Closed Car Loading Guide

Part 3
(formerly Pamphlet No. 8)

Minimum Loading Standards for
Plywood and Similar Panel
Products in Closed Cars
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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. Many commodities or packaging types, such as paper, prepared food, plywood, and intermediate bulk containers, are governed in greater detail in individual closed car loading guides. Commodity-specific guides will normally take precedence over these general guidelines. See the back cover for a complete listing of the Association of American Railroads' (AAR) boxcar loading guides.

1.1.2 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.

1.1.3 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.

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

1.1.5 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.

1.1.6 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.

1.1.7 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.

1.1.8 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 Railroads are responsible for supplying cars that are clean and have sound roofs, sides, and square end walls; 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.

2.2 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.

2.3 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.)

2.4 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.

2.5 Check the end walls to make sure they are not bowed. If the end wall is severely bowed, reject the car. If the end walls are bowed and you need to use the car, use materials of appropriate size and strength to bring the end walls back to square. This will help to ensure that the load remains tight during its journey. See Figure 2.1.

![Figure 2.1 Methods of using fillers to square bowed-end walls](image)
2.6 Check the car floors for any holes or rough surfaces that may result in leakage or damage to the product.

2.7 Inspect the car doors to make sure they open freely, close tightly, and can be secured properly.

2.8 Any deficiencies listed above may be cause for rejecting the railcar back to the railroad. If the shipper elects to load cars with these deficiencies, the shipper is then responsible for temporary repairs to bring the railcar to an acceptable level of quality.

2.9 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).
3.0 LOAD PLANNING

3.1 General Load Planning

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

3.1.2 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.

3.1.3 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.

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

3.1.5 Center bracing may be either wood bracing or pneumatic dunnage. When dunnage is composed of wood blocking, use both vertical and horizontal members of sufficient strength to ensure dunnage does not collapse or become dislodged when experiencing dynamic conditions en route.

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 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.

3.1.11 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. See Figures 3.1 and 3.2.
3.1.12 Carefully load stacks in ends of cars and in the doorway area. Except as otherwise provided, prevent plywood, when loaded, from contacting any portion of the end or side walls. Provide similar protection to prevent contact with the doorposts or side doors of the car. This is a mandatory safety requirement of Circular 42-K or reissue thereof. Shippers are responsible for preventing the lading from making contact with the doors and falling from the car when the doors are opened.

3.1.13 Load plywood or lumber in stacks crosswise or lengthwise of the car. Application of vertical separators or suitable material between the stacks is at the discretion of the shipper, with the exception of machine-edged sheets (e.g., tongue-and-groove and lapped). This type of product requires full sheets of plywood or other adequate protection between end wall fillers and first stacks in each end of the car and between each stack. Increased protection material may also be required for edges that face side walls and edges between rows.

3.2 Generic Load Plans for 50 ft 6 in., 52 ft 6 in., and 60 ft 9 in. Boxcars

3.2.1 Generic load plans for 50 ft 6 in., 52 ft 6 in., and 60 ft 9 in. boxcars are illustrated in Figures 3.3 and 3.4.
3.2.2 Use a combination of end wall fillers, stack separators, and lengthwise fillers to reduce lengthwise space in the doorway.
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4.0 PACKAGING AND UNITIZING

4.1 Overview

4.1.1 Plywood or similar panel products may be packaged with automatic or hand tools. Use a proper combination of strap, seals, and tensioning tools as specified by the manufacturer. Use straps with a minimum breaking strength of 1,200 lb. Seal the strap with a friction weld or heat-seal joint (sealless), with a minimum joint efficiency of 75%. Straps may be applied at a minimum tension of 500 lb with a minimum of 4,000 lb precompression; otherwise with a tension of 900 lb. Strap shall be clearly marked by the strap manufacturer with the “Strap I.D.” spaced at 5 ft intervals (maximum).

4.1.2 Corner protectors are optional at the discretion of the shipper. Any exception to the lading because of strapping indentations due to lack of corner protection is not considered the rail carrier’s responsibility.

4.1.3 For the latest updates of approved strapping, go to the TTCI Web site at http://www.aar.com/standards/open_top_loading_approvals.php.

4.1.4 For packages of specially treated plywood, such as those treated with mineral oil or plastic material for use in concrete forms, use both lengthwise and girth-wise straps to reduce coring of the packages.
4.2 Plywood or Similar Panel Products Such as Oriented Strand Board

4.2.1 Apply package straps not closer than 10 in. from each end of the package and in a perpendicular direction (not slightly askew). On packages of specially treated plywood, such as those treated with mineral oil or plastic material for use in concrete forms, use both lengthwise and girth-wise straps to reduce coring of the packages. See Figure 4.1.

Figure 4.1 Unitizing plywood
4.2.2 Methods shown in Figure 4.2 for tongue-and-groove material eliminate the need for vertical stack separators between crosswise stacks. Vertical separators are required between crosswise stacks at doorway areas and units loaded lengthwise in doorway areas.

![Diagram of packaging tongue-and-groove and machine-edged plywood](image)

*Figure 4.2 Packaging tongue-and-groove and machine-edged plywood*
4.3 Manufactured Board Panels

Apply the required number of straps shown in Table 4.1 for the length of the panel being packaged.

<table>
<thead>
<tr>
<th>Panel Length (in.)</th>
<th>Panel Thickness (in.)</th>
<th>5/16 or Less</th>
<th>3/8</th>
<th>7/16</th>
<th>1/2</th>
<th>9/16 or More</th>
</tr>
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<tr>
<td>120 and above</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>105–119</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>96–104</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>95 or less</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

Place the outside straps 6 in. to 8 in. from each end of the unit. Space the remaining straps evenly between the end straps. Use a 3/4-in.-thick sheet of plywood or particleboard on the bottom when panels are 5/16 in. thick or less. See Figure 4.3.
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.

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.

5.3 Lumber


5.4 Pneumatic Dunnage

Pneumatic dunnage is also referred to as air bags and disposable inflatable dunnage (D.I.D.) bags.

5.4.1 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>
<thead>
<tr>
<th>Level 1</th>
<th>For filling lateral voids, primarily in intermodal loads</th>
</tr>
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<tbody>
<tr>
<td>Level 2</td>
<td>For filling lengthwise voids in loads weighing up to 75,000 lb</td>
</tr>
<tr>
<td>Level 3</td>
<td>For filling lengthwise voids in loads weighing up to 160,000 lb</td>
</tr>
<tr>
<td>Levels 4 and 5</td>
<td>For filling lengthwise voids in loads weighing up to 216,000 lb</td>
</tr>
</tbody>
</table>

5.4.2 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.
5.4.3 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.

5.4.4 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.

5.4.5 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.

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

5.4.7 Void size after inflation will be from 4 in. to 12 in. See applicable commodity publications for possible exceptions to this limitation.

5.4.8 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. See Figure 5.1.

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

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

5.4.11 Use clean and dry air to fill dunnage bags.

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

5.4.13 Use two bag systems unless otherwise specified.

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

5.4.15 See http://www.aar.com/standards/dpls/pfds/PPPPD_Verification_List.pdf for the most current Product Performance Profile for Pneumatic Dunnage Product Verification List.
6.0 LOADING ENDS OF CAR

6.1 Plywood and Other 4 ft by 8 ft Panel Products

6.1.1 Plywood and other panel products are typically loaded with their long dimension crosswise in the car. Stacks may be either centered in the car or alternately loaded against opposite side walls, as shown in Figures 6.1 and 6.2. The combined unfilled crosswise space in the car cannot exceed 18 in. unless lateral fillers are used.

Figure 6.1 Standard loading stacks loaded crosswise alternately against opposite side walls

Figure 6.2 Use of lumber for filling crosswise space and lateral stack stabilizers

6.1.2 Use lateral void fillers if unfilled crosswise space exceeds 18 in. See Figure 6.2.

6.1.3 Stack units alternated against opposite side walls.
6.1.4 Cut appropriately sized sheets of plywood or oriented strand board (OSB, also known as hammer sheets) to extend adjacent from the upper unit risers to within 3 in. of each side wall, as shown in Figure 6.3. Set them in place atop the third layer of bundles to restrict lateral movement.  

![Figure 6.3 Using hammer sheets or hanging fillers in the end of the car](image-url)
6.1.5 Partial packages may be used to fill remaining crosswise space in each stack in the ends of the car, as shown in Figure 6.4.

![Figure 6.4 Dense pack loading—stacks loaded crosswise alternately against opposite side walls with on-end units to fill crosswise space](image)

6.1.6 Never position partial on-end or on-edge packages directly adjacent to the car doors on either side of the car when the packages are oriented parallel to the car side walls.

6.1.7 Secure any on-end or on-edge packages loaded adjacent to the doorway area by using other lading or by bracing to prevent the packages from shifting into the doorway area.

6.1.8 Place plywood separator sheet upright against the first stack at the end wall. Unitize partial unit with two 1 1/4 × 0.029 in. steel straps. Load partial unit on edge on two risers (see Figure 6.5, steps 1, 2, and 3).

6.1.9 Place plywood separator sheet upright against the on-edge unit. Load bottom two units of a second stack against a partial unit. Load top two units of the second stack and unitize with two 1 1/4 × 0.029 in. steel straps. Load bottom two units of third stack. Load partial unit on edge on two risers. Unitize partial unit with two 1 1/4 × 0.029 in. steel straps.

6.1.10 Place plywood separator sheet upright against the top of an on-edge unit. Load top two units of third stack. Unitize with two 1 1/4 × 0.029 in. steel straps.
STEP 1

Figure 6.5 Loading units on edge lengthwise in the end of the car

STEP 2

STEP 3

Figure 6.5 Loading units on edge lengthwise in the end of the car
6.2 Particle Board—5 ft × 8 ft Panels

Figures 6.6 and 6.7 illustrate how to load stacks of particle board crosswise in the end of car, either centered or against opposite side walls.

Figure 6.6 Stacks loaded crosswise and centered in the end of the car

Figure 6.7 Stacks loaded crosswise alternately against opposite side walls
### 6.3 Incomplete Layer Bracing
When weight restrictions prevent the full loading of railcars, stacks of full packs may be stepped down to the lower-height stacks by using half packs and unitizing straps, as shown in Figure 6.8. No full pack may be loaded with less than half its height supported by an adjacent stack, including a half pack. Use corner protectors to protect the lading when the top two packs adjacent to a stack containing a half pack are unitized with strapping.

![Figure 6.8 Bracing an incomplete layer](image)

### 6.4 Lengthwise Fillers
If the lading is rigid in nature and/or very dense, such as lumber or plywood, lengthwise fillers must have a combined crush strength as defined below.

**6.4.1** In cushioned-equipped cars, lengthwise fillers must have a combined crush strength equal to the weight of the load being restrained. In standard draft gear cars, lengthwise fillers must have a combined crush strength equal to twice the weight of the load being restrained. Secure fillers in position.

For example, if the filler is to be located at the end of a standard draft gear car loaded to 150,000 lb, the combined crush strength of the fillers must be \( \geq 300,000 \) lb. If two 4 × 8 ft filler panels are used side by side, their combined area is \( 2 \times 4 \times 8 = 64 \) ft\(^2\). The required minimum crush strength equals 300,000/64 or 4,687.5 lb/ft\(^2\). See Figure 6.9, Example 1, and Figure 6.10.

**6.4.2** Fillers centered in the same load require a minimum crush strength of 2,344 lb/ft\(^2\). See Figure 6.9, Example 3.
Figure 6.9 Minimum strength vs. position in load for lengthwise fillers

Figure 6.10 Using lengthwise fillers
7.0 LOADING DOORWAY AREAS

7.1 Plywood and Other 4 × 8 ft Panel Products without Pneumatic Dunnage (Dense-Pack Loading)

7.1.1 Do not load lading on edge when using the loading procedures described for machine-edged sheets.

7.1.2 Never position partial on-end or on-edge packages directly adjacent to the car doors on either side of the car when oriented parallel to the car’s side walls.

7.1.3 Secure any on-end or on-edge packages loaded adjacent to the doorway area by other lading or by bracing to prevent them from shifting into the doorway area.

7.1.4 Do not stack on-edge packages on other on-edge packages; only one layer of on-edge packages is permitted.

7.1.5 Design loads so that at no time during loading is there more than one on-end or on-edge package left unsupported. Do not rely upon on-end or on-edge packages to support other on-end or on-edge packages.

7.1.6 Secure any package, or portion thereof, constituting an incomplete layer to prevent lengthwise shifting.

7.1.7 Secure all packages loaded lengthwise in the car to prevent lateral shifting.

7.1.8 Package on-end packages that are not loaded on the car floor so that individual sheets cannot fall free of the package.

7.1.9 Plan loads so that stacks loaded lengthwise in the car cannot shift lengthwise beyond the door posts.

7.1.10 Place signage on both sides of the car and both sides of the lading directly inside the car doors. Signage shall include verbiage advising that packages in the load are on-end or on-edge.

7.2 Loading Procedure

7.2.1 Load each end of the car with five stacks placed crosswise. Place each stack alternately against opposite side walls. Fill the remaining crosswise void in each stack with a partial package stood upright on end.

7.2.2 If the last crosswise stack in either end of the car extends above the adjacent package(s) in a lengthwise doorway row, unitize the top two packages of the crosswise stack with one 1 1/4 in. × 0.029 in. steel strap located approximately 2 ft from the end of the stack (see Figure 7.1).
7.2.3 To load an off-door row, begin by loading one package lengthwise against the last crosswise stack in one end of the car (see Figure 7.2).
7.2.4 Stand a partial package on its end on top of the bottom lengthwise package and against the adjacent crosswise stack (The package is a minimum 8 in. thick when stood on end). For tension, place one 5/8 in. × 0.020 in. steel package band lengthwise around the package in addition to girth bands.

7.2.5 Next, load another partial package, minimum 8 in. thick, on its end on the floor in the remaining lengthwise space.

NOTE: The partial package placed on the floor in sequence 5 (Figure 7.2) may be loaded as the last package in the row. In this instance, the remaining three lengthwise packages in the row would be loaded against the first on-end package (loaded in sequence 4, Figure 7.2). The second on-end package would then be slid into the remaining lengthwise void. The two partial packages loaded on-end should be of sufficient size to fill all lengthwise void in the second layer.

7.2.6 Load a second lengthwise package on top of the first. Position it toward the opposite end of the car from the first, against the partial package on the floor. The two partial packages loaded on end should be of sufficient size to fill all lengthwise void in the second layer.

7.2.7 Load the remaining lengthwise packages on top of the second lengthwise package. Figure 7.2 details the load configuration and sequence.

7.2.8 Next, load one partial package lengthwise on its edge against the off-door row (see Figure 7.2). This partial package also has one additional lengthwise 5/8 in. × 0.020 in. package band.

7.2.9 Load the loading-side doorway row similarly to that of the off-door row, except reverse the on-end packages to opposite ends of the stack. Also, set in the third and fourth lengthwise packages in this row over the on-edge package in the center of the car (see Figure 7.3).

7.2.10 Install buffer sheets of 1/4 in. plywood (or equivalent) on both sides of the on-end packages in the doorway area.

7.2.11 Apply one 1 1/4 in. × 0.029 in. steel unitizing strap crosswise around lengthwise doorway units to restrict lateral movement.

7.2.12 Doorway protection is required. See paragraph 8.0.
7.3 Plywood and Other 4 ft × 8 ft Panel Products with Pneumatic Dunnage

7.3.1 Standard Loading with Aligned Doorway Stacks

7.3.1.1 This method is designed for loading plywood or similar panel products like OSB in 50 ft 6 in. boxcars. The load was tested in the “double-door” configuration shown in Figure 7.4. Use pneumatic dunnage bags for lengthwise bracing.

![Figure 7.4 Bracing plywood in aligned doorway stacks with pneumatic dunnage in double-door cars](image)

7.3.1.2 If necessary, use enough 2 × 4 in. lumber to extend above the lading at the ends of the car to square up bowed-end walls and/or to reduce the overall lengthwise void in the boxcar. Hold the uprights in place by nailing them to the end walls (in wood-lined cars), or by taping or using a cross brace at the top of the uprights. If a cross brace is used, position it above the height of the lading.
7.3.1.3 Load each end of the car with stacks placed crosswise. Place each stack alternately against opposite sidewalls. Place four stacks crosswise in each end of the car in double-door cars, and place five stacks in each end for single-door cars (see Figure 7.5). The combined unfilled crosswise space in the car cannot exceed 18 in. unless lateral fillers are used.

![Figure 7.5 Bracing plywood in aligned doorway stacks with pneumatic dunnage](image)

7.3.1.4 If the crosswise stacks are taller than the lengthwise doorway stack(s), the top two units of the last crosswise stack placed in each end of the car taller than the doorway stack are unitized with two 1 1/4 in. × 0.029 in. steel straps located approximately 2 ft from the end of the units. Use corner protectors under the unitizing straps to minimize edge indentations.

7.3.1.5 Load doorway stacks lengthwise, centered in the car. In a double-door car, load two lengthwise stacks, one against the last stack in each end of the car, with the lengthwise void located between the lengthwise doorway stacks.

7.3.1.6 In a single-door car, center the crosswise stack directly adjacent to the location of the void fillers and two pneumatic dunnage bags in the car, and stack at the same height as the doorway stacks, as shown in Figure 7.5. Load the lengthwise doorway stack (two rows) against the last stack in the end of the car opposite the centered crosswise stack, with the lengthwise void located between the lengthwise stack and the centered crosswise stack in the one end of the car.

7.3.1.7 Fill the lengthwise void in the doorway area with void fillers and pneumatic dunnage. The void fillers have an expanded cellular honeycomb core constructed of paperboard and paperboard facing sheets with a minimum uniform crush strength of 2,500 lb/ft². Use 3 in. wide void fillers of sufficient height to extend to the top of the lading surface to which they are adjacent. A minimum of one void filler is required on each side of each pneumatic dunnage (total of four) to serve as buffers. Use enough void fillers so that the remaining void filled by the dunnage is from 4 in. to 12 in. after the bag is inflated.

7.3.1.8 Lengthwise void fillers of other construction may be used in lieu of those described as long as they meet the above size and strength requirements and provide a uniform smooth contact surface for the dunnage.
7.3.1.9 Install two pneumatic dunnage bags between the void fillers, one in each row of the lengthwise doorway stack(s). The pneumatic dunnage bags are minimum 3 ft wide and tall enough to extend from 1 in. above the floor to the top of the doorway stacks. The bags must not extend beyond the lading. If the pneumatic dunnage bag twists or moves out of alignment during inflation, deflate the bag, reinstall it properly, and reinflate it.

7.3.1.10 Use the appropriate level of pneumatic dunnage for the weight of the load as listed in Table 5.1. Inflate level 3 pneumatic dunnage bags to 6 psi; inflate level 4 or 5 bags to 8 psi. Check the bags for leakage 30 minutes after inflation.

7.3.1.11 Unitize the doorway stacks with one 1 1/4 in. × 0.029 in. steel strap per stack, encircling both rows of the doorway stacks to restrict lateral movement. Use corner protectors under the unitizing straps to minimize edge indentations.

7.3.1.12 Doorway protection is required. See paragraph 8.0.

7.3.2 Standard Loading with Offset Doorway Stacks

7.3.2.1 This method is designed for loading plywood in single-door boxcars with inside lengths of 50 ft to 50 ft 8 in. Use the appropriate level of pneumatic dunnage for the weight of the load as listed in Table 5.1. Inflate level 3 pneumatic dunnage bags to 6 psi; inflate level 4 or 5 bags to 8 psi. Check the bags for leakage 30 minutes after inflation.

7.3.2.2 If necessary, use enough 2 × 4 in. lumber to extend above the lading at each end wall to reduce the amount of lengthwise void in the doorway area. Hold the uprights in place by nailing them to the end walls (in wood-lined cars), by taping, or by using a cross brace at the top of the uprights. If a cross brace is used, position it above the height of the lading (see Figure 2.1). As an alternative, this blocking also may be positioned between stacks. The doorway voids filled by the pneumatic dunnage bags must not exceed 12 in. after inflation.

7.3.2.3 Load each end of the car with five stacks of plywood units placed crosswise to the car. Alternate the first four stacks in each end against opposite sides of the car. Center the last stack in each end of the car (see Figure 3.1). If the last crosswise stack in either end of the car extends above the doorway units, unitize the top two packages of that crosswise stack with two 1 1/4 in. × 0.029 in. steel straps, positioning one strap approximately 2 ft from each end of the stack.

7.3.2.4 Begin the off-door doorway area row by loading a half package lengthwise against the last crosswise stack in one end of the car. Place a sheet of plywood or corrugated fiberboard on top of this package at the end that is loaded tight against the crosswise stack. This lumber or fiberboard should extend onto the top of the half package in the adjacent crosswise stack and is used to ensure that buffer sheets or pneumatic dunnage bags do not slip down in transit.
7.3.2.5 Load the remaining lengthwise units in the row on top of the first unit, tight against the last crosswise stack in the opposite end of the car (see Figure 7.6).

Figure 7.6 Bracing plywood in offset doorway stacks with pneumatic dunnage with air bags at the same end of the doorway stacks

7.3.2.6 Place the appropriate level pneumatic dunnage bag in the remaining void between the top lengthwise units and the crosswise stack. Place 1/2 in. plywood (or equivalent) buffer sheets on each side of the bag. Inflate the pneumatic dunnage bag to the appropriate psi for the level of bag. The void filled by the bag must not exceed 12 in. after inflation. See paragraph 7.3.2.2 if blocking is needed to reduce the void for bag placement.
7.3.2.7 Load the loading-side doorway row similarly to the off-door row. The loading side pneumatic dunnage bag may be located at the same end of the doorway as the first bag, as shown in Figure 7.6, or the location can be reversed to the opposite end of the doorway area, as shown in Figure 7.7. If the pneumatic dunnage bag is at the opposite end of the doorway area, place the lengthwise packages against the last crosswise stack in the opposite ends of the car from the off-door row.

Figure 7.7 Bracing plywood in offset doorway stacks with pneumatic dunnage with air bags at opposite ends of the doorway stacks

7.3.2.8 Apply two 1 1/4 in. × 0.029 in. steel straps crosswise around the lengthwise doorway units to unitize the rows and restrict lateral movement. Use corner protectors under the unitizing straps.

7.3.2.9 Doorway guide rails are required as doorway protection. If package risers are attached to the packages by the package straps, place 4 in. × 7 ft lumber (minimum) lengthwise adjacent to the bottom bundle on each side of the car. Secure by nailing to the car floor with a minimum of six 16d (3 1/2 in.) nails. If the risers are not secured to the packages, use guide rails consisting of two pieces of 2 in. × 4 in. × 7 ft laminated lumber.

7.3.2.10 After loading is completed, leave car door open and recheck air pressure 30 minutes after inflation for leakage.
7.3.3 Standard Loading with Aligned Doorway Stacks of Different Heights

7.3.3.1 This method is designed for loading full and half bundles of plywood in single-door boxcars that can be unloaded from either door. The doorway loading method applies to boxcars of any length and is applicable when the top of the doorway opening is lower than the top of the load. Use the appropriate level of pneumatic dunnage for the weight of the load as listed in Table 5.1. Inflate level 3 pneumatic dunnage bags to 6 psi; inflate level 4 or 5 bags to 8 psi. Check the bags for leakage 30 minutes after inflation.

7.3.3.2 Use blocking, minimum 2 × 4 in. × height of load, at each end wall to reduce the amount of lengthwise void in the doorway area. See Figure 2.1 for installation. As an alternative, this blocking also may be positioned between stacks. The doorway voids filled by the pneumatic dunnage bags must not exceed 12 in. after inflation.

7.3.3.3 Load each end of the car with alternated stacks in each end against opposite sides of the car. Center the last stack in each end of the car (see Figure 7.6).

7.3.3.4 Begin the off-door doorway area row by loading three full bundles lengthwise against the last crosswise stack in one end of the car. Evenly position two 2 in. × 4 in. × 5 ft pieces of laminated lumber or two 4 in. × 4 in. × 5 ft pieces of lumber on top of the upper bundle. This lumber acts as a riser for a half bundle that is loaded atop the risers. Apply one 1 1/4 in. × 0.029 in. steel strap crosswise to unitize the topmost full and half bundles. Use corner protectors under the unitizing straps. See Figure 7.8.

7.3.3.5 Place the appropriate level pneumatic dunnage bag in the remaining void between the lengthwise doorway units and the crosswise stack. Place 1/2 in. plywood (or equivalent) buffer sheets on each side of the bag. Inflate the pneumatic dunnage bag to the appropriate psi for the level of bag. The void filled by the bag must not exceed 12 in. after inflation.

7.3.3.6 Load the loading-side doorway row with three full bundles lengthwise against the last crosswise stack in one end of the car similarly to the off-door row. Apply one 1 1/4 in. × 0.029 in. steel strap crosswise around the bottom three lengthwise doorway units to unitize both rows and restrict lateral movement. Use corner protectors under the unitizing straps.
7.3.3.7 Place the appropriate level pneumatic dunnage bag in the remaining void between the lengthwise doorway units and the crosswise stack.

**NOTE:** This pneumatic dunnage bag will be of shorter dimension than that of the adjacent lengthwise doorway stack.

Place 1/2 in. plywood (or equivalent) buffer sheets on each side of the bag. Inflate the bag to the appropriate psi for the level of bag. The void filled by the bag must not exceed 12 in. after inflation.

7.3.3.8 Doorway guide rails are required as doorway protection. If package risers are attached to the packages by the package straps, place 2 in. × 4 in. × 7 ft lumber (minimum) lengthwise adjacent to the bottom bundle on each side of the car. Secure by nailing to the car floor with a minimum of six 16d (3 1/2 in.) nails. If the risers are not secured to the packages, use guide rails consisting of two pieces of 2 in. × 4 in. × 7 ft laminated lumber.

7.3.3.9 After loading is completed, leave the car door open and check pneumatic dunnage bags for leakage 30 minutes after inflation.

7.3.4 Unloading Doorway Stacks of Different Heights

7.3.4.1 If the car is placed with the off-loading door dockside and the topmost bundle is above the door opening, cut and remove the 1 1/4 in. × 0.029 in. steel strap unitizing the topmost two bundles.

7.3.4.2 Cautiously push the top half bundle across the risers so that the half bundle is now atop the adjacent lengthwise three-stacks-high stack. **CAUTION:** Avoid contacting the door frame or top door track with the forklift mast.

7.3.4.3 Continue to unload the doorway bundles proceeding to each end of the boxcar.

7.3.5 Dense-Pack Loading with Offset Doorway Stacks

7.3.5.1 This method is designed for loading plywood in single-door boxcars. Use 48 in. × 96 in. pneumatic dunnage bags as lengthwise bracing, as shown in Figure 7.9. This method does not allow on-end or on-edge partial packages loaded in the doorway area.

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**Figure 7.9** Bracing dense-pack plywood in offset doorway stacks with pneumatic dunnage
7.3.5.2 Load each end of the car with five stacks placed crosswise. Place each stack alternately against opposite sidewalls. Fill the remaining crosswise void in each stack with a partial package positioned upright on end. All stacks are 3 1/2 packages high. Position the half package in the last crosswise stack in each end of the car (adjacent to the doorway area) on the floor (see Figure 6.4.)

7.3.5.3 Secure on-end packages loaded adjacent to the doorway area with other lading or bracing to prevent the packages from shifting into the doorway.

7.3.5.4 Begin the off-door row by loading a half package lengthwise against the last crosswise stack in one end of the car. Place a piece of lumber or corrugated fiberboard on top of the half package at the end loaded tight against the crosswise stack. This lumber should extend onto the top of the half package in the adjacent crosswise stack and ensures buffer sheets do not slip down in transit (see Figure 7.10).

Figure 7.10 Bracing dense-pack plywood in offset doorway stacks with pneumatic dunnage—completed doorway

7.3.5.5 Load the remaining lengthwise packages in the row on top of the first, tight against the last crosswise stack in the opposite end of the car.

7.3.5.6 Place a pneumatic dunnage bag in the remaining void between the top lengthwise units and the crosswise stack. Place 1/2 in. plywood buffer sheets on each side of the bag. Use the appropriate level of pneumatic dunnage for the weight of the load as listed in Table 5.1. Inflate level 3 pneumatic dunnage bags to 6 psi; inflate level 4 or 5 bags to 8 psi. Check the bags for leakage 30 minutes after inflation. The void filled by the bag must not exceed 12 in. after inflation. Use end-wall blocking if required to reduce the void for the bag placement.

7.3.5.7 Load the loading-side doorway row similarly to the off-door row, except reverse the location of the pneumatic dunnage bag to the opposite end of the lengthwise stack. As a result, the lengthwise packages are positioned against the last crosswise stack in the opposite ends of the car from the off-door row.

7.3.5.8 Apply one 1 1/4 in. × 0.029 in. steel strap crosswise around the lengthwise doorway units to restrict lateral movement.

7.3.5.9 Doorway protection is required. See paragraph 8.0.
7.3.6 Dense-Pack Loading with Aligned and Inset Doorway Stacks

7.3.6.1 This method is designed for loading plywood in single-door boxcars with inside lengths of 50 ft to 50 ft 8 in. Use disposable pneumatic dunnage bags as lengthwise bracing for this load, as shown in Figure 7.11.

7.3.6.2 Load each end of the car with five stacks placed crosswise. Place each stack alternately against opposite sidewalls. Fill the remaining crosswise void in each stack with a partial package stood upright on end.

7.3.6.3 If the last crosswise stack in either end of the car extends above the adjacent package(s) in a lengthwise doorway row, unitize the top two packages of the crosswise stack with one 1 1/4 in. × 0.029 in. steel strap located approximately 2 ft from the end of the stack.

7.3.6.4 Begin the off-door row by loading one package lengthwise against the last crosswise stack.

7.3.6.5 Stand a partial package on-end on the floor adjacent to the end of the lengthwise package. Move the lengthwise package tight against the on-end unit.

7.3.6.6 Load the remaining lengthwise packages in the row on top of the first, tight against the on-end package. Place a 1 1/4 in. × 0.029 in. steel strap lengthwise around the top package in addition to the bands already in place.

7.3.6.7 Place a pneumatic dunnage bag in the remaining void between the lengthwise and crosswise stacks. Place 1/2 in. plywood buffer sheets on each side of the bag. Use the appropriate level of pneumatic dunnage for the weight of the load as listed in Table 5.1. Inflate level 3 pneumatic dunnage bags to 6 psi; inflate level 4 or 5 bags to 8 psi. Check the bags for leakage 30 minutes after inflation. The void filled by the bag shall not exceed 12 in. after inflation. End-wall blocking may be required to reduce the void for the bag placement.
7.3.6.8 Load a partial package on-edge lengthwise on the floor against the off-door row, as shown in Figure 7.12. Place one 5/8 in. × 0.020 in. steel band lengthwise around the package in addition to the bands already in place.

Figure 7.12 Bracing dense-pack plywood in aligned doorway stacks with pneumatic dunnage—on-edge unit lengthwise

7.3.6.9 Load the loading-side doorway similarly to the off-door row, except reverse the location of the on-end package and pneumatic dunnage bag to the opposite ends of the lengthwise stack. Set the top packages in this row over the on-edge package in the center of the car. Place a 1 1/4 in. × 0.029 in. steel strap lengthwise around the top package in addition to the bands already in place, as shown in Figure 7.13.
Figure 7.13 Bracing dense-pack plywood in aligned doorway stacks with pneumatic dunnage—completed doorway

7.3.6.10 Apply one 1 1/4 in. × 0.029 in. steel strap crosswise around the lengthwise doorway units to restrict lateral movement.

7.3.6.11 Doorway protection is required. See paragraph 8.0.
7.3.7 Dense-Pack Loading with Aligned and Inset Doorway Stacks in Double-Door Cars

7.3.7.1 This method is designed for loading plywood in boxcars with inside lengths of 52 ft to 52 ft 8 in. and 60 ft 6 in., with double-door openings 16 ft wide. Pneumatic dunnage bags are used as lengthwise bracing for this load. Figure 7.14 shows this load for a 52 ft 6 in. boxcar.

7.3.7.2 Load each end of the car with five stacks placed crosswise. Place each stack alternately against opposite sidewalls. Fill the remaining crosswise void in each stack with a partial package stood upright on end.

7.3.7.3 Load the off-door row two wide. Begin by loading full packages lengthwise against the crosswise stacks in each end.

7.3.7.4 After the off-door row is completed, place a pneumatic dunnage bag in the void between the two lengthwise stacks. Place a 1/2 in. plywood buffer sheet on each side of the bag. Inflate the bag to 8 psi. The void filled by the bag shall not exceed 12 in. after inflation.
7.3.7.5 Load two partial packages lengthwise on-edge on the floor against the off-door stacks (see Figures 7.14 and 7.15). Place one 5/8 in. × 0.020 in. steel band lengthwise around each on-edge package in addition to the bands already placed.
7.3.7.6 Load the loading-side doorway similarly to the off-door side, except set the top packages in each stack in this row over the on-edge packages in the center of the car. After loading is completed, place buffer sheets and a pneumatic dunnage bag in the void between the lengthwise stacks on the loading side, as shown in Figure 7.16. Use the appropriate level of pneumatic dunnage for the weight of the load as listed in Table 5.1. Inflate level 3 pneumatic dunnage bags to 6 psi; inflate level 4 or 5 bags to 8 psi. Check the bags for leakage 30 minutes after inflation.

![Figure 7.16 Bracing dense-pack plywood in aligned doorway stacks with pneumatic dunnage in double-door cars—completed doorway](image)

7.3.7.7 Apply one 1 1/4 in. × 0.029 in. steel strap crosswise around each lengthwise doorway stack to restrict lateral movement.

7.3.7.8 Doorway protection is required. See paragraph 8.0.

7.4 Particle Board—5 ft × 8 ft Panels with a Single Pneumatic Dunnage Bag

7.4.1 Single Air Bag, Single Lengthwise Doorway Stack

7.4.1.1 Place two 48 in. × 108 in. × 1/2 in. thick closed-cell honeycomb filler panels or other suitable filler at each end wall.

7.4.1.2 Load the stacks in the ends of the car crosswise to the car. Load the first stack in each end at the end wall and against one side wall. Load the remaining stacks in each end of the car tightly against the preceding stack and against the opposite side wall from the preceding stack (see Figure 7.17). Use one 48 in. × 108 in. × 1/2 in. thick closed-cell honeycomb filler panel between each crosswise stack and the adjacent side wall to prevent edge damage.
Figure 7.17 Bracing particleboard with a single pneumatic dunnage bag and a single doorway stack—completed load

7.4.1.3 Unitize the last crosswise stack, next to the doorway area, in each end of the car with one 1 1/4 in. \times 0.029 in. steel strap. Use corner protectors under unitizing straps to protect straps and lading.

7.4.1.4 Load one stack of particle board lengthwise and center in the doorway area. Unitize the lengthwise stack with one 1 1/4 in. \times 0.029 in. steel strap. Use corner protectors under unitizing straps to protect straps and lading.

7.4.1.5 Fill remaining lengthwise void with 48 in. \times 108 in. \times 1/2 in. thick closed-cell honeycomb filler panels and one 60 in. \times 96 in. pneumatic dunnage bag. Position the pneumatic dunnage bag at one end of the lengthwise stack. Use the appropriate level of pneumatic dunnage for the weight of the load as listed in Table 5.1. Inflate level 3 pneumatic dunnage bags to 6 psi; inflate level 4 or 5 bags to 8 psi. Check the bags for leakage 30 minutes after inflation. At least one honeycomb filler panel is required on each side of the pneumatic dunnage bag to serve as protective buffer sheets. If additional filler panels are needed, they may be positioned at either end of the lengthwise stack. The void space filled by the pneumatic dunnage bag shall not exceed 12 in. after the bag is inflated.

7.4.1.6 Apply doorway protection guide rails; i.e., one 2 in. \times 4 in. \times 96 in. piece of lumber secured by a minimum of six 16d (3 1/2 in.) nails on each side of lengthwise stack.
7.4.2 Two Air Bags, Single Lengthwise Doorway Stack

7.4.2.1 For methods to square bowed-end walls, see Figure 2.1.

7.4.2.2 Load packages crosswise in the ends of the car. Center stacks in the car with a uniform crosswise space at either end of the stacks. Aggregate crosswise space shall not exceed 18 in. unless appropriate additional bracing or filler material is used.

7.4.2.3 One or two rows of packages may be loaded lengthwise in the doorway area. Center row(s) loaded in the doorway as shown in Figures 7.17 and 7.18.

Figure 7.18 Bracing particleboard with two pneumatic dunnage bags and a single doorway stack—completed load
**LOADING DOORWAY AREAS**

**7.4.2.4** When the height of a stack is greater than the height of adjacent lengthwise void filler or dunnage bags, unitize the top two packages in that stack with two 1 1/4 in. × 0.029 in. steel straps, as shown in Figure 7.19.

Figure 7.19 Bracing particleboard with two pneumatic dunnage bags and a single doorway stack—completed doorway

**7.4.2.5** Use the appropriate level of pneumatic dunnage for the weight of the load as listed in Table 5.1. Inflate level 3 pneumatic dunnage bags to 6 psi; inflate level 4 or 5 bags to 8 psi. Check the bags for leakage 30 minutes after inflation. Maximum fill space is 12 in. and minimum fill space is 6 in. after inflation. Use 1/4 in. sheets of particleboard (or equivalent) buffer material between the face of the load and pneumatic dunnage bag.

**7.4.2.6** Apply guide rails and unitizing straps as doorway protection.
7.4.3 Two Air Bags, Two Lengthwise Doorway Stacks

Figure 7.20 illustrates how to brace particleboard with two pneumatic dunnage bags and two doorway stacks in a completed doorway.

Figure 7.20 Bracing particleboard with two pneumatic dunnage bags and two doorway stacks—completed doorway
8.0 DOORWAY PROTECTION

8.1 Doorway protection is required to prevent lading from falling or shifting out of the doorway or coming in contact with sliding doors.

8.2 For plywood and similar panel products in sliding or plug-door cars, use two Type 1A, Grade 4, nonmetallic unitizing straps around the lengthwise stacks in the doorway. See Figure 8.1.

![Figure 8.1 Doorway protection for sliding or plug-door cars loaded with plywood](image-url)
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<td>Pamphlet No. 6, Minimum Requirements for Loading, Bracing and Blocking Carload Shipments of Building Brick in Closed Cars (8/83)</td>
</tr>
<tr>
<td>6</td>
<td>Minimum Loading Standards for <strong>Prepared Food and Similarly Packaged Products</strong> in Closed Cars</td>
<td>02/2014</td>
<td>Pamphlet No. 17, Minimum Loading Standards for Packaged Food Products in Closed Cars and TOFC/COFC (10/88)</td>
</tr>
<tr>
<td>7</td>
<td>Minimum Loading Standards for <strong>Intermediate Bulk Containers</strong> in Closed Cars</td>
<td></td>
<td>New</td>
</tr>
<tr>
<td>8</td>
<td>Minimum Loading Standards for <strong>Bagged and Baled Commodities</strong> in Closed Cars</td>
<td></td>
<td>Pamphlet No. 3, Minimum Loading Standards for Bagged and Baled Commodities in Closed Cars (10/93)</td>
</tr>
<tr>
<td>9</td>
<td>Minimum Loading Standards for <strong>Coiled Metal Products</strong> in Closed Cars</td>
<td></td>
<td>Pamphlet No. 23, Minimum Standards for Loading Steel Products in Closed Cars, Trailers or Containers (4/95)</td>
</tr>
<tr>
<td>10</td>
<td>Minimum Loading Standards for <strong>Primary Metal Products</strong> in Closed Cars</td>
<td></td>
<td>Pamphlet No. 37, Minimum Standards for the Safe Loading of Ingots, Pigs, Anodes, Rods and Similar High Density Metallic Commodities in Closed Cars (11/84)</td>
</tr>
</tbody>
</table>

See also:
- Intermodal Loading Guide for Products in Closed Trailers and Containers (7/2011)
- Open Top Loading Rules Manual, Sections 1–7