover. The gasket should not protrude beyond the cover or the drum curb (Fig. 1).

b. Place the bolt ring onto the drum. Make sure that the bolt ring is oriented so that the lugs are positioned below the top surface of the drum. You will be required to pound on the cover with your palm, or a rubber mallet, or use a head press to make sure it is centered on the drum curb. Check to see that the cover and drum curb are pinched together and within the recess of the ring (Fig. 2).

c. Thread the bolt into the lugs, with lock nut between lugs, and tighten to 60 ft-lb of torque. It is necessary to hammer around the circumference of the ring while torquing in order to further seat the head onto the drum (Fig. 3). Continue hammering on the ring circumference and torquing the bolt until the torque is stabilized at 60 ft-lb, and does not loosen when further hammering on the ring circumference is performed (Fig. 4). The lock nut must be placed on the bolt, between the drum ring lugs, and tightened against the un-threaded lug (Fig. 5).

2.4 Fitting Installation

The table below shows the proper torque (in foot-pounds) that must be applied to each drum fitting to assure proper container performance:

<table>
<thead>
<tr>
<th>Plug Size</th>
<th>Type I (Truss Style) Octagonal Base, Round Head Plug</th>
<th>Type II (Riveted Style) Serrated Base, Hexagon Head Plug</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Steel Plugs</td>
<td>Poly Plugs</td>
</tr>
<tr>
<td>2&quot;</td>
<td>Rubber Gasket</td>
<td>Poly Gasket</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>12</td>
<td>20</td>
</tr>
</tbody>
</table>

3.4 Cap Seals

Cap seals must be installed by filler when non-metal flanges are used.

4.4 Bungs and Liners

- If a bung is required by the drum design type it must be installed into the drum and the top tied closed in a horse-tail fashion before installing the drum cover and ring.
- If a liner is required by the drum design type it must be installed into the drum, extended over the top drum curb, making sure there are no overlaps in the liner as it goes over the drum curb.
TWENTY QUESTIONS ABOUT PERFORMANCE-ORIENTED PACKAGING

1. Does the “UN” symbol applied as part of the durable mark by manufacturers and reconditioners have to be circled?

Yes, the symbol must be the lower-case “un” in a circle. The upper-case “UN” initials, without the circle, only are authorized when embossed in steel. [Section 178.503(a)(1)]

2. How big does the UN marking have to be?

On drums larger than 30 liters (7.9 gallons), DOT-required markings on drums, including the circled UN symbol, have to be at least 12 mm (1/2 inch) high. [Section 178.3(a)(4)]

3. Can a drum marked for liquids be used for solids?

Yes. [Section 173.24(b)(3)]

4. When a drum is marked for liquids, but is going to be used to ship solids, how is the authorized gross mass of the package determined?

The authorized gross mass of the filled package may be determined by multiplying the rated capacity of the container in liters (e.g., 220) by the specific gravity in the UN mark on the packaging, or 1.2 if it is not shown, plus the mass of the empty drum in kilos. [Section 173.24a(b)(3)]

5. Can a drum marked “Y” for Packing Group II materials be used to ship “Z” materials in Packing Group III?

Yes. [Section 178.503(a)(3)]

6. Can a drum marked “Y” for Packing Group II liquids be used to ship “Z” solids in Packing Group III and, if so, how is the authorized gross mass determined?

When putting a lower Packing Group solid in a drum marked for liquids, multiply the rated capacity of the container in liters by the specific gravity shown in the UN mark (or 1.2 if not shown), by 1.5, plus the net mass of the container. For example, 220 liters x 1.2 x 1.5 + 15 kg = 411 kg. [Section 173.24a(b)(3)]

7. Can a drum marked for solids be used to ship liquids?

No. A drum for liquids must be hydrostatically and leakproofness tested. A drum marked for solids, by showing an “S” in the mark, only has been design qualified by a drop and stacking test. Thus, a drum bearing an “S” mark would have to be remanufactured, including performance of required tests for liquids and application of a remanufacturer’s markings. [Section 178.503(a)(5)(ii)]
8. **What are the upper limits on the size of “non-bulk” packagings?**

A non-bulk packaging like a drum can contain no more than 450 liters (119 gallons) of a liquid hazardous material, or 400 kilos (882 pounds) of a solid material. [Section 171.8]

9. **What if the liquid that will be shipped in a drum has a net mass of more than 400 kilos?**

DOT has said that the 400 kg limitation applies to both liquids and solids, but this informal answer is contradicted by the UN and reality. To illustrate, 450 liters of water has a net mass of 450 kg. [Section 178.504(b)(8) and (9)]

10. **If a drum has a thickness mark of “0.8”, is it reconditionable?**

No, not without more information. A drum of a single steel thickness must have a minimum thickness of at least 0.92mm. For a 20/18-style drum, it is possible that the “0.8” mark means the sidewall is thick enough. It also is possible, however, that it is not. Furthermore, a single mark, while authorized by DOT regulation, does not say anything about the minimum thickness of the heads, which must be known before a 20/18-style drum is reused or reconditioned. [Section 173.28(b)(4) Table, and ISO Standard 3574, referenced in Section 178.503(a)(9)(I) and Appendix C to Part 178]

11. **What thickness marks unquestionably communicate that a 20/18-style drum is authorized for reuse or reconditioning?**

“1.2/0.9/1.2”

12. **What if I have seen a letter from the manufacturer saying that their “1.1” marking means their 20/18-style drum is reconditionable?**

The enforceable mark required by the regulations does not tell you the drum may be reconditioned. Correspondence, however, only has the significance you choose to accord to it based on the source; it has no regulatory meaning. [Part 178]

13. **Does a remanufacturer have to have an “M” number from the DOT?**

No, the remanufacturer can put its full name and address in the UN marking, rather than a symbol. In addition, if a symbol is going to be used, DOT advises that a reconditioner’s “R” number can be used as a remanufacturer’s symbol as well. It may be wise getting and using an “M” number, however, in order to distinguish between drums that are remanufactured and those that only are reconditioned.

14. **Does the thickness mark have to be embossed by a new drum manufacturer?**

Technically, it is not required for drums that will be limited to domestic ground transportation, until October 1, 1996. Until that time, a manufacturer could leave it and any other permanent marking off the drum on the rationale that the drum was not “liable to be reconditioned”. For international trade, however, as well as domestic water and air shipments, permanent embossment on the bottom of the “first line” information and an indication of nominal thickness is required. [Section 171.14(b)(1)]
15. **Does a remanufacturer have to emboss the thickness as part of his permanent mark on the remanufactured drum?**

No, unless the remanufacturer has changed the thickness of the steel from that shown by the original manufacturer on the bottom of the drum. [Section 178.503(d)]

16. **Does a reconditioner have to mark a UN drum with the month and year of reconditioning?**

No, DOT removed this requirement in Docket No. HM-215A. Reconditioners only need mark the year of reconditioning. [Section 178.503(c)(1)(iii)]

17. **How can a drum supplier tell customers what hydrostatic test pressure is adequate for their products?**

The drum supplier is unable to determine this for the customer because it depends upon the vapor pressure of the customer’s intended contents at certain reference temperatures.

18. **Can I install a plastic insert in an open head steel drum if the insert extends over the bead?**

Installation of such an insert is authorized, but DOT has said that it makes that drum a “different packaging”, i.e. a new design type requiring design qualification testing and compliance with all provisions applicable to a remanufacturer. [Section 178.601(c)(4)]

19. **Does DOT require “hazmat employee” training, testing and certification for employees who put RCRA-empty drums on or take them off a trailer?**

Yes, both require training. The regulations specifically say that anyone who loads, unloads or handles hazardous materials in transportation must be trained. “Transportation” is defined to include the loading, unloading and storage incident to transportation. An RCRA-empty drum is still a DOT-regulated hazardous material because it has not been cleaned and purged. Training is required to be repeated, including retesting and recertification, every 24 months. [Section 171.8 and Subpart H to Part 172]

20. **Does an IBC that contains less than 0.3% of its capacity, i.e. is RCRA-empty, have to be described on shipping papers when sent to a reconditioner?**

Yes, because the relief from DOT shipping papers for packaging sent for reuse or reconditioning is limited to non-bulk packagings (119 gallons or less). [Section 173.29(c)]
Non-Hazardous Packaging Requirements

UNIFORM FREIGHT CLASSIFICATION
RULE 40 AND ITEM 260

This section explains the regulations that govern the transportation of non-hazardous materials.
### RULE 40

#### SUPPLEMENT 12 TO UNIFORM FREIGHT CLASSIFICATION 6000-K

<table>
<thead>
<tr>
<th>RULE</th>
<th>SUBJECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>SHIPPING CONTAINERS</td>
</tr>
</tbody>
</table>

(Cancels Rule 40, Section 5 on Pages 323 to 325 of Classification)

**BARRELS, DRUMS, KITS OR PAILS, ALUMINUM OR STEEL**

**SECTION 5.** Except as otherwise provided in separate descriptions of articles, following definitions will govern aluminum barrels or drums, and steel barrels, drums, kits or pails, as freight shipping containers, empty or filled:

(a) Barrels or drums: Containers of 5 gallons capacity or over, with or without bails. Drums exceeding 165 gallons capacity will not be accepted as freight shipping containers.

(b) Kits or pails: Containers of less than 5 gallons capacity with bails, except filled containers need not have bails, see Note 2.

(c) Barrels, drums, kits or pails, when authorized in separate descriptions of articles as shipping containers, must comply with the following requirements, except as single trip containers as provided in Paragraph (5). Regulations of the Department of Transportation, Code of Federal Regulations, Title 49.

#### Minimum Thickness of Steel, U.S. Standard Gauge No.

<table>
<thead>
<tr>
<th>Rated (Marked) Capacity of Steel Barrels, Drums, Kits or Pails, see Paragraph (h)</th>
<th>Minimum Thickness of Steel, U.S. Standard Gauge No. For dry or solid articles other than single trip, see Note 1</th>
<th>Minimum Thickness of Steel, U.S. Standard Gauge No. For other than dry or solid articles see Note 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 5 gallons capacity (kits or pails only)</td>
<td>28 gauge</td>
<td>26 gauge</td>
</tr>
<tr>
<td>5 gallons to and including 7 gallons capacity</td>
<td>26 gauge</td>
<td>26 gauge</td>
</tr>
<tr>
<td>Over 7 gallons to and including 10 gallons capacity</td>
<td>26 gauge</td>
<td>22 gauge</td>
</tr>
<tr>
<td>Over 10 gallons to and including 20 gallons capacity</td>
<td>24 gauge</td>
<td>20 gauge</td>
</tr>
<tr>
<td>Over 20 gallons to and including 35 gallons capacity</td>
<td>23 gauge</td>
<td>20 gauge</td>
</tr>
<tr>
<td>Over 35 gallons to and including 57 gallons capacity</td>
<td>22 gauge (see Note 5)</td>
<td>18 gauge (see Notes 3, 4 and 5)</td>
</tr>
<tr>
<td>Over 57 gallons to and including 75 gallons capacity</td>
<td>20 gauge</td>
<td>16 gauge</td>
</tr>
<tr>
<td>Over 75 gallons to and including 110 gallons capacity</td>
<td>20 gauge</td>
<td>14 gauge</td>
</tr>
<tr>
<td>Over 110 gallons but not exceeding 165 gallons capacity</td>
<td>18 gauge</td>
<td>12 gauge</td>
</tr>
<tr>
<td>All steel barrels, drums, kits or pails for other than dry or solid articles must have side seams welded.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Capacity of Aluminum Barrels or Drums, with or without Steel Jackets

<table>
<thead>
<tr>
<th>Minimum Thickness of Aluminum, B.S.G. Gauge No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sides</td>
</tr>
<tr>
<td>5 gallons to and including 10 gallons capacity</td>
</tr>
<tr>
<td>Over 10 gallons to and including 25 gallons capacity</td>
</tr>
<tr>
<td>Over 25 gallons to and including 55 gallons capacity</td>
</tr>
<tr>
<td>Over 55 gallons to and including 110 gallons capacity</td>
</tr>
</tbody>
</table>

(Rule 40 continued on next page)
<table>
<thead>
<tr>
<th>RULE</th>
<th>SUBJECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>BARRELS, DRUMS, KITS OR PAIRS, ALUMINUM OR STEEL (Continued)</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE 1.** The term "dry or solid" is defined as referring only to articles which are dry or solid at a temperature of 100 degrees Fahrenheit.

**NOTE 2.** A ball is a handle extending completely across top of container and attached to sides.

**NOTE 3.** Steel barrels or drums, having from 16 to 20 gauge sides and ends may be used as containers for other than dry or solid articles, see Note 1, provided that containers have two more expanded rolling hoops in the widest and a center bottom clearance of 1/8 inch from the floor when empty.

**NOTE 4.** Closed-head steel drums, of rated (marked) capacities over 35 to and including 57 gallons, may be used as containers for other than dry or solid articles, see Note 1, when made of steel not thinner than 24 gauge, providing that continuous, parallel, geometrically similar, circumferential beads are so expanded in the entire height of the sides that the surface length of the steel in the axial direction does not change more than 1 percent. Heads and bottoms must be without corrugation or beading and without convexity. Each drum must be reinforced with an 18 gauge steel band that is an integral part of the double seam, resulting in a chime cross section containing eight layers of steel. The reinforcing band shall follow and support knuckle radius of the head and bottom with the inside edge upturned so that it does not contact the adjacent portions of the head or bottom. Drums may not be loaded more than single tier high.

**NOTE 5.** Top (head or cover) may be constructed of injection molded high density polyethylene, or polypropylene homopolymer or copolymer and have a minimum thickness of .090 inch. Top covers must have at least two concentric rings of not less than .14 inch depth, except when cover is of a minimum thickness of .125 inch, cover may have one concentric ring. For liquids or articles in liquids, covers must affect a liquid tight seal. Cover must be securely closed by lever or bolted down ring, or endless band rolled to bend sidewall and cover at chime, the band and ring must not be thinner than 22 gauge metal.

**SINGLE TRIP CONTAINERS**

(d) Single trip aluminum or steel barrels, drums, kits or pairs may be used as shipping containers only for dry or solid articles, see Note 1, for single movement and, when so used, minimum and maximum capacities of containers per Paragraphs (b) and (c) must be observed, but no thickness of metal is prescribed, and they must bear the initials "STC" to signify that they are single trip containers and are not to be again used as shipping containers after contents have been removed, following single shipment.

Single trip containers complying with the specifications for such containers in Agency C.L. Keller's Tariff No. BOE 6000-series, may be used for more than a single movement of liquid, dry or solid articles not subject to the Department of Transportation Regulations for transportation of explosives and other hazardous materials provided they comply with the requirements of Section 5 of this rule.

**FASTENING OF CAPS, COVERS, PLUGS OR TOPS**

(a) Caps, covers, plugs or tops must be made of metal or synthetic plastic and must be securely fastened, and filled packages must be proof against leakage or sitting.

Closures no greater than 3/16 inches in diameter may be of metal thinner than prescribed for head of container. On drums over 20 gallons to and including 57 gallons, lug cover closures no greater than 11/4" diameter may be of metal thinner than prescribed for head of container provided that they are equipped with gasket seal, not less than 16 lugs, and are manufactured of steel not less than 22 gauge thickness.

**NAME, ETC., OF MANUFACTURER TO BE SHOWN**

(f) All shipping barrels, drums, kits, or pairs, for use as freight containers, must bear the manufacturer's name, or an identifying symbol or trade-mark of manufacturer in lieu of the manufacturer's name and which symbol or trade-mark must be registered with the National Railroad Freight Committee, the gauge of metal in its thinnest part, capacity of container and year of manufacture—these may be abbreviated and then must appear in order specified, for example, 18-55-55, which signify that the container is made of 18 gauge metal, is 55 gallons capacity made in the year 1955. When gauge of metal in body differs from that in head, both must be indicated with slanting line between and with gauge of body indicated first, for example 20/18-55-55 for body 20 gauge and head 18 gauge. (Optionally, the thickness of metal used may be expressed in millimeters and marked as closely to the English equivalent as possible, and year of manufacture. These marks may be abbreviated and then must appear in order specified, for example, 0.94, which signify that the container is made of steel with a thickness of 1.1 millimeters, and is made in the year 1994. When the thickness of metal in body differs from that in head and in bottom, all three thicknesses must be indicated with a slash mark between and with the thickness of the head indicated first, for example 1.1.8(1.0.94 for body of 0.8 millimeter thickness head of 1.0 millimeter thickness, and bottom of 1.0 millimeter thickness.) The inscription must be plain and dully marked on container or on a plate securely brazed, welded or soldered thereto in letters that are legible and are not less than one-fourth inch in height. These requirements will not be necessary for steel shipping barrels, drums, kits, or pairs when manufactured in foreign countries, but shipping orders and bills of lading must bear the following certificate: "The steel shipping barrels, drums, kits, or pairs used for this shipment are of foreign manufacture and conform to construction requirements of Rule 40, Section 5."

(g) When a steel drum or barrel has been reconditioned for further use as a shipping container and in the reconditioning process changes are made which affect the original construction, the party making such changes must indicate his name or an identifying symbol or trade-mark on such container. Any symbol or trade-mark must be registered with the National Railroad Freight Committee. The marking must be plainly and dully made or by painting, stenciling or similar means or must be on a plate securely brazed, welded or soldered thereon, in letters that are legible and are not less than one-fourth inch in height. Identifying names, symbols or trade-marks of manufacturer or previous reconditioner must be removed or obliterated unless such names, symbols or identifying marks are embossed or affixed to a plate in such manner that removal or obliteration is not practicable.

(Rule 40 continued on next page)
ITEM 259—Concluded

Sec. 3, Performance Requirements:
1. Pails must be filled to marked capacity with commodity, or other material that remains liquid at 0°F., for a minimum of 4 hours. Drop tests must be performed with the pail flat on its side and also at a 45-degree angle on the bottom plate onto solid concrete from a height of 48 inches. No container shall be required to withstand more than one drop. A minimum of three containers must be tested at each of the above-mentioned areas without failure.
2. Three pails must be filled with commodity to marked capacity, conditioned at 130 degrees F., for 4 hours, stacked 3 high and vibrated for one hour at 1 'G' to a vertical linear motion. Each pail must perform without failure.
3. Pails filled with commodity to marked capacity must withstand a static load of 600 pounds for a period of 48 hours without dent or damage.

Failure will be defined as the leaking or spillage of contents.

Manufacturers may perform the above test using water in lieu of commodity, provided the viscosity of the commodity does not exceed 5,000 centipoise units, or exceed 10,000 centipoise units.

Pail manufacturers will be required to register with the National Classification Committee and submit sealed test report indicating compliance with the above performance requirements. Testing, with both water and sand, shall be required at a later date upon request by the National Classification Committee staff.

ITEM 260

SPECIFICATIONS FOR ALUMINUM BARRELS OR DRUMS AND STEEL BARRELS, DRUMS, BUCKETS, FIRKINS, KITS OR PALES

(a) Barrels, buckets, firkins, drums, kits or pails must comply with the following requirements, except single trip containers as provided in paragraph (b). Regulations of the DOT for the transportation of explosives and other dangerous articles (see CFI) by freight and the specifications of the shipping containers thereof must be observed.

<table>
<thead>
<tr>
<th>Minimum Thickness of Steel, U.S. Standard Gauge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated (marked) capacity of steel barrels, drums, buckets, firkins, kits or pales</td>
</tr>
<tr>
<td>See Note 5</td>
</tr>
<tr>
<td>For dry or solid articles other than single trip</td>
</tr>
<tr>
<td>Note 1</td>
</tr>
<tr>
<td>For other than dry or solid articles</td>
</tr>
<tr>
<td>Note 1</td>
</tr>
<tr>
<td>Under 6 gallons capacity</td>
</tr>
<tr>
<td>6 gallons to 7 including 7 gallons capacity</td>
</tr>
<tr>
<td>20 gauge</td>
</tr>
<tr>
<td>(Note 2), item 255</td>
</tr>
<tr>
<td>Over 7 gallons to and including 10 gallons</td>
</tr>
<tr>
<td>capacity</td>
</tr>
<tr>
<td>20 gauge</td>
</tr>
<tr>
<td>Over 10 gallons to and including 20 gallons</td>
</tr>
<tr>
<td>capacity</td>
</tr>
<tr>
<td>16 gauge</td>
</tr>
<tr>
<td>Over 20 gallons to and including 35 gallons</td>
</tr>
<tr>
<td>capacity</td>
</tr>
<tr>
<td>14 gauge</td>
</tr>
<tr>
<td>Over 35 gallons to and including 57 gallons</td>
</tr>
<tr>
<td>capacity</td>
</tr>
<tr>
<td>12 gauge</td>
</tr>
<tr>
<td>Over 57 gallons to and including 70 gallons</td>
</tr>
<tr>
<td>capacity</td>
</tr>
<tr>
<td>10 gauge</td>
</tr>
<tr>
<td>Over 70 gallons to and including 110 gallons</td>
</tr>
<tr>
<td>capacity</td>
</tr>
<tr>
<td>8 gauge</td>
</tr>
<tr>
<td>Over 110 gallons but not exceeding 166 gallons</td>
</tr>
<tr>
<td>capacity</td>
</tr>
<tr>
<td>6 gauge</td>
</tr>
<tr>
<td>All steel drums, buckets, firkins, kits, or pales for other than dry or solid articles must have side seams welded.</td>
</tr>
</tbody>
</table>

MINIMUM THICKNESS OF ALUMINUM, 8 & 6 GAUGE

<table>
<thead>
<tr>
<th>Minimum Thickness of Aluminum, 8 &amp; 6 Gauge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity of aluminum barrels or drums with or without steel jackets</td>
</tr>
<tr>
<td>Sides</td>
</tr>
<tr>
<td>Ends</td>
</tr>
<tr>
<td>16 gauge</td>
</tr>
<tr>
<td>14 gauge</td>
</tr>
<tr>
<td>10 gauge</td>
</tr>
<tr>
<td>8 gauge</td>
</tr>
</tbody>
</table>

(b) Single trip aluminum or steel barrels, drums, buckets, firkins, kits or pales, other than as referred to below, may be used as shipping containers only for dry or solid articles (Note 1) for single movement, and when so used, maximum capacity of single containers per paragraph (a) must be observed, but no thickness of metal is prescribed and they must bear the initials "SIC" to signify that they are single trip containers and are not to be used except as shipping containers after contents have been removed following initial shipment, except when containers and closing devices are in such condition that they will afford reasonable and proper protection of contents in further shipment to an ultimate destination.

Single trip containers complying with the specifications for such containers in the Code of Federal Regulations (CFR), Title 49 for the shipment of hazardous materials, may be used for more than a single movement of liquid, dry or solid articles not subject to the DOT regulations for transportation of explosives and other dangerous articles by freight, provided they comply with the requirements of paragraph (a), and provided they will afford reasonable and proper protection of contents.

(Continued on following page)

For explanation of abbreviations and reference marks, see last page of this tariff. ©ATA 1995
ITEM 290—Continued

(c) Covers, ends, heads or tops of aluminum drums or steel drums, buckets, linkins, kites or pails when metal must be of
some material and not less than 0.625 inch thickness as sidewalls except as otherwise specifically provided. They must be securely
installed and tied packages must be proof against leakage or tilting.

Top covers may be constructed of injection molded high density polyethylene or polypropylene homopolymer or copolymer
and have a minimum of at least two concentric rings of metal less than 1 inch depth. Covers must be made of a minimum thick
of 0.125 inch cover may have one concentric ring. Covers must be attached by a liquid tight gasket and a lever locking ring or an
access hinged door secured by two heavy latches. Metal covers must be made of steel. Metal covers are not to be more than 2
gauge thick. Bungs or plugs or bung or plug closure caps, covers or seals may be made of steel, plastic or rubber and must be
be thicker than 22 gauge metal.

(d) All aluminum or steel barrels or drums, manufactured for use as freight containers must bear:

1. The manufacturer's name or an identifying symbol or trademark of manufacturer in lieu of the manufacturer's name and
which symbol or trademark must be registered with the National Classification Committee, and the year of manufacture, abbreviated
and shown in the order specified in examples (a) and (b): for aluminum, 1990, and in the year 2000, 10; and dated 10.
(a) 10-55-05, indicating that the container body is made of 20 gauge metal, head made of 16 gauge metal; 35 gallons capacity,
and made in the year 2000. Optional.

(b) 10-55-05, indicating that the container body is made of 20 gauge metal, head made of 16 gauge metal; 35 gallons capacity,
and made in the year 1990. Optional.

The thickness of metal used may be expressed in millimeters and marked as closely to the English equivalent as possible
impracticable. These marks may be abbreviated and then must appear in the order specified, for example:

1,150, which will signify that the container is made of steel with a thickness of 1.15 millimeters and is made in the year 2000.
When the thickness of metal in the body differs from that in the head and the bottom, the thickness must be indicated
as when covered with the thickness of the head indicated first, for example: 1.1/8/1.0/0.5-6 8 for a body of 1
with a steel thickness of 1.1/8 millimeter, and head of 1.0 millimeter thickness, and bottom of 0.5 millimeter thickness.

The inscription must be plainly and durably marked on containers, or on a plate securely fastened thereto, in letters that are legible and are not less than one-fourth inch in height. These requirements will not be necessary for:

Steel shipping barreis, drums, kites or pails when manufactured in foreign countries, but shipping orders and bills of lading must
bear the following certificate: 'The steel shipping barrels, drums, kites or pails used in this shipment are of foreign manufacture
and conform to construction requirements of Item 284.',

(e) When a steel drum or container has been reconditioned for further use as a shipping container and in the reconditioning process
changes are made which alter the original construction, the party making such changes must indicate his name or an identifying
changes are made which alter the original construction, the party making such changes must indicate his name or an identifying
symbol or trademark, which symbol or trademark must be registered with the National Classification Committee, and the year of
manufacture, abbreviated and shown in the order specified in examples (a) and (b): for aluminum, 1990, and in the year 2000, 10;
and dated 10.
(a) 10-55-05, indicating that the container body is made of 20 gauge metal, head made of 16 gauge metal; 35 gallons capacity,
and made in the year 2000. Optional.

(b) 10-55-05, indicating that the container body is made of 20 gauge metal, head made of 16 gauge metal; 35 gallons capacity,
and made in the year 1990. Optional.

The thickness of metal used may be expressed in millimeters and marked as closely to the English equivalent as possible
impracticable. These marks may be abbreviated and then must appear in the order specified, for example:

1,150, which will signify that the container is made of steel with a thickness of 1.15 millimeters and is made in the year 2000.
When the thickness of metal in the body differs from that in the head and the bottom, the thickness must be indicated
as when covered with the thickness of the head indicated first, for example: 1.1/8/1.0/0.5-6 8 for a body of 1
with a steel thickness of 1.1/8 millimeter, and head of 1.0 millimeter thickness, and bottom of 0.5 millimeter thickness.

The inscription must be plainly and durably marked on containers, or on a plate securely fastened thereto, in letters that are legible and are not less than one-fourth inch in height. These requirements will not be necessary for:

Steel shipping barreis, drums, kites or pails when manufactured in foreign countries, but shipping orders and bills of lading must
bear the following certificate: 'The steel shipping barrels, drums, kites or pails used in this shipment are of foreign manufacture
and conform to construction requirements of Item 284.',

(f) When a steel drum or container has been reconditioned for further use as a shipping container and in the reconditioning process
changes are made which alter the original construction, the party making such changes must indicate his name or an identifying
changes are made which alter the original construction, the party making such changes must indicate his name or an identifying
symbol or trademark, which symbol or trademark must be registered with the National Classification Committee, and the year of
manufacture, abbreviated and shown in the order specified in examples (a) and (b): for aluminum, 1990, and in the year 2000, 10;
and dated 10.
(a) 10-55-05, indicating that the container body is made of 20 gauge metal, head made of 16 gauge metal; 35 gallons capacity,
and made in the year 2000. Optional.

(b) 10-55-05, indicating that the container body is made of 20 gauge metal, head made of 16 gauge metal; 35 gallons capacity,
and made in the year 1990. Optional.

The thickness of metal used may be expressed in millimeters and marked as closely to the English equivalent as possible
impracticable. These marks may be abbreviated and then must appear in the order specified, for example:

1,150, which will signify that the container is made of steel with a thickness of 1.15 millimeters and is made in the year 2000.
How To Write A Proper Drum Specification

Establishing a clear specification provides the following:

1. Consistent packaging at all locations
2. Reliable quotations from vendors
3. Protection from regulations
4. Quality Assurance controls

The following form is a guide to writing a packaging specification that will ensure you receive exactly what you want from your supplier.
## DRUM SPECIFICATION

<table>
<thead>
<tr>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
</tr>
<tr>
<td>Date</td>
</tr>
<tr>
<td>Authorized By</td>
</tr>
<tr>
<td>Specification</td>
</tr>
<tr>
<td>Condition</td>
</tr>
<tr>
<td>Type</td>
</tr>
<tr>
<td>□ New</td>
</tr>
<tr>
<td>□ Reconditioned</td>
</tr>
<tr>
<td>□ Tighthead</td>
</tr>
<tr>
<td>□ Openhead</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Rated</th>
<th>Maximum</th>
<th>Minimum</th>
</tr>
</thead>
</table>

| Overall Height |
| Overall Diameter |

| Minimum Steel Thickness (mm) |
| Head | Body | Bottom |

| Minimum Tare Weight |
| Minimum UN Performance Level |
| UN Embossment |
| Steel Thickness Embossment |
| Swedges |

<table>
<thead>
<tr>
<th>Fittings</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head</td>
<td></td>
</tr>
<tr>
<td>Body</td>
<td></td>
</tr>
</tbody>
</table>

| Cover Gasket Material |
| Closure Device (ring) |
| Chime Type |

| Material To Be Packaged |
| Particle Size (solid only) |
| □ Liquid |
| □ Solid |
| □ Powder |
| □ Grit |
| □ Sand |
| □ Gravel |
| □ Bag |

This drum must be manufactured so that it can be reconditioned for reuse with hazardous materials: □ YES □ NO

Other Comments: ____________________________________________________________