

**Casting Industry Suppliers Association (CISA)**  
**GUIDELINES FOR RECOMMENDED HANDLING**  
**OF**  
**REUSABLE BULK CONTAINERS**

**Casting Industry Suppliers Association**  
**223 West Jackson Boulevard**  
**Suite 800**  
**Chicago, IL 60606**  
**Tel. 312-957-1701**  
**Fax 312-957-1702**  
[www.cisa.org](http://www.cisa.org)

Copyright © Casting Industry Suppliers Association 1999  
All Rights Reserved

## TABLE OF CONTENTS

	<u>Page</u>
<b>1. INTRODUCTION</b>	<b>1</b>
<b>2. TYPICAL REUSABLE BULK CONTAINERS FOR FOUNDRY USE2</b>	
<b>3. GUIDELINES FOR SUCCESSFUL MANAGEMENT OF REUSABLE BULK CONTAINERS</b>	<b>3</b>
<b>3.1. Precautions to Protect Product Quality</b>	<b>3</b>
<b>3.2. Procedures and Guidelines for Proper Shipment and Handling</b>	<b>4</b>
<b>3.3. Proper Container Maintenance</b>	<b>5</b>
<b>3.4. Avoidance of Product Cross Contamination</b>	<b>6</b>
<b>4. ADDITIONAL GUIDELINES FOR PROPER CARE OF REUSABLE BULK CONTAINERS</b>	<b>7</b>
<b>4.1. General</b>	<b>7</b>
<b>4.2. Proper Handling of Phenolic Urethane Resin Binder Systems</b>	<b>7</b>
<b>4.3. Proper Handling of Water-Based Coatings</b>	<b>8</b>
<b>4.4. Proper Handling of Flammable Coatings</b>	<b>9</b>
<b>4.5. Proper Handling of Flexible Intermediate Bulk Containers</b>	<b>10</b>
<b>5. REFERENCES</b>	<b>12</b>

# **Casting Industry Suppliers Association (CISA)**

## **GUIDELINES FOR RECOMMENDED HANDLING OF REUSABLE BULK CONTAINERS**

### **1. INTRODUCTION**

Reusable bulk containers – including portable tanks, mini-tanks, tote tanks, and flexible intermediate bulk containers (FIBCs, bulk bags, or super sacks) – are popular within the foundry industry as a reusable package for the shipment and storage of various products. These containers provide another way of reducing the cost of material handling and avoiding potential disposal problems associated with other packaging. In addition, reusable bulk containers provide a lower cost alternative to large bulk storage facilities. In response to the popularity of these containers, CISA has developed guidelines based on industry experience and government regulations to assist foundrymen in effectively using reusable bulk containers, limiting risks to product quality, and complying with regulatory requirements.

The purpose of these Guidelines is to provide CISA members and their customers with guidelines for the recommended handling of reusable bulk containers. The objective of the Guidelines is to promote safe handling of reusable bulk containers and regulatory compliance. In this regard, the document provides a list of regulatory and other standards relevant to the use, storage, and transport of reusable bulk containers and a list of contacts so that more information can be obtained as desired. The following information and appendices are necessarily general in nature and may not answer all the questions you may have. Hopefully, we have highlighted the range of issues that should be considered when using reusable bulk containers. The appropriate type of containers and procedures will vary depending on your specific foundry and the products you use. Contact your supplier for additional information.

CISA offers these Guidelines as a service to its members, their customers and the casting and foundry industries. These Guidelines are not meant to be all encompassing, but rather to draw attention to the particular subjects covered. All suggestions and recommendations contained in these Guidelines are based upon information that is believed to be accurate to the best of the participating members knowledge and their collective experience, but are made without guarantee or representation as to results. The responsibility for the proper handling of reusable bulk containers remains with the specific facility and persons using the containers. **CISA EXPRESSLY DISCLAIMS ANY RESPONSIBILITY ARISING FROM THE USE, APPLICATION OR RELIANCE ON THE SUGGESTIONS, RECOMMENDATIONS AND INFORMATION CONTAINED IN THESE GUIDELINES.**

## 2. TYPICAL REUSABLE BULK CONTAINERS FOR FOUNDRY USE

The term reusable bulk container is generally applied to containers ranging in capacity from 200 - 660 gallons of liquid product or 2,000 – 4,000 pounds of dry powder. This size provides the greatest ease of storage, truck shipment, and movement within most foundry operations utilizing standard capacity lift trucks. Reusable bulk containers are popular across many industries leading to diversity in size, design, and construction materials. In terms of foundry operations, container designs are normally constructed from four kinds of materials:

- mild steel – typically 7 - 12 gauge;
- stainless steel;
- plastic containers with and without steel frames; and
- woven polypropylene fabrics.

The choice of construction is usually dictated by the chemical properties of the product being stored and the expected handling of the containers in transport and use. For example, the choice of container will vary depending on the flammability, corrosiveness, and vapor pressure of the product, among other factors.

The most widely used containers are typically cylindrical or cubic mild steel tanks. Plastic – typically high-density polyethylene (HDPE) – is the normal choice for certain catalysts, water-based refractory coatings, and chemicals that are corrosive in nature. However, ordinary plastic containers should not be used with flammable products due to the potential electrostatic ignition risk. Instead, containers made from metal or antistatic or conductive plastics should be used.

Container manufacturers must design reusable bulk containers for compliance with the U.S. Department of Transportation (DOT) and United Nations (UN) specifications. Containers complying with DOT specifications must be used for domestic shipments. Containers complying with UN specifications must be used for international shipments and may be used for domestic U.S shipments. Many reusable bulk containers serve only as day tanks to move product from main bulk tanks to individual work stations within the foundry or are filled on-site from bulk tank trucks, and thus may not be subject to DOT or UN transportation regulations. Nevertheless, CISA believes the rigorous interstate and international shipping criteria should be used in all cases even though they may not be required. In this regard, references to relevant DOT and UN specifications are outlined in **Section 5** of these Guidelines.

Additional requirements for reusable bulk containers are outlined by the National Fire Protection Association (NFPA). References to relevant NFPA standards are outlined in **Section 5** of these Guidelines. Containers meeting the DOT, UN, and NFPA requirements should satisfy the needs of most applications. Information about NFPA guidelines can be obtained from your local fire department or your insurance carrier. For

best results, CISA recommends joint discussions with the foundry product supplier, and in some cases the container manufacturer, to ensure correct selection of design features and container types. More detailed information can also be obtained directly from the DOT, UN, and NFPA. Contact information for these organizations is included in **Section 5** of these Guidelines.

Note that container manufacturers can also obtain exemptions from DOT requirements for certain containers. An exemption container will display its exemption number, i.e., DOT-E ####, on the side. Each exemption is a specific case and is assigned a special DOT exemption number. This number is on record with exemption documentation at DOT offices and lists all the specific conditions for the exemption – e.g., material handled, net weight, gross weight, etc. This number must also be shown on the bill of lading.

Most suppliers have established standard container options that they recommend to customers based upon their knowledge of product characteristics and containers with past satisfactory performance. Typical considerations for individual systems include: (1) design of stacking adapters; (2) specifications for discharge valves; (3) the size and number of openings and fittings; (4) the type of top hatch; (5) the type of pressure relief device to prevent over-pressurization if exposed to fire; (6) the design of eye flanges for transport by crane; and (7) completeness of product discharge from the container, among other considerations.

### **3. GUIDELINES FOR SUCCESSFUL MANAGEMENT OF PORTABLE REUSABLE BULK CONTAINERS**

Experience of CISA members and their customers have led to recognition of a series of key focus areas that will help users of reusable bulk containers to avoid many potential pitfalls. These key focus areas are:

- Precautions to protect product quality;
- Procedures and guidelines for proper shipment and handling;
- Proper container maintenance; and
- Avoidance of product cross-contamination.

Each of these areas is discussed in the following sections.

#### **3.1. Precautions to Protect Product Quality**

Most products used by foundries can be adversely affected by improper storage. Basic guidelines to follow include:

- Do not expose containers to rain or snow. Heating and cooling can cause moisture to be sucked into the container even when sealed properly.
- Do not store containers at extreme temperatures. Many foundry products are irreversibly damaged by exposure to extreme cold or heat. For example, exposure to direct sunlight or proximity to hot castings, core ovens, or furnaces can adversely affect product performance.
- Keep containers closed except when filling or emptying the product. Most resin binder systems and refractory coatings are damaged or altered by the evaporation of solvents or water. For example, phenolic urethane Part II systems can be adversely affected by the moisture present in ambient air. Relatively little moisture from the atmosphere can destroy a full container of resin. Your supplier is your best guide for proper precautions. Rotate inventories as a standard practice to avoid exceeding usable product life.
- Occasionally, users open hatches to determine when containers are empty. This practice should be avoided because it can result in the introduction of contaminants and debris to the container leading to costly cleanup procedures or the plugging of discharge lines. Most containers include a smaller opening that can be removed to inspect the tank. However, all necessary precautions should be taken to prevent unsafe practices with containers containing residual material. Review these precautions with your supplier before taking action. Ideally, containers containing flammable liquids should be equipped with a level indicator that does not require the tank to be opened.

### **3.2. Procedures and Guidelines for Proper Shipment and Handling**

- To obtain the best long-term results, the user should discuss the use of reusable bulk containers with their planned supplier before beginning shipments. In particular, we recommend the customer have a qualified supplier representative review planned storage and handling procedures and conduct worker training on the proper use of reusable bulk containers.
- Giving consideration to supplier guidelines, establish and document formal procedures and policies. For example, the process should ensure that empty tanks never are returned to the supplier without all valves and openings being properly sealed. Plugs should always be secured in the discharge pipe.
- Users should carefully inspect and document the condition of the container – including the legs and support system – before returning it to the supplier. Damage should be repaired by the container owner prior to shipment. During repairs, all necessary precautions should be taken to prevent unsafe practices with tanks containing residual materials, e.g., welding a container containing flammable

substances. Valves and gaskets should be inspected to verify fitness for shipment prior to filling the tank.

- As specified under EPA’s hazardous waste regulations, empty containers must meet legally defined standards before they are suitable for return to the supplier. The specific standards and criteria that must be met in various instances for a container to be considered “empty” are found in EPA’s hazardous waste regulations implementing the Resource Conservation and Recovery Act (RCRA, as amended). References to relevant EPA requirements are outlined in **Section 5** of these Guidelines.
- Portable tanks should be stored in an area where an accidental spill can be contained.
- Users of reusable bulk containers should recognize that it is illegal for suppliers to knowingly accept delivery of contaminated or otherwise unusable material under EPA’s hazardous waste regulations unless the company is an EPA certified waste disposal facility.

### **3.3. Proper Container Maintenance**

Certain reusable bulk containers – including metal and rigid plastic containers – must be inspected and recertified for use every 2.5 years in accordance with DOT and UN requirements. A more rigorous inspection is required every 5 years. The expiration date of certification must be clearly stamped on the container. Suppliers cannot legally refill any container with an expired certification. Containers having expired certifications must be returned empty by the supplier or sent out for recertification.

To avoid these problems, CISA recommends that users of reusable bulk containers establish a tracking system that maintains a unique ID number for each container with an expiration date clearly marked on the container to ensure that they are submitted for recertification on a timely basis. Such a system also provides an audit trail for these assets to prevent losses. Some containers may have a DOT exemption. Customers and suppliers should have copies of the exemption at the shipping locations and follow the testing requirements of the exemption.

Reusable bulk containers require cleaning on periodic basis. However, the interval can vary greatly depending upon the type of product being used and the amount of care given to the container. For example, frequent air contamination or the presence of foreign material can quickly lead to the need for cleaning of containers used for many binder systems. Most suppliers either clean containers themselves or have arrangements with qualified container cleaning services. Charges for cleaning will depend on the container condition and the stored product.

### 3.4. Avoidance of Product Cross-Contamination

While some of the problems associated with contamination of any material in reusable containers may be obvious, there are some cases where the results of contamination can create severe hazards. Frequently, binder systems consist of two or more components that will, when mixed together, react to produce a cured material. While the mixing of components in the process may be performed safely due to the nature of the precautions taken and equipment used, inadvertent mixing of the pure binder components in a storage container can lead to serious consequences ranging from product loss to violent chemical reaction. In some cases, the reaction could lead to boiling or explosion of the container contents, creating a serious danger to personnel.

For these reasons, close attention should be paid to proper labeling of the containers and the establishment of rigorous precautions to avoid cross-contamination. Some valuable guidelines include the following:

- Ensure that your suppliers clearly mark and label containers. This is particularly important in systems of two or more components to differentiate between components. Labeling should be in accordance with U.S. Occupational Safety and Health Administration (OSHA) and DOT requirements. Be sure that personnel understand OSHA and DOT requirements. References to relevant OSHA and DOT requirements are outlined in **Section 5** of these Guidelines.
- Whenever possible, segregate the different components of a system, i.e., potentially incompatible substances, in your storage area to reduce the probability of reaction in the event of a spill or leak.
- If your procedures include on-site unloading of bulk tank trucks into reusable bulk containers, ensure that your procedures require a minimum of two persons to verify that the correct component is being loaded in each container and that each person signs documents or records attesting to that fact. Be certain that there are enough containers on-site to accept the delivered quantity.
- Establish formal training procedures and documentation in your plant. Take advantage of the skills and experience of your supplier when developing your container management system.
- Avoid transferring residual product from one tank to another. If required, have two persons verify and attest (document) that cross-contamination will not occur.

## **4. ADDITIONAL GUIDELINES FOR PROPER CARE OF REUSABLE BULK CONTAINERS**

### **4.1. General**

To prevent contamination of materials shipped in reusable bulk containers and to minimize unnecessary repairs and cleaning, the following procedures should be followed:

- Keep reusable bulk containers sealed until connected to feed mixers or day tanks. Do not open hatches for routine unloading.
- As soon as containers are empty in accordance with EPA's hazardous waste regulations or are taken out of service, all container openings should be closed. Hatches should be properly latched, bungs should be screwed tight, and a screw plug should be screwed into the discharge opening. All threads should be kept clean because exposure of some resins to air can cause solidification of the material, making it very difficult to replace or remove bung plugs.
- Containers should be stored indoors (if possible) or otherwise kept dry. Avoid temperature extremes. Refer to specific product storage requirements provided by the supplier.
- Contaminants and debris should be kept away from containers.
- Containers should not be shipped back to the supplier with pipefittings, couplings, or other items attached. These create the potential for breakage and leakage. Hatches and valves should be closed tightly. All parts of the container should be in place and secured.
- Care should be taken when moving containers with a fork lift truck so as to not damage the container or fittings and thus minimize the risk of causing a leak or spill. Some containers are constructed so that fork openings must be entered from a certain side. Most tanks, however, are suitable for entry from all four sides. The metal shield typically covering the discharge valve is not capable of bearing a load and will be damaged if a forklift strikes it or an attempt to lift under it is made.

### **4.2. Proper Handling Of Phenolic Urethane Resin Binder Systems**

The primary requirement for handling phenolic urethane resin systems is to prevent the introduction of moisture into reusable bulk containers containing the coreactant part II. Exposure of the coreactant part II to moisture can adversely affect its performance. The following guidelines should assist you in developing a procedure to keep the binder system in excellent condition.

- Ensure that no brass valves or parts are used with the container. These copper-based materials should never come in contact with coreactant part II or catalyst.
- Keep all container openings sealed properly with the correct fittings and gaskets. When not in use, the discharge pipe should be sealed with a threaded plug to prevent accidental discharge.
- Some containers have special valves and the handle positioning is opposite to that of most standard valves. On such valves, when the handle is in-line, i.e., parallel to the pipe, the valve is closed. This is designed to prevent breakage or accidental opening of the valve by passing personnel or vehicles. To reduce potential confusion, there should be a label on containers which clearly depicts the open and closed valve positions.
- On containers containing coreactant part II, install a desiccant dryer on the inlet breather line when the tank is placed in service and opened.
- To prevent loading and use errors, place “Part I” or “Part II” labels on containers both near the outlet valve and on the side of containers near the top.
- As soon as containers are empty in accordance with EPA’s hazardous waste regulations, close all openings and replace the discharge pipe plug. Remove the desiccant dryer and plug the opening.
- Do not store filled or empty tanks outside where exposure to rain or snow is possible. Store resins and coreactants between 60 – 90°F and avoid storage in direct sunlight, which can cause radiant heat damage to the products.
- See also **Section 4.1.** of this document for directions on preparing tanks for return and refilling.
- Proper electrical grounding practices should be followed whenever flammable and combustible liquids or explosible dusts are being handled. Guidelines for proper grounding of metal containers are outlined in NFPA 77. Ordinary plastic containers should not be used with flammable liquids due to the potential electrostatic ignition risk.

#### **4.3. Proper Handling Of Water-Based Coatings**

- Keep the main top hatch and all container openings closed when the container is in storage, transport, or when the mixer is not in place.
- When the mixer is in place, minimize the extent to which the hatch is opened to prevent introduction of contaminants and debris.

- Continuous agitation of coating during down periods should not be necessary. Mix the coating briefly just before discharging contents from the bottom valve. If the coating is discharged on a continuous basis, maintain gentle agitation during the discharge interval.
- Store full or empty containers indoors and at temperatures within the range specified by the supplier. Do not store containers in direct sunlight.
- Rinse the interior of empty containers with clean water. Drain thoroughly. As soon as containers are empty in accordance with EPA's hazardous waste regulations, close all valves and other openings prior to return shipment. Be sure that pipe threads on the discharge valve are clean. A plug should be screwed securely into the discharge opening.
- For additional information, refer to the main product label on the container and refer to the product material safety data sheet (MSDS). For additional directions on preparing containers for return and refilling, see **Section 4.1.** of this document.

#### **4.4. Proper Handling of Flammable Coatings**

- Keep the main top hatch and all container openings closed when the container is in storage, transport, or when the mixer is not in place.
- Full or empty tanks should be stored and used only in areas approved for handling and storage of flammable liquids. Consult federal state and local fire regulations. Relevant references to NFPA and OSHA requirements are outlined in **Section 5** of these Guidelines.
- The use of flammable liquids in open containers is generally not recommended. If the liquid in the container can be maintained at a temperature less than its flash point – less a suitable safety factor – then opening the container hatch may be permissible. A suitable safety factor will result in the liquid being maintained at a temperature such that the resulting concentration of vapor evolved from the liquid is less than 25 percent of its lower flammable limit (LFL). [NFPA 69] Vapor pressure data for the liquid can be used to determine a suitable safety margin and maximum safe storage and handling temperature. Otherwise, sealing of the container – other than a controlled pressure relief vent – during agitation should be considered.
- Proper electrical grounding practices should be followed whenever flammable and combustible liquids or explosible dusts are being handled. Guidelines for proper grounding of metal containers are outlined in NFPA 77. Ordinary plastic

containers should not be used with flammable liquids due to the potential electrostatic ignition risk.

- The mixer and all other proximate equipment should be rated for use in flammable atmospheres and be approved for use with flammable liquids. Consult federal, state, and local fire regulations. Also, consult with the coating supplier or equipment manufacturer for specific guidelines.

Areas in which rated electrical equipment should be used can be determined in accordance with NFPA 497 or 499. Specifications for electrical equipment rated for use in flammable atmospheres are outlined in NFPA 70 – the National Electrical Code (NEC). Reference to these and other relevant standards are outlined in **Section 5** of these Guidelines.

- Store full or empty containers indoors (if possible) and at temperatures within the range specified by the supplier. Do not store containers in direct sunlight.
- As soon as tanks are empty in accordance with EPA's hazardous waste regulations, close all valves and other tank openings prior to return shipment. Be sure discharge valve threads are clean. Insert a valve plug into the discharge opening. Dispose, recycle, or otherwise manage rinse solvent in a manner that complies with prevailing federal, state, and local regulations.
- For additional information, refer to the main product label on the container and refer to the product material safety data sheet (MSDS). For additional directions on preparing containers for return and refilling, see **Section 4.1.** of this document.
- Continuous agitation of the coating during down periods should not be necessary. Mix the coating briefly just before discharging of contents from the bottom valve. If the coating is discharged on a continuous basis, maintain gentle agitation during the discharge interval.

#### **4.5. Proper Handling of Flexible Intermediate Bulk Containers**

Flexible intermediate bulk containers (FIBCs) -- also known as bulk bags and super sacks -- are used to handle, transport, and store bulk solids and powders. They are most commonly fabricated from woven polypropylene fabric sewn into a cubic shape with four side panels as well as top and bottom panels. The top panel has a filling spout, while the bottom panel has a discharge spout. Each spout may be secured with tie closures referred to as drawstrings. FIBCs may be lifted and supported by four loops located at the four corners of the top panel. FIBCs are sometimes used with polyethylene inner liners. FIBCs are convenient to use because, among other reasons: (1) they enable operators to move large quantities of material easily and efficiently around the work area through the

use of forklifts and hoists; and (2) they are collapsible and thus require less storage space when empty.

FIBCs can be generally classified as: (1) standard; (2) groundable antistatic; (3) ungrounded antistatic. The polypropylene fabrics from which standard FIBCs are made are insulating in electrostatic terms and thus have a propensity to accumulate static charge. Charge can accumulate on FIBC panels during filling due to a phenomenon known as charge compaction. As bulk solids and powders accumulate in an FIBC, the electric field on the surface of the powder intensifies. This causes the ionization of the air adjacent to the powder surface and results in the acceleration of oppositely charged ions towards the FIBC panels. FIBC panels may become charged during emptying primarily due to contact electrification and charge transfer mechanisms. Charge accumulated on FIBC panels can give rise to electrostatic discharges upon exposure to grounded plant, personnel, or equipment. Such discharges may be sufficiently energetic to ignite flammable atmospheres, including gases, vapors, or dust clouds.

A number of FIBC designs have been put forward to address the electrostatic hazard associated with FIBCs. Groundable antistatic FIBCs incorporate conductive elements such as laminates, coatings, or threads that are connected to a common grounding tab. These designs essentially intercept charge on the FIBCs panels and channel it to ground. Ungrounded antistatic FIBCs incorporate technologies to dissipate static charge or otherwise prevent incendive discharges.

Potential electrostatic ignition sources include: (1) brush-type electrostatic discharges from insulating FIBC fabrics; (2) spark-type electrostatic discharges from conductive elements which are inadvertently or otherwise isolated from ground; (3) propagating brush-type electrostatic discharges from insulating FIBCs; and (4) cone-type electrostatic discharges from bulk solids or powders accumulating within an FIBC. Flammable atmospheres may include flammable vapors or dust clouds from vessels into which solids from the FIBC are being introduced or dispersed dust within the ullage space of the FIBC as it empties.

Due to the many different FIBC designs presently available, it is difficult to develop general precautions. Generally, supplier guidelines should be observed and/or expert advice should be sought. Relevant general recommendations for proper handling of FIBCs include the following:

- (1) FIBCs should be transported in a manner that minimizes the risk of tearing the woven polypropylene fabric. FIBCs should be lifted vertically using all four lifting loops. FIBCs may be lifted using a forklift truck or hoist. Suitable hoists should be equipped with a bracket that lifts each corner loop individually and simultaneously or that ensures that the loops are otherwise lifted straight up. The four loops should not be gathered into one common hoist hook.

When forklift trucks are used, the corner loops should be placed so that they are straight when the bag is lifted. The hoist hooks and fork truck prongs should be dulled or otherwise protected to reduce the risk of tearing the FIBC loops. The movement of FIBCs on pallets is generally not recommended, unless the user is certain that the bulk density of the powder is sufficient to ensure that the FIBC will remain rigid in transit.

- (2) FIBCs constructed from insulating fabrics having breakdown voltages of four (4) kilovolts (kV) or greater should not be used for any flammable bulk solid or powder due to the risk of propagating brush discharges. Neither should such FIBCs be used in or around any flammable gas, vapor, or dust;
- (3) FIBCs constructed from insulating fabrics having breakdown voltages of less than 4 kV may be used for bulk solids or powders having MIEs greater than 25 millijoules (mJ). However, such FIBCs should not be used in or around flammable gases, vapors, or dusts having MIEs of 25 mJ or less;
- (4) FIBCs constructed from fabrics incorporating conductive or antistatic laminates, coatings, or threads should be suitably grounded when these elements have been interconnected and a grounding tab provided;
- (5) Guidance should be sought from the supplier before using FIBCs constructed from fabrics incorporating conductive elements that are not electrically interconnected and for which a grounding tab has not been provided; and
- (6) The use of insulating, antistatic, and conductive liners in any FIBC can have unanticipated and potentially hazardous electrostatic effects. Guidance should be sought from the supplier before such liners are used with FIBCs.

## **5. REFERENCES**

### **5.1. National Fire Protection Association (NFPA) Standards**

For additional information on the standards listed below contact:

National Fire Protection Association  
One Batterymarch Park  
Quincy, Massachusetts 02269-9101  
(800) 735-0100

**NFPA 30 – Flammable and Combustible Liquids Code; National Fire Protection Association (NFPA); Quincy, MA; 1996.**

Chapter 4 - Container and Portable Tank Storage

- 4-1 General
- 4-2 Design, Construction, and Capacity of Containers
- 4-4 Design, Construction, and Operation of Inside Storage Areas
- 4-5 Requirements for Storage Areas in Other Occupancies
- 4-7 Outdoor Storage
- 4-8 Fire Protection and Control

Appendix E - Suggested Fire Protection for Containers  
of Flammable and Combustible Liquids

**NFPA 69 – Standard on Explosion Prevention Systems; National Fire Protection Association (NFPA); Quincy, MA; 1997.**

All sections.

**NFPA 70 – The National Electrical Code (NEC); National Fire Protection Association (NFPA); Quincy, MA; 1999.**

- Article 110 - Requirements for Electrical Installations
- Article 505 - Class I Hazardous (Classified) Locations
- Article 506 - Class II Hazardous (Classified) Locations

**NFPA 77 – Recommended Practice on Static Electricity; National Fire Protection Association (NFPA); Quincy, MA; 1996.**

All sections.

**NFPA 386 – Standard for Portable Shipping Tanks for Flammable and Combustible Liquids; National Fire Protection Association (NFPA); Quincy, MA; 1990.**

- Chapter 1 - General Provisions
- Chapter 2 - Design and Construction of Portable Shipping Tanks
- Chapter 3 - Appurtenances
- Chapter 4 - Operation and Use

**NFPA 497 – Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas; National Fire Protection Association (NFPA); Quincy, MA; 1997.**

All sections.

**NFPA 499 – Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas; National Fire Protection Association (NFPA); Quincy, MA; 1997.**

All sections.

## **5.2. United Nations (UN) Recommendations**

For additional information on the requirements listed below contact:

United Nations  
Committee on the Transport of Dangerous Goods  
One UN Plaza  
New York, New York 10017  
(212) 963-7684

**Recommendations on the Transport of Dangerous Goods – 9<sup>th</sup> Edition; ST/SG/AC.10/1/Rev. 9; United Nations (UN); New York; June 1995.**

Chapter 16 - Recommendations on Intermediate Bulk Containers

### 16.1. General Provisions

- 16.1.1. Scope
- 16.1.2. Definitions and Code System
- 16.1.3. Construction Requirements
- 16.1.4. Testing, Certification, and Inspection
- 16.1.5. Marking
- 16.1.6. Operational Requirements

- 16.2. Specific Requirements for Metal IBCs
- 16.3. Specific Requirements for Flexible IBCs
- 16.4. Specific Requirements for Rigid Plastic IBCs
- 16.5. Specific Requirements for Composite IBCs with Plastic Linings
- 16.6. Specific Requirements for Fiberboard IBCs
- 16.7. Specific Requirements for Wooden IBCs

### **5.3. U.S. Department of Transportation (DOT) Regulations**

For additional information on the regulations listed below contact:

U.S. Department of Transportation  
Office of Hazardous Materials Transportation Research  
400 Seventh Street, S.W.  
Washington, D.C. 20590  
(800) 467-4922 or  
(202) 366-4488

- |                       |   |
|-----------------------|---|
| <b>49 CFR 171.8</b>   | <b>Definitions</b>  |
|                       | Bulk Packaging<br>Intermediate Bulk Container<br>Non-Bulk Packaging<br>Portable Tank  |
| <b>49 CFR 172.302</b> | <b>General Marking Requirements for Bulk Packagings</b>   |
| <b>49 CFR 172.514</b> | <b>Labeling Requirements for Bulk Packagings</b>  |
| <b>49 CFR 173.32</b>  | <b>Qualification, Maintenance, and Use of Portable Tanks<br/>Other than Specification IM Portable Tanks</b>   |
| <b>49 CFR 173.35</b>  | <b>Hazardous Materials in Intermediate Bulk Containers</b>  |
|                       | (a) Scope<br>(b) Inspection<br>(c) Corrosion and Abrasion Protection<br>(d) Head Space Requirements<br>(e) Order of Closure<br>(f) Transport<br>(g) Containment Requirement<br>(h) Pressure Rating<br>(i) Exclusions<br>(j) Restriction for Packing Group I Materials<br>(k) Static Control Requirement<br>(l) Filling Limits |

**49 CFR 173**                      **Subpart F - Bulk Packaging for Hazardous Materials  
Other than Class 1 and Class 7 [49 CFR 173.240 –  
173.249]**

Identifies types of containers and vehicles by DOT code that are allowed to carry designated low, moderate, and high hazard materials

**49 CFR 174.63**                      **General Handling and Loading Requirements for  
Portable Tanks, IM Portable Tanks, Intermediate Bulk  
Containers, Cargo Tanks, and Multi-Unit Tank Car  
Tanks for Rail Transport**

**49 CFR 176.76**                      **General Handling and Stowage Requirements for  
Transport Vehicles, Freight Containers, and Portable  
Tanks Containing Hazardous Materials for Vessel  
Transport**

**49 CFR 176**                      **Subpart I - Detailed Requirements for the Transport  
of Class 3 Flammable and Combustible Liquids by  
Vessel [49 CFR 176.305 – 173.340]**

**49 CFR 178**                      **Subpart H - Specifications for Portable Tanks [49  
CFR 178.245 – 178.272]**

General Requirements  
Materials of Construction  
Design Pressure  
Closures for Manholes and Domes  
Tank Mountings  
Protection of Valves and Accessories  
Name Plate  
Closures  
Discharge Outlets  
Repairs  
Safety Devices  
Linings  
Marking  
Documentation

**49 CFR 178**                      **Subpart N - Intermediate Bulk Container  
Performance-Oriented Standards [49 CFR 178.700 –  
178.710]**

Purpose, Scope, and Definitions  
Identification Codes  
Marking  
General Standards  
Standards for Metal IBCs  
Standards for Rigid Plastic IBCs  
Standards for Composite IBCs  
Standards for Fiberboard IBCs  
Standards for Wooden IBCs  
Standards for Flexible IBCs

**49 CFR 178**                      **Subpart O - Testing of Intermediate Bulk Containers  
[49 CFR 178.800 – 178.819]**

Purpose and Scope  
General Requirements  
Preparation of Fiber Containers for Testing  
Testing and Certification  
Drop Test  
Bottom Lift Test  
Top Lift Test  
Leakproofness Test  
Hydrostatic Pressure Test  
Stacking Test  
Topple Test  
Righting Test  
Tear Test  
Vibration Test

**5.4. U.S. Environmental Protection Agency (EPA) Regulations**

For additional information on the regulations listed below contact:

U.S. Environmental Protection Agency  
Office of Solid Waste  
401 M Street, S.W.  
Washington, D.C. 20460  
(800) 424-9346 [Hazardous Waste Hotline]

**40 CFR 261.7      Residues of Hazardous Waste in Empty Containers**

**5.5. U.S. Occupational Safety and Health Administration (OSHA) Regulations**

For additional information on the regulations listed below contact:

Occupational Safety and Health Administration  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, D.C. 20210  
(202) 523-1452

**29 CFR 1910.106      Flammable and Combustible Liquids**

- (d) Container and Portable Tank Storage
  - (1) Scope
  - (2) Design, Construction, and Capacity of Containers
  - (3) Storage Cabinets
  - (4) Design and Construction of Inside Storage Rooms
  - (5) Storage Inside Buildings
  - (6) Storage Outside Buildings
  - (7) Fire Control

**5.6. Other References**

**Bralower, P.M.; Responsible Drum Handling: An Environmental Necessity; Modern Castings Magazine, February 1989, pp. 30-32.**