Closed Car Loading Guide

Part 7

Minimum Loading Standards for Intermediate Bulk Containers (Including Drums) in Closed Cars

Approved June 25, 2014, by the Damage Prevention and Freight Claim Committee
Minimum Loading Standards for INTERMEDIATE BULK CONTAINERS (INCLUDING DRUMS) IN CLOSED CARS

(Cancels G.I.S. Nos. 659, 695, 707, 711, 712, 714, 716, 721 and 724)

Issued: July 2014

Published by Transportation Technology Center, Inc.
55500 DOT Road
Pueblo, CO 81001

(Printed in U.S.A.)
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1.0 INTRODUCTION

1.1 Overview

1.1.1 The purpose of this guide is to relate basic good car loading procedures that have been developed through laboratory and field testing, engineering studies, and accumulated experience in rail transportation. Compliance with the “Minimum Loading Standards” contained herein will ensure conformance with Circular No. 42-K rules and provide adequate protection for lading from sources of damage in the normal railroad environment.

1.1.2 The general rules contained in Circular No. 42-K or supplements thereto issued by the AAR are formulated for the purpose of providing safe methods of loading boxcars and must be observed.

1.1.3 The loading rules and/or practices apply to shipments transported in the USA, Canada, and Mexico.

1.1.4 The loading methods in individual closed car loading publications issued by AAR's Damage Prevention and Loading Services are minimum standards that have been evaluated and approved by the AAR Damage Prevention and Freight Claim Committee. The minimum standards offer practical guidelines on the subjects covered. Because these are minimum standards, it may be necessary to supplement the methods in some instances.

1.1.5 Securement standards in AAR closed car loading publications are intended for safe transit of the railcar from origin to destination and for the prevention of lading and equipment damage. The standards do not address unloading practices.

1.1.6 Loading and bracing methods not currently approved may receive consideration for approval and publication under the Damage Prevention and Loading Services General Information Bulletin, No. 2, “Procedures Governing Evaluation and Acceptance of New Closed Car Loading and Bracing Methods and Materials.” Submit requests to Director, Damage Prevention and Loading Services, Association of American Railroads, Transportation Technology Center, Inc., 55500 DOT Road, Pueblo, CO 81001.

1.1.7 CAUTION: Car rocking motion caused by lift equipment entering and/or exiting the railcar may cause unsupported packages or articles with a high center of gravity to fall to the floor. Minimize access to the car. Exercise caution when inside a partially loaded car. Lift operators should stay on lift equipment, whenever possible, while inside a partially loaded car.

1.2 Reference Documents

1.2.1 Circular No. 42-K (or supplements thereto)
“General Rules Covering Loading of Carload Shipments of Commodities in Closed Cars”—These requirements must be observed in all closed car loading activities to ensure safe transit of the railcar from origin to destination, thereby eliminating hazard to railroad operation.

1.2.2 Circular No. 43-E (or supplements thereto)
“Rules Governing the Loading, Blocking, and Bracing of Freight in Closed Trailers and Containers for TOFC/COFC Service”—This publication contains the requirements covering loads in trailers or containers.
INTRODUCTION

1.3 Rail Transportation Environment

1.3.1 There are inherent characteristics of the rail environment that must be understood to recognize the need for many of the requirements identified in this publication.

1.3.2 Forces encountered within the rail vehicle are induced by shock and/or vibration. In most instances, the force is a complex result of both shock and vibration. Force input due to shock is mainly a result of impacts during switching and train slack action (run-in and run-out during train movement). Force input due to vibration is a result of the movement of the railcar's wheels on the rails. This vibration force can act either in a vertical or lateral plane. These forces are due to the movement of the car wheels on the rails, the truck geometry, rail joints, rail elasticity, nonuniformities of the rail and wheels, and overall track condition. When all these factors are acting on a rail vehicle, the resultant force is very complex.

1.3.3 The lading in a rail vehicle can also generate forces; for instance, in canned commodities, the metal cans can act as springs. For multilayer loads in the rail vehicle, any vertical force input in the bottom layers can be greatly amplified as it travels to the top layers. This is the transmissibility factor due to the harmonics of a particular stack or column of containers.

1.3.4 Uncontrolled movement and/or displacement of the lading in a rail vehicle can cause safety problems, equipment failure, damage, and unloading problems. The following minimum loading standards in conjunction with proper packaging will provide safe arrivals.
2.0 SELECTION AND PREPARATION OF CAR

2.1 Overview

2.1.1 Railroads are responsible for supplying cars that are clean and have sound roofs, sides, and square endwalls; smooth floors; and snug-fitting doors. Any exception is cause for rejection. Shippers are responsible for inspecting interiors of cars to see that they are suitable to carry lading safely and damage-free.

2.1.2 Before attempting to open the doors of any railcar, check to make sure that all hardware is intact so that the doors open safely. Check the door tracks to make sure they are equipped with stops on the ends so that the doors do not fall off when opened.

- It is critical to check locking bars and related hardware to make sure you can safely open plug doors.
- Make sure the doors are operating correctly before fully opening them. There is always the possibility that material or lading may be leaning against the inside doors or is applying pressure.
- Use extreme care when opening any type of railcar door to protect against injury.

2.1.3 Always check the car to see if water entry is possible. Make sure that the car is watertight. Look for light leaks or evidence of new or large amounts of rust, which may indicate recent water entry into the car.

(Note to customers: Notify appropriate carriers immediately if railcars are received with water damage to ensure that the car is shopped and repaired before the car is used again.)

2.1.4 Check the car floors for any holes or rough surfaces that may result in leakage or damage to the product.

2.1.5 Inspect the cars for any protrusions or rough, broken, or bent surfaces that could result in damage to the product. It is important that cars are clean and free from nails, brads, staples, fragments of steel, and dunnage remnants. To prevent damage, cover projections of lining or anchor devices with protective materials taped in place or otherwise adequately secured.

2.1.6 Check the endwalls to make sure they are not bowed. If the endwall is severely bowed, reject the car. If the endwalls are bowed and you need to use the car, use materials of appropriate size and strength to bring the endwalls back to square. This will help to ensure that the load remains tight during its journey.

2.1.7 If the car supplied is not suitable for loading and the shipper elects to load the car rather than reject it, it is the shipper's responsibility to properly prepare the car.

2.1.8 Cover rough surfaces with fiberboard sheets or other suitable materials. Do not use kraft paper.

2.1.9 In refrigerator cars, cover floor racks with at least a single thickness of corrugated fiberboard, placing the corrugations lengthwise of the car to prevent rolling or bunching. Abut sheets on the floor and do not overlap. Make the interior endwall adjacent to the motor compartment flush with the endwalls by adding several thicknesses of corrugated fiberboard.

2.1.10 When plug doors do not provide a flush surface with the car's sidewalls, use protective material such as corrugated fiberboard.

2.1.11 The loading methods illustrated in this guide have a proven track record of success in specific car types. Please note the type of car for which each method is used. Failure to use the proper loading method in the proper type of equipment will result in damage to the product and a dissatisfied customer (i.e., if a loading method is shown for use in a cushion equipped car, use that loading method only in cushion-equipped cars).
2.2 Bulkhead Equipment

2.2.1 When cars are equipped with bulkhead doors, inspect the doors to determine if they can be moved safely, then move the doors to approximately where they will be located under load. Engage the locking mechanisms to make certain they are operational. Inspect for full extension all locking pins at the top and bottom of the bulkhead doors. Locking pins must penetrate the tracks a minimum of $\frac{1}{2}$ in. Tapered locking pins must penetrate the tracks a minimum of $\frac{1}{2}$ in. beyond the taper (see Figure 2.1).

![Figure 2.1 Bulkhead doors](image)

2.2.2 The weight of cargo restrained by each bulkhead must not exceed one-half of the load limit stenciled on the car sides.

2.2.3 Examine all bulkhead doors before loading. This cannot be emphasized too strongly. Before moving a bulkhead door, inspect the overhead assembly to determine if it is in good condition so the door can be moved safely.

2.2.4 Inspect locking handles to determine if they function properly. Inspect locking pins to make sure they penetrate into the holes of the overhead and floor locking tracks. If locking pins do not penetrate, DO NOT LOAD.

2.2.5 After cargo is loaded, place the door squarely (straight up and down) and snugly against the load, and lock into place. If the face of the load is not flush, use filler material to make it flush. If the door's surface is not smooth, protect the product with fiberboard.

2.2.6 Inspect the locking pins to make sure they have penetrated the overhead and floor locking tracks a minimum of $\frac{1}{2}$ in.
3.0 LOAD PLANNING

3.1 General Load Planning

3.1.1 Load, block, or brace commodities tightly lengthwise and crosswise to eliminate all void spaces, which are primary reasons for damage. Take up any void spaces remaining in a car. Use blocking, fillers, and other suitable materials, and secure them in accordance with the methods outlined in this guide and other guides listed on the back cover of this book.

3.1.2 Load and secure lading to permit unloading from either side of the railcar, except when dimensions of individual units of freight prohibit unloading from either side of the car.

3.1.3 Inspect lading before loading car. Do not load damaged lading.

3.1.4 Evenly distribute the weight of loads from side-to-side and end-to-end in the car and to a uniform height of lading insofar as lading permits. Always center the units in the doorway area along the lengthwise centerline of the car.

3.1.5 Plan loads so that a combination of endwall fillers, separators, and center bracing will facilitate unloading lengthwise lifts from both sides of cars equipped with staggered doors.

3.1.6 Stow lading in a manner to prevent contact with doorposts.

3.1.7 Fill all lengthwise space with lading and with lading and filler material, or appropriately block and brace.

3.1.8 When there is a possibility of lading falling or rolling out of the doorway or coming in contact with sliding or plug-type side doors, protect openings with wood doorway protection, steel straps, or other material of sufficient strength and number, and adequately secure it.

3.1.9 Apply temporary bracing in partly loaded or unloaded cars that will be switched during the process of loading or unloading.

3.1.10 Plan load so that crosswise space is minimized without exceeding an aggregate of 18 in., unless additional appropriate bracing is used. Maintain vertical alignment to prevent crosswise movement.

3.1.11 Load units in a straight line lengthwise in the car to ensure face-to-face unit alignment. If unit alignment is not maintained, use divider sheets. Crosswise space may be filled with product placed alongsidewalls or down the center with protective material separating hand-stacked and unitized lading, unless other means of maintaining vertical alignment of the units are used.
3.1.12 When cars are pallet or slip-sheet loaded, load the units against the sidewalls and apply lateral void fillers in voids between the unit rows. Units may also be loaded tight against one sidewall and fillers applied between the units and the other sidewall, and alternated in opposite ends (see Figure 3.1).
3.2 Care and Protection of Rail Equipment

3.2.1 Have lift truck operators use extreme care in turning units within cars or backing a lift truck out of car doors to avoid damage to sidewalls and bulkhead doors. Do not use lift equipment to open or close railcar side doors or to position bulkhead doors.

3.2.2 Some lift truck forks are longer than the units being loaded or unloaded. Have lift truck operators use extreme care so that the forks do not protrude through and beyond the units and damage the product or the endwall of the car beyond the unit being handled. See Figure 3.2.

3.3 General Loading Principals

3.3.1 Load is tight crosswise and lengthwise in the car.

3.3.2 Follow proper loading procedures, such as the following:
   - Do not load damaged product.
   - Place lighter products on top of heavier products.
   - Load shipping containers with similar characteristics together.
   - Avoid floating layers, if possible.
   - Use separators and dividers, as necessary.

3.3.3 When shipments in noninsulated cars are subjected to climatic changes leading to condensation, it may be necessary to use protection over the top of the load.
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4.0 PACKAGING AND UNITIZING

4.1 Palletized Units

4.1.1 Ensure that pallets are of sufficient strength for the type of product handled and are in good condition with no broken boards or protruding objects.

4.1.2 When loading, provide palletized units with unit-to-unit contact with minimum overhang of shipping containers on pallets. Pallet under-hang is not permitted lengthwise of the railcar except when filled with approved filler material.

4.1.3 In double-layer pallet loads, have units equal in height to ensure pallet contact both longitudinally and laterally. If this is not the case, separate stacks of units with suitable divider sheets. Use separators between pallet and product.

4.1.4 Load and brace lading to permit unloading from either side of railcar. Use four-way entry pallets in doorway, if possible.

4.2 Nonmetallic Package Straps Used with Wood Bins Containing Liquid Products

4.2.1 Use approved 5/8 in. x 0.035 in. Type IV polyester plastic strapping for packaging wood bins containing liquid products shipped in closed cars, trailers, or containers.

4.2.1.1 Use straps with a minimum breaking strength of 1,200 lb.

4.2.1.2 Use straps that are sealed with a friction weld or heat seal joint (sealless) with a joint strength of 900 lb (75% of minimum breaking strength).

4.2.1.3 Strap shall be clearly marked by the strap manufacturer with the "Strap I.D." spaced at 5 ft intervals (maximum).


4.2.2 Figure 4.1 is an example of a typical packaging strap application for wood bins containing liquid products. Such bins are often referred to as “scholle” bins. Containers of this type are commonly constructed of removable plywood sides, tops, and bottoms, and employ vertical metal corner protectors. The product is contained in various types of bladders within the bin, which permit them to be quickly filled and quickly emptied. The bin is placed on and secured to a wood skid by application of metal or polyester plastic strapping.
4.2.3 Polyester strapping must be applied as shown in Figure 4.1. Use eight straps to secure the wood bin to the pallet and to unitize the bin sides. Apply four straps horizontally to unitize the bin sides. Apply four straps (two in one direction and two in the other) vertically to secure the bin to the pallet. Follow the manufacturer's instructions for application and sealing of the straps.

4.2.4 Inspect the loaded bins held in storage for proper strap tension and seal integrity, and make adjustments before they are used again in rail shipment.

4.3 Dividers

4.3.1 The construction and quantity of properly installed divider sheets will vary based on many factors (e.g., density of product and weight of load). The following are the minimum standards for use of divider sheets in cars that do not have cushioning devices or load restraining devices. Shippers are expected to cooperate with carriers when it can be demonstrated that additional use of divider sheets is necessary to avoid excessive damage. See Figure 4.2.

![Figure 4.2 Unitized double-layer pallet loads](image)

4.3.2 Use corrugated or solid fiberboard divider sheets where product height differences occur within the load. Use corrugated or solid fiberboard divider sheets approximately the same width and height as the load. When corrugated divider sheets are used, place the divider sheets so that corrugations are vertical.

4.3.3 Use divider sheets between doorway stacks to facilitate unloading.
5.0 BLOCKING AND BRACING MATERIALS

5.1 Steel Strapping

5.1.1 Use the proper combination of steel straps, seals, sealing tools, notches, or crimps to provide a minimum breaking strength of 4,725 lb and 75% joint efficiency for all doorway protection straps.

5.1.2 Use metal protectors, such as corner guards or plates, sufficient to provide a suitable radius to protect straps at all points on lading having sharp edges and/or sharp corners.

5.1.3 Use tensioning and sealing equipment properly. Check the tools periodically to ensure their efficiency.

5.1.4 More detailed information regarding steel strapping is available in the *Closed Car Loading Guide*, Part 1, (formerly Pamphlet No. 14), “Minimum Loading Standards for Freight in General Purpose Boxcars.”

**NOTE:** For the latest updates of approved strapping, go to the TTCI Web site at [http://www.aar.com/standards/open_top_loading_approvals.php](http://www.aar.com/standards/open_top_loading_approvals.php).

5.2 Nonmetallic Strapping

5.2.1 Use the proper combination of nonmetallic straps, seals, and sealing tools to provide a minimum breaking strength of 3,285 lb and 75% joint efficiency for all doorway protection straps.

5.2.2 More detailed information regarding nonmetallic strapping is available in the *Closed Car Loading Guide*, Part 1, (formerly Pamphlet No. 14), “Minimum Loading Standards for Freight in General Purpose Boxcars.”

**NOTE:** For the latest updates of approved strapping, go to the TTCI Web site at [http://www.aar.com/standards/open_top_loading_approvals.php](http://www.aar.com/standards/open_top_loading_approvals.php).

5.3 Lengthwise Filler Material

5.3.1 Filler construction: lengthwise void fillers must be of uniform strength over the face of the void filler and capable of withstanding a load of 1,500 lb/ft² (test full-dimension filler sheet), as shown in Figures 5.1 and 5.2.

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**Fig. 5.1 Using lengthwise filler to fill pallet underhang**
5.3.2 Make the height and width dimensions of the faces of the filler material as near as possible to the dimensions of the faces of the units they will be separating.

5.3.3 Do not reuse filler material if it has been damaged and is no longer capable of filling the intended void, or if there is any evidence of creasing or damage to the core, which might reduce the compression strength of the filler.

5.3.4 Do not use lengthwise void filler material as a bulkhead or in lieu of a bulkhead.

5.4 Crosswise Filler Material

5.4.1 Plan load so that crosswise space is minimized without exceeding an aggregate of 18 in., unless additional appropriate bracing is used. Maintain vertical alignment to prevent crosswise movement. See Figure 5.3.
5.5 **Pneumatic Dunnage**

5.5.1 **Table 5.1** defines five levels of performance for pneumatic dunnage:

- Level 1 for pneumatic dunnage as lateral void fillers (and load securement in certain intermodal applications)
- Levels 2 to 5 for pneumatic dunnage as lengthwise void fillers in flat platen-type applications with varied performance requirements

Pneumatic dunnage meeting Level 2 to 5 requirements fulfills all Level 1 requirements.

<table>
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<tbody>
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<td>Level 1</td>
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<tr>
<td>Level 2</td>
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<tr>
<td>Level 3</td>
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<tr>
<td>Levels 4 and 5</td>
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5.5.2 Usage guidelines: follow the manufacturer's instructions on care and storage of bags prior to use. Inflate bags with an approved inflator, in accordance with the manufacturer's instructions.

5.5.3 After inflation, check to see that dunnage bags are approximately the same size as the face of the load. Do not extend the dunnage bag beyond the face of the load. See **Figure 5.4**.

5.5.4 Use buffer material of sufficient strength to prevent it from conforming to dunnage bag contour, to prevent chafing, to prevent dunnage bag from crushing load at proper inflation pressure, and to prevent lading from damaging dunnage bags.

5.5.5 Use buffer material equal or slightly larger in size than face of lading. Have lading adjacent to bag(s) nearly equal in height on each side of bag.

5.5.6 Inflation pressure may vary from 2 psig to 10 psig depending on the nature of lading and the level of air bag used.

5.5.7 Void size after inflation will be from 4 in. to 12 in. See applicable commodity publications for possible exceptions to this limitation.
5.5.8 Install bag(s) so that the bottom(s) will be a minimum of 1 in. above the floor after inflation. Apply protective material (e.g., fiberboard) between the bag and floor.

5.5.9 Use hold-down methods when necessary to prevent bag displacement from the void area.

5.5.10 Use an air gauge to ensure prescribed air pressure at inflation. Recheck air pressure one-half hour after inflation for leakage.

5.5.11 Use clean and dry air to fill dunnage bags.

5.5.12 Do not use bags in tandem (back-to-back). Do not use dunnage bags to fill more than one lengthwise void in a car.

5.5.13 Use two bag systems unless otherwise specified.

5.5.14 When loading single layer units, use one bag positioned horizontally. For units loaded two layers high, use two bags positioned vertically or horizontally adjacent to each other. Normally a 48- by 96-in. bag is compatible with side-by-side unit loads measuring 48 in. long by 40 in. wide to 54 in. high.

5.5.15 Reusable dunnage bags intended for use only in filling crosswise (lateral) voids must be prominently marked by the manufacturer to indicate proper application. Never use bags marked for this application to fill lengthwise voids.

5.5.16 Leave the door of the car open after loading is completed, and check bag 30 minutes after installation for leakage.

5.5.17 For further information, refer to AAR General Information Bulletin No. 9, “Product Performance Profile for Pneumatic Dunnage.”

5.5.18 See http://www.aar.com/standards/dpls/pfdls/PPPD_Verification_List.pdf for the most current “Product Performance Profile for Pneumatic Dunnage Product Verification List.”
6.0 UNIT LOADING

6.1 Plastic Intermediate Bulk Containers Braced by Disposable Inflatable Dunnage Bags and Lengthwise Void Fillers

6.1.1 The following intermediate bulk container has been evaluated and found acceptable for use with this loading method:

<table>
<thead>
<tr>
<th>Company</th>
<th>Container Description</th>
<th>Description</th>
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<tr>
<td>Buckhorn, Inc.</td>
<td>Citadel Heavy Duty</td>
<td>Molded of polypropylene, approved for food contact, and designed for use with a recyclable liner; 3,000 lb container capacity.</td>
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6.1.2 This loading method is intended for plastic intermediate bulk containers filled with liquid and bulk tomato products in single-door boxcars with inside lengths of 50 ft to 50 ft 6 in. Figure 6.1 shows an example of the load pattern. Some variation may be necessary depending on the number of plastic containers being loaded.

The plastic container tested was 45 in. wide × 48 in. long × 46.63 in. high. The number of plastic containers actually loaded will depend on weight and order requirements.

Figure 6.1 Plastic IBCs with dunnage bags
UNIT LOADING

6.1.3 Thoroughly inspect intermediate bulk containers prior to filling and again prior to railcar loading to verify component integrity and overall good working order. Reject any container not found intact or in good working condition.

6.1.4 If necessary, use 2 in. × 4 in. lumber or other suitable material at the ends of the car to square up bowed endwalls.

6.1.5 Load plastic containers with their 48 in. dimension lengthwise to the car in each end. Load in two rows, each row against opposite sidewalls. Load and align all plastic containers corner to corner, tightly against the endwalls and sidewalls. The top layer containers must be loaded to properly nest and interlock with the bottom adjacent containers.

6.1.6 Load the plastic containers in the doorway with their 48 in. dimension lengthwise to the car. Fill the lengthwise void in the doorway area with high-strength, honeycomb-panel void fillers and pneumatic dunnage. Place void fillers 8 in. thick × 45 in. wide × 89 in. high between the last stack of plastic containers at the end of the car and the first stack of plastic containers at the doorway. Typical loads will require two void fillers placed in tandem at one location and single void fillers at the opposite doorway area. Align void fillers with the last stack at the end of the car. Construct void fillers so that the area of the void filler contacting the top and bottom of each container has minimum compression strength of 6,000 lb/ft². Locate corrugated blocks with minimum compression strength of 6,000 lb/ft² at each corner of the void filler and also equidistant between the top and bottom corners. The blocks in each corner are 6 in. × 6 in. × 8 in. thick. The blocks along the sides are 8 in. × 8 in. × 8 in. thick. For the remaining area, construct honeycomb to create a maximum of 9 in. cell linerboard. See Figure 6.2 for an example of a void filler showing construction requirements. At a minimum, locate appropriately sized blocks of such strength as illustrated.

6.1.7 Fill the remaining voids between the two doorway plastic containers on each side of the boxcar with a 6 ply, 48 in. × 84 in. pneumatic dunnage bag (use to fill a 4 in. to 12 in. space after inflation). One sheet of fiberboard is required on each side of the pneumatic dunnage to serve as a buffer. Inflate each bag to 6 psi. Check the bags for leakage 30 minutes after inflation.

6.1.8 Fill all crosswise voids throughout the car with void fillers with a minimum compression strength of 500 lb/ft². Void fillers must fit tightly between the containers to prevent lateral shifting. Crosswise void fillers, drop-down filler type, must fully brace the top layer containers and 30% (minimum) of the bottom layer containers.

Figure 6.2 Reinforced longitudinal void filler
6.1.9 Packaging

6.1.9.1 Product Specifications: “CITADEL” Heavy Duty

**Intermediate Bulk Container**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>48 in. long × 45 in. wide × 46.63 in. high</td>
</tr>
<tr>
<td>Volume</td>
<td>300 gallons</td>
</tr>
<tr>
<td></td>
<td>69,970 cubic in.</td>
</tr>
<tr>
<td>Maximum Capacity</td>
<td>3,000 lb</td>
</tr>
</tbody>
</table>

6.1.9.2 Layer pads (foam or corrugated) are routinely used between the top of the aseptic inner liner and the lid of the intermediate bulk container to minimize and/or negate product surge during transportation (see Figure 6.3). This is a particularly important addition to the basic packaging when shipping products such as 100% juices that have a potential to rise and move in a billowing or swelling manner.

![Figure 6.3 Intermediate bulk container](image)

6.2 Plastic Intermediate Bulk Containers with Disposable Inflatable Dunnage Bags and Lengthwise Void Fillers

6.2.1 The following intermediate bulk containers have been evaluated and found acceptable for use with this loading method:

<table>
<thead>
<tr>
<th>Company</th>
<th>Container Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schoeller Arca Systems, Inc.</td>
<td>Combo Life 300 (CL300) Nominal bin paste capacity 2,850 lb 48.6 in. × 44.7 in. × 45.6 in.</td>
<td>Molded of food grade plastic, approved for food contact, and designed for use with a recyclable liner</td>
</tr>
<tr>
<td>Schoeller Arca Systems, Inc.</td>
<td>Combo Life 315 (CL315) Nominal bin paste capacity 3,040 lb 48.6 in. × 44.7 in. × 48 in.</td>
<td>Molded of food grade plastic, approved for food contact, and designed for use with a recyclable liner</td>
</tr>
</tbody>
</table>
UNIT LOADING

6.2.2 This method is intended for plastic intermediate bulk containers filled with tomato products for loading in single-door boxcars with inside lengths of 50 ft to 50 ft 6 in. Figure 6.4 is an example of the load pattern. Some variation may be necessary depending on the number and size of plastic containers being loaded. The number of plastic containers actually loaded will depend on weight and order requirements.

![Diagram of plastic intermediate bulk container with dunnage bags]

6.2.3 Use level pneumatic dunnage bags of a level appropriate for the weight of the load. Inflate level 3 bags to 6 psi; inflate level 4 pneumatic bags to 8 psi.

6.2.4 If necessary, use 2 in. × 4 in. lumber or other suitable material at the ends of the car to square up bowed endwalls.

6.2.5 Load plastic containers with longest side lengthwise to the car in each end. Load in two rows, each row against opposite sidewalls. Load and align all plastic containers corner to corner, tightly against the endwalls and sidewalls. The top layer containers must be loaded to properly nest and interlock with the bottom adjacent containers.

6.2.6 Load the plastic containers in the doorway with their 48 in. dimension lengthwise to the car. Fill the lengthwise void in the doorway area with high-strength, honeycomb-panel void fillers and pneumatic dunnage. Place void fillers 8 in. thick × 45 in. wide × 89 in. high between the last end-of-car plastic containers and the first doorway plastic containers. Typical loads will require two void fillers placed in tandem at one location and single void fillers at the opposite doorway area. Align void fillers with the last end of car plastic containers.
6.2.7 Construct void fillers so that the area of the void filler contacting the top and bottom of each container has minimum compression strength of 6,000 lb/ft². At minimum, locate corrugated blocks with minimum compression strength of 6,000 lb/ft² at each corner of the void filler and also equidistant between the top and bottom corners. The blocks in each corner are 6 in. × 6 in. × 8 in. thick. The blocks along the sides are 8 in. × 8 in. × 8 in. thick. Construct all of the remaining area of the void fillers with honeycomb to a maximum of 9 in. cell linerboard. See Figure 6.2 for an example of a void filler showing construction requirements.

6.2.8 Fill the remaining voids between the two doorway wood bins on each side of the boxcar with a 48 in. × 84 in. pneumatic dunnage bag of a level appropriate for the weight of the load. One sheet of fiberboard is required on each side of the pneumatic dunnage bags to serve as a buffer. Inflate each bag to 6 psi. Check the bags for leakage 30 minutes after inflation.

6.2.9 Fill all crosswise voids at each end of the car with void fillers with a minimum compression strength of 500 lb/ft². Void fillers must fit tightly between the containers to prevent lateral shifting. Crosswise void fillers, drop-down filler type, must fully brace the top layer containers and 30% (minimum) of the bottom layer containers. Use high-strength honeycomb panels to fill the crosswise void in the doorway area between containers.

6.3 Wood Bins Braced by Disposable Inflatable Dunnage Bags and Lengthwise Void Fillers

6.3.1 This method is used for loading wood bins filled with tomato products in single- or double-door boxcars with inside lengths of 50 ft to 60 ft 9 in. Figures 6.5 and 6.6 are examples of two loading patterns. Some variation may be necessary depending on the number of wood bins being loaded. The typical wood bin tested was 44 in. wide × 48 in. long × 43 in. high. The number of wood bins actually loaded will depend on weight and order requirements.
6.3.2 Use eight 5/8 in. × 0.020 in. minimum steel package bands having minimum breaking strength of 1,250 lb with a minimum joint strength of 938 lb (75% of the minimum breaking strength) or the appropriate polyester plastic bands for each wood bin. Apply four bands horizontally to unitize the bin sides. Apply four bands vertically (two in one direction and two in the other) to secure the bin to the pallet. See Figure 6.5.

6.3.3 If necessary, use 2 in. × 4 in. lumber or other suitable material at the ends of the car to square up bowed endwalls.

6.3.4 Load wood bins, long side lengthwise to the car, in each end. Load in two rows, each row against opposite sidewalls. Load and align all wood bins corner to corner, tightly against the endwalls and sidewalls. It is possible that the first few wood bins loaded in each end of the car may tend to twist during the transportation cycle. Therefore, use separators to prevent damage to the horizontal package bands between the first and second and second and third wood bins in each end of the car.

6.3.5 Load the wood bins in the doorway long side crosswise to the car. Fill the lengthwise void in the doorway area with void fillers and pneumatic dunnage. Place void fillers 8 in. thick × 45 in. wide × 89 in. high between the last stack of wood bins (end of car) and the first doorway wood bin. Typical railcars (50 ft to 50 ft 6 in.) will require two void fillers placed in tandem at each location. Align void fillers with the last end-of-car wood bins.
6.3.6 Construct void fillers so that the area of the void filler contacting the top and bottom of each wood bin has minimum compression strength of 6,000 lb/ft². Locate corrugated blocks with minimum compression strength of 6,000 lb/ft² at each corner of the void filler and also equidistant between the top and bottom corners. The blocks in each corner are 6 in. × 6 in. × 8 in. thick. The blocks along the sides are 8 in. × 8 in. × 8 in. thick. Construct all of the remaining area of the void fillers with honeycomb to a maximum of 9 in. cell linerboard. See Figure 6.2 for an example of void filler showing construction requirements.

6.3.7 Fill the remaining voids between the two doorway wood bins on each side of the boxcar with a 48 in. × 84 in. pneumatic dunnage bag of the appropriate level for the weight of the load (use to fill a 4 in. to 12 in. space after inflation). One sheet of fiberboard is required on each side of the pneumatic dunnage bags to serve as a buffer. Inflate each bag to 6 psi. Check the bags for leakage 30 minutes after inflation.

6.3.8 Fill all crosswise voids throughout the car with void fillers with a minimum compression strength of 500 lb/ft². Void fillers must fit tightly between the containers to prevent lateral shifting. Crosswise void fillers, drop-down filler type, must fully brace the top layer containers and 30% (minimum) of the bottom layer containers.

6.4 Reusable Polyethylene Void Fillers and Pneumatic Dunnage Bags for Securing Wood Bins

6.4.1 Use this method for loading wood bins filled with tomato products into single- or double-door, cushioned-equipped boxcars with inside lengths of 50 ft to 60 ft 9 in. Figures 6.7 through 6.10 show examples of loading patterns for 50 ft and 60 ft cars. Some variation may be necessary depending on the number of wood bins being loaded. The typical wood bin, as tested, was 44 in. wide × 48 in. long × 43 in. high. The number of wood bins actually loaded will depend on weight and order requirements.
6.4.2 Use eight 5/8 in. × 0.020 in. minimum steel package bands having minimum breaking strength of 1,250 lb with a minimum joint strength of 938 lb (75% of the minimum breaking strength) or the appropriate polyester plastic bands for each wood bin. Apply four bands horizontally to unitize the bin sides. Apply four bands vertically (two in one direction and two in the other) to secure the bin to the pallet. See Figure 4.1.

6.4.3 If necessary, use 2 in. × 4 in. lumber or other suitable material at the ends of the car to square up bowed endwalls.
6.4.4 Load wood bins, long side lengthwise to the car, in each end. Load in two rows, each row against opposite sidewalls. Load and align all wood bins corner to corner, tightly against the endwalls and sidewalls. The first few wood bins loaded in each end of the car may tend to twist during the transportation cycle. Place 4 in. thick reusable polyethylene filler panels that are 48 in. wide × 96 in. high between the first and second and the second and third wood bins in each end of the car.

6.4.5 Load the wood bins in the doorway with their long side crosswise to the car. Fill the lengthwise void in the doorway area with reusable polyethylene void fillers and pneumatic dunnage. Place 4 in. thick reusable polyethylene filler panels (48 in. wide × 96 in. high) between the last wood bins of the last car and the wood bin of the first doorway. Typical 50 ft to 50 ft 6 in. railcars will require two void filler panels placed in tandem at each location. Align void fillers with the last end-of-car wood bins.

6.4.6 Construct the void filler panels with minimum compression strength of 6,000 lb/ft² over the entire panel. Fill the remaining voids between the two doorway wood bins on each side of the boxcar with the appropriate level of 48 in. × 84 in. pneumatic dunnage for the weight of load (use to fill a 4 in. to 12 in. space after inflation). A 4 in. reusable void filler panel is required on each side of the pneumatic dunnage to serve as a buffer/filler. Inflate each bag to 6 psi. Check the bags for leakage 30 minutes after inflation.

6.4.7 Fill all crosswise voids, including the doorway area, with void fillers with minimum compression strength of 500 lb/ft². Void fillers must fit tightly between the wood bins to prevent lateral shifting and to prevent possible damage to the package bands. Floor-standing, reusable, polyethylene, lateral void fillers must fully brace the bottom layer bins and 60% (minimum) of the top layer bins.

6.4.8 Only the following polyethylene void fillers have been evaluated and found acceptable for use with this securement system:

<table>
<thead>
<tr>
<th>Type</th>
<th>Compression Strengtha/</th>
<th>Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Void Filler Panels (4 in.)</td>
<td>25,000 lb +</td>
<td>Fabri-Form</td>
</tr>
<tr>
<td>Interlocking Spacers</td>
<td>20,000 lb +</td>
<td>Fabri-Form</td>
</tr>
</tbody>
</table>

a/ See ASTM Standard D642 for information on testing procedures

**NOTE:** The “degree of reusability” was not addressed during testing. As with other reusable dunnage products, they should not be used if they are torn, damaged, or in any way compromised from fulfilling their original intent when new.
6.5 Woven Polypropylene Bulk Bags (Super Sacks) in an Incomplete Second Layer Secured by Nonmetallic Strapping

6.5.1 Use only cushion-equipped cars when employing the loading method described herein.

6.5.2 Use woven polypropylene bulk bags, or “Super Sacks,” measuring 35 in. × 35 in. × 45 in. and weighing approximately 2,500 lb per bulk bag.

6.5.3 Fill all empty crosswise space with fillers appropriate for the size and weight of the lading to avoid unbalanced loads.

6.5.4 Load bulk bags three across in the floor layer for a total of 16 stacks.

6.5.5 For loading an incomplete second layer, distribute the load equally at each end of the car.

6.5.6 Secure each end of the incomplete layer using four Type 1A, Grade 4, polyester woven straps (minimum breaking strength 3,285 lb) in a belt-loop configuration. Apply the straps to the doorposts or sidewall anchors. Apply two straps horizontally and two straps diagonally across the car. See Figure 6.11.

Figure 6.11 Woven polypropylene bulk bags in an incomplete second layer
6.5.7 Apply securement straps at or behind the face of the incomplete second layer. See Figure 6.12.

Figure 6.12 Detail of strap placement

6.5.8 Use buffer material (e.g., fluted cardboard liner) between the straps and bags to protect the lading.

6.5.9 Use the correct buckle and tensioning tools on the straps in accordance with manufacturer's instructions. Apply the buckle properly to maintain strap tension. Split and knot the strap on the tensioning side of the buckle after tensioning, when possible, to ensure against strap slippage.

6.6 Woven Polypropylene Bulk Bags (Super Sacks) Using a Woven Polyester Strapping Securement System

6.6.1 Use only cushion-equipped cars when employing this loading method.

6.6.2 Use woven polypropylene bulk bags, or “Super Sacks,” measuring 35 in. × 35 in. × 45 in. and weighing approximately 3,250 lb per bulk bag.

6.6.3 Fill all empty crosswise space with fillers appropriate for the size and weight of the lading to avoid unbalanced loads.

6.6.4 Except for the last stack, load the floor layer units in a 3-3 pattern starting at the endwalls. Stow the last stack two-wide at the doorposts on the centerline of the car. Load an incomplete second layer directly on top of the floor layer.

6.6.5 The preferred anchor location is at the sidewall at least 36 in. behind the face of the load. Secure to permanent wall anchors at staggered locations. If sidewall anchors do not correspond with required strap placement, doorpost anchors may be used.
6.6.6 Secure the floor layer in each end of the car using a minimum of two Type 1A, Grade 4, polyester cord straps approved for load securement in a belt-loop configuration. Apply the straps to the doorposts and join with wire buckles at the front of the load. Secure the top layer in each end of the car with a minimum of four Type 1A, Grade 4, polyester cord straps approved for load securement in a belt-loop configuration. Join with wire buckles at the front of the load. (See Figure 6.13.)

Figure 6.13 Woven polypropylene bulk bags using a polyester strapping securement system

6.6.7 Use buffer material (e.g., fluted cardboard liner) between the straps and bags to protect the lading.

6.6.8 Apply securement straps at or behind the face of the incomplete second layer.

6.6.9 Use the correct buckle and tensioning tools on the straps in accordance with the manufacturer’s instructions. Apply the buckle properly to maintain strap tension. Split and knot the strap on the tensioning side of the buckle after tensioning, when possible, to ensure against strap slippage.
6.7 55 Gallon Plastic Drums Stowed Two or Three Layers High in Cushioned Boxcars Using Bulkhead Pads and 1 5/8 in. Wide Polyester Cord Strapping

6.7.1 Use this method for loading 55 gallon plastic drums filled with tomato paste into single- or double-door, cushioned-equipped boxcars having an inside length of 60 ft 9 in. and secured with a reusable G-Force™ Shock Absorption System and 1 5/8 in. wide ASTM Type 1A, Grade 7, polyester cord strapping. Figure 6.14 is an example of a load pattern for 60 ft cars. The number of plastic drums actually loaded will depend on weight and order requirements. Open-head plastic drums must contain the product within aseptic liners. The height of the employed cushioned bulkhead is dependent upon the load height (i.e., two or three layers high).

![Figure 6.14 Load pattern for 55 gallon drums in 60 ft cars (detail of G-Force™ Shock Absorption System)](image)

6.7.2 Use only cushioned-equipped railcars when employing this loading method.

6.7.3 Loop five lengths of 1 5/8 in. wide ASTM Type 1A, Grade 7, polyester cord strapping through the sidewall anchors at five horizontal positions preferably vertically offset and at least 36 in. behind the face of the load. Cut the looped straps in lengths that can be comfortably joined at the center face of the load after the bulkheads and dunnage have been positioned. Choose the anchor locations so the topmost strap is as close to the top of the load and the bottom strap is as close to the bottom of the load as possible. Space the remaining three straps equally between the top and bottom straps. Temporarily secure the straps to the sidewalls or drape the straps outside the railcar so that they do not impede loading.

6.7.4 Except for the last stack, load the drums two or three layers high in a 5-5 pattern starting at each endwall. Stow and nest the last stack four-drums wide in each end of car. Use 500 lb, double-wall, corrugated separator sheets or equivalent between layers.

6.7.5 Use longitudinal separators in the upper layers between the last two five-wide stacks to be loaded to ensure upright vertical stack alignment at the face of the load.

6.7.6 Position one set of hinged foam pad bulkheads upright on end at each corner at the face of the load. The panel height should approximate the height of the load.
6.7.7 Position a 35 in. × 108 in. × 6 in. honeycomb panel or equivalent (minimum 1,500 lb/ft² crush strength) at the center face of the load to fill center void between pads. The panel height is adjusted for the height of load (i.e., two or three layers high).

6.7.8 Secure the load in each end of the car using 1 5/8 in. ASTM Type 1A, Grade 7, polyester cord straps in a looped application secured to permanent wall anchors. Join with ladder-style buckles at the front of the load. Use the correct buckle and tensioning tools on the straps in accordance with the manufacturer’s instructions. Apply properly to maintain strap tension. Apply strap hangers to all straps to maintain strap position during transit. See Figure 6.15 and 6.16.

Figure 6.15 Load plan for 55 gallon drums in 60 ft cars

Figure 6.16 Side view for 55 gallon drums in 60 ft cars

6.7.9 Bulkheads pads should not be reused if degraded or if they show any sign that use might compromise load integrity.

6.7.10 Use longitudinal separators in upper layers only if needed to ensure a vertical stack at the face of load.
7.0 DOORWAY PROTECTION

7.1 Doorway protection is required to prevent lading from falling or shifting out of the doorway or coming in contact with sliding doors. Protect opening with wooden guide rails, steel straps, or other materials of sufficient strength, and adequately secure.

7.2 Use flush doorway protection in boxcars with sliding doors to prevent the lading from coming into contact with the side doors or to prevent the weight of the lading bearing against the side doors.

7.3 Unit Loads
To keep lading in position, secure openings with 1 1/4 in. × 0.029 in. steel straps or equivalent, covered with corrugated fiberboard. One strap is required for the bottom layer units and two straps for the top layer units.
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<table>
<thead>
<tr>
<th>Part</th>
<th>Subject/Title</th>
<th>Publication Date</th>
<th>Formerly</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Minimum Loading Standards for <strong>Freight</strong> in General Purpose Boxcars</td>
<td>01/2014</td>
<td>Pamphlet No. 14, Minimum Loading Standards for Freight in General Purpose and Specially Equipped Boxcars (12/84)</td>
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<td>3</td>
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</table>

See also:
- *Open Top Loading Rules Manual, Sections 1–7*